ANNA UNIVERSITY, CHENNAI

NON- AUTONOMOUS COLLEGES

AFFILIATED TO ANNA UNIVERSITY

M. TECH., TEXTILE TECHNOLOGY

REGULATIONS 2025

PROGRAMME OUTCOMES (POs):

PO	Programme Outcomes
PO1	An ability to independently carry out research /investigation and development work to solve practical problems
PO2	An ability to write and present a substantial technical report/document.
PO3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PROGRAMME SPECIFIC OUTCOMES(PSOs):

PSO	Programme Specific Outcomes
PSO1	Apply textile technology knowledge to develop innovative processes/products and manage industrial operations effectively.
PSO2	Demonstrate ethical responsibility and apply engineering and management principles to lead and execute projects in multidisciplinary teams.

ANNA UNIVERSITY, CHENNAI

POSTGRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: M. Tech., Textile Technology **Regulations:** 2025

Abbreviations:

BS – Basic Science (Mathematics)
ES – Engineering Science (General (**G**), Programme Core (**PC**), Programme Elective (**PE**)
SD – Skill Development
SL – Self Learning

OE – Open Elective

L – Laboratory Course
T – Theory

LIT – Laboratory Integrated Theory

PW – Project Work

TCP – Total Contact Period(s)

Semester - I									
S. No.	**Course Code**	**Course Title**	**Type**	**Periods per week**			**TCP**	**Credits**	**Category**
				L	**T**	**P**			
1.	MA25C08	Statistics for Technologists	T	3	1	0	4	4	ES (PC)
2.	TX25101	Polymer and Fibre Physics	LIT	3	0	2	5	4	ES (PC)
3.	TX25102	Theory of Short Staple Spinning	T	3	0	0	3	3	ES (PC)
4.	TX25103	Advances in Fabric Formation	T	3	0	0	3	3	ES (PC)
5.	TX25104	Wetting and Wicking of Textile Materials	T	3	0	0	3	3	ES (PC)
6.	TX25105	Textile Product Development Laboratory	L	0	0	4	4	2	SD
7.	TX25106	Technical Seminar	-	0	0	2	2	1	SD
Total Credits							**24**	**20**	

Semester - II									
S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P			
1.		Theory of Textile Structures	T	2	1	0	3	3	ES (PC)
2.		Automotive Textiles	T	3	0	0	3	3	ES (PC)
3.		Textiles for Protection	T	3	0	0	3	3	ES (PC)
4.		Theory of Coloration and Functional Finishes	T	3	0	0	3	3	ES (PC)
5.		Programme Elective I	T	3	0	0	3	3	ES (PE)
6.		Industry Oriented Course I	---	1	0	0	1	1	SD
7.		Evaluation of Textile Materials	T	3	0	0	3	3	ES (PC)
8.		Evaluation of Technical Textile Laboratory	L	0	0	4	4	2	SD
9.		Advanced Textile Testing Laboratory	L	0	0	4	4	2	SD
10.		Self Learning Course	--	-	-	-	-	1	-
Total Credits							**27**	**24**	

Semester – III									
S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P			
THEORY									
1.		Programme Elective II	T	3	0	0	3	3	ES (PE)
2.		Programme Elective III	T	3	0	0	3	3	ES (PE)
3.		Programme Elective IV	T	3	0	0	3	3	ES (PE)
4.		Industry Oriented Course II	---	1	0	0	1	1	SD
5.		Open Elective	---	3	0	0	3	3	---
6.		Textile Product Engineering Laboratory	L	0	0	4	4	2	SD
7.		Project Work I	---	0	0	12	12	6	SD
Total Credits							**29**	**21**	

Semester IV									
S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P			
1.		Project Work II	---	0	0	24	24	12	SD
Total Credits							**24**	**12**	

PROGRAMME ELECTIVE COURSES (PE)

S. No.	Course Code	Course Title	Periods			Total Contact Periods	Credits
			L	T	P		
1.		Alternative Spinning System	3	0	0	3	3
2.		Process Control and Optimization in Yarn Spinning	3	0	0	3	3
3.		Bioprocessing of Textiles	3	0	0	3	3
4.		High Performance Textiles	3	0	0	3	3
5.		Coated and Laminated Textiles	3	0	0	3	3
6.		Sustainability in Textile Industry	3	0	0	3	3
7.		Textile Reinforced Composites	3	0	0	3	3
8.		Filtration Textiles	3	0	0	3	3
9.		Clothing Science	3	0	0	3	3
10.		Functional Dyes	3	0	0	3	3
11.		Sports and Agro Textiles	3	0	0	3	3
12.		Synthesis and Application of Nanomaterials in Textile	3	0	0	3	3
13.		Electrically Conductive and Electronic Wearable Textiles	3	0	0	3	3
14.		Medical and Hygiene Textiles	3	0	0	3	3
15.		Recycling of Textiles	3	0	0	3	3
16.		Surface Treatments for Textiles	3	0	0	3	3

Semester I

MA25C08	Statistics for Technologists	L	T	P	C
		3	1	0	4

Course Objective:

To make the students to learn about the

- Probability distributions, sampling and testing of hypothesis.
- Process control using charts and process capability.
- Design of experiments for industry applications and
- Modeling the probabilistic phenomena.

Probability Distribution and Estimations: Applications of Binomial, Poisson, normal, t, exponential, chi-square, F and Weibull distributions in engineering; point estimates and interval estimations of the parameters of the distribution functions.

Activity: Use real or simulated data sets to fit different probability distributions (Binomial, Poisson, Normal, Weibull, etc.) using software or spreadsheets.

Hypothesis Testing: Sampling distribution; significance tests applicable– normal test, t-test, chi-square test and F- test; p-Values; selection of sample size and significance levels with relevance to industry applications; acceptance sampling.

Activity: Perform hypothesis tests (t-test, Chi-square, F-test) and interpret results.

Analysis of Variance and Non-Parametric Tests: Analysis of variance for different models; non-parametric tests – sign test, rank test, concordance test.

Activity: Conduct ANOVA and non-parametric tests on sample data.

Process Control and Capability Analysis: Control charts for variables and attributes – basis, development, interpretation, sensitizing rules, average run length; process capability analysis.

Activity: Create control charts and calculate process capability.

Design and Analysis of Experiments: 2k full-factorial designs; composite designs; robust designs; development of regression models, regression coefficients; adequacy test; process optimizations.

Activity: Demenstration of Design of experiments software tool.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

References:

1 Chatfield, C. (1983). *Statistics for technology: A course in applied statistics*. Routledge. https://doi.org/10.1201/9780203738467

2 Leaf, G. A. V. (1984). *Practical statistics for the textile industry* (Parts I & II). The Textile Institute.

3 Moen, R. D., Nolan, T. W., & Provost, L. P. (1998). *Quality improvement through planned experimentation*. McGraw-Hill.

4 Montgomery, D. C. (2000). *Design and analysis of experiments*. John Wiley & Sons.

5 Montgomery, D. C. (2002). *Introduction to statistical quality control*. John Wiley & Sons

	Description of CO	PO	PSO1	PSO2
CO1	Apply probability distributions to analyze and interpret engineering data.	PO1 (3), PO2(2),	2	1
CO2	Perform hypothesis testing, ANOVA, and non-parametric tests for decision-making.	PO1 (3), PO2(2), PO4(2)	3	2
CO3	Construct control charts and assess process capability in quality control.	PO1 (3), PO2(2), PO4(2)	1	2
CO4	Design and analyze experiments for process optimization.	PO1 (3), PO2(2), PO4(2)	1	3

TX25101	Polymer and Fibre Physics	L	T	P	C
		3	0	2	4

Course Objective:

To enable the students to learn about

- Fundamentals of fibre forming polymer and its characteristics, polymerization techniques.
- Different types of polymer and its nature, properties of polymeric fibres.
- Conducting of experiments to characterize the polymers, fibres, yarn.

Fundamentals of Polymer: Classification of polymers; Fundamental definitions; synthetic fibre forming polymers; fundamental concepts of polymerization; molecular architecture in polymers, configuration, conformation; molecular weight and its influence on fibre formation.

Activity: Identify and classify different polymers; analyze molecular structures using sample data.

Polymerization and Kinetics of Polymerization: Chemistry of polymerization – chain polymerization, step polymerization; free radical polymerization – cationic polymerization – anionic polymerization; polycondensation; dilute solution properties, thermodynamics, kinetics of chain and step polymers, concentrated polymer solutions and polymer melts; molecular weight and size; viscosity, average molecular weight, degree of polymerization and polydispersity.

Activity: Model polymerization kinetics using reaction rate data; compare chain vs step polymerization.

Rubbery and Glassy Polymers: Polymer micro structure, chemical, geometrical; rubber elastic state, thermo-elastic behaviour and thermodynamics: energetic and entropic elastic forces; mechanical theory of rubber elasticity; swelling of rubbers in solvents; the glassy amorphous state- amorphous polymers, the glass transition temperature, non-equilibrium features of glassy polymers and physical ageing, theories for the glass transition, mechanical behaviour of glassy, amorphous polymers, structure of glassy, amorphous polymers.

Activity: Perform experiments or simulations on rubber elasticity and glass transition behavior.

Molten and Crystalline Polymers: The molten state, fundamental concepts in rheology, measurement of rheological properties of molten polymers, flexible-chain polymers, liquid-crystalline polymers; crystalline polymers- polymer crystallography, the crystal lamella, crystals grown from the melt and the crystal lamella stack, lattice indices, super molecular structure-methods of assessing super molecular structure, relaxation processes in semicrystalline polymers.

Activity: Measure and analyze rheological properties of polymer melts; study crystalline structures with microscopy images.

Structure-Property Relationships: Mechanical properties of natural and synthetic fibres; moisture sorption behaviour of natural and synthetic fibres; thermal, frictional and optical properties of fibres.

Activity: Test mechanical and thermal properties of natural vs synthetic fibers; analyze moisture absorption data.

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)

List of Experiments

1. Molecular weight determination using GPC
2. Rheological studies using Brookefield viscometer
3. Determination of MFI
4. Birefringence measurement
5. Creep and Stress relaxation of filament
6. DSC Thermogram analysis of different fibres
7. Analysis of spectrogram
8. Analysis of VL curve
9. Interpretation of imperfections and faults
10. Analysis of tensile behavior of yarns
11. Thermal stability studies on fibres using TGA
12. Analysis – FTIR spectrograph and NMR graphs
13. Determination of crystallinity by XRD

References:

1. Baird, D. G., & Collias, D. I. (2014). Polymer processing: Principles and design. Wiley.
2. Billmeyer, F. W. (1984). Textbook of polymer science (3rd ed.). Wiley.
3. Gedde, U. W. (1995). Polymer physics. Chapman & Hall.
4. Gordon, M. (1963). High polymers. Addison-Wesley.
5. Gupta, V. B., & Kothari, V. K. (1985). Man-made fibre production. Chapman & Hall.
6. Hongu, T., & Phillips, G. (1997). New fibres. Woodhead Publishing.
7. Kothari, V. K. (2000). Textile fibres: Developments and innovations. IAFL Publication.
8. Odian, G. (1991). Principles of polymerization (3rd ed.). Wiley.
9. Sperling, L. H. (1986). Introduction to physical polymer science. Wiley.
10. Walczak, Z. K. (2002). Processes of fiber formation. Elsevier Science.
11. Zhang, X. (2014). Fundamentals of fiber science. DEStech Publications.

	Description of CO	PO	PSO1	PSO2
CO1	Classify polymers and interpret their molecular structures and architectures.	PO1 (3), PO2(2),	1	2
CO2	Explain polymerization methods and analyze their reaction kinetics.	PO1 (3), PO2(2), PO4(2)	2	3
CO3	Evaluate the mechanical, rheological, and crystalline behavior of polymers.	PO1 (3), PO2(2), PO4(2)	1	2
CO4	Correlate polymer structure with thermal, mechanical, and moisture properties in fibers.	PO1 (3), PO2(2), PO4(2)	1	3

TX25102	Theory of Short Staple Spinning	L	T	P	C
		3	0	0	3

Course Objective:

- To enable the students to learn the theory of various operations carried out at different stages of yarn spinning

Fibre Dispersion and Cleaning: Necessity of fibre-individualization; fibre opening and cleaning in blow-room machinery; forces acting on the fibre during carding operation; the mechanism of fibre dispersion, fibre transfer, short fibre removal and trash removal; entanglement and disentanglement of fibres; the new approaches to improve fibre-dispersion in carding operation; mechanism of removal of short fibre and trash in comber.

Activity: Observe and analyze fibre dispersion and trash removal efficiency in carding machine samples.

Fibre Straightening, Neps Removal: Theory of hook formation; measurement of fibre extent, influence of fibre extent on yarn quality; improvement of fibre-extent by carding, drafting and combing actions; generation of neps, neps removal in carding and combing.

Activity: Measure fibre extent and assess nep count before and after carding/combing.

Attenuation: Principle of roller drafting and its application in yarn production; ideal drafting; factors affecting drafting force, fibre dynamics during drafting, drafting irregularities and their causes and remedies; effect of amount of draft and draft distribution on strand irregularity; the function of aprons in roller drafting; limitation of apron-drafting and the scope for improvement; mechanism of wire-point drafting and its application in yarn production; merits and demerits of wire-point drafting; comparison of wire-point drafting with roller drafting.

Activity: Conduct drafting experiments to identify irregularities and evaluate drafting force.

Twisting: Twisted yarn geometry, forces acting on fibre and yarn during twisting, effect of fibre helix angle on strength, parameters affecting optimum twist level; balloon and spinning triangle formation and their effects on yarn quality and productivity; fundamental requirement to create real twist in a strand, mechanism of twisting in ring spinning, separation of twisting and winding actions of yarn; ply twisting, twist balance; modified twisting principles - open end twisting, false twisting, two nozzle air-jet twisting, air-vortex twisting, up-twisting, two-for-one twisting, hollow-spindle twisting; merits and demerits of modern twisting system.

Activity: Test yarn samples with varying twist levels to study effects on strength and quality.

Fibre Blending and Levelling: Importance of achieving homogeneous blending in fibre-mix; types of mixing during spinning preparatory process; lateral and longitudinal fibre blending; analysis of fibre blend index values; process parameters of spinning machinery for processing blended material; influence of intermediate product uniformity on yarn uniformity; different methods of levelling adopted during spinning processes.

Activity: Calculate blend uniformity using blend index and compare yarn uniformity from blended fibres.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

References:

1. Grosberg, P., & Iype, C. (1999). Yarn production: Theoretical aspects. Textile Institute.
2. Iredale, J. A. (1992). Yarn preparation: A handbook. Intermediate Technology.
3. Klein, W. (2014). The Rieter manual of spinning, Vol. 1. Rieter Machine Works Ltd.
4. Klein, W. (2014). The Rieter manual of spinning, Vol. 2. Rieter Machine Works Ltd.
5. Klein, W. (2014). The Rieter manual of spinning, Vols. 1–3. Rieter Machine Works Ltd.
6. Lawrence, C. A. (2003). Fundamentals of spun yarn technology. CRC Press.
7. Lord, P. R. (1999). Yarn production: Science, technology and economics. Textile Institute.
8. Oxtoby, E. (1987). Spun yarn technology. Butterworth.
9. Salhotra, K. R., & Chattopadhyay, R. (1998). Book of papers on blow room, card. Indian Institute of Technology Delhi.
10. Shaw, J. (1982). Short-staple ring spinning. Textile Progress, The Textile Institute.

	Description of CO	PO	PSO1	PSO2
CO1	Explain the fibre dispersion and cleaning for yarn production.	PO1(3), PO2(2),	2	3
CO2	Improve fibre straightening and nep removal techniques.	PO1(3), PO2(2), PO4(2)	3	2
CO3	Analyze and correct irregularities in the drafting process.	PO1 (3), PO2(2), PO4(2)	2	1
CO4	Apply modern twisting and blending techniques for yarn uniformity.	PO1 (3), PO2(2), PO4(2)	1	3

TX25103	Advances In Fabric Formation	L	T	P	C
		3	0	0	3

Course Objective:

To enable the students to learn about

- Advances in fabric formation and their structural features, characteristics and application.

Woven Fabrics: Principle of fabric formation and fabric structure – circular woven fabrics, narrow fabric; advances in 3-D woven fabrics – principle of hollow, shell and nodal fabric formations; Noobing – principle and fabric structure; applications.

Activity: Examine and compare samples of circular, 3D woven, and noobing fabrics.

Knitted Fabrics: Advances in circular knitting – loop transfer, seam less knitting and sliver knitting techniques; 3-D knitted fabrics – circular and flat weft knit techniques, applications; spacer fabrics – weft and warp knit techniques, applications.

Activity: Identify knitting techniques by analyzing various knitted fabric samples.

Braided Fabrics: Principle and production of 3-D braided structures – Cartesian braiding, rotary braiding, and hexagonal; advances in track and column braiding – production of tubular and bifurcated structure; applications.

Activity: Observe and classify different 3D braided structures using fabric samples or images.

Auxetic Fabrics: Introduction to auxetic materials – polymer, fiber and yarn; Auxetic fabric structure; principle and production of woven, weft knit, warp knit and nonwoven auxetic fabrics; 3D auxetic fabrics; braided auxetic fabrics; applications.

Activity: Test mechanical properties of auxetic fabric samples and observe their unique behavior.

Smart Fabrics: Definition and classifications; production and development of smart fibre and yarn; smart fabric structure and preparation, weaving, knitting and braiding technique; applications.

Activity: Research and present applications of different smart fabrics in industry.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

References:

1. Au, K. F. (2011). Advances in knitting technology. Woodhead Publishing.
2. Chen, X. (2015). Advances in 3D textiles. Woodhead Publishing.
3. Kellie, G. (2016). Advances in technical nonwovens. Woodhead Publishing.
4. Kyosev, Y. (2016). Recent developments in braiding and narrow weaving. Springer.

5. McLoughlin, J., & Sabir, T. (2018). High-performance apparel. Woodhead Publishing.
6. Vassiliadis, S. (2011). Advances in modern woven fabrics technology. InTech.

	Description of CO	PO	PSO1	PSO2
CO1	Explain the principles and structural variations of woven fabrics, including 3D and noobing fabrics.	PO1(3), PO2(2),	3	2
CO2	Describe advanced knitting techniques and identify different knitted fabric types.	PO1(3), PO2(2), PO4(2)	2	3
CO3	Classify braided fabric structures and explain various braiding methods.	PO1 (3), PO2(2), PO4(2)	3	2
CO4	Analyze the production techniques and unique properties of auxetic fabrics.	PO1 (3), PO2(2), PO4(2)	1	3

TX25104	Wetting and Wicking of Textile Materials	L	T	P	C
		3	0	0	3

Course Objective:

This course aims

- To enable the students to analyse the mathematical representation of power system components and solution techniques and generalise the power flow analysis using various methods.
- To infer the knowledge of the different types of faults and its calculation using computer method and mathematical model.
- To know the concept of numerical integration methods to analyse power system transient stability.

Fundamentals on Wetting: Surface tension of liquids and theories on its measurements; equilibrium state of a liquid on a solid; solid-liquid interaction in immersion, penetration, adhesion and spreading.

Activity: Measure surface tension of liquids using standard methods and analyze wetting behavior on solids.

Characterization of Wetting: Determination of wetting force and work of adhesion; measurement of contact angle using Goniometry and tensiometry; critical assessment of the above techniques; importance of wetting of fabrics and its assessment.

Activity: Use a goniometer to measure contact angles on fabric samples and interpret results.

Wicking in yarns and Fabrics: Fundamentals of wicking; wicking in yarns and its measurement; wicking in fabrics from an infinite and finite reservoir; studies on factors affecting wetting and wicking in fibres and fibrous assemblies; mathematical models of wetting and wicking.

Activity: Perform wicking tests on yarn and fabric samples; analyze effect of different parameters.

Modification of Substrates: Effect of substrate modification on wetting and wicking behavior: chemical, enzyme, plasma; coating and lamination; finishing.

Activity: Compare wicking behavior before and after substrate modification treatments.

Application: Areas of wetting and wicking of fibrous materials; role of wetting and wicking on dyeing and printing, and comfort behavior of textiles; significance of wetting and wicking in medical and hygiene products; usefulness of wetting and wicking in industrial and domestic products.

Activity: Case study analysis of wetting and wicking impact on textile applications.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)

References:

1 Huang, H., Ye, C., & Sun, W. (2008). Moisture transport in fibrous clothing assemblies. *Journal of Engineering Mathematics*.
2 Ningtao. (2009). *Liquid transport and wicking in nonwoven materials*. VDM Verlag Dr. Müller.
3 Pan, N., & Gibson, P. (2006). *Thermal and moisture transport in fibrous materials*. Woodhead Publishing.
4 Pan, N., & Zhong, W. (2006). Fluid transport phenomenon in fibrous materials. *Journal of Textile Progress, 38*(1).
5 Patnaik, A., Rengasamy, R. S., Kothari, V. K., & Ghosh, A. (2006). Wetting and wicking in fibrous materials. *Journal of Textile Progress, 38*(1).

	Description of CO	**PO**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of wetting, surface tension, and their role in textiles.	PO2(2), PO4(2)	2	3
CO2	Measure and interpret wetting behavior using contact angle techniques.	PO1(3), PO2(2), PO4(2)	3	1
CO3	Describe wicking mechanisms in yarns and fabrics.	PO1 (3), PO2(2), PO4(2)	3	2
CO4	Evaluate how substrate modifications affect wetting and wicking in textile applications.	PO1 (3), PO2(2), PO4(2)	2	2

TX25105	Textile Product Development Laboratory	L	T	P	C
		0	0	4	2

Course Objective:

This course aims

- To enable the students to analyse the mathematical representation of power system components and solution techniques and generalise the power flow analysis using various methods.
- To infer the knowledge of the different types of faults and its calculation using computer method and mathematical model.
- To know the concept of numerical integration methods to analyse power system transient stability.

1. Development of narrow fabric
2. Development of flat bed- knit structure
3. Development of seamless garment
4. Development of nanofibrous web
5. Development of fibrous web
6. Development of textile reinforced composite
7. Development of core spun yarn
8. Development of metalized yarn
9. Development of metalized fabric
10. Development of electronic textile
11. Development of multilayer fabric and laminated

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

	Description of CO	PO	PSO1	PSO2
CO1	Develop advanced textile structures and innovative yarns.	PO2(2), PO4(2)	2	3
CO2	Fabricate specialized fabrics and textile composites.	PO1(3), PO2(2), PO4(2)	3	1
CO3	Create smart and electronic textiles with functional applications.	PO1 (3), PO2(2), PO4(2)	3	2