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Choice Based Credit System (CBCS) in Light of NEP-2020
M. Tech. in Textile Chemistry (76 Credit_2023-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC311	DSE	Chemistry of Dyes and Pigments	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. Demonstrate about chemical structure and molecular architecture of dyes and pigments.
2. Impart knowledge on method of synthesis and characterisation of dyes and pigments.

Course Outcomes (COs): The students will be able to

1. Understand chemical structure and molecular architecture of dyes and pigments.
2. Understand the design of a dye and its properties.
3. Understand the dye synthetization process and its characterisation.

SYLLABUS

UNIT I: Introduction to Dyestuffs **9 Hours**

Definition of dye, basis of colour, dye versus pigments, History of dyestuffs - indigo of ancient India, purple of the ancients, natural mordant dyes, era of synthetic dyes, diazotization, fluorescent brighteners, reactive dyes.

Unit II: Light, Color and Dyestuffs

Color and chemical constitution, atomic vibration and wave mechanics, orbital theory of valency, use wise classification of dyes, law of absorption of light, commercial dyes, CI constitution number, CI generic number, nomenclature of commercial dyes, colour index classification; Consideration in dye design; General properties of dyestuff.

UNIT III: Dyestuff Intermediates **9 Hours**

Important unit processes - sulphonation, nitration, reduction, halogenation, diazotization, alkali fusion; Benzene intermediates, naphthalene intermediates, anthraquinone intermediates.

UNIT IV: Synthesis of Dyestuff and Characterization **9 Hours**

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MTTC311	DSE	Chemistry of Dyes and Pigments	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Synthesis of specific organic and inorganic dyes - direct dye, acid dye, mordant dye, basic dye, vat dye, solubilised vat dye, sulphur dye, azo dye, anthraquinone dye, indigo dye, reactive dye, disperse dye, solvent dye, food color and pigments. Dye characterization by NMR, IR spectroscopy, UV–vis and fluorescence.

Unit V: Pigments **9 Hours**

Structure and properties of pigments, organic pigments - azo, anthraquinone, perylene tetracarboxylic acid, Halogenated copper phalocyanin and its derivatives, inorganic Pigments - mineral and salts and its derivatives, Pigment Emulsion, Binder emulsion.

References:

1. The Chemistry of Synthetic dyes and Pigments, H. A. Lubs, American Chemical Society Monograph Series, Robert E. Kreiger Publishing Company, Florida, 1982.
2. Chemistry of dyes and principles of dyeing by V A Shenai, Sevak Publication, 2000.
3. Handbook of synthetic dyes and pigments, K.M Shah, Bombay Multi-tech Publishing Company, 1998.
4. Color Chemistry: Syntheses, Properties, and Applications of Organic Dyes and Pigments, Heinrich Zollinger, John Wileyand Sons, 1993.
5. Modern Concept of Color and Appearance by A.K. Roy Choudhury, Science Publishers & IBH Publishing Co. Pvt. Ltd., 2000.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC321	DSE	NEW FIBRES AND FUNCTIONAL TEXTILES	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objective (CEOs):

1. The course aims to introduce new or highly specialized technological aspects in Fibre science.
2. This course would provide an understanding of basic concepts related to the manufacture of high performance and specialty fibres.
3. The course also aims to relate the interdependence of structure, properties, and applications of those fibres.

Course Outcomes (Cos): Students will be able to:
1. Identify and comprehend the properties of new textile fibres accurately.
2. Explain the correct manufacturing process of various new high-performance/specialty fibres.
3. Comprehend and design products as per the requirement.
4. Understand application of new fibres in the specialty areas.

SYLLABUS

UNIT I Introduction to High Performance and Specialty Fibres **10 HOURS**
Definition, classification and structural requirements of high performance and specialty fibres, Polymerization, spinning and properties of aramids, aromatic polyesters, concept of rigid rod and ladder polymers.

UNIT II High Performance Fibres **7 HOURS**
Manufacture of carbon fibres from polyacrylonitrile, viscose and pitch precursors, Concept of gel spinning and spinning of UHMPE fibres, Elastomeric polymers and fibres.

UNIT III Specialty Fibres **9 HOURS**
Conducting fibres, Thermally and chemically resistant polymers and fibres, Methods of synthesis, production and properties of glass fibre. Specialty fibres: profile fibres, bicomponent fibres and hybrid fibres, Superabsorbent polymers and fibres.

UNIT IV Functional and Smart Textiles: Composites and Sportswear **10 HOURS**
Definition and Classification of Functional and Smart textiles; Introduction to Composites:

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MTTC321	DSE	NEW FIBRES AND FUNCTIONAL TEXTILES	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Theory, Types, Properties; High Performance fibers, thermoplastic and thermosetting Resins; Composite Manufacturing and Applications. Sportswear: design, testing and materials – fibers, yarns, fabrics for temperature control and moisture management.

UNIT V Functional and Smart Textiles: Medical, Smart and Intelligent Textiles 9 H0URS
Medical textiles: Classification, types and products, Health, and Hygiene Textiles- protection against microbes, Wound management- dressings, suture and bandages, Implants and drug delivery systems; Smart and Intelligent Textiles: Passive and Active functionality, stimuli sensitive textiles, Electronic Textiles: wearable computers, flexible electronics.

References:

1. Smart Textiles and Their Applications, (1st Ed.), 2016, Koncar, V. (Ed.), eBook ISBN: 9780081005835.
2. Medical and Healthcare Textiles, (1st Ed.), 2010, Anand, S. C., Kennedy, J. F., Miraftab, M., Rajendran, S. (Ed.), eBook ISBN: 9780857090348.
3. Fibrous and Textile Materials for Composite Applications, 2016, Rana, S., Fangueiro, R. (Ed.), eBook ISBN: 978-981-10-0234-2.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC 331	DSE	Nanotechnology in Textile	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
1. The course aims to introduce new or highly specialized technological aspects in fibre science.
2. This course would provide an understanding of basic concepts related to the manufacture of high performance and specialty fibres.
3. The course also aims to relate the interdependence of structure, properties and applications of those fibres.

Course Outcomes (COs): Students will be able to
1. Identify and comprehend the technology of Nano fibers.
2. The student should be able to synthesis the Nano materials.
3. Comprehend and design products as per the requirement.
4. The student will understand the Nano finishing.

Syllabus

UNIT I Introduction to Nano Technology **10 HOURS**
Introduction to nanomaterials, Classification of nano materials, Introduction to Nanotechnology, Size and surface dependence of their physical and chemical properties.

UNIT II Nano Materials Synthesis for Textiles **8 HOURS**
Synthesis of Nanomaterials used in Textiles such as carbon nanotube, fullerenes, metal and metal oxide nanoparticles i.e. nano silver, nano silica, nano titania, nano zinc oxide, nano magnesium oxide.

UNIT III Nano Fibre and Nano Finishing **10 HOURS**

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MTTC 331	DSE	Nanotechnology in Textile	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
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Nanofibres: preparation, properties and applications i.e. filtration, tissue engineering etc.; Nanofinishing: self-cleaning, antimicrobial, UV protective etc.; Nanocoating on textile substrates: Plasma Polymerization.

UNIT IV Characterization of Nanomaterials **8 HOURS**

Characterization techniques i.e. XRD, AFM, SEM/TEM, DLS, Zeta potential etc. and their application in nanotechnology. Nanotoxicity.

UNIT V Application of Nano Technology in Textiles **10 HOURS**

Med Textiles, Sports Textile, Mobile Textiles, Agro Textiles, Building Textiles.

References:

1. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).
2. W. N. Chang, Nanofibers Fabrication, Performance and Applications, Nova Science Publishers Inc., (2009).
3. Charles P Poole, Jr and Frank J Owens, Introduction to Nanoscience and Nanotechnology; Wiley India -Student Edition (2006).
4. Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, Nanoscale Science and Technology, John Wiley and Sons (2005).
5. M Joshi and A Bhattacharya, Nanotechnology: A New Route to High Performance Textiles, Textile Progress, Vol 43, No.3, Sep (2011).
6. Ed. P Brown and K Stevens, Nanofibres and Nanotechnology in Textiles, Woodhead Publishing Co. UK (2007).
7. Ed. Deopura BL, R Alagirusamy, M Joshi and Gupta B, 'The Impact of Nanotechnology on Polyesters and Polyamides' , A chapter in the book titled "Advances in Polyesters and Polyamides", Woodhead Publishing Co. UK (2008).

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC 331	DSE	Nanotechnology in Textile	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

8. Ed. T J Pinnavia & G W Beall Polymer Clay Nanocomposites, John Wiley and Sons Ltd. England (2000).
9. S. Ramakrishna, K Fujihara, W Teo and TL Zumie Ma , An Introduction to Electrospinning and Nanofibres, , World Scientific Publishing Co. Ltd. (2005).
10. Zhen Guo, Li Tan, Fundamentals and Applications of Nanomaterials, (Artech House) London (2009).
11. Hari Singh Nalwa, Encyclopedia Of Nanoscience and Nanotechnology, American Scientific Publishers, 10 Volumes Set (2004).

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC312	DSE	Technology of Wet Processing Machinery	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. Demonstrate various principles and mechanisms of textile wet processing machinery.
2. Build analysing capability of various problems associated with operation of textile wet processing machinery.

Course Outcomes (COs): The students will be able to

1. Understand various principles of working of textile wet processing machinery.
2. Analyse various advancement in textile wet processing machinery.
3. Understand the concept of water and energy conservation in wet processing machinery.

SYLLABUS

UNIT I: Wet Processing Machinery **9 Hours**

Basic requirement of wet processing machinery, their classification and principle of operation, Advantages, and limitations of batchwise, semi-continuous and continuous machineries, Utility machinery.

UNIT II: Machinery for Pretreatments **Hours 10**

Machines for shearing, cropping, singeing, desizing, scouring, bleaching, mercerization; advancement in machinery for pretreatments- J Box, Vaporloc, Saturator, rope bleaching, Roller bed steamers, BEN-INJECTA, BEN-IMPACTA, CBR (Continuous Bleaching Range), energy and water conservation.

UNIT III: Machinery for Dyeing **Hours 10**

Machines for fiber dyeing, Yarn dyeing, Hank dyeing, Package dyeing, rope dyeing, warp dyeing, Fabric dyeing, Garment dyeing. Batch, semicontinuous and continuous dyeing, advancement in machinery for dyeing, supercritical dyeing, energy and water conservation.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC312	DSE	Technology of Wet Processing Machinery	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT IV: Machinery for Printing **8 Hours**

Roller printing machine, Flatbed screen printing, Rotary screen printing, Transfer printing, Digital Printing, steamer. Advancement in machinery for printing machine and steamer, energy and water conservation.

UNIT V: Machinery for Finishing **8 Hours**

Padding mangle, Sanforizer, Swizzing Calendar, Calendar, Friction Calendar, Shreinering Calendar, Embossing Calendar, Raising machine, Shearing machine, Seuding machine, Cylinder Drier, Stenter, Palmer Drier, Compactor. Advancement in machinery for finishing, energy and water conservation.

References:

1. Textile Preparation and Dyeing by Asim Kumar Roy Choudhury, Science Publishers, 2006.
2. Handbook of Textile and Industrial dyeing; M. Clerk (Editor), Woodhead Publishers, 2011.
3. Textile Printing, Leslie W.C. Miles, Society of Dyers and Colourists, UK, 2003.
4. Chemical Finishing of Textiles, W.D. Schindler, P.J. Hauser, Woodhead Publishing, 2004.
5. Technology of Bleaching and Mercerizing, V A Shenai, Sevak Publication, 2003.
6. Technology of Printing, V A Shenai, N M Saraf, Sevak Publications, 1998.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC 322	DSE	Process Control in Textile Chemical Processing	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. Impart knowledge on process control in pretreatment processes.
2. Demonstrate various process control methods in dyeing.
3. Demonstrate various process parameters in printing and finishing.

Course Outcomes (COs): The students will be able to

1. Understand process control in pretreatment.
2. Understand and demonstrate process control in dyeing.
3. Understand process control in printing and finishing.

Syllabus

UNIT I: Introduction to Process Control — 9 Hours

Main functions of process control, Approach To process control, Definition of quality, Characteristics of Quality or Dimensions of Quality, Some factors influencing the quality, Necessary steps to control quality and to maintain it, Hinderances to be avoided to maintain quality, ISO 9000/14000.

UNIT II: Process Control in Textile Pretreatments — 9 Hours

Desizing: Nature of size, % wet pick up, concentration of desizing agent, impregnation and dwell time, temperature, pH; Scouring: Kier lining, removal of air, Circulation and flow rate, recipe of scouring; Bleaching: Water hardness, concentration of chemicals; Souring: Concentration of acid, flow rate; Mercerization; Moisture control, temperature of padding solution, wet pick up during mercerization.

UNIT III: Process Control in Dyeing — 9 Hours

Yarn Dyeing: Shape of cheese, angle of winding, Perforation of spindles, Pump pressure, recipe, Colour dissolution, Steam leakage, variation in package density; Beam and Jet Dyeing Machines

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MTTC 322	DSE	Process Control in Textile Chemical Processing	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

(HTHP Dyeing Machines): Parameters for fabric preparation, air entrap, flow reversal, vessel pressure; Jet Dyeing Machine: Jet pressure, temperature, pH; Jigger Dyeing Machine : Batching, colour preparation, colour and chemical addition, addition of colour for shade correction.

UNIT IV: Process Control in Printing **9 Hours**

Process parameters for Printing: fabric preparation, gum preparation, colour preparation, design checking, Cleaning of rubber blanket, Stability of printing paste; Fixation: Process Parameter for Polymerization: Temperature, Exhaust, free movement of guide rollers; Ageing: Time and speed, Guide rollers, water level, acid injection, Steam pressure, condensation; Soaping

UNIT V: Process Control in Finishing **9 Hours**

Stenter: Nip pressure, Bow and Heading controller, Chamber temperature, Dwell time, Overfeeding, Expander, blower, width of fabric, Thermic fluid leakage, Concentration of chemicals, Viscosity, Drying efficiency; Sanforizer: Temperature, belt and blanket, Shrinkage; Calander: Nip pressure, threading, speed, Roller surface.

References:

1. Textile Preparation and Dyeing, Asim Kumar Roy Chaudhury, Science Publishers, 2006.
2. Handbook of textile and industrial dyeing, M. Clerk, Woodhead Publishers, 2011.
3. Textile Processing - Printing Dyeing Finishing, J. L. Smith, Abhisek Publications, 2019.
4. Textile Printing, Leslie W.C. Miles, Society of Dyers and Colourists, UK, 2003.
5. Chemical finishing of Textiles, W.D. Schindler, P.J. Hauser, Woodhead Publishing, 2004.
6. Scouring and Bleaching, V.A. Shenai, Sevak Publications, Mumbai, 1987.
7. Technology of Dyeing, V.A. Shenai, Sevak Publications, Mumbai, 1984.
8. Principles of Textile Finishing, Asim Kumar Roy Choudhury, ELSEVIER, 2017.
9. Technology of Finishing, V A Shenai, N M Saraf, Sevak Publications, Bombay, 1996.
10. Advances in Functional Finishing of Textiles, Mohammad Shahid, Ravindra Adivarekar, Springer, 2020.

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MTTC332	DSE	STATISTICAL METHOD AND DESIGN OF EXPERIMENT	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To introduce the students with the Fundamentals of the Statistics used in the Textile Technology.

Course Outcomes (COs): The students will be able to

1. Apply modern probability theory in the Textile Technology.
2. Understand and design the experiment, conduct statistical tests, and analyse the results to arrive at the conclusions.
3. Know the fundamental principles of the sample distribution.
4. Study the capability of process and control the process based on data available.
5. Make decisions with minimum error from available data.

Syllabus

Unit I Probability Distribution and Estimations **10 HOURS**

Applications of Binomial, Poisson, Normal, t, exponential, chi-square, F and Weibull distributions in textile engineering; point and interval estimations of the parameters of the distribution functions.

Unit II Testing of Hypothesis **10 HOURS**

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

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M. Tech. in Textile Chemistry (2023-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC332	DSE	STATISTICAL METHOD AND DESIGN OF EXPERIMENT	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Unit III Analysis of Variance and Non-parametric Tests **8 HOURS**

Analysis of variance for different models; non-parametric tests - sign test, rank test, concordance test.

Unit IV Process Control and Capability Analysis **8 HOURS**

Control charts for variables and attributes - basis, development, and interpretation, sensitizing rules, average run length; process capability analysis.

Unit V Design and Analysis of Experiments **9 HOURS**

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

References:

1. Montgomery D.C., "Introduction to Statistical Quality Control", John Wiley and Sons, Inc., Singapore, 2002.
2. Leaf G.A.V., "Practical Statistics for the Textile Industry, Part I and II", The Textile Institute, Manchester, 1984.
3. Douglas C. Montgomery, "Design and analysis of experiments", John Wiley & Sons, Inc, Singapore, 2000.
4. Ronald D. Moen, Thomas W. Nolan, Lloyd P. Provost, "Quality improvement through planned experimentation', McGraw-Hill, 1998.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC332	DSE	STATISTICAL METHOD AND DESIGN OF EXPERIMENT	60	20	20	0	0	3	0	0	3

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5. Leaf G A V, "Practical Statistics for the Textile Industry", Part I and II, The Textile Institute, Manchester, 1984.
6. Montgomery D.C., "Introduction to Statistical Quality Control", John Wiley and Sons, Inc., Singapore, 2002.
7. Ronald D Moen, Thomas W Nolan and Lloyd P Provost, "Quality Improvement Through Planned Experimentation", McGraw Hill, 1998.
8. Meloun M and Militky J, "Statistical Data Analysis: A Practical Guide", Woodhead Publishing Ltd. UK, 2011.
9. J. R. Nagla, "Statistics for Textile Engineers", Woodhead Publishing India Pvt. Ltd., 2014.
10. Hayavadana J, "Statistics for Textile and Apparel Management", Woodhead Publishing Ltd., UK, 2012.

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M. Tech. in Textile Chemistry (76 Credit_2023-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTC 303	PW/I	DISSERTATION (PART - I)	0	0	0	240	160	0	0	20	10

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. The course will expose the students to the method of starting the research work through literature review and analysis of a particular problem.
2. The course will provide the students about the latest instrument and machinery in the institute lab, various research lab and industry.

Course Outcomes (COs):

Students will be able:

1. Apply the knowledge to study a particular problem.
2. Analyze and solve the problem coming during their research work.
3. To create an aptitude for research work.

Procedure:

Each student will work in the institute lab/outside research/industry institute to study and conduct their research work.

The student may work thoroughly on the literature review and try to understand the problem.

The student may start their project work to a particular project under the guidance of the faulty guide allotted to them.

Each student has to give three power point presentations during the semester in front of the senior faculty members and research scholars.

At the end of the semester each student will be required to submit a report of their work done during the semester which will be assessed by their guide for the internal valuation. The students are also required to appear in the end semester examination.

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