

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW



EVALUATION SCHEME & SYLLABUS FOR B. TECH. FOURTH YEAR

Textile Technology

Based On

**AICTE Model Curriculum & NEP2020
[Effective from the Session: 2025-26]**

STUDY AND EVALUATION SCHEME
B. Tech. Textile Technology

Effective from SESSION-2025-26

		SEMESTER VII												
Sl. No	Subject Code	Subject	Learning Mode	LTP			Evaluation Scheme						Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	BTT701	Garment Manufacturing Technology	Offline	3	-	-	20	10	30	-	70	-	100	3
2	BTT070/ BTT071/ BTT072	Departmental Elective-IV	Offline	3	-	-	20	10	30	-	70	-	100	3
3	BOEM**	Open Elective-II	Offline/ MOOCs	3	0	0	20	10	30	-	70	-	100	3
4	BTT751	Garment Manufacturing Technology Lab	Offline	0	0	2	-	-	-	50	-	50	100	1
5	BTT752	Mini Project or Internship Assessment*		0	0	4	-	-	-	100	-	-	100	2
6	BTT753	Project-I		0	0	10	-	-	-	150	-	-	150	5
7	BTT754	Startup and Entrepreneurial Activity Assessment#		0	0	4	-	-	100	-	-	-	100	2
		Total		9	0	20							750	19
		*The Mini Project or internship (5-6 weeks) conducted during summer break after VI semester and will be assessed during VII semester. #The Startup and Entrepreneurial Activity Assessment will be done in 7 th semester under which a student will have to undergo a startup/entrepreneurship activity of at least 60 hours till 6 th semester												

		SEMESTER VII												
Sl. No	Subject Code	Subject	Learning Mode	LTP			Evaluation Scheme						Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	BOEM**	Open Elective-III	MOOCs	3	0	0	20	10	30	-	70	-	100	3
2	BOEM**	Open Elective-IV	MOOCs	3	0	0	20	10	30	-	70	-	100	3
3	BTT851	Project-II		0	0	18	-	-	-	100		350	450	10
		Total		6	0	18	24						650	16

The Internal Assessment of MOOCs will be done by the respective institute and the External Assessment (End Semester Examination) will be done by the University.

B. Tech 4th Year
VII Semester Syllabus

BTT701	Garment Manufacturing Technology	(L-T-P: 3-0-0)	3 Credits
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Course Objectives:

- 1.To familiarize with various processes involved in garment manufacturing, human body measurements and pattern making terms.
2. To develop understanding of marker planning, spreading, cutting and fusing processes.
3. To acquire knowledge of sewing and finishing processes, machinery used and other associated aspects.
4. To understand and apply the concept of Industrial Engg to improve productivity and efficiency of a garment manufacturing unit.
5. To understand and resolve various quality related aspects involved at various stages of garment manufacturing.

Unit 1: Overview of Indian and Global apparel industry, Introduction to garment manufacturing process, Garment classification; familiarisation with body measurements for men, women and kids; patternmaking terminologies.

Total Lectures Required: 8

Unit 2: Pre-Sewing Operations: principles and objectives of marker planning, marker efficiency, computerised marker planning techniques, fabric spreading and its requirements, cutting process-objective of cutting, different methods of cutting; fusing-means, equipment, methods, and requirements.

Total Lectures Required: 8

Unit 3: Sewing and finishing: Definition of stitch and seam, their classifications and applications; methods of stitch formation, Classification of sewing machines, commonly used sewing machines and their main parts and functions; Different feed systems; Sewing thread–types, properties, applications, ticket number; Calculations of sewing thread consumption, sewing needles and its types; garment finishing processes, Pressing- purpose, categories, means, equipment and methods.

Total Lectures Required: 8

Unit 4: Production Planning and Industrial Engg: Introduction to Industrial Engg, Concept of SAM, SMV, Performance Rating, allowances, Productivity, Efficiency, Time study and Method study; Line-balancing, preparation of operation bulletin, work-aids; Production Planning and Control.

Total Lectures Required: 8

Unit 5: Quality Control: Fabric inspection systems; sewing thread quality requirements; cutting and fusing defects, stitch and seam defects, sewing defects; finishing defects, Acceptable quality level(AQL).

Total Lectures Required: 8

Grand Total Lectures Required: 40

Course Outcome:

At the end of the course, students will develop adequate knowledge and skills to be able to work in garment industry. They will be able to:

1. Understand human body measurements and pattern making terminologies.
2. Apply marker planning, spreading, cutting, sewing and finishing techniques in garment industry.
3. Identify and explain various types of machinery used in garment manufacturing.
4. Apply industrial engineering concepts in garment industry.
5. Identify and resolve quality issues occurring at different stages of garment manufacturing.

Textbooks and References:

1. Harold Carr and Barbara Latham, "The Technology of clothing manufacture", 4th Edition Wiley-Blackwell, 2008.
2. Gerry Cooklin, Steven George Hayes and John McLoughlin, "Introduction to Clothing Manufacture", Wiley-Blackwell, 2006.
3. Helen J Armstrong, "Pattern Making for Fashion Design", 5th Edition, Prentice Hall, Tokyo, 2006.
4. R. Rathinamoorthy and R. Surjit, "Apparel Machinery and Equipments", Woodhead Publishing India Pvt. Ltd, New Delhi, 2015.
5. Mehta P. V., "Managing quality in the apparel industry", New Age International, Chennai, 1998.
6. Laing R.M. and Webster J, "Fundamentals of stitches and Seams", Textile Institute, 1998.
7. Jacob Solinger, "Apparel Manufacturing Handbook", Van Nostrand Reinhold Company, 1988.

Departmental Elective-IV

BTT070	Process Control in Spinning and Weaving	(L-T-P: 3-0-0)	3 Credits
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Course Objectives:

- 1 To familiarize the students with concept of process control, tools and techniques of process control and its importance in achieving quality objectives and reduction of waste.
- 2.To familiarize the students on various process and quality related problems faced during yarn production and measures to achieve quality objectives.
3. To understand scope and systems of process control in weaving, setting norms and schedule of checks, machinery audit.
4. To understand the process control in warping, minimizing end breakage in warping, quality of warping beam.
5. To understand the process control in loom shed, snap study, time and motion study, control of warp and weft breakage, causes and remedies of fabric defects.

Unit-1: Process control and its importance, application of various tools and techniques for process control, cotton fibre selection and bale management system, ways to achieve quality and cost optimization, control of waste in spinning, cleaning efficiency of blow room and card, yarn realization, control of neps and fibre rupture, assessment of performance of blow room & card.

Total Lectures Required: 8

Unit -II: Means to improve productivity and machine efficiency, controlling end-breakage rate in ring spinning, control of yarn faults and package defects, classimat faults, control of yarn quality-count, lea strength and their variability, study of CV% (within bobbin and between bobbin), single yarn strength and elongation, control of yarn unevenness, imperfections and hairiness, process control measures at different stages of yarn spinning.

Total Lectures Required: 8

Unit-III: Scope of process control in weaving, systems of process control in weaving, setting norms and schedule of checks, machinery audit, optimizing quality of winding, control of quality of knot, producing good package, dressing of the beams for reducing incidence of cross ends.

Total Lectures Required: 8

Unit IV: Process control in warping, minimizing end-breakage in warping, quality of warping beam, control of productivity, factors responsible for loss in efficiency, control of productivity, process control in sizing, choice of recipe and size pick-up, control of size pick-up, control of yarn stretch, quality of sized beams.

Total Lectures Required: 8

Unit V: Process control in loom shed, snap study, time and motion study, control of warp and weft breakage, causes and remedies of fabric defects, factors responsible for loss in efficiency, control of productivity, process control in grey inspection, and folding sections

Total Lectures Required: 8

Grand Total Lectures Required: 40

Course Outcome: At the end of the course, students will develop adequate knowledge and skills to:

1. Explain the importance of process control in various area of spinning process.
2. Describe productivity, means to improve productivity, maximizing machine efficiency in ring spinning.
3. Explain process control in weaving, setting norms and schedule of checks, machinery audit.
4. Explain process control in warping, minimizing end breakage in warping, quality of warping beam,
5. Explain process control in loom shed, snap study and time and motion study, control of warp and weft breakage, causes and remedies of fabric defects.

Text Books and References :

1. Process Control in Textile Manufacturing, edited by A. Majumdar, A. Das, R. Alagirusamy and V. K. Kothari, Woodhead Publisher (2011).
2. Evenness Testing in Yarn Production, Part I and II, by R. Fruter, The Textile Institute, Manchester (1982).
3. Seminar on Process Control in Spinning, Edited by R. Chattopadhyay, IIT Delhi (2001),
4. On line Quality Control in Spinning and Weaving, Textile progress, Vol 17, No.1/2
5. Total Quality management by D. H. Besterfield, C. Besterfield-Michna, G. H. Besterfield, M. Besterfield-Sacre, H. Urdhwareshe, R. Urdhwareshe, Pearson, New Delhi (2012).

BTT071	Sustainability in Textile Industry	(L-T-P: 3-0-0)	3 Credits
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Course Objectives: The course aims to introduce the concept of sustainability in various stages of textile and apparel manufacturing, understanding of the environmental issues in textile supply chain and familiarity with guidelines and regulations that support sustainable textile production practices.

Unit-1 : Defining sustainability and circularity, three dimensions of sustainability, sustainable development goals, Net zero. Environmental impacts of textile and fashion industry, resource consumption (water, energy etc.) in fibre production, yarn manufacturing, fabric manufacturing, and chemical processing; Types of emissions, scopes I, II and III, measuring carbon footprints, decarbonizing textile supply chain; Case study of Tirupur textile industry.

Total Lectures Required: 8

Unit-2 : Sustainable textile processes, restricted substances for textile and clothing industry; Concepts of green chemistry, natural dyeing, supercritical carbon dioxide, ozone, UV and plasma technologies, foam dyeing, dope dyed fibres; Renewable energy sources, solar, hydro, wind, etc. Effluent treatment, primary, secondary and tertiary treatments, zero liquid discharge (ZLD); Standards of BOD, COD, TDS, TSS, pH, and heavy metals.

Total Lectures Required: 8

Unit 3: Circularity, circular design, 3Rs (reduce, reuse and recycle), RESOLVE framework, restoration and regeneration; Textile recycling, upcycling, and downcycling, open-loop and close-loop recycling, sorting technology; Methods of recycling, mechanical, thermal and chemical recycling, recycling of pre and post-consumer textiles, challenges.

Total Lectures Required: 8

Unit 4: Life cycle analysis, cradle-to-gate, cradle-to-grave, and cradle-to-cradle approaches, cut-off and allocation approaches, system boundary; Steps of LCA, unit of analysis, inventory assessment, impact assessment, and interpretation; Case studies related to LCA analysis of textile products. Traceability- the need for traceability in the textile value chain, use of blockchain and fibre tags/coins for traceability

Total Lectures Required: 8

Unit 5: Standards and certifications, needs, ISO 14000, Oeko-tex 100, Higg- index, GOTS, SMETA members ethical trade audit (SEDEX), Global Recycled Standard (GRS). Environmental, social and governance (ESG) factors, social sustainability issues in textile and fashion industry, governance mechanisms; Case of Rana Plaza disaster.

Total Lectures Required: 8

Grand Total Lectures Required: 40

Course Outcomes: At the end of the course, students will develop familiarity and understanding of various aspects related to sustainability in textile and apparel industry. Specifically, they will develop:

1. An understanding of the textile supply chain, associated sustainability issues, environmental impact; carbon footprint; resources used in textile manufacturing and how to reduce consumption of these resources.
2. Understanding of Sustainable textile processes, Green Chemistry, Renewable energy sources, effluent treatment and concept of zero liquid discharge (ZLD).
3. An understanding of Circularity, Recycling and methods of recycling
4. Familiarity with the concept of Life cycle analysis and traceability.
5. Familiarity with regulations and standards promoting sustainability in textile supply chain.

Textbooks and References:

1. Sustainable Textiles: Life Cycle and Environmental Impact by R. Blackburn, Woodhead Publishing Series, 2009.
2. Roadmap to Sustainable Textiles and Clothing: Eco-friendly Raw Materials, Technologies, and Processing Methods edited by S. S. Muthu, Springer (2014).
3. Roadmap to Sustainable Textiles and Clothing: Environmental and Social Aspects of Textiles and Clothing Supply Chain edited by S. S. Muthu, Springer (2014).
4. Roadmap to Sustainable Textiles and Clothing: Regulatory Aspects and Sustainability Standards of Textiles and the Clothing Supply Chain edited by S. S. Muthu, Springer (2015).
5. Sustainable coloration of Textiles edited by S. S. Muthu, Springer (2015).
6. Life Cycle Assessment- Theory and Practice by Michael Z. Hauschild, Ralph K. Rosenbaum, Stig Irving Olsen, Springer (2018).
7. Blackburn, R.S. (2009) Sustainable Textiles: Lifecycle and Environmental Impact: Woodhead Publishing Series in Textiles, ISBN: 9781845694531. □
8. Jain, C. (2016) Simplifying Corporate Sustainability – A guide to implementing Sustainable Practices in Textile Industry: Createspace Independent Pub. ISBN 978-981-11-0386-5. □
9. Gardetti, M.A., Torres, A.L. and Gardetti, M.A.(2013) Sustainability in Fashion and Textiles, Greenleaf Publishing Limited, ISBN 978-1-906093-78-5 (hbk). □
10. <https://www.cceindia.org/file/ZLD-Concept-note.pdf>

BTT072	High Performance Fibres and Composites	(L-T-P: 3-0-0)	3 Credits
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Course Objectives: The objective of this course is to introduce the manufacturing methods and properties of various high-performance fibres known for their high tensile properties or thermal resistance. Another objective of this course is to familiarize the students with fibre reinforced composites, their manufacturing methods and evaluation.

Unit 1: Introduction, history and development of high-performance fibres, Aramid fibres, polymerisation of meta and para-aramid, concept of liquid crystalline state, dry-jet wet spinning, structure and properties of aramids, applications, introduction about other high-performance fibre, UHMWPE, Aromatic polyester, PBO and PEEK.

Total Lecture required = 8

Unit 2: Carbon fibre, Precursors for carbon fibre, Rayon based, PAN based, and pitch based carbon fibres, Stabilisation, Carbonisation and Graphitisation, Comparison of carbon fibres from precursors, Surface treatment of carbon fibre, properties and applications, Introduction to Glass fibre, Ceramic fibre, properties and applications.

Total Lecture required = 8

Unit 3: Definitions, Composites, Reinforcements and matrices, Types of reinforcements, Types of matrices, Types of composites, Carbon Fibre composites, Properties of composites in comparison with standard materials, Applications of metal, ceramic and polymer matrix composites.

Total Lecture required = 8

Unit 4: Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical. Textile composites: Constituents of composites, roles of reinforcement, matrix and interface, different forms of reinforcement, Thermoplastic and thermoset matrices, 3D Woven Textile Structural Polymer Composites.

Total Lecture required = 8

Unit 5: Design, Development, and Characterization of Advanced Textile Structural Hollow Composites, Testing of composites, tensile, bending and impact testing, three-point bending test, Izod and Charpy impact tests and their differences, Dynamic mechanical analysis, Storage and loss moduli and damping factor.

Total Lecture required = 8

Grand total of lectures required = 40

Course Outcome: After completing the course student will be able to:

- 1 Understand high-performance fibre, aramid fibre types, polymerisation of aramide and other high-performance fibres.

- 2 Carbon fibre precursors types, process of manufacturing carbon fibres, properties and applications, introduction of glass fibre and ceramic fibre.
- 3 Basics of composites and its types, properties and applications of carbon fibre composite, polymer fibre composites.
- 4 Different techniques to prepare prepegs, manufacturing of textile composites, 3D woven composites.
- 5 Design and development of hollow composites, testing and characterization of composite materials.

Textbooks and References

1. High Performance Fibres, by J. W. S. Hearle, Woodhead Publishing, 2001
2. High Performance Fibres by S. K. Mukhopadhyay, Textile progress Vol. 25, Textile Institute, Manchester, 1993
3. An Introduction to Composite Materials by D. Hull and T.W. Clyne, Cambridge University Press; 3rd edition, 2019
4. Fiber Reinforced Composites Materials: Manufacturing, and Design by P. K. Mallick, CRC Press, 2008
5. Analysis and Performance of Fiber Composites by B. D. Agarwal, L. J. Broutman, K. Chandrashekhara, Wiley, 2015
6. Composite Materials: Science and Engineering by K. K. Chawla, Springer, 2015
7. Advances in Textile Structural Composite by Rajesh Mishra, Polymers MDPI, 2023
8. NPTEL course on High Performance and Speciality Fibres by M. Jassal, IIT Delhi

BTT751	Garment Manufacturing Technology Lab	(L-T-P: 0-0-2)	1 Credit
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Suggested List of Experiments:

1. Learn how to take Body measurements related to Men's and Women's Wear.
2. Learn how to make patterns for Men's Shirt.
3. Learn how to make manual marker plan and optimize marker efficiency by trial-and-error method.
4. Develop understanding of operating an industrial lockstitch sewing machine.
5. Develop understanding of operating an industrial overlock sewing machine.
6. Learn how to carry out various sewing machine adjustments.
7. Learn construction of various types of stitches
8. Learn construction of various types of seams
9. Prepare samples of sewing defects