M Tech Programme
in
Textile Engineering and Management

Course Curriculum

Dr B R AMBEDKAR
NATIONAL INSTITUTE OF TECHNOLOGY
JALANDHAR – 144011
Year 2014
### Semester - I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hrs/week</th>
<th>Credits</th>
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<tbody>
<tr>
<td>TT-501</td>
<td>Advances in Fibre Production</td>
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<td>TT-503</td>
<td>Advances in Yarn Production</td>
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<td>Advances in Fabric Production</td>
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<td>TT-507</td>
<td>Advances in Colouration and Finishing Technology</td>
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<td>TT-509</td>
<td>Production Management in Textiles</td>
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<tr>
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<td>Mechanical Processing Lab</td>
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<td>Structural Mechanics of Fabrics</td>
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<td>TT-506</td>
<td>Statistical Methods and Design of Experiments</td>
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<td>TT-508</td>
<td>Costing, Project Formulation and Appraisal</td>
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<td>TT-510</td>
<td>Textile Marketing and Merchandising</td>
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<td>TT-XXX</td>
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<td>TT-XXX</td>
<td>Department Elective -II</td>
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<td>TT-600</td>
<td>Project Part-I*</td>
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*The credits shall be consolidated on the completion of Project part – II*

### Semester - IV

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**Grand Total of Credits** = 65

### Electives

- TT- 611 Characterization of Polymers and Fibres
- TT- 613 Post Spinning Operation
- TT- 615 Advanced Chemical Processing
- TT- 617 Garment Manufacturing Technology
- TT- 619 Geosynthetics
- TT- 621 Operation Research and Logistic Management
- TT- 623 Knitting and Nonwoven Technology
- TT- 625 Textile Structural Composites
- TT- 627 Simulations and Modelling of Textile Processes
- TT- 629 Physical Properties of Fibre
- TT- 633 Medical Textiles
- TT-635 Textile Product Design
- TT-637 Heat and Mass Flow through Fibrous Material
- TT-639 Process Control in Mechanical Processing of Textiles
- TT-641 Application of OR in Textiles
- TT-643 Technical Textiles
- TT-645 Financial Management and Accounting
- TT-647 Advances in Apparel Technology
Core Subjects

TT 501  Advances in Fiber Production [2-0-0-2]


Books Recommended:

TT 503 Advances in yarn Production [2-0-0-2]


Books Recommended:
TT 505 Advances in Fabric Production [2-0-0-2]


Books Recommended:

TT 507 Advances in Colouration and Finishing Technology [2-0-0-2]

Books Recommended:

TT 509 Production Management in Textile [3-0-0-3]

Books Recommended:

TT 513 Mechanical Processing Laboratories [0 0 3 2]
A. Exploration of product development possibilities in Spinning and Weaving laboratories.
B. Product development by using the existing prototype machines.
   1. Friction spun Yarn
   2. ring Spun Yarn
   3. Air –jet Spun Yarn
C. Measurement of properties of the yarns.
D. Preparation of Fabric Samples in knitting machines and measurement of Fabric properties.
E. Preparation of Fabric Samples in Weaving machines and measurement of Fabric Properties.

**TT 515 Chemical Processing Laboratories [0 0 3 2]**

1. Identification of dye from given dyed sample and reproduction of the same.
2. Assessment of fastness criteria of dyed samples.
3. Evaluation of Anti-crease finish
5. Evaluation of flame retardant finish.
7. Quality assessment of processed and finished samples.
8. Extrusion and drawing of mono-filament.
10. Demonstration of various analytical equipments i.e. DSC, TGA, FTR etc.

**TT 502 Structural Mechanics of Yarn [2 1 0 3]**


**Books Recommended :**
**TT 504 Structural Mechanics of Fabrics [2-1-0-3]**


**Books Recommended:**


**TT 506 Statistical Methods and Design of Experiments [2-1-0-3]**

Various statistical tools and their usefulness. Measurement of dispersion, binomial, Poisson and normal distribution, analysis of discrete and ranking data, acceptance sampling, control charts, correlation and regression, principles of experimental design, typical application of experimental design, simple comparative experiments, experiment with single factor, analysis of variance, Various type of design, introduction to factorial designs, \(2^k\) factorial design, two level design, three level design, fitting regression models, multiple regression and correlation analysis, response surface methodology, test of significance and model lack of fit, use of replicates, use of computers and software package.

**Books Recommended:**


**TT 508 Costing, Project Formulation and Appraisal [3-0-0-3]**

Costing- elements of costs, expenses excluded from cost, cost sheet, cost concept, cost classification, treatment of stock. Project Planning – Capital expenditure, phases of capital budgeting, generation and screening of project ideas, project rating index, resource allocation
framework. Project Analysis - Feasibility study, product life cycle, market analysis, market planning, market survey and characterisation of markets, demand analysis, demand forecasting, technical analysis, project charts and layouts. Financial analysis – Cost of project, means of finance, projected financial statements, working capital requirement, estimate of sale and production, cost of production, cash flow, time value of money and cost of capital. Appraisal criteria – net present value, benefit cost ratio, internal rate of return, payback period, analysis of risk and social cost benefit analysis. Project implementation - Network techniques, PERT, CPM. Project Review and Administration.

Books Recommended:

TT 510 Textile Marketing and Merchandising [3-0-0-3]
Marketing management - Domestic marketing, international marketing, textile product development and marketing, product life cycle, pricing, marketing channels and promotion mix. Marketing research – Basic concepts, research process, identifying market segment, product research, advertising research, market and sales analysis. Merchandising - Merchandise buying and handling process, resident buying offices, merchandise pricing, merchandising forecasting and budgeting. Framework of retailing, developing and applying retail strategies, factors affecting retail price strategy, societal impact of retail merchandising, selling to retailers.

Books Recommended:

TT 512 Advanced Textile Testing Lab [0-0-3-2]
1. Evaluation of tensile and compressional characteristics of different woven and nonwoven fabric.
2. Evaluation of filtration efficiency of bag filters.
4. Evaluation and analysis of HVI data for differently graded cotton material.
5. Evaluation and analysis of bending behaviour of woven fabric using Shirley stiffness tester and through bending length measurement.
TT-514 Software Engineering Lab [0-0-2-1]

- Learning of different statistical packages such as STATISTICA/ SYSTAT/MINITAB. Analysis of basic statistical tools along with design of experiment, multivariate analysis and neural networks.
- Detail study of various modules of software’s use for surface/texture designing in fabric production.
- Detail study of various modules of garment/fashion designing software.
- Study of various stages/modules of CAD software of apparel production.
- Study of various stages/modules of Cut Planner software used in apparel production.
- Study of different tools and modules of merchandising software of apparels viz-production/order/supply and its marketing.
- Use of MATLAB in textiles.

TT 601 Seminar [0-3-0-3]

Student should undertake in depth study of a topic of outside the regular courses offered in the programme. The 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 project being pursued by the student. The evaluation will be based on the report, seminar and viva-voce.

Electives

TT 611 Characterizations of Polymers and Fibres [3-0-0-3]


Books recommended:
TT 613 Post Spinning Operations [3-0-0-3]


Heat Setting process, parameters for heat setting, equipment for heat setting and evaluation of degree of set. Post spinning operation on multifilament sewing threads.

Books recommended:

TT 615 Advanced Chemical Processing [3-0-0-3]


Books Recommended:

**TT 617 Garment Manufacturing Technology [3-0-0-3]**


**Books Recommended:**
2. Carr Harold and Barbara, “The Technology of clothing Manufacture”, Om Book Service, Delhi, 1998

**TT 619 Geosynthetics [3-0-0-3]**

Fundamental of physical, chemical and mechanical properties affecting engineering behaviour of soil, identification, classifications, permeability, effective stress and pore water pressure, seepage of soils and design of filter criteria.

Geosynthetics types and functions, fibres used, material construction and manufacturing processes in case of geotextiles, composition of geomembrane and geogrids and their manufacturing, structure of geocomposites, testing of geocomposites with and without soil, evaluation of filtration and drainage functions, reinforcement, creep, moisture barrier characteristics, durability and ageing.


**Books Recommended:**

**TT 621 Operation Research and Logistic Management [3-0-0-3]**

Operation research - introduction, historical development, phases of operation research study, general linear programming, simplex method, sensitivity analysis. Transportation problem, methods of finding an initial solution, degeneracy, optimum solution, post optimality analysis, variation in transportation problems, assignment problems, variation in assignment problems, queuing, game theory, minimax and maximin strategies, decision theory, replacement decisions. Inventory management techniques- selective inventory control: ABC analysis, economics order quantity, ordering cost, acquisition cost, inventory carrying cost or holding cost, just in time, information systems for inventory management, store management and merchandising, make or buy decision, analysis of investment in inventory, value analysis and material management. Enterprise resource planning.

**Books Recommended:**

**TT 623 Knitting and Nonwoven Technology [3-0-0-3]**

Weft and warp knitting machines, Different forces acting on needle butt, dynamics of knitting process, mechanics of loop formation, different machines, process and yarn parameters affecting the yarn tension in knitting zone and loop length, development in knitting machines, design and performance of high speed knitting cam, yarn feeding devices on circular knitting machine, warp knitted fabric and its different industrial uses, geometry and properties of knitted fabrics, process control in knitting, classification and areas of application of nonwoven fabrics, different methods of production of nonwoven fabric, effect of machine, fiber and process variables on properties of non woven fabrics, failure mechanism in nonwoven fabrics, prediction of needle punch nonwoven fabric behaviour.

**Books Recommended:**
**TT 625 Textile Structural Composites [3-0-0-3]**


Polyamide fibres: Aliphatic polyamide (N6 and 66) and their application in rubber tyre. Fully aromatic polyamides or aramid fibres (Nomex and Kevlar), their manufacture, structure, properties and applications.

Carbon fibres: Different precursors, preoxidation, carbonization, graphitization, structure and properties. application in composite.

Flexible chain high performance fibres, manufacture and application in composite.

Glass fiber, manufacture, properties and application in composite.

Nanocomposite: Introduction, advantages and different nanomaterials commonly used as fillers (Carbon nanotubes, carbon nanofibres and Nano clay).

**Books Recommended:**

**TT 627 Simulations of Textile Processes [3-0-0-3]**

Concept of simulation, mathematical simulation, empirical model building, fuzzy logic, theory of artificial neural network and expert system, CAD system, usefulness of different simulation systems.

Application of different simulation techniques on cotton mixing, fiber blending, carding process, drafting, yarn formation, package building, simulation of weaving and knitting process, on line quality control, application of CAD in textile manufacturing, prediction of yarn tensile and bending properties, simulation of fabric low stress behaviour such as shearing, bending and tensile modulus. Prediction and simulation of fabric tensile and tearing strength.

**Books Recommended:**
TT 629 Physical Properties of Fibre [3-0-0-3]


Books Recommended:

TT-631 Environmental Practices in Textiles [3-0-0-3]


Books Recommended:

TT-633 Medical Textiles [3-0-0-3]

Introduction to healthcare and medical textile devices, role of textile structures and biomaterials in healthcare, Types of textiles and biomaterials for medical applications, Key properties of medical textile products, Healthcare and hygiene products. Wound care products and bandaging Hi-tech textiles for interactive wound therapies, Surgical Textiles; Suture threads. Application of implantable biomedical devices: Vascular textiles, Knitted cardiac biological valves, hollow fibres as dialysis membrane, Tissue culture engineering. The role of reusable medical textiles, Advantages of reusable textiles, Types of reusable textiles used for medical applications, Nonwoven materials and technologies for medical

Books Recommended:

TT-635 Product Design [3-0-0-3]

Concepts of engineering, product development and design, Characteristics of successful product design, Product development process tools. Product architecture. Evolution of engineering. Engineering attributes and concepts. Basic concepts and critical factors for product development Simplified view of product development The product development cycle, Business and marketing aspects related to product development Product-focus versus user-focus product development Role of research in product development The core task in product development The product design cycle, Design conceptualization Design analysis. Basic differences between design conceptualization and design analysis. General guidelines for design conceptualization Basic tools of design conceptualization Purpose of design analysis Optimization analysis: linear programming. Product design economics.

References

TT-637 Heat and Mass flow through Fibrous Materials [3-0-0-3]

Books Recommended:


TT-639 Process Control in Mechanical Processing of Textiles [3-0-0-3]

The basic aspects of process control programme, relevance of modern testing instruments in optimization of yarn quality and process performance, bale management in spinning mills, waste management in spinning mills, fibre friction and process performance, control of yarn blemishes leading to fabric faults; Optimum realization of yarn tenacity and elongation, controlling mass variation in yarn, yarn faults and hairiness, technological considerations: productivity and quality of yarns obtained from new spinning systems (rotor, friction, airjet). Winding - quality of knots and splices, quality of package, control of hard waste, yarn quality requirements for shuttle and shuttleless looms. Warping and sectional warping - performance, process parameters and productivity. Minimizing end breaks, quality of warper’s beam, control of hard waste; choice of size recipe, control of size pick up, quality of sized beam. Quality of weaver’s beam. Control of cross, extra, missing and buried ends, loom efficiency, factors influencing loom efficiency, hard waste, productivity. Fabric defects and their control.

References:

2. C.A. Lawrence, Fundamentals of Spun Yarn Technology, 2003, CRC Press LLC, USA

TT 641 Application of Operation Research in Textiles [3-0-0-3]

Operations research - introduction, historical development, phases of operation research study, general linear programming, simplex method, sensitivity analysis. Transportation problem, methods of finding an initial solution, degeneracy, optimum solution, post optimality analysis. Application of Transportation problems, Assignment problems, Queuing theory, Sequencing models in textile production. Game theory and its suitability in textile production. Inventory management techniques - selective inventory control: ABC analysis, economics order quantity, ordering cost, acquisition cost, inventory carrying cost or holding cost, just in time, information systems for inventory management, store management and merchandising, make or buy decision,
analysis of investment in inventory, value analysis and material management. Enterprise resource planning.

**Books Recommended:**

**TT 643 Technical Textiles [3-0-0-3]**

- Definition and scope for technical textiles, brief idea about technical fibres, role of yarn and fabric construction, composite material.
- Filtration textiles: Definition of filtration parameters, theory of dust collection and solid liquid separation, filtration requirements, concept of pore size and particle size, role of fiber, fabric construction and finishing treatments.
- Geotextiles: Brief idea about geosynthetics and their uses, essential properties of geotextiles, geotextile testing and evaluation, application examples of geotextiles.
- Medical textiles: Classification of medical textiles, description of different medical textiles.
- Protective Clothing: Brief idea about different type of protective clothing, functional requirement of textiles in defence including ballistic protection materials and parachute cloth, temperature and flame retardant clothing, chemical protective clothing, water proof breathable fabrics.
- Automotive textiles: Brief idea about the important properties and requirements in automotive textiles, textiles components in tyre, tyre structure and design.
- General technical textile: Textiles in agriculture, electronics, power transmission belting, hoses, canvas covers and tarpaulins.

**Books Recommended:**

**TT 645 Financial Management and Accounting [3-0-0-3]**


**Ratio Analysis:** Meaning and nature of Ratio Analysis, Use and significance of Ratio Analysis  Limitations of Ratio Analysis, Classification of ratio, Test for short-term financial position: Current liquid and Absolute liquid ratios, Efficiency and Activity ratios: Stock turnover, Debtor turnover Ratio, Average collection period, creditors turnover ratio, Average Payment Period, Test of solvency: Debt-Equity ratio, Equity ratio, Solvency ratio, and Net Worth ratio, Profitability ratios: Gross profit, Operating Expense, Net profit And operating profit ratios, Return on Investment and Earnings Per Share.

**Statements of changes in Financial Position:** Fund flow statement, Cash flow statement.

**Corporate Finance:** Meaning, Evolution and importance of corporate finance, Approaches of finance function, contents of finance function, Relationship of finance with other business functions, financial divisions, and functions of Finance Manager.

**Sources of Finance:** Classification of sources of finance, Security financing, Ownership securities, Equity Shares, Preference Shares, Deferred Shares, Debentures and Retained Earnings, Depreciation as source of funds, factoring, commercial banks, public deposits, lease financing and mutual funds.

**Working Capital Management:** Meaning, concept and classification of working capital, Needs and objectives of working capital, Disadvantages of Inadequate and redundant working capital, Principles of working capital management, Estimation of working capital requirements, Financing of working capital.

**Control of Capital Issues:** Securities and Exchange Board of India (SEBI) SEBI Act1992, Purpose of SEBI Act, Powers and functions of SEBI, Guidelines issued by SEBI (inclusive of recent modifications), Evaluation of SEBI, limitations of SEBI.

**Capital Budgeting:** Introduction to investment, types of investment decisions,Factors affecting investment decisions Traditional techniques of capital budgeting: Payback Period and Average Rate of return methods, Modern techniques of capital budgeting: Net Present Value and Internal Rate of Return methods Capital Rationing.

**Recommended Books**


**TT 647 Advances in Apparel Technology [3-0-0-3]**

**Introduction:**- Introduction to garment manufacturing and Indian apparel industry. Latest developments in apparel manufacturing and machinery.


**Sewing Machine Mechanisms & Accessories** – Introduction to sewing m/c and its parts and working details, types of sewing m/c, Attachment of sewing m/c, Automation in industrial sewing machines, automatic placket feeder, Automatic pocket maker, auto button sewer, Electronic Sewing machines Application of robotics in sewing, LAN in Sewing machines, high speed stitching. Preparation of seamless garments and its applications, sewing room planning.

**Sewing Needles and Threads** - Needle – functions, special needles, Needle points, sewing thread – construction, material, thread size and packages.

**Seams & Stitches** – Seams. Different types, Superimposed, lapped, bound, flat, decorative, edge neatening, addition to Garment edges, single piece addition, Stitches – lock stitch, chain stitch, hand stitch type, multi-thread chain stitch, over edge chain stitch and covering chain stitches.

**Stitch formation Mechanics:** - Mechanism of lock stitch formation, Factors affecting yarn tension and stitch length of a seam during stitching, Mathematical model of lock stitch, Development of yarn tension during lock stitching, Modeling of take-up arm displacement

**Components and Trims** - Labels – linings, interlinings, wadding, lace, braid, elastic, hock and loop fastening shoulder pads, eyelets and laces, Zip fasteners and buttons.

**Garment finishing & Packing machines** - CNC pressing machines, Quality control in apparel production.

**Apparel Production parameters** – control parameters, Product Development, Time management. Breakdown of operation sequence, Development of Flow process, Grid chart for operation sequence.


**Books Recommended:**

Our high school curriculum includes three, year-long courses. Video courses are led by experienced teachers who make the material easy for students to follow and comprehend. Every lesson begins with a warm-up activity as well as a guiding question to get students thinking, promote inquiry, and activate prior knowledge. Time4Learning’s high school curriculum is no different. With 14 elective courses available, students have a wide-range of subjects and topics they can choose from. Those include: Environmental Science. Development of courses and designing your curriculum is a student’s benefit by studying at Atlantic International University. An alternative method of education. Distance Learning at AIU is enhanced by vast academic resources and innovative technologies build into the Virtual Campus: Hundreds of self-paced