

**Program name**

**MASTER OF ENGINEERING  
(MAN-MADE TEXTILES)**

**Program code**

**617272**



**Department of Textile Engineering**

**Faculty of Technology and Engineering**

**The Maharaja Sayajirao University of Baroda**

**Vadodara**

### **PSO for M.E. (Man-Made Textiles)**

- PSO1: Post Graduates of the programme will have the Critical Thinking, formulate and analyse complex Engineering Problems, Solving them and reaching to substantiate conclusions using principles of engineering and sciences.
- PSO2: Post Graduates of the programme will have successful career in Research, academics and textile industry. Capable of continual learning ability and will be adapting to the constantly changing technology. Also will have skills to undertake Collaborative and Multidisciplinary activities.
- PSO3: Post graduates of the program will have the ability to design and develop system components or processes to meet quality and cost effective Textile Products by using the concepts of Science, Engineering, Textile engineering and other related disciplines to achieve customer goals
- PSO4: Post graduates of the program will have necessary skills to take up Entrepreneurial Venture, Serve to the needs of Textile Industry and the Nation.

**Bloom's Taxonomy Levels:**      1. Remember   2. Understand      3. Application   4. Analysis      5. Evaluation   6. Creation

**Titles of Courses and Detailed Syllabi  
w.e.f. 2019-20**

**(M.M.T. PART-I)  
(M.M.T. PART-II)**

| <b>Sr. No</b> | <b>Subject Code</b> | <b>Subject Title</b>                              | <b>Page No.</b> |
|---------------|---------------------|---------------------------------------------------|-----------------|
| PART-I        | AMT2104             | Mathematics and Statistics                        |                 |
|               | ACH2108             | Polymer Chemistry                                 |                 |
|               | APH2107             | Polymer and Fibre Physics                         |                 |
|               | TXE2101             | Theory of Text. Structure – I                     |                 |
|               | TXE2104             | Engg. Properties of Textile Materials             |                 |
|               | TXE2104L            | Engg. Properties of Textile Materials Lab         |                 |
| PART-II       | CSC2105             | Structured Programming and Numerical Analysis     |                 |
|               | CSC2105L            | Structured Programming and Numerical Analysis Lab |                 |
|               | TXE2203             | Textured Yarn Technology                          |                 |
|               | TXE2203L            | Textured Yarn Technology Lab                      |                 |
|               | TXE2206             | Production of Man-made fibres                     |                 |
|               | TXE2207             | Post Spinning Operations                          |                 |
| -             | TXE2208             | Developments in Man-made fibres                   |                 |



| No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | t<br>Hours | (%) | Level         |                                        |                    | nts of<br>Employ<br>ability<br>(Emp)/<br>Entrepr<br>neursh<br>ip<br>(Ent)/<br>Skill<br>Develo<br>pment<br>(SD) | nence to<br>Local<br>(L)/<br>Nationa<br>l (N)/<br>Region<br>al(R)/G<br>lobal<br>(G) | n to<br>Gender<br>(G),<br>Environ<br>ment<br>and<br>Sustaina<br>bility<br>(ES),<br>Human<br>Values<br>(HV)an<br>d<br>Professi<br>onal<br>Ethics<br>(PE) |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|---------------|----------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | <b>Numerical Methods:</b><br><br><b>System of non linear equations:</b><br>Newton-Raphson method.<br>Least square approximation.<br><b>Interpolation:</b><br>i) Linear interpolation,<br>ii) Spline interpolation.<br><b>System of linear equations:</b> Iterative methods<br><b>PDE and Modeling of Textile problems through PDE:</b><br>Wave equation, Heat equation, Laplace equation and its<br>numerical solution using Finite Difference Method.<br>Application of DFT and FFT in Textile problems. | 14         | 27  | 1, 2, 3,<br>5 | CO 1,<br>CO 2,<br>CO 3,<br>CO4,<br>CO5 | PSO<br>1,<br>PSO 3 | SD                                                                                                             | G                                                                                   | PE                                                                                                                                                      |
| 2   | <b>Statistics and its applications</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 12         | 22  | 2, 3, 5       | CO6                                    | PSO<br>1,          |                                                                                                                |                                                                                     |                                                                                                                                                         |

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|   | <b>Multiple Linear Regression:</b><br>Introduction, Estimation the coefficients, Linear Regression model using matrices, Properties of the least square estimators, inferences in multiple linear regressions.<br><b>Design of techniques:</b><br>Some general principles completely randomized designs, randomized-block designs, Latin square and related design.                                                                                                               |    |    |         |     | PSO 3        |  |  |  |
| 3 | <b>Modeling and Simulation:</b><br>System and its terminology, Various kinds of Models: Physical model and Mathematical model, Continuous and Discrete systems and their simulation. Needs and techniques of Mathematical Modeling (MM)<br>Classification of MM Modeling in Mechanical vibration                                                                                                                                                                                  | 10 | 24 | 2, 3, 6 | CO7 | PSO 1, PSO 3 |  |  |  |
| 4 | <b>Optimization:</b><br><b>LPP:</b><br>Formulation, Solution using Graphical method<br>Simplex method<br><b>Classification Optimization techniques:</b><br>single variable optimization, Multivariable optimization, Unconstrained optimization, Multivariate optimization with equality constraints (Lagrange's Multipliers), Multivariate optimization with inequality constraints (Kuhn-Tucker condition)<br>Dynamic programming problem: Discontinuous and continuous models. | 12 | 27 | 2, 3, 5 | CO8 | PSO 1, PSO 3 |  |  |  |

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| Reference Books |                                                                                                  |
|-----------------|--------------------------------------------------------------------------------------------------|
| 1.              | Florence Gordon and S.Gordon : Contemporary Statistics, a computer approach, 1994                |
| 2.              | J.D.Faires and R.Burden : Numerical methods, 2nd edition, Brooks cole publishing Co., 1998.      |
| 3.              | S.S.Sastry : Introductory Methods of Numerical Analysis, Prentice hall of India, NewDelhi, 1997. |
| 4.              | J.N.Kapur : Mathematical Modeling, Wiley eastern Ltd., 1994. 5. Gordon : System, Simulation      |
| 5.              | Kantiswarup, P.K.Gupta and Manmohan. : Operation Research, Sultanch and sons.                    |
| 6.              | S.S.Rao : Optimization theory and Applications: Wiley Eastern,1984.                              |
| 7.              | Rudra Pratap : Getting started with Matlab, Saunders,1996.                                       |



| No. |                                                                                                                                                                                                                                 | Hours | (%) |         |     |      | ability<br>(Emp)/<br>Entrepr<br>neursh<br>ip<br>(Ent)/<br>Skill<br>Develo<br>pment<br>(SD) | (L)/<br>Nationa<br>l (N)/<br>Region<br>al(R)/G<br>lobal<br>(G)<br>develop<br>mental<br>needs | (G),<br>Enviro<br>nment<br>and<br>Sustain<br>ability<br>(ES),<br>Human<br>Values<br>(HV)an<br>d<br>Profess<br>ional<br>Ethics<br>(PE) |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|---------|-----|------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Introduction of natural and synthetic polymers, Essential characteristics of fiber forming polymers                                                                                                                             | 08    | 13  | 1, 2    | CO1 | PSO1 | Emp                                                                                        | G                                                                                            | HV                                                                                                                                    |
| 2.  | Step growth (condensation) polymerization, Kinetics and statistics of linear stepwise polymerization, kinetics, mechanism, control and distribution of molecular weights in condensation polymerization of Nylon and Polyesters | 08    | 13  | 1,2,3   | CO2 | PSO1 |                                                                                            |                                                                                              |                                                                                                                                       |
| 3.  | Chain growth(addition) polymerization with special reference to polyolefins and acrylonitrile based polymers, kinetics, initiator efficiency, autoacceleration. Chain transfers, retarders and inhibitors                       | 07    | 13  | 2,3,4   | CO3 | PSO1 |                                                                                            |                                                                                              |                                                                                                                                       |
| 4.  | Ionic and Coordination Polymerization, kinetics of ionic and stereospecific polymerization.                                                                                                                                     | 08    | 14  | 2,3,4,5 | CO4 | PSO1 |                                                                                            |                                                                                              |                                                                                                                                       |
| 5.  | Polymerization Techniques, Bulk, Emulsion, Dispersion, Melt and Solution polymerization.                                                                                                                                        | 07    | 12  | 1,2,3   | CO5 | PSO1 |                                                                                            |                                                                                              |                                                                                                                                       |

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|----|------------------------------------------------------------------------------------------------------------|----|----|-------|-----|------|--|--|--|
| 6. | Polymer Solutions, Thermodynamic polymer solutions its approximations and limitations                      | 06 | 09 | 1,2   | CO6 | PSO1 |  |  |  |
| 7. | Measurement of molecular weight and size and group analysis                                                | 08 | 13 | 2,3,4 | CO7 | PSO1 |  |  |  |
| 8. | Measurements of Molecular weight of polymers: Osmometry, light scattering, ultracentrifugation, Viscometry | 08 | 13 | 2,3,5 | CO7 | PSO1 |  |  |  |

#### Reference Books:

|    |                                                                                                                                    |
|----|------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Polymer Science –V. R. Gowarikar, N. V. Vishwanathan & J. Sreedhar (2 <sup>nd</sup> edition, New Age International (P) Ltd.) 2015. |
| 2. | Text book of Polymer Science – F. W. Billmeyer (3 <sup>rd</sup> edition, Wiley – Interscience) 2007.                               |
| 3. | Principles of Polymer Chemistry – P. J. Flory (1 <sup>st</sup> edition, Cornell University Press) 1953.                            |
| 4. | Physical Chemistry of Polymers – A. Tager (2 <sup>nd</sup> edition, MIR Publishers) 1978.                                          |
| 5. | Principles of Polymer Science - P. Bahadur, N. V. Sastry, (2 <sup>nd</sup> edition, Narosa Publishing House, New Delhi) 2002.      |
| 6. | Plastic Materials and Processing – A Brent Strong (3 <sup>rd</sup> edition, Pearson) 2005.                                         |

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------|--|---------------|--------------------------|----------|----|---------|----------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------|
|                                                                                                                                                                                                                                       |            | The Maharaja Sayajirao University of Baroda<br>Faculty Technology and Engineering<br>Department of Textile Engineering |  |               | Academic Year            |          |    | 2020-21 |                                                                            |                                                                       |                                                                    |
| M.E. (Man-Made Textiles): Regular Programme                                                                                                                                                                                                                                                                            |            |                                                                                                                        |  |               |                          |          |    |         |                                                                            |                                                                       |                                                                    |
| Year                                                                                                                                                                                                                                                                                                                   | I          | Core / <del>Elective</del> / <del>Foundation</del><br>APH2107: Polymer and Fibre<br>Physics                            |  |               | Credits / Hours per week |          |    | 04      |                                                                            |                                                                       |                                                                    |
| Semester                                                                                                                                                                                                                                                                                                               | I          | Year of Introduction: 2003<br>Year of Syllabus Revision: 2012                                                          |  |               | Maximum Marks / Grade    |          |    | 100     |                                                                            |                                                                       |                                                                    |
| Mode of Transaction                                                                                                                                                                                                                                                                                                    |            | Lectures, Tutorials                                                                                                    |  |               |                          |          |    |         |                                                                            |                                                                       |                                                                    |
| Course Outcome (CO) APH2107<br>CO1 Understanding the fibres<br>CO2 Understanding the physical properties of fibres<br>CO3 Methods to determine physical properties<br>CO4 Understanding of advances in instrumentation<br>CO5 Understanding of spectroscopy of fibre<br>CO6 Understanding of Thermal behavior of fibre |            |                                                                                                                        |  |               |                          |          |    |         |                                                                            |                                                                       |                                                                    |
| Unit No.                                                                                                                                                                                                                                                                                                               | Topic/Unit |                                                                                                                        |  | Contact Hours | Weightage (%)            | BT Level | CO | PSO     | Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development | Relevance to Local (L)/ National (N)/ Regional(R)/ Global (G) develop | Relation to Gender (G), Environment and Sustainability (ES), Human |

|   |                                                                                                                                        |    |    |              |                   |              | ment<br>(SD) | mental<br>needs | Values<br>(HV)an<br>d<br>Profess<br>ional<br>Ethics<br>(PE) |
|---|----------------------------------------------------------------------------------------------------------------------------------------|----|----|--------------|-------------------|--------------|--------------|-----------------|-------------------------------------------------------------|
| 1 | <b>FIBER Fundamentals</b><br>Molecular architecture in polymers, elements of chain statistics, requirements of fiber-forming polymers, | 06 | 12 | 1            | CO1               | PSO1         | SD           | G               | ES                                                          |
| 2 | <b>Crystallization</b><br>The crystallization of polymers, the concept of order in polymers, crystallinity, orientation                | 09 | 19 | 1,2          | CO2<br>CO3<br>CO4 | PSO1         |              |                 |                                                             |
| 3 | <b>Structure of Fibres</b><br>Physical structure of natural and man-made fibers                                                        | 09 | 19 | 1,2, 3,<br>6 | CO2<br>CO3        | PSO1<br>PSO3 |              |                 |                                                             |
| 4 | <b>Physical methods from investigation of fiber structure</b><br>X-ray diffraction, IR spectroscopy,                                   | 06 | 12 | 2, 3,4       | CO2<br>CO5        | PSO1<br>PSO2 |              |                 |                                                             |
| 5 | <b>Physical methods from investigation of fiber structure</b><br>Optical and electron microscopy                                       | 12 | 25 | 2, 3,4       | CO4<br>CO6<br>CO5 | PSO1<br>PSO4 |              |                 |                                                             |
| 6 | <b>Thermal properties of Fibres</b><br>Glass transition temperature, Differential Scanning Calorimetry                                 | 06 | 13 | 2,3,5        | CO2<br>CO6        | PSO1<br>PSO2 |              |                 |                                                             |

| Reference Books |                                                                                                 |
|-----------------|-------------------------------------------------------------------------------------------------|
| 1.              | Physical properties of Textile fibers by W.E. Morton and J.W.S. Hearle, Woodhead Publishers, UK |
| 2.              | Fibre Structure by Hearle and Peters                                                            |
| 3.              | Introduction to Polymer Physics by Petepechko                                                   |
| 4.              | Fibre Science & Technology by P. Ghosh (TS 1540 G4F4)                                           |
| 5.              | A Text Book of Fibre Science by S.P.Mishra (TS 1540 M4T3)                                       |
| 6.              | Fundamentals of Molecular Spectroscopy, C.N. Banwell & E.M.McCash, TMG Hill Publishing Co.      |
| 7.              | Spectroscopy by Rajkumar                                                                        |

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|  | The Maharaja Sayajirao University of Baroda<br>Faculty Technology and Engineering<br>Department of Textile Engineering |                                                                                                | Academic Year            |               | 2019-20  |    |             |                                                                                 |                                                                                    |                                                                                    |
| M.E. (Man-Made Textiles): Regular Programme                                       |                                                                                                                        |                                                                                                |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| Year                                                                              | I                                                                                                                      | Core / <del>Elective</del> / <del>Foundation</del><br>TXE2101 Theory of Textile<br>Structure-I | Credits / Hours per week |               |          |    | 04(theory)  |                                                                                 |                                                                                    |                                                                                    |
| Semester                                                                          | I                                                                                                                      | Year of Introduction: 2000                                                                     | Maximum Marks / Grade    |               |          |    | 100(theory) |                                                                                 |                                                                                    |                                                                                    |
| Mode of Transaction                                                               |                                                                                                                        | Lectures & Tutorials                                                                           |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| Course Outcome (CO) TXE 2101                                                      |                                                                                                                        |                                                                                                |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| CO1 Understanding of engineering approach of textile structure.                   |                                                                                                                        |                                                                                                |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| CO2 Understanding of Fibre migration and arrangement in twisted yarns.            |                                                                                                                        |                                                                                                |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| CO3 Understanding of Extension and breakage of spun yarns.                        |                                                                                                                        |                                                                                                |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| CO4 Understanding of Theory of Extension of Continuous filament yarns.            |                                                                                                                        |                                                                                                |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| CO5 Understanding of Breakage of Continuous Filament yarn                         |                                                                                                                        |                                                                                                |                          |               |          |    |             |                                                                                 |                                                                                    |                                                                                    |
| Unit No.                                                                          | Topic/Unit                                                                                                             |                                                                                                | Contact Hours            | Weightage (%) | BT Level | CO | PSO         | Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD) | Relevance to Local (L)/ National (N)/ Regional (R)/ Global (G) developmental needs | Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                      |    |     |            |     |                      |     |       |                                         |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|------------|-----|----------------------|-----|-------|-----------------------------------------|
|   |                                                                                                                                                                                                                                                                                                                                                                                                                      |    |     |            |     |                      |     |       | d<br>Profess<br>ional<br>Ethics<br>(PE) |
| 1 | Introduction, Textile properties, structures and mechanics of fibres, Mechanics of simple yarn structure and filament & blended yarn structure. Textile yarns, twist and basic geometry of twisted yarns, Idealized helical yarn structure, Yarn count and twist factor, Twist contraction and its calculations, Real and idealized yarns, Packing of fibres in yarn, Deviations from idealized form of yarn packing | 15 | 25% | 1,2,3,4,5, | CO1 | PSO1<br>PSO2<br>PSO3 | EMP | N, G, |                                         |
| 2 | Introduction to fibre migration, Theoretical treatment of migration, Characterization of migration behavior, Effect of tension on migration, Interactions of twisting and migration, Factors affecting the migration of fibres                                                                                                                                                                                       | 09 | 15% | 4,5,6      | CO2 | PSO1<br>PSO2<br>PSO3 |     |       |                                         |
| 3 | Introduction to spun yarn mechanics – traditional view, Spun yarn mechanics – modified qualitative approach, Various experimental studies of yarn strength, Comparison of various theories of tensile properties                                                                                                                                                                                                     | 09 | 15% | 4,5,6,     | CO3 | PSO1<br>PSO2<br>PSO3 |     |       |                                         |
| 4 | Extension of Continuous filament yarn – Variation of Fiber Extension, Analysis of Tensile forces, Analysis with Transverse forces and Lateral contraction – Theoretical model, yarn geometry, definition of yarn element, variation of strain through the yarn, stress-strain relation of the filament., Total yarn stress, Analysis of large extension – effects of large extension.                                | 15 | 25% | 3,4,5,     | CO4 | PSO1<br>PSO2<br>PSO3 |     |       |                                         |
| 5 | Extension and breakage of continuous filament yarn – Nature of rupture, modes of propagation of break, effect of twisting methods on Tensile properties                                                                                                                                                                                                                                                              | 12 | 20% | 4,5,6,     | CO5 | PSO1<br>PSO2<br>PSO3 |     |       |                                         |

| <b>Reference Books</b> |                                                                                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                     | Structural Mechanics of Fibers, Yarn and Fabrics, Volume-I-J.W.S.Hearle, P.Grosberg, S.Backer. Published by: Wiley Interscience Publication,1969                      |
| 2.                     | Theory of Elasticity (Third edition)-S.P.Timoshenko, J.N.Goodier. McGrawHill-Indian edition.                                                                          |
| 3.                     | Research/Review papers from: Journal of Textile Institute, Textile Research Journal, Indian Journal of Fiber and Textile Research, Textile Progress, Conferences etc. |
| 4.                     | Master's Dissertations and Ph.D thesis.                                                                                                                               |

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|  <b>The Maharaja Sayajirao University of Baroda</b><br><b>Faculty Technology and Engineering</b><br><b>Department of Textile Engineering</b>                                                                                     |                   | <b>Academic Year</b>                                                                                                     |                                 |                 |           | <b>2019-20</b> |                                                                                        |                                                                                          |                                                                                           |
| <b>M.E. (Man-Made Textiles): Regular Programme</b>                                                                                                                                                                                                                                                                |                   |                                                                                                                          |                                 |                 |           |                |                                                                                        |                                                                                          |                                                                                           |
| <b>Year</b>                                                                                                                                                                                                                                                                                                       | <b>I</b>          | <b>Core / <del>Elective</del> / <del>Foundation</del></b><br><b>TXE 2104: Engineering Properties of Textile Material</b> | <b>Credits / Hours per week</b> |                 |           |                | <b>04(theory)</b>                                                                      |                                                                                          |                                                                                           |
| <b>Semester</b>                                                                                                                                                                                                                                                                                                   | <b>I</b>          | Year of Introduction: 2000                                                                                               | <b>Maximum Marks / Grade</b>    |                 |           |                | <b>100(theory)</b>                                                                     |                                                                                          |                                                                                           |
| <b>Mode of Transaction</b>                                                                                                                                                                                                                                                                                        |                   | Lectures & Tutorials                                                                                                     |                                 |                 |           |                |                                                                                        |                                                                                          |                                                                                           |
| <b>Course Outcome (CO) TXE 2104</b><br>CO1 To impart advance knowledge about fiber structure<br>CO2 To give an in-depth understanding of various engineering properties of fibers – such as tensile, elastic recovery, moisture absorption, dielectric, and fiber friction and study reported research literature |                   |                                                                                                                          |                                 |                 |           |                |                                                                                        |                                                                                          |                                                                                           |
| <b>Unit No.</b>                                                                                                                                                                                                                                                                                                   | <b>Topic/Unit</b> | <b>Contact Hours</b>                                                                                                     | <b>Weightage (%)</b>            | <b>BT Level</b> | <b>CO</b> | <b>PSO</b>     | <b>Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)</b> | <b>Relevance to Local (L)/ National (N)/ Regional(R)/ Global (G) developmental needs</b> | <b>Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and</b> |

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|   |                                                                                                                                                                                                                                                                                                                                                                        |    |     |            |            |                         |        |        | Professional Ethics (PE) |
| 1 | Nature of matters and different methods to study structure of material. Requirement of fiber structure, traditional view and various models proposed like micellar, fringed micellar, lamellar, fringed lamellar, fibril and fringed fibril Molecular structure of various fibers like cotton and viscose rayon. Molecular structure of wool, silk and synthetic fiber | 08 | 10% | 2,3,4,5    | CO1        | PSO1, PSO2, PSO3 PSO4   | EMP,SD | R,N,G  | HV, ES,PE                |
| 2 | Fiber density – difficulties in fiber density determination, various methods for fiber density determination, density and order                                                                                                                                                                                                                                        | 03 | 5   | 2,3,4,5, 6 | CO2        | PSO 1<br>PSO 2<br>PSO 3 |        | EMP,SD |                          |
| 3 | Fiber moisture absorption, its significance in textiles, measurement of regain – various methods and the sources of errors involved, hysteresis in fiber moisture absorption, reports on moisture absorption of various textile fibers, various factors influencing fiber moisture absorption                                                                          | 07 | 10  | 2,3,4,5, 6 | CO2        | PSO1, PSO2, PSO3 PSO4   |        |        |                          |
| 4 | Heats of sorption of fibers, differential and integral heats of sorption, their interrelation, measurement of heats of sorption, heats of sorption of various fibers, factors affecting heats of sorption                                                                                                                                                              | 05 | 7.5 | 2,3,4,5, 6 | CO2        | PSO1, PSO2, PSO3 PSO4   |        |        |                          |
| 5 | Introduction to moisture sorption, effect of hydrophilic groups, directly attached and indirectly attached water molecules, absorption in crystalline and non-crystalline regions, molecular explanation for hysteresis. Limited                                                                                                                                       | 06 | 10% | 2, 3, 4, 5 | CO1<br>CO2 | PSO1, PSO2, PSO3 PSO4   |        |        |                          |

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|   | swelling concept and capillary theory to explain water absorption .Theory proposed by Pierce and multi-layer adsorption Hailwood and horrobin's theory.                                                                                                                                                                                                                                                                                          |    |      |               |             |                                |  |         |  |
| 6 | Tensile properties and working principles of tensile instruments like CRL, CRE and CRT along with their differences. Experimental work done by Meridith with thorough discussion of results obtained for various fibers like cotton and cellulosic fibers, viscose rayon, acetate rayon, wool and synthetic fibers. Effect of moisture, temperature, light and chemical environment on various fibers. Mechanism of failure in different fibers. | 08 | 12%  | 2,3,4,5       | CO1,<br>CO2 | PSO1,<br>PSO2,<br>PSO3<br>PSO4 |  | R, N, G |  |
| 7 | Introduction to elastic recovery with important terms and definitions related to it. Experimental works of Meridith related to recovery characteristics of different fibers like cotton and cellulosic fibers, viscose rayon, wool, synthetic fibers and so on. Discussing influence of test conditions on recovery and mechanical conditioning, swelling recovery and simple recovery models proposed.                                          | 05 | 12%  | 2,3,4,5       | CO2         | PSO1,<br>PSO2,<br>PSO3<br>PSO4 |  |         |  |
| 8 | Time effects in mechanical properties of fibers, fiber creep behavior, primary and secondary creep, research study reports on fiber creep, cumulative- extension test, fiber stress relaxation – its measurement, dynamic tests, characterization of viscoelastic behavior of fibers, methods of dynamic testing, research reports on fiber dynamic behavior, fiber fatigue                                                                      | 10 | 17.5 | 2,3,4,5,<br>6 | CO2         | PSO1,<br>PSO2,<br>PSO3<br>PSO4 |  |         |  |
| 9 | Dielectric properties of fibers, significance, measurement of fiber dielectric properties and difficulties involved in it, various factors influencing fiber dielectric properties                                                                                                                                                                                                                                                               | 05 | 10   | 2,3,4,5,<br>6 | CO2         | PSO1,<br>PSO2,<br>PSO3<br>PSO4 |  |         |  |

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|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|-----------|-----|--------------------------------|--|--|--|
| 10                     | Friction in textiles, methods to measure it. Pollitt's method to determine coefficient of friction and differential frictional effect in wool.                        | 03 | 06 | 2, 3, 4,5 | CO2 | PSO1,<br>PSO2,<br>PSO3<br>PSO4 |  |  |  |
| <b>Reference Books</b> |                                                                                                                                                                       |    |    |           |     |                                |  |  |  |
| 1.                     | Research/Review papers from: Journal of Textile Institute, Textile Research Journal, Indian Journal of Fiber and Textile Research, Textile Progress, Conferences etc. |    |    |           |     |                                |  |  |  |
| 2.                     | Engineering properties of textile materials by Morton and Hearle, Woodhead publishing                                                                                 |    |    |           |     |                                |  |  |  |

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|  |                                                                                              | The Maharaja Sayajirao University of Baroda<br>Faculty Technology and Engineering<br>Department of Textile Engineering |                                                                                                                                    |  | Academic Year |                          | 2019-20    |             |     |                  |
| M.E. (Man-Made Textiles): Regular Programme                                       |                                                                                              |                                                                                                                        |                                                                                                                                    |  |               |                          |            |             |     |                  |
| Year                                                                              |                                                                                              | I                                                                                                                      | Core / <del>Elective</del> / <del>Foundation</del><br>TXE2104L: Engineering Properties of Textile Materials<br>(Practical/TW/Viva) |  |               | Credits / Hours per week |            | 02          |     |                  |
| Semester                                                                          |                                                                                              | I                                                                                                                      | Year of Introduction: 2000                                                                                                         |  |               | Maximum Marks / Grade    |            | 50          |     |                  |
| Mode of Transaction                                                               |                                                                                              |                                                                                                                        | Laboratory Experiments, discussion, drawing, term work                                                                             |  |               |                          |            |             |     |                  |
| No.                                                                               | Experiment                                                                                   |                                                                                                                        |                                                                                                                                    |  |               | Contact hrs.             | %Weightage | BT Level    | CO  | PSO              |
| 1                                                                                 | Introduction to the various properties of textile materials                                  |                                                                                                                        |                                                                                                                                    |  |               | 1                        | 3.33%      | 1,2,3,4,5,6 | CO2 | PSO1, PSO2, PSO3 |
| 2                                                                                 | Measurement of the fineness property of various textile materials like fibre, filament, yarn |                                                                                                                        |                                                                                                                                    |  |               | 1                        | 3.33%      |             |     |                  |
| 3                                                                                 | Study of strength and elongation property of textile material                                |                                                                                                                        |                                                                                                                                    |  |               | 4                        | 13.33%     |             |     |                  |
| 4                                                                                 | Study of the stress relaxation property of textile material                                  |                                                                                                                        |                                                                                                                                    |  |               | 4                        | 13.33%     |             |     |                  |
| 5                                                                                 | Study of the creep behavior of textile material                                              |                                                                                                                        |                                                                                                                                    |  |               | 4                        | 13.33%     |             |     |                  |
| 6                                                                                 | Study of the torsional rigidity of textile material                                          |                                                                                                                        |                                                                                                                                    |  |               | 4                        | 13.33%     |             |     |                  |
| 7                                                                                 | Study of the hysteresis of the moisture property of textile material                         |                                                                                                                        |                                                                                                                                    |  |               | 4                        | 13.33%     |             |     |                  |
| 8                                                                                 | Study of the critical dissolution time of the textile material                               |                                                                                                                        |                                                                                                                                    |  |               | 4                        | 13.33%     |             |     |                  |
| 9                                                                                 | Study of the melt flow index of the polypropylene polymer chips and filament material        |                                                                                                                        |                                                                                                                                    |  |               | 4                        | 13.33%     |             |     |                  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                             |                                                                                                                     |                                 |                |
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|                                                                                                                                                                                                                                                                                                                                                                           | <b>The Maharaja Sayajirao University of Baroda</b><br><b>Faculty Technology and Engineering</b><br><b>Department of Textile Engineering</b> |                                                                                                                     | <b>Academic Year</b>            | <b>2019-20</b> |
| <b>M.E. (Man-Made Textiles): Regular Programme</b>                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                             |                                                                                                                     |                                 |                |
| <b>Year</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>II</b>                                                                                                                                   | <b>Core / <del>Elective</del> / Foundation</b><br><br><b>CSC2106: Structured Programming and Numerical Analysis</b> | <b>Credits / Hours per week</b> | <b>04</b>      |
| <b>Semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                             | Year of Introduction: 2007<br>Year of Syllabus Revision: 2019                                                       | <b>Maximum Marks / Grade</b>    | <b>100</b>     |
| <b>Mode of Transaction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                             | Lectures and Practical                                                                                              |                                 |                |
| <b>Course Outcome (CO) CSE2101</b><br><br>CO1 Understand the need and types of programming languages in use.<br>CO2 Understand the fundamentals of a programming language.<br>CO3 Learn problem solving techniques.<br>CO4 Understand the concept of structured programming.<br>CO5 Understand dynamic memory management techniques.<br>CO6 Implement file handling mechanisms<br>CO7 Understand various user-defined data types in a programming language |                                                                                                                                             |                                                                                                                     |                                 |                |

CO8 Learn some advanced concepts of a programming language.

| Unit No. | Topic | Contact Hours | Weightage (%) | BT Level | CO | PSO | Elements of Employability (Emp)/Entrepreneurs hip (Ent)/Skill Development (SD) | Relevance to Local (L)/National (N)/Regional (R)/Global (G) | Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE) |
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|   |                                                                                                                                                                                                                                                                                                                                                          |    |    |       |                   |      |           |   |    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|-------|-------------------|------|-----------|---|----|
| 1 | <p>Introduction to Computer and Programming:</p> <p>Basic block diagram and functions of various components of computer, basic concepts of hardware and software, types of software, compiler and interpreter, evolution of programming languages, concepts of machine level, assembly level and high-level programming, flow charts and algorithms.</p> | 05 | 12 | 1,2   | CO1<br>CO2        | PSO3 | EMP<br>SD | G | PE |
| 2 | <p>Fundamentals of C Programming:</p> <p>Features of C language, structure of C program, C character set, comments, header files, data types, constants and variables, operators, expressions, evaluation of expressions, type conversion, precedence and associativity, C tokens, operators, storage classes</p>                                        | 08 | 20 | 1,2,3 | CO3<br>CO4        | PSO3 |           |   |    |
| 3 | <p>Control Structures in C:</p> <p>Simple statements, decision making statements, simple if, if..else statement, else..if statement, switch case, looping statements, entry controlled loops, exit controlled loops, nesting of control structures, break and continue, goto statement</p>                                                               | 07 | 17 | 1,2,3 | CO3<br>CO4        | PSO3 |           |   |    |
| 4 | <p>Derived and User-Defined Data Types:</p> <p>Concepts of array, one- and two-dimensional arrays, declaration and initialization of arrays, string, string storage, built-in-string functions, Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and</p>                           | 07 | 23 | 1,2,3 | CO3<br>CO4<br>CO7 | PSO3 |           |   |    |

|                        |                                                                                                                                                                                                                                                                                                                     |    |    |       |                                 |      |  |  |  |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|-------|---------------------------------|------|--|--|--|
|                        | functions, structures and pointers, unions                                                                                                                                                                                                                                                                          |    |    |       |                                 |      |  |  |  |
| 5                      | Function in C Programming:<br><br>Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function                                                                                                                                     | 05 | 18 | 1,2,3 | CO3<br>CO4                      | PSO3 |  |  |  |
| 6                      | Advanced Concepts of C Programming:<br><br>Basics of pointers, pointer to pointer, pointer and array, pointer to array, array of pointers, functions returning a pointer, pointer arithmetic, introduction to dynamic memory allocation, malloc, calloc, realloc, file management, the preprocessor, error handling | 08 | 10 | 1,2,3 | CO3<br>CO4<br>CO5<br>CO6<br>CO8 | PSO3 |  |  |  |
| <b>Reference Books</b> |                                                                                                                                                                                                                                                                                                                     |    |    |       |                                 |      |  |  |  |
| 1.                     | Programming in ANSI C by E. Balaguruswamy, TMH                                                                                                                                                                                                                                                                      |    |    |       |                                 |      |  |  |  |
| 2.                     | The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI                                                                                                                                                                                                                                                      |    |    |       |                                 |      |  |  |  |
| 3.                     | Programming in C Ansi standard by Yashwant Kanetkar                                                                                                                                                                                                                                                                 |    |    |       |                                 |      |  |  |  |
| 4.                     | Programming in C - Gottfried B.S., TMH                                                                                                                                                                                                                                                                              |    |    |       |                                 |      |  |  |  |
| 5.                     | A Structured Programming Approach using C – B.A. Forouzan & R.F. Gillberg, THOMSON Indian Edition                                                                                                                                                                                                                   |    |    |       |                                 |      |  |  |  |
| 6.                     | Let us C - Y.Kanetkar, BPB Publications                                                                                                                                                                                                                                                                             |    |    |       |                                 |      |  |  |  |



**The Maharaja Sayajirao University of Baroda**  
**Faculty Technology and Engineering**  
**Department of Textile Engineering**

**Academic Year**

**2019-20**

**M.E. (Man-Made Textiles): Regular Programme**

|                            |           |                                                                                                                  |                                 |            |
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| <b>Year</b>                | <b>II</b> | <b>Core / <del>Elective</del> / Foundation</b><br><b>CSC2106L: Structured Programming and Numerical Analysis</b> | <b>Credits / Hours per week</b> | <b>04</b>  |
| <b>Semester</b>            |           | Year of Introduction: 2007<br>Year of Syllabus Revision: 2019                                                    | <b>Maximum Marks / Grade</b>    | <b>100</b> |
| <b>Mode of Transaction</b> |           | Lectures and Practical                                                                                           |                                 |            |

**Course Outcome (CO)**

CO1 Understand the need and types of programming languages in use.

CO2 Understand the fundamentals of a programming language.

CO3 Learn problem solving techniques.

CO4 Understand the concept of structured programming.

CO5 Understand dynamic memory management techniques.

CO6 Implement file handling mechanisms

CO7 Understand various user-defined data types in a programming language

CO8 Learn some advanced concepts of a programming language.

| Unit No. | Topic | Contact Hours | Weightage (%) | BT Level | CO | PSO | Elements of Employability (Emp)/Entrepreneurs hip (Ent)/Skill Development (SD) | Relevance to Local (L)/National (N)/Regional(R)/Global (G) | Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional |
|----------|-------|---------------|---------------|----------|----|-----|--------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
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|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |    |       |            |      |           |   | Ethics<br>(PE) |
| 1 | <p>1. Write a program that reads two integer numbers statically and perform arithmetic operations on it and prints the result.</p> <p>2. Write a program that reads two floating point nos. from keyboard and gives their addition, subtraction, multiplication, division and modulo. Compare the results with results of above program.</p>                                                                                                                                             | 05 | 12 | 1,2   | CO1<br>CO2 | PSO3 | EMP<br>SD | G | PE             |
| 2 | <p>1. Write a program to test whether a number entered is positive, negative or equal to zero.</p> <p>2. Write a program to take a character as an input and display whether it is a number, alphabet upper/lower/vowel) or a special character (Use nested if statement).</p> <p>3. Write a program to enter the marks of student in four subjects. Then calculate the total, aggregate and display the grades obtained by the student using else-if ladder as well as switch case.</p> | 08 | 20 | 1,2,3 | CO3<br>CO4 | PSO3 |           |   |                |
| 3 | <p>1. Write a program to find the sum of n natural numbers using while loop, for loop and goto statement.</p> <p>2. Write a program to read the numbers until -1 is encountered. Also calculate the sum and average of all positive numbers and mean and sum of all</p>                                                                                                                                                                                                                  | 07 | 17 | 1,2,3 | CO3<br>CO4 | PSO3 |           |   |                |



| Reference Books |                                                                                                   |
|-----------------|---------------------------------------------------------------------------------------------------|
| 1.              | Programming in ANSI C by E. Balaguruswamy, TMH                                                    |
| 2.              | The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI                                    |
| 3.              | Programming in C Ansi standard by Yashwant Kanetkar                                               |
| 4.              | Programming in C - Gottfried B.S., TMH                                                            |
| 5.              | A Structured Programming Approach using C – B.A. Forouzan & R.F. Gillberg, THOMSON Indian Edition |
| 6.              | Let us C - Y.Kanetkar, BPB Publications                                                           |

|                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                        |                                                                               |  |                |                |          |                |              |                                                                                 |                                                                                  |                                                                                                            |
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|                                                                                                                                                                                                                                                                                               | The Maharaja Sayajirao University of Baroda<br>Faculty Technology and Engineering<br>Department of Textile Engineering |                                                                               |  |                |                |          | Academic Year  | 2019-20      |                                                                                 |                                                                                  |                                                                                                            |
| M.E. (Man Made Textiles): Regular Programme                                                                                                                                                                                                                                                                                                                                    |                                                                                                                        |                                                                               |  |                |                |          |                |              |                                                                                 |                                                                                  |                                                                                                            |
| Year                                                                                                                                                                                                                                                                                                                                                                           | I                                                                                                                      | Core / <del>Elective</del> / Foundation<br>TXE 2203: Textured Yarn Technology |  |                |                |          | Hours per week | 04 (theory)  |                                                                                 |                                                                                  |                                                                                                            |
| Semester                                                                                                                                                                                                                                                                                                                                                                       | II                                                                                                                     | Year of Introduction: 2000                                                    |  |                |                |          | Maximum Marks  | 100 (theory) |                                                                                 |                                                                                  |                                                                                                            |
| Mode of Transaction                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                        | Lectures & Tutorials                                                          |  |                |                |          |                |              |                                                                                 |                                                                                  |                                                                                                            |
| Course Outcome (CO)<br>CO1 Understanding the basic concepts of texturizing<br>CO2 Knowledge about the new developments in different texturizing techniques<br>CO3 To study the material, machine and process variables for setting the quality of yarn<br>CO4 Learning the characteristics of the parent and textured yarns<br>CO5 Knowledge of applications of textured yarns |                                                                                                                        |                                                                               |  |                |                |          |                |              |                                                                                 |                                                                                  |                                                                                                            |
| Unit No.                                                                                                                                                                                                                                                                                                                                                                       | Topic/Unit                                                                                                             |                                                                               |  | Cont act Hours | Weight age (%) | BT Level | CO             | PSO          | Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD) | Relevance to Local (L)/ National (N)/ Regional(R)/Global (G) developmental needs | Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE) |
| 1                                                                                                                                                                                                                                                                                                                                                                              | Concept and classification of Texturing, based                                                                         |                                                                               |  | 5              | 10%            | 1,2,3    | CO             | PSO1,        | EMP, SD                                                                         | R,N,G                                                                            | ES                                                                                                         |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |     |         |                       |                  |  |  |  |
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|   | on yarn characteristics, and methods, Different Structure form in texturing, Difference between thermo-mechanical and mechanical bulking process. Concept of BCF yarn.                                                                                                                                                                                                                                                                                                                                                      |    |     |         | 1                     | PSO3, PSO4, PSO5 |  |  |  |
| 2 | Introduction to Air Jet Texturing Process., Air jet texturing Machine Detail: Yarn passage, function and construction of different parts. Development in machine and modification required to process technical yarn, Basic Air flow requirements and Development in Nozzle. Hypothesis develop by different scientist for Loop forming Mechanism, Effect of Material, Machine and Processing parameter on yarn characteristics and application, Comparative analysis of air jet textured yarn quality measurement systems. | 15 | 25% | 1,2,4,5 | CO 2, CO 3, CO 4,C O5 |                  |  |  |  |
| 3 | Commingling Technology, Machine Detail, function of each part, modification required for high performance yarn,Types of Nozzle and geometry, Effect of Material and Processing Parameter on yarn characteristics. Concept of BCF yarn                                                                                                                                                                                                                                                                                       | 10 | 15% | 1,2,4,5 | CO 2, CO 3, CO 4,C O5 |                  |  |  |  |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |    |     |         |                  |                        |  |  |  |
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| 4 | Introduction to texturising, various synthetic fibres and their market shares. Advantages and disadvantages of synthetic fibres. Texturising: Purpose, Various types of textured yarn, their properties and production mechanism. Texturising process and the various parameters which affect textured yarn quality. Various evaluation criterion of textured yarns. High stretch yarns and various methods of high stretch yarns productions. | 7  | 12% | 1,2,3,5 | CO 1, CO 2, CO 3 | PSO1, PSO3, PSO4, PSO5 |  |  |  |
| 5 | Conventional Method of high stretch yarns production. Continuous process of high stretch yarn productions. Analysis of Twist-Heat Set-Untwisting Mechanism. Different False Twisting Mechanisms, their advantages and disadvantages.                                                                                                                                                                                                           | 10 | 16% | 2,3,4,5 | CO 2, CO 3, CO 4 |                        |  |  |  |
| 6 | Various process of heat setting mechanisms in texturing process. Effect of tension and tension control of texturing process. How to improve heat setting in texturing process. Disadvantages of high stretch yarns, properties of low stretch yarns and their productions.                                                                                                                                                                     | 6  | 10% | 3,4,5,6 | CO 2, CO 3,      |                        |  |  |  |
| 7 | Various production techniques of low stretch yarns. Crimped textured yarns and their properties. Production of crimped yarn by stuffer box. Production of textured yarns by edge crimping mechanism. Production of knit-                                                                                                                                                                                                                       | 7  | 12% | 2,3,4   | CO 2, CO 5       |                        |  |  |  |



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|  | The Maharaja Sayajirao University of Baroda<br>Faculty Technology and Engineering<br>Department of Textile Engineering                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                 |  |  | Academic Year            |            | 2020-21    |                        |                        |
|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                 |  |  |                          |            |            |                        |                        |
| M.E. (Man Made Textiles): Regular Programme                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                 |  |  |                          |            |            |                        |                        |
| Year                                                                              | I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Core / <del>Elective</del> / Foundation<br>TXE 2203L : Textured Yarn Technology (Practical /TW) |  |  | Credits / Hours per week |            | 02         |                        |                        |
| Semester                                                                          | II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Year of Introduction: 2000                                                                      |  |  | Maximum Marks / Grade    |            | 50         |                        |                        |
| Mode of Transaction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Laboratory Experiments, discussion, term work                                                   |  |  |                          |            |            |                        |                        |
| No.                                                                               | Experiment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                 |  |  | Contact hrs.             | %Weightage | BT Level   | CO                     | PSO                    |
| 1                                                                                 | Introduction, classification and details of various Texturing methods & textured yarns, importance of Texturing continuous filaments. Draw Winding: Brief introduction, drawing and heat setting concept. Passage of POY multifilament yarn through the draw winding machine. Drive to different parts of the machine like drawing godets and winding drum. Study of different parameters used during drawing on draw winding machine. Effect of different parameters on yarn quality. Calculation of draw ratio, Over feed percentage. |                                                                                                 |  |  | 7                        | 23.33%     | 1,2,3, 4,5 | CO 1, CO 2, CO 3, CO 4 | PSO1, PSO2, PSO3, PSO4 |
| 2                                                                                 | False twist draw texturing machine: Brief introduction of the draw texturizing machine. Objects of draw texturizing and different concept used during draw texturizing process. Passage of POY multifilament yarn through the draw texturizing machine. Drive to different parts of the machine like V1, V2, V3 rollers, twisting unit, take up roller, traversing guide and oil roller. Effect of different parameters on yarn quality. Calculation of draw ratio, Over feed percentage at stabilizing and take up zone and D/Y ratio. |                                                                                                 |  |  | 7                        | 23.33%     | 2,3,4, 5   |                        |                        |
| 3                                                                                 | Airjet Texturing Machine :<br>Introduction of the Airjet texturizing machine. Objects of Airjet texturizing and                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                 |  |  | 7                        | 23.33%     | 2,3,4, 5   |                        |                        |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |     |             |  |  |
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|   | different concept used during Airjet texturizing process. Passage of FDY multifilament yarn/s through the Airjet texturizing machine. Drive to different parts of the machine like godets, take up roller, traversing guide. Effect of different parameters on yarn quality. Calculation of Over feed percentage in texturizing and take up zone.                                                                                                                                                                                                                                                                                                                                                                 |   |     |             |  |  |
| 4 | Testing of POY feed yarn: Denier, strength, elongation, boiling water shrinkage.<br>Testing of Drawn yarn: Denier, strength, elongation, boiling water shrinkage.<br>Testing of False twist draw texturized yarn: Denier, strength, elongation, boiling water shrinkage, textured yarn defects and their possible causes and remedies, effect of ambient condition, process control programme at continuous filament plant.<br>Testing of Air jet texturized yarn: Denier, strength, elongation, boiling water shrinkage, loop height, loop frequency, bulk %, textured yarn defects and their possible causes and remedies, effect of ambient condition, process control programme at continuous filament plant. | 9 | 30% | 2,3,4,<br>5 |  |  |

|                                                                                                        |                                                                                                                        |                                                                                              |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
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|                       | The Maharaja Sayajirao University of Baroda<br>Faculty Technology and Engineering<br>Department of Textile Engineering |                                                                                              | Academic Year            |                |          |    |         | 2019-20                                                                         |                                                                                    |                                                                                                            |
| M.E. (Man Made Textiles):Regular Programme                                                             |                                                                                                                        |                                                                                              |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
| Year                                                                                                   | I                                                                                                                      | Core / <del>Elective</del> / <del>Foundation</del><br>TXE2206: Production of Man Made Fibres | Credits / Hours per week |                |          |    |         | 04                                                                              |                                                                                    |                                                                                                            |
| Semester                                                                                               | II                                                                                                                     | Year of Introduction: 2004<br>Year of Syllabus Revision: 2012                                | Maximum Marks / Grade    |                |          |    |         | 100                                                                             |                                                                                    |                                                                                                            |
| Mode of Transaction                                                                                    |                                                                                                                        | Lectures and Tutorials                                                                       |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
| Course Outcome (CO) (TXE2206)                                                                          |                                                                                                                        |                                                                                              |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
| CO 1 Organize the principles of man-made fibre spinning process and the effect parameters              |                                                                                                                        |                                                                                              |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
| CO 2 Summarize the polymer and fibre production using synthetic polymers and the effect of parameters  |                                                                                                                        |                                                                                              |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
| CO 3 Implement the polymer and fibre production using regnerated polymers and the effect of parameters |                                                                                                                        |                                                                                              |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
| CO 4 Paraphrase the polymer and fibre production using addition polymers and the effect of parameters  |                                                                                                                        |                                                                                              |                          |                |          |    |         |                                                                                 |                                                                                    |                                                                                                            |
| Unit No.                                                                                               | Topic/Unit                                                                                                             |                                                                                              | Contact Hours            | Weight age (%) | BT Level | CO | PSO     | Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD) | Relevance to Local (L)/ National (N)/ Regional(R)/ Global (G) developmenta l needs | Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE) |
| 1                                                                                                      | General principle of spinning: Flow of fluid through a capillary, die - swell, melt, dry and wet spinning.             |                                                                                              | 6                        | 10             | 1,2,3,4  | 1  | 1, 2, 3 | EMP,SD                                                                          | R,N,G                                                                              | PE                                                                                                         |
| 2                                                                                                      | Melt spinning process : Melt extrusion, spinning conditions such as spinneret size, rate of extrusion,                 |                                                                                              | 6                        | 10             | 1,2,3,4  | 1  | 1, 2, 3 |                                                                                 |                                                                                    |                                                                                                            |
| 3                                                                                                      | Spinning stretch and its effect on filament structure and properties with special reference to polyamide and           |                                                                                              | 6                        | 10             | 1,2,3,4  | 1  | 1, 2, 3 |                                                                                 |                                                                                    |                                                                                                            |

|   |                                                                                                                                                                                                                                                                                                  |   |    |         |   |         |  |  |  |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|---------|---|---------|--|--|--|
|   | polyester fibres.                                                                                                                                                                                                                                                                                |   |    |         |   |         |  |  |  |
| 4 | Polyamide fibres: Introduction to important polyamides, polyamidation reaction. Synthesis of nylon 6 and nylon 66. Production of Newer nylons.                                                                                                                                                   | 6 | 10 | 1, 2, 3 | 2 | 1, 2, 3 |  |  |  |
| 5 | Polyester Fibres: Detailed studies of polyesters. Esterification and polycondensation reaction, Industrial process for fibre production of PET and co-polymers.                                                                                                                                  | 9 | 15 | 1, 2, 3 | 2 | 1, 2, 3 |  |  |  |
| 6 | Viscose Rayon: Detailed studies of regenerated cellulose. Ageing of Alkali cellulose, cellulose xanthate and xanthation reaction. The ripening process and its effect on molecular structure. Coagulation bath on fibre properties. Self crimping of fibres. High tenacity and polynosic fibres. | 9 | 15 | 1, 2, 3 | 3 | 1, 2, 3 |  |  |  |
| 7 | Fibres from addition polymers : Polyethylene, polypropylene                                                                                                                                                                                                                                      | 6 | 10 | 1, 2, 3 | 4 | 1, 2, 3 |  |  |  |
| 8 | Fibre based on polyacrylonitrile, copolymers for fibre production, polyvinyl alcohol fibres                                                                                                                                                                                                      | 6 | 10 | 1, 2, 3 | 4 | 1, 2, 3 |  |  |  |
| 9 | Elastomeric fibres of spandex type , Bicomponent fibres.                                                                                                                                                                                                                                         | 6 | 10 | 1, 2, 3 | 4 | 1, 2, 3 |  |  |  |

#### Reference Books

|    |                                                                                                                                 |
|----|---------------------------------------------------------------------------------------------------------------------------------|
| 1. | Manufactured Fibre Technology, V.K.Kothari & V.B.Gupta, Chapman & Hall, 1997.                                                   |
| 2. | Production of synthetic fibres, A.A. Vaidya, Prentice-Hall of India Private Limited, 1988.                                      |
| 3. | Man-made Fibres, R. W. Moncrieff, Wiley international, 1970.                                                                    |
| 4. | Textile Yarns, B.C.Goswami, J.G.Martindale and F.L.Scordioo, Wiley international.                                               |
| 5. | High-Speed Fiber Spinning: Science and Engineering Aspects, Andrzej Ziabicki, Hiromichi Kawai, Krieger Publishing Company, 1991 |
| 6. | Manmade fibres, NCUTE pilot programme, B.L.Deopura                                                                              |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                             |                                                                                            |                      |                                 |                 |           |                    |                                                                                        |                                                                                          |                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------|---------------------------------|-----------------|-----------|--------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>The Maharaja Sayajirao University of Baroda</b><br><b>Faculty Technology and Engineering</b><br><b>Department of Textile Engineering</b> | <b>Academic Year</b>                                                                       |                      | <b>2019-20</b>                  |                 |           |                    |                                                                                        |                                                                                          |                                                                                                  |
| <b>M.E. (Man Made Textiles): Regular Programme</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                             |                                                                                            |                      |                                 |                 |           |                    |                                                                                        |                                                                                          |                                                                                                  |
| <b>Year</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>I</b>                                                                                                                                    | <b>Core / <del>Elective</del> / Foundation</b><br><b>TXE 2207:Post Spinning Operations</b> |                      | <b>Credits / Hours per week</b> |                 |           | <b>04(theory)</b>  |                                                                                        |                                                                                          |                                                                                                  |
| <b>Semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>II</b>                                                                                                                                   | Year of Introduction: 2002                                                                 |                      | <b>Maximum Marks / Grade</b>    |                 |           | <b>100(theory)</b> |                                                                                        |                                                                                          |                                                                                                  |
| <b>Mode of Transaction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                             | Lectures & Tutorials                                                                       |                      |                                 |                 |           |                    |                                                                                        |                                                                                          |                                                                                                  |
| <b>Course Outcome (CO) TXE 2207</b><br>CO1 To impart knowledge about need and varieties of post spinning techniques employed for making spun manufactured yarn usable<br>CO2 To give details of blending techniques used for short staple spinning and constrains involved<br>CO3 To explore technical aspects considered in the selection of blend components to get desired product yarn quality at an economical rate<br>CO4 To study machine and process variables of post spinning operations along with their control like drawing, heat setting, twisting, etc. |                                                                                                                                             |                                                                                            |                      |                                 |                 |           |                    |                                                                                        |                                                                                          |                                                                                                  |
| <b>Unit No.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Topic/Unit</b>                                                                                                                           |                                                                                            | <b>Contact Hours</b> | <b>Weightage (%)</b>            | <b>BT Level</b> | <b>CO</b> | <b>PSO</b>         | <b>Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)</b> | <b>Relevance to Local (L)/ National (N)/ Regional(R)/ Global (G) developmental needs</b> | <b>Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Profess</b> |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |     |             |                     |                   |             |        | ional<br>Ethics<br>(PE) |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------------|---------------------|-------------------|-------------|--------|-------------------------|
| 1 | Introduction: Basic information on man-made fibers with reference to its production, properties (positive and negative), why consumption of cotton worldwide has dropped.<br>Need for blending. Different options for the processing of blends: Brief introduction for commercialized spinning systems: cotton, worsted and woolen.                                                                                                                                                       | 06 | 10% | 1,2,3,4,    | CO1<br>CO2          | PSO1              | Emp,<br>Ent | L,RN,G | ES                      |
| 2 | Selection of Blend constituents:, Compatibility of fibers used in the blends, blend ratio, Interrelationship between Fibre characteristics and spinnability in terms of crimp, fiber finish, static charge, friction....etc., , mechanics of blending Constrains taken care off in the Selection of blend constituents                                                                                                                                                                    | 09 | 15% | 3,4,5       | CO2,<br>CO3         | PSO2<br>&<br>PSO3 |             |        |                         |
| 3 | Blending techniques: methods available<br>i. Blending at blow-room: Explanation of blow-room blending with example of a typical Reiter/ Trutzscler BR line.<br>• Changes to be made on card to process blend material<br>ii. Blending at draw frame: Explanation of Draw frame blending with example of a typical blend ratio.<br>• Changes to be made on Draw frame onwards machine up to Ring frame to process blend material.<br>iii. Unconventional systems of spinning blended yarn. | 12 | 20% | 3,<br>4,5,6 | CO1,<br>CO2,<br>CO3 | PSO2<br>&<br>PSO3 |             |        |                         |
| 4 | Quality Control for Blended Yarn: Indices of blending, degree of mixing, Uniformity of Blend/ Blend homogeneity; Tracer fiber technique                                                                                                                                                                                                                                                                                                                                                   | 03 | 5%  | 3,4,5,6     | CO3                 | PSO4              |             |        |                         |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |     |               |              |                                 |  |  |  |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|---------------|--------------|---------------------------------|--|--|--|
| 5 | a) Drawing: Introduction to drawing, fundamental study of a drawing unit,<br>b) Drawing behavior of thermoplastic polymers, nature of the load-elongation behavior, and mechanism of drawing through neck.<br>c) Necking behavior of PET polymer and Nylon 6.<br>d) Influence of drawing on structure and properties of fibres, drawing induced structural changes in different fibres,                                                                    | 8 | 13% | 3,4,5,6       | CO1,<br>CO4  | PSO2,<br>PSO3,<br>PSO4,<br>PSO5 |  |  |  |
| 6 | e) Orientation strengthening and limiting draw ratio, drawing stress and molecular discontinuities.<br>f) Orientation stretching for high strength, High speed spinning and the spin draw process.<br>g) Drawing of pre oriented yarns and draw warping                                                                                                                                                                                                    | 7 | 12% | 2,3,4,5       | CO1,<br>CO4, |                                 |  |  |  |
| 7 | a) Heat setting: Introduction to heat setting, nature of set, mechanism of temporary set and permanent set,<br>b) Heat setting behavior of Polyamide and PET polymer fibres<br>c) Effect of tension during heat setting on fibre properties<br>d) Thermal healing, heat setting under dry and wet heat.<br>e) Settability and the measurement of the degree of set                                                                                         | 8 | 13% | 2,3,4,5,<br>6 | CO1,<br>CO4  |                                 |  |  |  |
| 8 | a) Twisting of manufactured fibres: Importance of twist in manufactured fibres, different twisting methods, two stage twisting,<br>b) Two for one twister, general description of TFO twister, TFO design for filament yarn, Understanding of tension change at various stages of passage yarn in TFO<br>c) Effect of twist on yarn and fabric properties, effect of twist on filament yarn properties, effect of twist on tension properties of flat yarn | 7 | 12% | 3,4,5,6       | CO1,<br>CO4  |                                 |  |  |  |

|                         |                                                                                                                                                                   |  |  |  |  |  |  |  |  |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|
|                         | d) Effect of twist on tenacity of flat yarn, effect of twist on mechanical properties of twisted textured yarn                                                    |  |  |  |  |  |  |  |  |
|                         | e) Quality control in yarn twisting                                                                                                                               |  |  |  |  |  |  |  |  |
| <b>Reference Books:</b> |                                                                                                                                                                   |  |  |  |  |  |  |  |  |
| 1.                      | Manufactured Fibre Technology, V.K.Kothari & V.B.Gupta                                                                                                            |  |  |  |  |  |  |  |  |
| 2.                      | Manmade Fibres, R. W. Moncrieff                                                                                                                                   |  |  |  |  |  |  |  |  |
| 3.                      | Yarn Texturing Technology, J.W.S. Hearle, L. Hollick, D.K. Wilson, Woodhead Publishing Ltd, Cambridge (2001)                                                      |  |  |  |  |  |  |  |  |
| 4.                      | Research/Review papers from: Journal of Textile Institute, Textile Research Journal, Indian Journal of Fiber and Textile Research, Textile Progress, Conferences. |  |  |  |  |  |  |  |  |
| 5.                      | Master's Dissertations and Ph.D thesis.                                                                                                                           |  |  |  |  |  |  |  |  |
| 6.                      | Companies' brochure and technical literature from their website, data from Government and trade portals.                                                          |  |  |  |  |  |  |  |  |
| 7.                      | High-speed Fibre Spinning : Science and Engineering Aspects, Andrzej Ziabicki, Hiromichi Kawai, Krieger Publishing Company, (1991)                                |  |  |  |  |  |  |  |  |

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| <br>सत्यं शिवं सुन्दरम्                                                                                                                                                                                                                                                                                      | <b>The Maharaja Sayajirao University of Baroda</b><br><b>Faculty Technology and Engineering</b><br><b>Department of Textile Engineering</b> | <b>Academic Year</b>                                                                                         |                                 |                      |                 |           | <b>2019-20</b> |                                                                                        |                                                                                          |                                                                                          |
| <b>M.E. (Man Made Textiles): Regular Programme</b>                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                             |                                                                                                              |                                 |                      |                 |           |                |                                                                                        |                                                                                          |                                                                                          |
| <b>Year</b>                                                                                                                                                                                                                                                                                                                                                                                   | <b>I</b>                                                                                                                                    | <b>Core / <del>Elective</del> / <del>Foundation</del></b><br><b>TXE 2208:Developments in Man Made Fibers</b> | <b>Credits / Hours per week</b> |                      |                 |           |                | <b>04(theory)</b>                                                                      |                                                                                          |                                                                                          |
| <b>Semester</b>                                                                                                                                                                                                                                                                                                                                                                               | <b>II</b>                                                                                                                                   | Year of Introduction: 2002                                                                                   | <b>Maximum Marks / Grade</b>    |                      |                 |           |                | <b>100(theory)</b>                                                                     |                                                                                          |                                                                                          |
| <b>Mode of Transaction</b>                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                             | Lectures & Tutorials                                                                                         |                                 |                      |                 |           |                |                                                                                        |                                                                                          |                                                                                          |
| <b>Course Outcome (CO) TXE 2208</b><br>CO1 To Impart latest knowledge about new generation of manmade fibers.<br>CO2 To give details of high functional and high performance fibers.<br>CO3 To explore use of new generation of fibers in advanced textile products.<br>CO4 To study environmental usefulness, techno economic survey and sustainability aspect of advanced textile products. |                                                                                                                                             |                                                                                                              |                                 |                      |                 |           |                |                                                                                        |                                                                                          |                                                                                          |
| <b>Unit No.</b>                                                                                                                                                                                                                                                                                                                                                                               | <b>Topic/Unit</b>                                                                                                                           |                                                                                                              | <b>Contact Hours</b>            | <b>Weightage (%)</b> | <b>BT Level</b> | <b>CO</b> | <b>PSO</b>     | <b>Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)</b> | <b>Relevance to Local (L)/ National (N)/ Regional(R)/ Global (G) developmental needs</b> | <b>Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and</b> |

|   |                                                                                                                                                                                                                                                             |    |     |             |            |              |      |       |                          |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------------|------------|--------------|------|-------|--------------------------|
|   |                                                                                                                                                                                                                                                             |    |     |             |            |              |      |       | Professional Ethics (PE) |
| 1 | Detail classification of new fibers (next generation fibers), their manufacturing methods, physical and chemical properties                                                                                                                                 | 09 | 15% | 1,2,3,4,    | CO1        | PSO1         | EMP, | N,G,L | ES                       |
| 2 | High functional (Mechanical, chemical, physical and biological function) and high performance fibers, their physical and chemical properties.                                                                                                               | 09 | 15% | 3,4,5       | CO2        | PSO2<br>PSO3 |      |       |                          |
| 3 | Fiber materials for advanced technical textiles, special requirements of raw material used for advanced technical textile products, worldwide scenario, and India's prospect to explore the emerging global markets                                         | 06 | 10% | 3,<br>4,5,6 | CO3        | PSO2<br>PSO3 |      |       |                          |
| 4 | Advanced technical textile products, their manufacturing methods, applications (contribution to resources and environment, technical textiles, protection and safety, IT & electronics) product sustainability, techno economic analysis and market survey. | 06 | 10% | 3,4,5,6     | CO4        | PSO4<br>PSO5 |      |       |                          |
| 5 | Classification of different generation of fiber based on performance and end use ,Concept of new performance fiber based on physical and chemical modification ,sustainable synthetic fiber and its application                                             | 08 | 15  | 1,2,3,4     | CO2        | PSO2<br>PSO3 |      |       |                          |
| 6 | Physical modification of fibers<br>Bi-component Fiber Production, properties and application. Microfibre :and Nanofiber Production, properties and application                                                                                              | 12 | 18  | 2,3,4,5     | CO2<br>CO3 | PSO2<br>PSO3 |      |       |                          |
| 7 | Chemical modification of fiber<br>Other specialty fibers and yarns characteristics , Properties and application, Sustainable fibers, Biodegradable and high absorbent fibers                                                                                | 10 | 17  | 3,4,5,6     | CO3<br>CO4 | PSO2<br>PSO3 |      |       |                          |

| <b>Reference Books</b> |                                                                                                                                                                   |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                     | New Fibers, Tatsaya Hongu                                                                                                                                         |
| 2.                     | Developments in manmade fibers, Dr.V.B.Gupta, Dr V.K.Kothari                                                                                                      |
| 3.                     | Research/Review papers from: Journal of Textile Institute, Textile Research Journal, Indian Journal of Fiber and Textile Research, Textile Progress, Conferences. |
| 4.                     | Master's Dissertations and Ph.D thesis.                                                                                                                           |
| 5.                     | Companies' brochure and technical literature from their website, data from Government and trade portals.                                                          |