**Department of Textile Technology**

**TXL 747: Colour Science**

3 credits (3-0-0)
Prerequisites: EC 75

Colour and chemical constitution, physics and chemistry of colour, measurement of colour Colorimetry and CIE system, Qualities of Colorants, Colour-order systems, Colour Sensors, Physiology of Colour Vision, Visual and instrumental evaluation of whiteness, shade sorting, colour uncertainty

**TXL748: Advances in Finishing of Textiles**

3 credits (3-0-0)
Prerequisites: EC 75/TXL747/TXL753


**TXP 748: Textile Preparation and Finishing Lab**

1 credit (0-0-2)
Prerequisites: TXL747/TXL753

Preparatory and finishing related project based experiments, Chemistry and principle of each treatment and analysis of results.

**TXL 749: Theory and Practice of Dyeing**

3 credits (3-0-0)
Prerequisites: EC 75

Advances in dyes, Speciality dyes: photochromic, thermochromic, electrochromic, mechanochromic; Fluorescent and near IR dyes; Dyes for camouflage; Banned dyes; Safe and eco-friendly dyes, natural dyes; Mechanisms of dyeing; Thermodynamics of dyeing; Kinetics of dyeing; Dye-fibre interactions; Role of fibre structure in dyeing; Advances in dyeing processes: low liquor, salt free, low energy intensive dyeing; Dyeing of blends; Mass coloration of man-made fibres; Dyeing of speciality fabrics: stretch fabrics, light weight, textured, garment dyeing, micro-denier fabrics, fibre dyeing; Effect of finishes on shade and fastness; Dyeing faults and case studies.

**TXP 749: Textile Coloration Lab**

1 credit (0-0-2)
Prerequisites: B Tech. Textile/ BE Textile/ MSc Textile
Project based experiments in dyeing and colouration, dyeing of fabric, visual and instrumental assessment of shade variation. Subjective vs objective evaluation, Shade sorting, whiteness index. Azo dye synthesis and characterization.

**TXP 751:**  
**Characterization of Chemicals and Finished Textiles Lab**  
1 credit (0-0-2)  
Prerequisites: B Tech. Textile/ BE Textile/ MSc Textile

Evaluation, characterization and analysis of textile auxiliaries, chemicals, dyes, and water, Project based experiments for evaluation of the dyed and finished textiles.

**TXS 751:**  
**Research Seminar**  
1 credit (0-0-2)  
Prerequisites: TXT800

Presentation and discussion based on work done during internship or selected topics on current and future technologies.

**TXR 752:**  
**Professional Practices**  
1 credit (0-0-2)  
Prerequisites:

Interaction and discussion with experts from industry and academia in the field of textiles and allied industries for sharing best practices followed in the industry including case studies, Exposure to a variety of topics and issues related to professional ethics.

**TXL 753:**  
**Advanced Textile Printing Technology**  
2 credits (2-0-0)  
Prerequisites: EC 75

Historical development in textile printing techniques and machines; limitations thereof; theoretical concepts of transfer printing and scope; transfer printing inks, transfer paper, machines and process conditions; concept of digital printing, technology and challenges thereof, machines and principles, continuous jet verses drop-on-demand, suitability of inks for different class of fibre/fabrics, auxiliaries needed, issues related to standardization, pre- and post-printing operations, scale and economics of operation. Printing faults and related process control principles, novel printing methods, raised, plasma, fancy, 3-D effects.

**TXL 754:**  
**Sustainable Chemical Processing of Textiles**  
2 credits (2-0-0)  
Prerequisites: EC 75

Sustainability, Green Processing technologies, which require fewer chemicals, consume less energy and water and release cleaner effluent, Technologies using organic and natural fibers, Bio composites, Process technologies using new enzymes, ozone, and foam technology, Low-salt reactive dyes, Combined dyeing and finishing, Industrial Hazardous Waste Management, in-plant management, reduction, recycling and disposal of waste, Laws related to
environmental protection specially with reference to textile industry, Compliance, certification, social accountability and ethical practices.

**TXL 755:**
Textile Wet Processing Machines: Automation and Control

3 credits (3-0-0)  
Prerequisites: EC 75

Basic concepts of fluid flow, heat and mass transfer with specific emphasis on textile processes, Feedback control principles and systems, Sensors and transducers used in chemical processing machines; Machinery for processing of textiles in fibre, yarn and fabric form, batch and continuous machines. Machines for pre-treatment, dyeing, printing and finishing, developments in machinery for improving the effectiveness of treatment and reduction in chemical, energy and water consumption, mechanical finishing machines, garment processing

**TXL 756:**  
Textile Auxiliaries

3 credits (3-0-0)  
Prerequisites: EC 75


**TXT 800:**  
Industrial Summer Training

Non-credit Mandatory for TCP  
Prerequisites: TXL747/TXL753/TXL749

Non-credit course. The students will be required to undergo summer internship in a textile and present the experience of internship.

**TXD 805:**  
Major Project Part I (TCP)

6 Credits (0-0-12)  
Prerequisites: TXL747/TXL748/TXL749/TXL753

Project work related to the area

**TXD 806:**  
Major Project Part I (TCP)

12 Credits (0-0-24)  
Prerequisites: TXL747/TXL748/TXL749/TXL753

Project work related to the area

**TTL 711:**  
Polymer and Fibre Chemistry:

3 credits (3-0-0)

Introduction to natural and synthetic polymers. Terms and fundamental concepts. Step-growth polymerization, Carother's equation. Functionality; Crosslinking. PET manufacturing. Chain growth polymerization, Free radical

**TTP 711: Polymer and Fibre Chemistry Laboratory**

1.5 credits (0-0-3)

Identification of fibres by chemical and burning tests, polymerization of vinyl monomers such as styrene, acrylamide using bulk polymerization, solution polymerization, emulsion polymerization, radiation induced polymerization. Condensation polymerization and interfacial polymerization of nylon-6, Molecular weight measurement. Intrinsic viscosity and end group analysis, preparation of phenol-formaldehyde resin. Analysis of chemical structure by FTIR, UV spectroscopy.

**TTP 712: Polymer and Fibre Physics Lab:**

1.5 credits (0-0-3)

Characterization of fibres by Infrared spectroscopy, Density measurements, Thermal analysis such as Thermogravimetric Analysis (TGA), Differential Scanning calorimetry (DSC) and Thermo-Mechanical Analyser (TMA), Dynamic Mechanical Analysis (DMA), Sonic modulus, X-ray diffraction studies, Birefringence measurement, Optical microscopy studies, Scanning Electron Microscopy (SEM) of fibres.

**TTL 712: Polymer and Fibre Physics:**

3 credits (3-0-0)


**TTL713: Technology of Melt Spun Fibres:**

4 credits (3-1-0)

**TTL714: Physical Properties of Fibres:**

3 credits (3-0-0)

Introduction to fibre structure and requirements of fibre forming polymers Moisur Relations: Moisture sorption and desorption in fibres Sorption isotherms, Heats of sorption, Swelling and theories of moisture sorption. Mechanical

**TTL 715:**
**Technology of Solution Spun Fibres:**

3 credits (3-0-0)


**TTP716:**
**Fibre production and post-spinning operations Laboratory:**

2 Credits (0-0-4)

Experiments related to fibres production processes. Effect of moisture and temperature on MFI of PET and PP. Mett spinning of PET, PP & nylon-6 filament yams on laboratory spinning machines. Single and two stage drawing of the as spun yams or industrial POY. Demonstration of high speed spinning machine. Wet and dry heat setting of PET and nylon drawn yams. Effect of temperature and tension on heat setting. Determination of structure and mechanical properties of as spun, POY, drawn and heat set yams using DSC, Xray, PTIR, density, sonic modulus. Effect of shear rate, temperature on polymer solution viscosity using Brookfield Rheometer and ball-fall method. Wet spinning or dry jet wet spinning of PAN copolymers. False twist and air jet texturing processes. Determination of structure of textured yam under microscope.

**TTL717:**
**Advances in Manufactured Fibres:**

3 credits (3-0-0)


**TTL718:**
**High Performance Fibres and Composites:**

3 credits (3-0-0)

**TTL721:**
**Theory of Yarn Structure:**

3 credits (2-1-0)
Types of yarn. Role of yarn structure on yarn and fabric properties. Structural parameters of yarn. Twisting forms

TTL 722: Mechanics of Spinning Processes:

3 credits (3-0-0)


TTL723: Selected Topics in Yarn Manufacture:

3 credits (2-1-0)


TTL724: Textured Yarn Technology:

3 credits (3-0-0)

Principles of texturing and modern classification; False twist texturing process- mechanisms and machinery, optimization of texturing parameters, barre?, structure-property correlation of textured yarns; Draw-texturing- the need and fundamental approaches; Friction texturing- the need and development, mechanics of friction texturing, latest development in twisting devices, optimization of quality parameters. Noise control in texturing. Air jet texturing Principle, mechanisms, development of jets and machinery, process optimization and characterization, air jet texturing of spun yarns. Air interlacement - Principle and mechanism, jet development and characterization. Bulked continuous filament yarns - Need, principle, technology development. Hi-bulk yarns - Acrylic Hi-bulk yarn production, mechanism and machines involved, other such products. Solvent and chemical texturing - Need, texturing of synthetic and natural fibres.

TTL731: Theory of Fabric Structure:

3 credits (2-1-0)

and their application in the study of tensile, bending, shear, compressional and buckling deformation of woven fabrics. Structure and properties of knitted and nonwoven fabrics.

TTL 732:
**Computer Aided Fabric Manufacturing:**

3 credits (2-0-2)

Electronic Dobby: Working principle, constructional variants, design of the electronic dobbay, drive arrangement, systems for pattern data transfer. Electronic Jacquard: Working principle, constructional variants, various electronic jacquard systems, selection system, pattern data transfer and management. CAD for dobbay, jacquard, label weaving and carpet: Development of Jacquard designs, process of drafting and sketch design, development of figures, composition of design, geometric ornamentation, arrangement of figures, weave simulation. **Laboratory:** Working on electronic dobbay and electronic Jacquard, working on CAD, development of various designs on CAD and development of design samples.

TTL733:
**Selected Topics in Fabric Manufacture:**

3 credits (2-0-2)


TTL741:
**Coloration of Textiles:**

3 credits(3-0-0)


TTL 742:
**Theory and Practice of Textile Finishing:**

3 credits(2-0-2)

General overview of the recent technological developments in the area of textile finishing. Special emphasis will be on formaldehyde free finishes for wash-n-wear and durable press applications, fire retardants for apparel and industrial textiles, silicon and amino silicon softeners, fluoro-chemicals for water repellency and soil release functions, water proof breathables principles and technology involved in their production, surface modifications of textiles and their impact on various functional properties, antistats for synthetic fibres / fabrics, microencapsulation and its relevance in textile finishing application. , new finishes for different functional and aesthetic requirements.
TTL743: Principles of Colour Measurement and Communication:

3 credits (2-0-2)

TTL744: Environmental Management in Textile & Allied Industries:

3 credits (3-0-0)


TTL 751: Apparel Engineering and Quality Control:

3 credits (2-0-2)


TTL761: Costing, Project Formulation and Appraisal:

3 credits (2-1-0)

**Project Cycle:** Phases of project cycle identification, preparation evaluation, documentation & Supervision. Various functions in project cycle - Technical, commerical, financial, economic, and managerial. Project formulation and Appraisal: Appraisal concept, Need for appraisal, Methodology, Various aspects - market, management, technical, financial and economic, Key financial indicators in appraisal, Investment decision from appraisal report, Post-project appraisal. Evaluation of Technological Content of Textile

**Projects:** The choice of Technology and their assessment, operating constraint, appropriateness of technology, factors influencing selection, various aspects of technology transfer. Project Utilities and Environmental Aspects for Textile projects: Power, Steam, Fuel, Water, Compressed air, Air conditioning, Pollution (air, water, ground noise). Special Appraisals: For Modernisation projects, balancing equipment, expansion and diversification projects (including backward & forward integration).

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**TTP 761:**

**Evaluation of Textile Material I:**

1 credits (0-0-2)

Characterization of Fibre: Birefringence, sonic modulus, density measurements, thermal analysis, X-rays (orientation and crystallinity).
Yarn Testing: Tensile properties, hairiness, cross-sectional studies and yarn preparation.

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**TTP 762:**

**Evaluation of Textile Material II:**

1 credits (0-0-2)


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**TTL762:**

**Management of Textile Production:**

3 credits (2-1-0)


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**TTL763:**

**Technical Textiles:**

3 credits (2-1-0)

drainage by geotextiles. Soil characteristics. Methods of long term prediction of geotextile life and survivability in soil.


**TTL764:**
**Process Control in Spinning & Weaving:**

3 credits (3-0-0)


**TTL765:**
**Product Development:**

3 credits (2-1-0)


**TTL771:**
**Electronics and Controls for Textile Industry:**

4 credits (3-0-2)


**Laboratory:** Experiments on sensors and transducers (displacement, position, strain, temperature, rotational speed). Basic analog circuits with diodes and transistors. Basic digital Gates. SCR and TRIAC control of motor speed. Data acquisition and control with microprocessors/ microcontrollers.
TTL772: Computer Programming and its Applications:

3 credits (2-0-2)


TTL773: Design of Experiments and Analytical Techniques:

3 credits (3-0-0)


TTL 866: Functional and High Performance Textiles:

3 credits (2-1-0)


TTS 890: Independent Study (Fibre Science & Technology):

3 credits (0-3-0)

Student should undertake a research oriented activity including software development, machine design and development, instrumentation, product and process development or indepth study of a subject of outside the regular courses offered in the programme. This study should be carried out under the guidance of a faculty member. The subject area chosen by the student should be sufficiently different from the area of major project being pursued by the student. The student must submit a detailed plan of work for the programme coordinator before approval of registration for the course.
**TTS 891:**
Independent Study (Textile Engineering):

3 credits (0-3-0)

Student should undertake a research oriented activity including software development, machine design and development, instrumentation, product and process development or in depth study of a subject of outside the regular courses offered in the programme. This study should be carried out under the guidance of a faculty member. The subject area chosen by the student should be sufficiently different from the area of major project being pursued by the student. The student must submit a detailed plan of work for the programme coordinator before approval of registration for the courses.

**TTD891:**
Major Project Part-I (Fibre Science & Technology):

6 credits (0-0-12)

**TTD892:**
Major Project Part-II (Fibre Science & Technology):

12 credits (0-0-24)

**TTD893:**
Major Project Part-I (Textile Engineering):

6 credits (0-0-12)

**TTD894:**
Major Project Part-II (Textile Engineering):

12 credits (0-0-24)