Department of Textile Technology

M. Tech. (Textile Technology)

Curriculum (With effect from academic year 2018-19)

(L-T-P) indicates L-Lecture, T-Tutorial and P-Practical

M. Tech. Semester-I

Course Contents Number	Course Contents	LTP Scheme per Week			Credits
		L	T	P	
PCC-TT-501	Advanced Yarn Production	3	0	2	4
PCC-TT-502	Melt Spinning & Texturizing	3	0	2	4
PCC-TT-503	Computer Application in Textiles	3	0	2	4
PEC-TT-5**	Program Elective I	3	0	2	4
PEC-TT-5**	Program Elective II	3	0	0	3
OEC-8**	Open Elective	3	0	0	3
AUD-9**	Audit Course Contents	2	0	0	0
				Total Credits:	**22**

M. Tech. Semester-II

Course Contents Number	Course Contents	LTP Scheme per Week			Credits
		L	T	P	
PCC-TT-510	Modern Weaving Technology	3	0	2	4
PCC-TT-511	Evaluation Techniques of Textiles	3	0	2	4
PEC-TT-5**	Program Elective III	3	0	2	4
PEC-TT-5**	Program Elective IV	3	0	2	4
MCC-590	Research Methodology and IPR	2	0	0	2
MAC-591	English for Research Paper Writing	2	0	0	0
PRJ-TT-532	Mini Project	0	0	4	2
				Total Credits:	**20**

(** Indicates last two digits of Elective Course Contents number)

M. Tech. Semester-III

Course Contents Number	Course Contents	LTP Scheme per Week			Credits
		L	T	P	
DIS-TT-601	Dissertation- Part I	0	0	28	14
				Total Credits:	**14**

M. Tech. Semester-IV

Course Contents Number	Course Contents	LTP Scheme per Week			Credits
		L	T	P	
DIS-TT-602	Dissertation- Part II	0	0	28	14
Total Credits:					**14**

List of Course Contentss for Elective-I – (Any One)

PEC-TT-504	Smart Textiles
PEC-TT-505	Fiber Characterization & Mechanical Properties
PEC-TT-506	High Performance Fibres

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List of Course Contentss for Elective-II - (Any One)

PEC-TT-507	Textile Project Planning & Implementation
PEC-TT-508	Industrial Engineering & Management
PEC-TT-509	Industrial Law and Economics

List of Course Contentss for Elective-III -(Any One)

PEC-TT-518	Technical Textile - I
PEC-TT-519	Advanced Textile Wet Processing
PEC-TT-520	Garment Technology & Merchandising

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List of Course Contentss for Elective-IV - (Any One)

PEC-TT-507	Knitting & Nonwoven Technology
PEC-TT-508	Textile Composites
PEC-TT-509	Technical Textile - II

List of Course Contentss for Open Elective

OEC-801	Business Analytics
OEC-802	Industrial Safety
OEC-803	Operations Research
OEC-804	Cost Management of Engineering Projects
OEC-805	Composite Materials
OEC-806	Waste to Energy

List of Audit Course Contentss

AUD-901	Project Management
AUD-902	Disaster Management
AUD-903	Sanskrit for Technical Knowledge
AUD-904	Value Education
AUD-905	Constitution of India
AUD-906	Pedagogy Studies
AUD-907	Stress Management by Yoga
AUD-908	Personality Development through Life Enlightenment Skills

SEMESTER-I

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PCC-TT-501	**Advanced yarn production**	**04**	**03**	**02**

Course Contents Objectives:

1. To explain opening and cleaning aspects of modern blow room machinery and process parameters involved in it.
2. To describe design aspects of different zones of modern card to process parameters involved in it.
3. To describe design aspects of various components of a comber & theories of drafting.
4. To describe fibre blending and process parameters involved in it.
5. To describe advance aspects of various spinning technologies.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Critically analyze various aspects of opening and cleaning in modern blow room machinery and also process parameters involved in it
2. Critically analyze design aspects of different zones of modern card and process parameters involved in it.
3. Critically analyze design aspects of various components of a comber & theories of drafting.
4. Critically analyze fibre blending and process parameters involved in it.
5. Critically study advance aspects of various spinning technologies.

Course Contents :-

Unit I- Spinning Preparations: Fibre mixing and blending practices in industry, Bale Management, Blending Performance Evaluation – Degree of Mixing, Index of Blend Irregularity, Hamburger model- yarn tenacity prediction from fiber properties, Evaluation of blow room performances and AFIS applications

Unit II - Fibre separation in carding, Design and actions of wire points in carding, Transfer efficiency in carding, Roller drafting, Irregularity in textile strands, Limit irregularity, Index of irregularity, Causes of generation of irregularities, Hook removal in drawframe, Autolevellers in carding/ drawframe, Details of combing preparation, Process parameters in speedframe and roving quality

Unit III - Ringframe: Twisting and winding process in ring spinning, Yarn tension in spinning balloon and its effect on yarn quality, Mass variation in ring spun yarns- basics, causes, measurements and detections

Unit IV- Rotor Spinning: Productivity- Charka, Ring and Rotor spinning, Fibre properties and yarn quality, Yarn tension in rotor spinning, Process and machine parameters and yarn properties

Unit V - Air-Jet Spinning: Twisting and yarn formation, Process and machine parameters and yarn properties, Yarn structure and properties

Unit VI - Friction Spinning: Mechanism of yarn formation, Production of multi-layer and multi-component yarns by friction spinning, Yarn structure and property relation

References Books:

1. *Spinning of Manmade and Blends on Cotton System, K. R. Salhotra*
2. *Textile Mathematics, Vol.-2 (The Textile Institute), J. E. Booth*
3. *The Technology of Short Staple Spinning, (Short Staple Spinning Series, Vol.-I), W. Klein*
4. *A Practical Guide to Opening and Carding, (Short Staple Spinning Series, Vol.-II), W. Klein*
5. *A Practical Guide to Combing and Drawing, Vol.-3 (The Textile Institute), W. Klein*
6. *A Practical Guide to Ring Spinning, Vol.-4 (The Textile Institute), W. Klein*
7. *New Spinning Systems, Vol.-5 (The Textile Institute), W. Klein*
8. *Fundamentals of Spun Yarn Technology (CRC Press), Carl A. Lawrence*
9. *The Principles and Theory of Ring Spinning, Vol.-V (The Textile Institute), A. E. De Barr and H. Catling.*
10. *Open-end Spinning (Elsevier Science), V. Rohlena*
11. *Rotor Spinning- Technical and Economic Aspects (Textile Trade Press, The Textile Institute), E. Dyson*
12. *Rotor Spinning (The Textile Institute, Manchester), C. A. Lawrence and K. Z. Chen*

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PCC-TT-502	**Melt spinning & Texturizing**	**04**	**03**	**02**

Course Contents Objectives

1. To describe the requirements of Melt spinning process
2. To explain the details of spinneret design
3. To illustrate the different parameters needed and raw material properties in spinning process
4. To understand the texturizing processes and different parameters needed therein.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Describe the significance and scope of synthetic fibres in textiles
2. Explain the technical details spinneret design.
3. Complete understanding the properties needed for synthetic yarn manufacturing
4. Complete understanding the manufacturing of textured yarn

Course Contents :-

Unit I - Introduction, melt spinning concepts of polyester, polypropylene, Nylon, spinning of LOY, POY, FDY, BCF, Flow chart & various components of a melt spinning line, functions and design of the extruder, manifold,

Unit II - dynamic mixer, spinning beam, metering pump, melt filters, spinning pack, spinneret, types, design & role of quench chamber, spin finish applicator, winder, dryer, spin finish pump, intermingling device, Drawing & heat setting.

Unit III - Raw material, types of chips, storage & conveying of chips, Chips properties, dew point, melt spinning line parameters & their controls, quench air parameters, winding parameters & calculations, testing & properties of raw materials & filament yarn, packaging of spools, norms for gradation,

Unit IV- problems & remedial action during process, burn-out section, spin finish oil preparation, auto control systems, oil heating systems, Air treatment plant

Unit V - Procedure for starting up of line, mounting & removal of spinning pumps, spin packs,

Post spinning processes: texturizing, types, basic principles of draw & air jet texturising, yarn processing on texturising machine, processing parameters, yarn properties, problems & remedial actions during texturising,

Unit VI- comparative study of texturising machines, modern developments, texturising for fancy yarn production. Modern developments in twisting & rewinding.

Reference books:

1. *Manufactured fibre technology, V B Gupta & V K Kothari, Chapman & Hall*
2. *http://nptel.ac.in/Course Contentss/*
3. *Winter School on Manmade Fibres Vol-1; Edited By Gupta & Kothari; 1988,IITD*
4. *Winter School on Manmade Fibres Vol-II; Edited By Gupta & Kothari;1988, IITD Man-made fibres -*

Moncrieff.
5. *Production of Synthetic Fibers by A. A. Vaidya, Ist Edition, published by Prentice Hall of India, New Delhi, 1988*
6. *Yarn Texturing Technology by J. W. S. Hearle, L. Hollick and D. K. Wilson; Textile Institute, WoodHead Publishing House, U. K.*
7. *A Guide to Crimping/Texturising Technology by MANTRA, Surat*

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PCC-TT-503	**Computer Applications in Textile:**	**04**	**03**	**02**

Course Contents Objectives

1. To describe the Object-oriented Programming using C++.
2. To explain the Relational Databases & E Commerce.
3. To illustrate the applications of ERP and Its Related Technologies with real life examples.
4. To explain the applications of SAP & its advantages.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Describe the significance and scope of Programming using C++
2. Explain the technical details of Relational Databases & E Commerce
3. Compile the various properties, merits and applications of ERP.
4. Evaluate the suitability of SAP for various applications

Course Contents

Unit I - Object-oriented Programming using C++: Introduction to object oriented programming, basic program construction, variable types, loops & decisions, structures, functions, objects & classes, arrays, polymorphism, operator overloading, function overloading, inheritance

Unit II - Relational Databases: Relational Model, Database Users, Roles of Database Administrator, keys, Domain Constraints, Referential Integrity, Structured Query Language (SQL),Database recovery methods

Unit III - E-Commerce : The scope of electronic commerce, definition of electronic commerce-e-commerce and the trade cycle, Electronic markets, Electronic data interchange, Internet Commerce, Business Strategy in E-commerce. The value chain, supply chain, Porter's value chain model. Inter organization value chains, Business to business E-commerce, Inter organizational transaction, the credit transaction trade cycle. Advantages & disadvantages of Electronic markets. Application of E-commerce in textile industries.

Unit IV - ERP and Its Related Technologies: Introduction to ERP, Basic ERP concepts, Justifying ERP Investments, RISK of ERP, Benefits of ERP. ERP and Related Technologies, Business Process Reengineering (BPR), Product Life Cycle Management, Supply Chain Management (SCM), Customer Relationship Management (CRM). Use of ERP in Textile Industry.

Unit V - SAP: Architecture of SAP R/3, SAP Integrated- Analysis, Implementation, and Design, Three-Tier Architecture, Need of Multi-tier Architecture, Integrating Environments.

Unit VI - Business Intelligence System: Technical Architecture overview, Back room Architecture, Presentation Server Architecture, Front room Architecture, Metadata, Standard Reports, Dashboards and Scorecards

Reference Books

1. Object Oriented Programming with C++ - E. Balagurusamy.
2. Database System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.)
3. E-Commerce – David Whiteley, TmH.
4. ERP Demystified - Alexis Leon, TMH
5. Enterprise Resource Planning – Alexis Leon, TMH.
6. SAP R/3 SAP Architecture, Administration, Basis, ABAP Programming with MM and SD Modules – Dreamtech Press.
7. The Data Warehouse Lifecycle Toolkit By Ralph Kimball,Ross, 2nd edition, Wiley Publication

Practical:

Practical's are to be conducted based on the above Course Contents

List of Course Contentss for Elective-I – (Any One)

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-504	**Elective-II - Smart Textiles**	**04**	**03**	**02**

Course Contents objectives:

1. To describe general introduction of smart textiles and modelling of intelligent materials.
2. To elucidate temperature sensitive shape memory polymers.
3. To explain solar textiles and introduction to conductive materials.
4. To understand applications of smart / intelligent textiles.

Course Contents Outcomes: At the end of the Course Contents students will be able to

1. Remember general introduction of smart textiles and modelling of intelligent materials.
2. Understand solar textiles and conductive materials.
3. Annalise temperature sensitive shape memory polymers.
4. Interpret applications of smart / intelligent textiles.

Course Contents

Unit I - General introduction: Definition, classification, intelligent systems and general applications.

Unit II - Modelling of intelligent materials: Background, underpinnings of interdisciplinary,scientific practices and research strategies for intelligent garments

Unit III - Phase change materials: Heat balance and thermo-physiological comfort, Phase change technology, PCM in textiles, Future prospects of PCM in textiles and clothing

Intelligent textiles with PCMs: Basic information of phase change materials, Phase change properties of linear alkyl hydrocarbons, Textiles f

Unit IV - Temperature sensitive shape memory polymers: A concept of smart materials, Shape memory polymer and smart materials, Some examples of shape memory polymer for textile applications, Potential use of shape memory polymer in smart textile, General field of application, Challenges and opportunities. Study of shape memory polymer films for breathable textiles: Breathability and clothing comfort, Breathable fabrics, Water vapor permeability (WVP) through shape memory polyurethane Chromic and conductive materials: Photo chromic materials, Thermochromics materials, Color changing, Electro chromic materials

Unit V - Solar textiles: production and distribution of electricity coming from solar radiation: Solar cells, Textiles as substrates, Technological specifications, Challenges to be met, Suitable textile constructions.

Introduction to conductive materials: Electric conductivity, Metal conductors, Ionic conductors, inherently conducting polymers, Application technologies for conducting fibre materials Multipurpose textile based sensors: Introduction, Conductive polymer textile sensors, Conductive polymer composites (CPCs) textile sensors Textile micro system technology: Textile micro system technology, Textiles are inherent microstructures, Textile-based

compliant mechanisms in micro-engineering and mechatronics

Unit VI - Applications: Intelligent textiles for medical and monitoring applications, Context aware textiles for wearable health assistants, Intelligent garments in prehospital emergency care, Intelligent textiles for children, Wearable biofeedback systems, Applications for woven electrical fabrics

Reference Books

1. Smart fibres, fabrics and clothing edited by Xiaoping Tao, Wood head publishing Ltd., England.
2. Intelligent Textile and clothing edited by H. R. Mattila, Wood head Publishing, England.
3. Clothing bisensory Engineering edited by Y. L. and A. S. W Wang, Wood head publishing ltd. England.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical /Week
PEC-TT-505	**Elective-I** **Fiber Characterization & Mechanical Properties**	**04**	**03**	**02**

Course Contents Objectives

1. To describe the fibre structure and morphology
2. To explain the Tensile properties of fibres
3. To illustrate the Theories of mechanical properties with numerical examples
4. To evaluate the structural parameters by investigation techniques.

Course Contents Outcomes

At the end of the Course Contents students will be able to

1. Understand the fibre structure and morphology
2. Analysis the technical details of Tensile properties of fibres
3. Illustrate the theories of mechanical properties with numerical examples
4. Analysis and evaluation of fiber structure by different methods & Techniques.

Course Contents

Unit I - Mechanism of deformation in fibers, Principles of elasticity & Visco elasticity,

Unit II - Stress-strain relations, Creep, Stress-relaxation, Time-temperature effects,

Unit III - Dynamic mechanical properties, Model theory of visco-elasticity,

Unit IV - Thermodynamic analysis of mechanical deformation & rubber elasticity,

Unit V - fibre friction optical properties of fibers,

Unit VI - Refractive index & birefringence.X-ray diffraction, Electron microscopy, IR spectroscopy, Scanning electron microscopy & study of fine structure, Surface structure of different textile fibres.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-506	**Elective-I** **High Performance Fibres:**	**04**	**03**	**02**

Course Contents Objectives

1. To describe the Requirements of high performance (HP) fibres
2. To explain the Manufacturing of aramids, carbon, glass and chemical resistant fibres
3. To illustrate the properties of aramids, carbon, glass and chemical resistant fibres
4. To explain the applications of aramids, carbon, glass and chemical resistant fibres

Course Contents Outcomes

At the end of the Course Contents students will be able to

1. Describe the significance and scope of HP fibres in technical textiles
2. Explain the technical details of Glass, Aramids, Carbon and other HP fibres
3. Compile the various properties and merits of above stated fibres in technical textiles
4. Evaluate the criteria for applications in technical textiles and their cost.

Course Contents

Unit I - Significance of high performance fibres. Critical comparison of Reguar and High performance fibres, Review of various fibre manufacturing processes.

Unit II - Manufacturing of aramid fibres, Analysis of structure and characteristics of important aramid fibres, Comparison of characteristics of important commercially available aramid fibres, Studies on the applications of aramid fibres.

Unit III - Manufacturing of high performance polyethylene and fully aromatic polyester fibres, analyses of characteristics of high performance polyethylene fibres and fully aromatic polyester fibres.

Unit IV - Studies on the applications of these fibres Inorganic high performance fibres: Glass fibre manufacture, properties and Applications Ceramic Fibres: Analysis of characteristics and applications of silicon carbide based fibres, Alumina based fibres. Single crystal oxide fibres.

Unit V - Critical analyses of fibre characteristics and applications of Chlorinated fibres: PVDC Fluorinated Fibres: PTFE, PVF, PVDF and FEP Poly (entheretherketones): PEEK Poly (phenylene sulphide): PPS Poly (ether imide) : PEI, PBI, and PBO

Unit VI - Technological developments in the manufacturing of bicomponent fibres, importance and applications of bicomponent fibres.

Reference Books

1. High Performance Fibres, Edited by J. W. S. Hearle, Published by wood head publishing Ltd., England in association with Textile Institute Manchester
2. Carbon fibers by J. P. Donnet and R. C. Bansal, Marcel Dekker, New York
3. Hand book of Fibres Science and Technology, High Technology Fibres, Edited by
4. Manachem Lewin and Jack Preston.

5. New fibers. T. Hongu and G. 0. Phillips Ellis Horwood Ltd, Chichester,
6. Kevlar aramid fiber. By H.H. Yang. John Wiley and Sons, Chichester, New York,
7. Mukhopadhyay S. K., "Advances in Fibre Science" The Textile Institute. 1992, ISBN:1870812379
8. Gupta V.B. Textile Fibres: Developments and Innovations. Vol. 2, Progress in Textiles: Science and Technology. Edited by V.K. Kothari, IAFL Publications, 2000.

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-507	**Textile Project Planning & Implementation**	**04**	**03**	**02**

Course Contents Objectives:

1. To explain the logic of project concept and its development cycle
2. To describe in detail the technical analysis for raw material and utilities
3. To illustrate the correlation of money with time with examples
4. To explain requirements for appraisal and project implementation

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Describe the logic of Project development cycle & identification of Investment
2. Explain the Basics of Technical Analysis for Material inputs & utilities
3. Explain the Time value of money with numerical examples
4. Discuss the study on Appraisal criteria & Project implementation steps

Course Contents :-

Unit I - Overview.

Project development cycle, Objectives of investment, decision-making, Risk & return Identification of investment opportunities – Governmental regulatory framework – Generation & screening of project ideas – Project

Identifications for an existing company.

Unit II - Market & demand analysis – Information required for market & demand analysis – demand forecasting methods – market planning. Cost of Capital – Basic concepts – Cost of debt – cost of preference capital – cost of Capital – Weighted average cost of capital –Marginal cost of capital-Cost of capital for a new company.

Unit III - Technical Analysis – Material inputs & utilities – Manufacturing process. Technology – Plant capacity – location & site – structures & civil works –Machineries & equipment's – Project charts & layouts – Work schedule –Need for tendering alternatives.

Unit IV - Financial Analysis – Cost of Project – Means of finance – Estimation of Sales & Production – Cost of production – Working capital requirement& financing – Profitability projections – Breakeven point – Project cost flow statements – Projected balance sheet – Multi – year projection

Unit V - Time value of money – Future value of single amount, Future value of an annuity –Present value of single amount – Present value of an annuity. Analysis of Risk – Types & measurement of project risk – Analytical

derivation or simple estimation – Sensitivity Analysis – Scenario analysis–Selection of a project-Risk analysis in practice

Unit VI - Appraisal criteria – Urgency, Payback period – Accounting, Debt service coverage ratio, Rate of Return, Net present value – Internal rate of return – Annual capital charge – Investment appraisal in practice.

Project implementation – Forms of project organization – Project planning – project control –

Human aspects of project management –Prerequisites for successful project implementation
References Books: 1. Textile Project Management by A. Ormerod, The Textile Institute Publication. 2. Goal Directed Project Management by E.S. Andersen, K.V. Grude & Tor Hang, Coopers & Cybranl Publication. 3. Project, Planning Analysis, Selection Implementation & Review by Prasanna Chandra, Tata McGraw Hill Publishing Co. Ltd., 4. Industrial Organisation & Engg. Economics T.R. Banga & S.C. Sharma, Khanna Publishers, Delhi.
Practical: Practicals are to be conducted based on the above Course Contents.

List of Course Contentss for Elective-II - (Any One)

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-508	**Elective-II** **Industrial Engineering and Management :**	**04**	**03**	**02**

Course Contents Objectives:

2. To explain need of industrial engineering and principles of management
3. To understand theoretical concepts and practical aspects of work studies.
4. To learn theoretical concepts ergonomics.
5. To understand theories of TQM.

Course Contents Outcomes: At the end of the Course Contents students will be able to

1. Understand importance of industrial engineering and principles of management
2. Understand theoretical concepts and apply work studies.
3. Understand and apply theories of TQM.
4. Evaluate and design Work system design ergonomically.

Course Contents :-

Unit I -Introduction to Work Study: Definition: Purpose of study, objectives, brief history and evolution, work study and productivity, human factor in application of work study, scope, applications, relationship, between Productivity & standard of living, basic work content, excess work content Management, techniques to reduce excess work content due to product process and ineffective time in control of workers and Management.

Unit II - Ergonomics: Introduction, Principles, Work system design, Man-machine system, Human behaviour and equipment design, Tools, Techniques and applications, Effect of environment on performance of worker, working conditions, prevention accidents and hazards, lighting, ventilation etc.

Unit III - Method Study: Definition, Concept, Objectives and Procedure of method study, Flow and handling of materials; Process chart symbols, recording techniques like Flow process charts, Operation, Flow and Two handed Process charts, Flow diagram, String diagram, Multiple Activity chart, travel chart, Operation Analysis, Analysis of motion, analysis and critical examination of existing methods and development of improved methods, Motion economy, Design of work place layout, Therbligs, SIMO chart.

Unit IV - Work Measurement: Definition, significance of work measurement; origin, development and procedure of work measurement, introduction to various work measurement techniques.

Time Study and Other Works Measurement Techniques: Time study: definition, equipment for basic time study, time study forms and other equipment. Steps in use of techniques of time study; selecting the job, breaking the job into elements, approach to the worker, the elements, timing each element, Maynard Operation Sequencing Technique (MOST),Average and qualified worker, rating procedures, criteria affecting the choice of rating procedures, criteria affecting the choice of

rating procedures, continuous timing, fly back timing, accumulative timing; standard ratings.

Unit V - Comparison of observed and standard ratings, factors affecting the rate of working, scales of rating, rating factors, recording the rating, summarizing the study, allowances, calculation and application of allowances.

Work sampling and production studies; General study of standard data & PTS.

Unit VI - Quality management:

Quality as a Corporate Strategy, What is Quality?, New Quality Concepts, Quality Circles, Kaizen, Contributions of Quality Management scientists- Dr. Deming, Crosby, Dr. Armrod V. Feigen Baum, Dr. Ishikawa- Seven tools of quality management. Total Quality Management, Roadmap for TQM, Implementation of TQM, Six Sigma, Five 'S' , TIMWOOD 7-Seven Wastes, ERP etc.

Reference Books:

1. Introduction to work study - ILO
2. Motion & Time study Design & Measurement of Work - Ralph Barnes (Wiley Eastern).
3. Work Study - R.M. Currie & Faraday. (ELBS Pitman).
4. Hand Book of Industrial Engineering - Irson& Grant.
5. Productivity management - Concepts & Techniques- S.C.Sawhney.
6. Production and Operations Management – IInd Edition by S. N. Chary, published by Tata McGraw Hill
7. Testing and quality management by DR. V. K. Kothari

Practical:

Practicals and assignments are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-509	**Elective-II** **Industrial Law and Economics**	**03**	**03**	**00**

Course Contents Objectives:

1. To understand principles of economics and entrepreneurship
2. To know labor legislations
3. To apply statistical methods for data analysis.
4. To learn and apply DEA model for productivity measurement.
5. To do SWOT analysis of Indian Textile Industry

Course Contents Outcomes:

1. Remember principles of economics and entrepreneurship
2. Knowledge of labor legislations
3. Use statistical methods for data analysis.
4. Apply DEA model for productivity measurement.
5. SWOT analysis of Indian Textile Industry

Course Contents

Unit I Basic concepts of micro and macroeconomics:

Supply and demand, demand schedule and demand curve, demand function, supply schedule and supply curve, production function, factors of production, returns to scale, economies of scale, balance sheet of the company

Unit II Basic econometrics:

Definition, methodology of econometrics, regression analysis, regression versus correlation, nature and sources of data for econometric analysis, two variable regression analysis, use of EXCEL and SPSS for regression analysis

Unit III Efficiency and productivity measurement:

Basic concepts of efficiency measurement, selection of input and output variables, mathematical aspects of Data Envelopment Analysis, application of computer based softwares such as DEAP, EMS, productivity measurement approaches, partial factor productivity with its limitations, total factor productivity, productivity measurement using DEA software

Unit IV Structure of Indian textile industry:

Functions & organizational set-up of cotton and man-made industry, jute, silk, wool and woolen textiles industry, decentralized power loom sector, handlooms, handicrafts, public sector undertakings, textile research associations, government textile policies, export/import trends, domestic market, SWOT analysis of Indian textile industry, globalization and effect of WTO on Indian textile industry

Unit V Industrial relations & Labour laws:

Definitions & objectives of industrial relation, charge procedure, punishment & appeal, collective bargaining, employee grievances -nature, grievance handling procedure, workers participation in

management, Industrial Disputes Act 1947, The Factories Act 1948, The Wages Act 1956, The Minimum Wages Act 1948, Workmen's Compensation Act 1923, The Gratuity Act 1972

Unit VI Entrepreneurship development:

Introduction, entrepreneur, modern concepts and qualities required, classification of entrepreneur, factors conductive for promoting entrepreneurship, EDC/EDP–training and development of women entrepreneur

Reference Books:

1. Principles of Economics by Alfred Marshall
2. Principles of Economics by H. S. Agrawal
3. An Introduction to Data Envelopment Analysis by R. Ramanathan
4. Basic Econometrics by Damodar N. Gujarati
5. Annual report of Ministry of Textiles, www.textilemin.nic.in
6. Compendium of Textile Industry by Textile Commissioner
7. Labour & Industrial Law by S. K. Mishra
8. Industrial & Business Management by Martand T. Telsang

Practical:

Case Studies and assignments are to be conducted based on the above Course Contents.

M. Tech. Semester-II

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PCC-TT-510	**Modern Weaving Technology**	**04**	**03**	**02**

Course Contents Objectives:

1. To explain technological significance in the design development of automatic winding machine and process parameters involved in it.
2. To explain technological significance in the design developments of beam and sectional warping machine and process parameters involved in it.
3. To explain technological significance in the design development of sizing machine.
4. To explain technological significance in the design development of unconventional weaving machines machine and process parameters involved in it

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Understand technological significance in the design development of automatic winding machine and process parameters involved in it.
2. Critically analyze technological significance in the design developments of beam and sectional warping machine and process parameters involved in it.
3. Critically analyze technological significance in the design development of sizing machine.
4. Evaluate design, functional and constructional aspects of unconventional weaving machines.

Course Contents

Unit I - Need of modern developments in weaving and its benefits **Modern developments in Winding:**

Introduction: Yarn count monitoring, online classification of yarn defects, classification of foreign fibres. Joining of yarns, splicing: Pneumatic splicing, Electrostatic splicing, Mechanical splicing. Precision winder, auto speed control, automation, spindle identification, waste control, environment controls.

Uniform build of yarn package: Theory & practice. Effect of winding faults on H.S. warping and weaving.

Unit II - Modern Warping and Sizing: Concept of modern warping, developments in creel, head stock and different control systems. Concept of modern sizing, developments in sow box, driving of cylinders and head stock, Development in sizing ingredients and different control systems.

Unit II - Modern Looms: Suitability of H.S. weaving machines. Technical aspects, economic aspects, manufacturer and machine related criteria, growth of technology, economics.

Air-Jet Looms: Principles of weft insertion, weft tensioning, weft length measurement, sley movement, take-up motion. Equation of motion for weft yarn. Air-jet velocity profile, main

nozzle, air guides, relay nozzle, weft travel position in air-jet, energy requirements. Method of operation of main jet. The air stream in the main nozzle area and its action on the weft thread. Improvement jet system. Study on pneumatic weft insertion behavior in main nozzle. Interaction between air, yarn and guide system to increase the yarn velocity. Advancement of Air-jet looms. Range of applications.

Unit III - Rapier weaving: Recent developments, development in filling insertion, picking speed, secure filling transfer, and versatility of Rapier of Rapier gripper. Free flight rapier, light rapier head, electronic filling tension controller, pre winder switch-off monitoring, filling detection at the end of insertion, pick finding, rapier cleaning devices. Electronic controls, developments in let-off mechanism and take-up mechanism, selvedges. Efficiency of rapier loom.

Unit IV - Gripper Projectile Loom: Ballistic weft insertion, velocity and acceleration of projectile, work done in picking. Different kinds of projectiles uses, colour change at thread transfer. Some features of modern Sulzer looms. PU & PS series machines, Sulzer P7100. Economics of projectile weaving machine. Range of applications.

Unit V -Techno Economics of High Speed weaving: Introduction, parameters needed for techno economics analysis. Selection of weaving machines. Cost-width relationship, colour & weft mixing, noise level, yarn quality, floor & building. Economic analysis. Capital cost, accommodation cost, spare parts cost, energy cost, accommodation costs, and conclusion.

Unit VI - The position of cloth fell under stable weaving conditions: The function of take-up motion, the physical aspect of the cloth fell equation, the relation between beat-up force & pick spacing (the inverse distance equation). Bumping conditions, cloth fell equation under bumping condition.

Reference Books:

1. Principles of Weaving- Mark & Robinson.
2. Shuttless Wvg.Machines- OldrichTalavasek and Vladimir Svaty.
3. Weaving machincs, mechanisms management – M.K.Talukdar,
4. High speed weaving-K.Jaychandran at all-PSG College of Technology, Coimbatore
5. SIZING-Materials, Methods, Machines- Ajgaonkar, Talukdar and Wadekar

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PCC-TT-511	**Evaluation Techniques of Textiles**	**04**	**03**	**02**

Course Contents objectives:

1. To learn basic science of testing of fibre, yarn and fabric.
2. Understand quality measurement systems.
3. Learn the functional testing methods.
4. Study in deep the Spectrometer and its application in textile measuring techniques.

Course Contents outcome:

1. Apply knowledge of science & engineering for textile testing
2. Analyze textile material using various test methods
3. Learning new methods/technology for testing Understand textile testing from environmental angle Writing textile testing reports
4. Assess textile material in relation to health and safety

Course Contents

Unit I - Textile Quality Management Overview: Quality and its importance, ISO system

Unit II - Fiber Testing: AFIS- Principle, working and applications, Advantages over HVI

Yarn Testing: CTT- Principle, working and applications

Unit III - Fabric Testing: KES- Principle, working and applications; FAST- Principle, working and applications

Unit IV - Functional Testing: Tests for Thermal Transmission, Moisture Vapour Transport, Combined Effect of Thermal and Moisture properties, Electrical Properties, Flammability

Unit V - IR Spectroscopy: Principle and its applications for Cotton, Blend Analysis

Testing for UV Protection: In vitro and In vivo

Unit VI - Labelling: Woolmark, Care, etc.

References:

1. Progress in Textiles: Science & Technology, Volume 1, Testing and Quality Measurement, V K Kothari, IAFL publications, India, 1999
2. Intelligent Textiles and Clothing, H r Mattila, Woodhead Publishing Limited, 2006
3. Textiles for Protection, R A Scott, Woodhead Publishing Limited, 2005
4. Textile Testing Fiber, Yarn & Fabric, Arindam Basu, SITRA, 2001
5. Smart Textiles for Medicine and Healthcare, L Van Langenhove, Woodhead Publishing Limited, 2007
6. www.nptel.ac.in

Practical:

Practicals are to be conducted based on the above Course Contents.

List of Course Contentss for Elective-III -(Any One)

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-518	**Technical Textile - I**	**04**	**03**	**02**

Course Contents Objectives:

1. To introduce technical yarns and technical textiles.
2. To describe Coating & Lamination Textiles and application of technical textiles.
3. To explain different finishes on yarn.
4. To describe Miscellaneous Applications.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Describe introduction of technical textiles
2. Explain Coating & Lamination Textiles and application of technical textiles.
3. Describe different Novel finishes on yarn.
4. Describe Shape memory polymer and its outcomes
5. Explain Miscellaneous Applications.

Course Contents :-

Unit I - Introduction, types of technical yarn, yarn characteristics: monofilament, multifilament, intermingled yarn, tape yarn, core spun yarn-Non elastic core and elastic core, plied/ folded yarn, cabled yarn, braided yarn.

Unit II -Tape yarn production technique, fibrillated tape yarns. Filament wrapped yarns. Properties and performance of technical yarns.

Unit III - Textile Coating & Laminating: Coating materials, coating polymers such as PVC, PVDC, PU, PTFE, Acrylic polymers, rubber and its derivatives, EVA, CARBON NANO TUBES.

Unit IV - Principles of coating, aqueous coating, hot melting coating, metal coating, plaiting, plasma treatment. Different methods of coating.

Unit V- Novel technical textile yarns: Introduction, reflective yarns, classification, and manufacturing process. UV protected yarn, preparation of UV protection yarn, metallic and metalloplastic yarns, and manufacturing techniques. Antimicrobial yarns, treatments, durable antimicrobial fibre/yarn. Yarns for specific purpose. Anti-static yarn, anti-stress yarn, anti-allergic yarn, soluble yarn.

Unit VI - Electro conductive yarns, manufacturing process, Measurements, EMSE, applications High modules yarns such as Glass, Carbon, and Ceramic, Basalt fibers, HPPE fibres, their properties and uses. Shape memory polymer yarns, manufacturing process, applications. Plasma treated yarns for biomedical applications. Chemistry of plasma processing. Industrial sewing threads, structure of sewing threads, thread finishing, yarn numbering. Threads for very high

temperature. Surgical threads, classifications, manufacturing process, characterization

References Books:

1. A. R. Horrocks & S. C. Anand, Handbook of technical textiles, The Textile Institute, Wood Head Publication Ltd., 2007
2. R. Alagiruswami and A. Das, Technical Textile yarns, The Textile Institute, Wood Head Publication Ltd., 2010
3. Wellington Sears Handbook of Industrial Textiles by Sabit Adanur, Technomic Publishing Co. INC, Lancaster, Basel,1995
4. High performance fibres by P.Bajaj and A. K. Sengupta, The Textile Institute
5. Industrial Applications of Textiles: Textiles for Filtration and Coated Fabrics, P. Bajaj and A. K. Sengupta, The Textile Institute, Textile Progress, Vol 14, No.1

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-519	**Elective-III** **Advanced Textile Wet Processing:**	**04**	**03**	**02**

Course Contents Objectives:

1. To educate basic knowledge of procedures, machinery & chemistry of different dyeing processes.
2. To educate basic developments of dyeing machines.
3. To know the colour measurement techniques.
4. To understand the modern printing, advanced finishing and eco treatments.

Course Contents Outcomes:

1. Student developed understanding of engineering knowledge in different dyeing and finishing operation & technology for textile fabrics.
2. Student developed understanding of problem analysis skills in identifying different types of dyes and finishes applied in textile & their quality evaluation.
3. Student developed understanding of modern tools & machines required for different dyeing, printing and finishes application in fabrics.
4. Students developed understanding to work as individual & team work through conducting different individual & group assignment & practical job work.
5. Students developed understanding in effective communication through repeated written and oral test & assignment of the subject

Course Contents

Unit I - Dyeing Process Developments & Kinetics: Influence of fibre structure on dye uptake; Kinetics of Dyeing; Developments in dyes and dyeing processes for the dyeing of various textile substrates with various dye classes. Advances in Mass coloration.

Unit II - Dyeing Machines Developments:; Advances in cheese dyeing machines. Advances in Beam dyeing; Advances in soft flow dyeing machines, Advances in jet dyeing machines. Developments in jiggers, Continuous dyeing machineries & its developments, Various dyeing defects caused by the above machineries; Garment Dyeing & it's modern machineries.

Unit III - Color Measurements: Spectrophotometric color measurement & analysis of dye solutions; Fastness properties of dyed materials and their assessment. Identification of dyes on fibres.

Unit IV - Pollution & Eco Treatments: Pollution aspects of textile dyeing; Modern approaches to eco-friendly wet processing of woven and knitted textiles. Eco-friendly dyes and their method of dyeing; Technology and principles of effluent treatment. Advanced color removal technologies, recovery and reuse of water and chemicals.

Unit V - Modern Printing: Principle and working of fully automatic flatbed screen printing machine ;Rotary Printing machine; Transfer Printing machine-Digital Printing; Garment Printing machines; Various practical problems & possible remedies in the above printing machineries;

Modern developments in textile printing machines/techniques.

Unit VI - Modern Finishing: General overview of the recent technological developments in the area of textile finishing machines/techniques. Formaldehyde free finishes; stone wash, Enzyme wash, Bio – polishing, Acid wash, sand blasting, leather finish, rubbery touch, feather touch, easy care finishes, wrinkle free and wrinkle resistant finish, water repellent finish, UV protective garments, Anti – microbial/ anti – bacterial inhibition finish, silicone softeners, fire retardant finishes for garments, functional finishes for garments; Micro- encapsulation and its relevance in textile finishing application.

Reference Books:

1. Dyeing & Chemical Technology of Textile Fibres, By: **E. R. Trotman**; Published By: Charles Griffin & Company Ltd.
2. Fundamentals & Practices in Coloration of Textiles, By: **Chakraborty J. N.**; Published By: Woodhead Publishing India in Textiles.
3. Technology of Textile Printing; By- **R.S.Prayag;** Published By: Mrs. R.S.Prayag, Dharwad, and Karnataka State.
4. Textile Printing; Edited By Leslie W.C. Miles, Published By: Society of Dyers & Coulrists(2003)
5. Technology of Textile Processing – Vol-IV "Technology of Printing" By: **Dr.V.A.Shenai**.; Published By: Sevak Publications, Mumbai.
6. Technology of Textile Processing - Vol.6, "Technology of Dyeing" By: **Dr. V. A. Shenai**; Published By: Sevak Publications, Mumbai.
7. Technology of Textile Processing - Vol.2,"Chemistryof dyes & Principle of dyeing" By: Dr. V. A. Shenai. ; Published By: Sevak Publications, Mumbai**.**
8. Book of Papers: **Convention on Natural Dyes-Dec-1999;** Published By: IITD.
9. Schindler W.D. And Hauser P.J., "Chemical Finishing of Textiles", Woodhead Publishing Limited, Cambridge, 2004.
10. Chemistry & Technology of Fabric Preparation & Finishing, By: Dr. Charles Tomasino, Published By: Dept. Of Textile Engg, Chemistry & Science, College of Textiles, North Carolina State University, North Carolina.
11. Textile Finishing; By: **R.S Prayag**; Published By: Mrs. L.R.Prayag, Dharwad, Karnataka State.

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-520	**Elective-III** **Garment Technology & Merchandising:**	**04**	**03**	**02**

Course Contents Educational Objectives (CEO): The student should learn-

1. Apply basic elements and principles of garment manufacturing.
2. Learn garment manufacturing process
3. Design and produce a buyer specification garment
4. Elucidate the management of the Garment business
5. Illustrate the fashion marketing and merchandising process.
6. Study Retailing and Global Sourcing Strategies, Supply Chain and demand chain analysis

Course Contents Outcomes (COs):

Upon successful completion of this Course Contents, the student will be able to:

1. Remember basic elements and principles of garment manufacturing.
2. Handle and control garment manufacturing process
3. Create a Design and produce a buyer specification garment
4. Evaluate the management of the Garment business
5. Apply the fashion marketing and merchandising process.
6. Depict Retailing and Global Sourcing Strategies, Supply Chain and demand chain analysis

Course Contents

Unit I - Introduction – Sectors and structure of apparel industry, Overview of Indian garment industry, Nature & scope of apparel manufacturing industry and its developments in recent years.

Unit II - Sequence of garment manufacturing process. Latest developments in garment technology.

Grading, Types and making of lay plan, Requirements of spreading, types and methods of spreading, spreading equipment's and tools, cutting equipment's and tools and their modernization, size charts etc.

Unit III - Technology of Sewing machines, Sewing defects. Fabric sew ability, principles of selecting proper stitch and seam types, Effect of stitch type on elasticity and strength, Effect of stitch type on seam slippage. Stitch less garments.

Garment dyeing and finishing, Value added garments. Pressing & finishing: object, classifications, means, components, machinery and equipment's, garment finishing and inspection, Quality Standards of some giant retailers, TUV, SGS and ASTM testing standards.

Unit IV - Production technology: Manual systems make through systems, straight line systems, modular production systems, unit production systems, quick response systems.

Ware housing: Handling equipment's, storage equipment's, packing equipment's. Application of CAD/CAM in garment manufacturing

Unit V - Definition and role of merchandiser, Buying indication, Market structure in export markets. Design buying influences. Merchandising and Range Development: Fashion forecast for

Europe and USA, elements of design, Interpretation of forecast for brands in color, silhouette and fabrics.

Unit VI - General range development and specific buyer range developments. Colors: International interpretation of colors. Market Research: Buyer behavior, apparel brand management, advertising & promotion, Retail management, Pricing, Approaches for global markets: Effect on Global Economy Analysis of effect of international production and distribution of textiles and apparel goods on the global economy, Cost-plus and backward pricing, Elements of cost plus approach & cost sheet, Merchandise line pricing.

Reference Books:

1. The Technology of clothing manufacturing by Harold Carr, Barbara Latham, Publisher – Blackwell scientific publications
2. Handbook for designing by Ritu Jindal, S. Malhan, Publisher - Mittal Publications
3. Managing Productivity in the apparel Industry by Rajesh Bheda,Michael T. Fralix, Publisher – CBS publications & distributors
4. The apparel industry in India, Ila Kantilal
5. CAD/CAM in clothing & Textiles by Grey and Stephens Publications – Gower Publishing, Hampshire, 1998.
6. Fashion Buying, Elain Stone
7. Principles of Fashion Merchandising, Sidney Packard

Practical:

Practicals are to be conducted based on the above Course Contents.

List of Course Contents for Elective-IV - (Any One)

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-507	**Elective-IV** **Knitting & Nonwoven Technology:**	**04**	**03**	**02**

Course Contents Objectives:

1. This Course Contents work will help the student to enhance their knowledge in knitting & nonwovens process.
2. Also give the student an independent knowledge of machine & structure about knitting & nonwoven.
3. To learn about variables, testing, defects in process and products.
4. To study techno economics, uses & applications
5. To study calculations involved in knitting & nonwovens.

Course Contents Outcome:

1. It will update the knowledge about modern aspects of warp knitting and non-woven production and application.
2. Students will gain detailed knowledge of machine & structure..
3. Students will able to set the process and testing of products produced.
4. Student will come to know techno economics, uses & applications
5. Students will evaluate and analyze calculations involved in knitting & nonwovens.

Course Contents

Unit I - Warp knit fabrics; warp knit v/s woven construction, warp knits vs weft knit.
Machine required for single jersey, rib, pearl and interlock double jersey structures. Structure, fabric defects, latest developments & calculation.

Unit II - Classes of warp knitting machinery, knitting cycle, Tricot, Raschel machines. Knitting elements 7 cycles of Tricot and Raschel machine.

Unit III - Plain Tricot structures, knitted with two full set guide bars, two bar
Tricot, Shark skin, Queens cord, Velour and Velvet structures, Satin, overfed pile structures, reverse lock knit. Differences between Tricot and Rachel machines and fabrics. Yarns for warp knitting:- Materials for warp knitting, filament and spun yarns, unconventional yarns, important yarn properties for warp knitting, winding and warping for warp knitting. Faults in warp knits. warp knitting calculations

Unit IV - Classification & process of nonwovens, web forming, laying and bonding different techniques

Unit V - Melt spun and melts blown nonwovens, process, variables, defects & applications.

Unit VI - Nonwoven fabric finishing: types of finishing techniques, Fabric inspection, Testing & study of process variables, advantages, disadvantages and techno economics of all above non-woven technologies.

Reference Books:

1. Fundamentals & advances in Knitting Technology- S C Ray, WPI
2. Knitting Technology by David J. Spencer, WPI
3. Knitting Technology by D.B. Ajgoankar, Universal Publishing Corporation, Mumbai.
4. .Nonwoven Process Performance & Testing – Turbak
5. Nonwoven Fabric Construction Synthetic Fibres – Jan-Mar 2007.
6. Proceedings of the Seminar - Nonwoven Technology Market & Product Potential, IIT, New Delhi December 2006.
7. Handbook of nonwovens, Edited by S. J. Russell, Wood head Publishing, CRC Press, Washington DC, 2007
8. W.Albrecht, H. Fuchs and W.Kettelmann, Nonwoven Fabrics: Raw Materials, Manufacture, Applications, Characteristics, Testing Process, Wiley-VCH, Verlag GmbH & Co.KGaA, Weinheim, 2003.
9. M.S. Casper, Nonwoven Textiles, Noyes Data Corp.(Park Ridge, N.J), 1975.
10. M. McDonald, Nonwoven Fabric Technology, Park Ridge, NJ: Noyes Data, 1971

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-508	**Elective-IV** **Textile Composites**	**04**	**03**	**02**

Course Contents Objectives

1. To explain requirements of fibre and matrix for composite fabrication & their types
2. To describe the fibre-matrix interactions in unidirectional lamina
3. To explain details of various methods of composite fabrication
4. To explain properties of composites and their applications

Course Contents Outcomes

At the end of the Course Contents students will be able to

1. Understand the logic, need, requirements of composites based on end use
2. Elucidate the manufacturing of the composites and fibre used for fabrication
3. Evaluate the performance of composites including fibre matrix interactions
4. Discuss the 3D textile structural composites

Course Contents

1. **Composites:** Definition, Objectives, Classification, Applications
2. **Matrix Materials:** Polymers used, Properties of polymers, Thermoset and thermoplastic resins, Nonpolymeric materials
3. **Fabrication:** Hand lay, Bag molding, Pultrusion, Blow molding, Preformed molding, etc.
4. **Mechanics:** Isostress, isostrain conditions, Critical Fiber Length, Crictical Fiber volume, Calculations for stress, strain and modulus; changes for continuous to discontinuous fibers, Failure mechanism
5. **Applications:** For structural engineering, electrical, civil, aerospace, defense, automobile, sports, medicine and others
6. Surface treatments, Flamability and fire resistance of composites, Laminated composite

Reference Books:

1. Design and Manufacture of Textile Composites, Long C A, PublisherWoodhead Publishing Series in Textiles
2. Composite Materials, K Srinivasan, Publisher Narosa Publishing House, Delhi
3. Analysis and Performance of Fiber Composites, Bhagwan D. Agarwal, Lawrence J, Broutman, and K Chandrashekhara
4. Composite Materials: Design and Applications, Daniel Gay, Suong V Hoa and Stephen W Tsai
5. Composite Material Science & Engineering, Spring Verlag
6. 3D Textile Reinforcements in composite Materials, Antonio Miravete, Publisher Woodhead Publishing Series in Textiles
7. www.nptel.ac.in

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PEC-TT-509	**Elective-IV** **Technical Textile - II**	**04**	**03**	**02**

Course Contents Objectives:

1. To develop core knowledge of technical textiles to serve industry.
2. Understand different applications of medical textiles, sports textiles, protective clothing and geotextiles
3. Study different design techniques of construction of technical textiles
4. Design methods for stabilization of soil
5. Create new design with all your knowledge.

Course Contents Outcomes:

1. Fundamental of science of Technical Textiles.
2. The subject requires collection of information from journals, net and understands the complex problem deeply to design different protective clothing such as EMI protective clothing, radiation protective clothing and other mechanical protective clothing..
3. Design of different Technical Textiles such as flame retardant fabrics, chemical protective clothing, sports textiles, medical textiles, geotextiles
4. Application of Technical Textile and safety of human life & society using mechanical protective clothing, bullet proof cloth for military uses etc.
5. Designing and analysis of medical textiles, sports textiles, protective clothing and geotextiles

Course Contents

Unit I - Medical textiles:

Introduction, textile materials used-category wise, fibre used, wound care, bandages, extracorporeal devices, implantable materials, sutures, soft tissue implants, orthopaedic implants, cardiovascular implants, healthcare and hygiene products.

Unit II - Sports footwear:

Functional design of sportswear, functional fit of sport footwear, biomechanics of the foot, functional materials and components in sport footwear

Unit III - Mechanical protective clothing:

Introduction, materials used, gloves, chain saw clothing, electrostatic protection, Physical requirements for military textiles, military combat clothing systems, Bullet proof fabrics principles & designs, mechanics of ballistic impact, textile materials for ballistic protection, design of ballistic vests and helmets, ballistic testing and evaluation, Clean room fabric, radiation protection, Protective clothing for space.

Unit IV - Chemical protective clothing

Different types of protective materials, components, clothing materials, protection from liquid, toxic fumes and gases, Performance evaluation of chemical protective clothing, chemical, biological and radiation hazards and their prevention.

Unit V - Heat and flame protection:

Fire fighter's protective clothing, Military flame-retardant, heat protective textiles, military flame and heat threat, criteria for protection of individual, toxic fumes and smoke, thermoplastic melt hazard, flame retardant textiles in military use.

Unit V - Geo-textiles:

An overview of Geosynthetics their uses in different fields. Testing of Geotextiles and their needs, Designing for reinforcement on roads. Introduction, uses of Geotextiles. Mode of action. Design method with geotextiles by Giroud and Noiry method. Construction with geotextile. Design with geogrids for payments, Erosion control, and conventional graded filter. Geotextile filter. Geotextile filter criteria. Geotextile survivability, construction criteria, Designing or stabilization with geotextile walls. Construction details, design method.

Reference Books:

1. Soil Mechanics-B.C.Punmia
2. Non-woven bonded fabrics- J.Lunenschlos, Publisher- Ellis Harwood Series.
3. Designing with Geosynthetics-Robert M.Koerner, Publisher-Prentice Halla, Englewood cliff
4. A. R. Horrocks& S. C. Anand, Handbook of technical textiles, The Textile Institute, Wood Head Publication Ltd., 2007
5. R. Alagiruswami and A. Das, Technical Textile yarns, The Textile Institute, Wood Head Publication Ltd., 2010
6. Handbook of Industrial Textiles by SabitAdanur, Technomic Publishing Co. INC, Wellington Sears Lancaster, Basel,1995
7. Industrial Applications of Textile by R. S. Goy & J. A. Jenkins, Textile progress , 1970, March Vol. II No.1Textiles in sports by R. Shishoo, Wood Head Publication, The Textile Institute, 2005

Practical:

Practicals are to be conducted based on the above Course Contents.

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
PRJ-TT-532	**Mini Project**	**02**	**--**	**04**

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Describe the problem /idea and review and summarize the literature for the topic of the identified problem
2. Illustrate the suitable design of experiments including experimental plan.
3. Explain the concepts of design, development, construction, and fabrication of innovative product/system for the project title
4. Use various tools of testing and statistical analysis for the data in order to draw relevant conclusions.

Rationale:

The mini project will involve the design, development, construction, and fabrication of innovative product/system approved by the department. This is a laboratory oriented Course Contents which will provide a platform to students to enhance their practical knowledge and skills. Each student must keep a project notebook The notebooks will be checked periodically throughout the semester by the guide and also during the internal viva, as part of the project grade.

Guidelines:

1. Students should select a problem which addresses some textile industry problem, or other product developments in textiles. One mini project per semester per student
2. The selected topic for mini project should be based on development/fabrication of innovative product which he/she learnt during Course Contents work.
3. Students should understand testing of various instruments relating to topic of mini project.
4. Execution of mini project should be carried out by students only under guidance of allotted faculty. One faculty per student.
5. Students should develop a necessary product with product specifications with reference to end use.
6. Students should see that final product submitted by them is in working condition.
7. 15-20 pages report to be submitted by students in prescribed guide lines. Presentation is for 10 minutes.

- Group of students cannot be permitted to work on a single mini project. Individual student has to carry out mini project.
- A demonstration and internal oral examination on the mini project also should be done at the end of the semester.
- Department may arrange demonstration with poster presentation of all mini projects developed by the students at the end of semester.
- It is desirable that the product developed by the students have some novel features.
- A test of significance should be applied to the test results to ascertain the conformity of significant difference.

SEMESTER-III

Code	Name of the Course Contents	Total credits	Lectures /week	Practical / Week
DIS-TT-601	**Dissertation Part I**	**14**	**00**	**28**

Course Contents Objectives:

1. To identify the problem /idea and review and summarize the literature for the topic of the identified problem
2. To describe the process flow for undertaking the research/survey trials with appropriate standards and process variables
3. To design, development, construction, and fabrication of innovative product/system for the final submission
4. To explain various tools of testing and statistical analysis for the data in order to draw relevant conclusions

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Describe the problem /idea and review and summarize the literature for the topic of the identified problem
2. Illustrate the suitable design of experiments including experimental plan.
3. Explain the concepts of design, development, construction, and fabrication of innovative product/system for the project title
4. Use various tools of testing and statistical analysis for the data in order to draw relevant conclusions.

Rationale: The Dissertation work of Phase I is mainly the 50% of the project work. This includes literature review, design of experiment, selection of proper method of experiment, starting of work.

Guidelines for Dissertation Phase I:

1. Students should complete the literature review..
2. Students should design the experiment
3. Select the proper method of testing
4. Select the materials
5. start the work and get result
6. Mid - Project Evaluation will be done at the end of Semester.

SEMESTER-IV

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
DIS-TT-602	**Dissertation Part II**	**14**	**00**	**28**

Course Contents Objectives:

1. Continuation of problem given in third semester
2. Testing and evaluation of problem using proper statistical aids.
3. Validation of results, paper publishing.
4. To design, development, construction, and fabrication of innovative product/system for the final submission

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Describe the problem /idea and review and summarize the literature for the topic of the identified problem
2. Illustrate the suitable design of experiments including experimental plan.
3. Explain the concepts of design, development, construction, and fabrication of innovative product/system for the project title
4. Use various tools of testing and statistical analysis for the data in order to draw relevant conclusions.

Rationale: The Dissertation work of Phase II is mainly the completion of the remaining 50% of the project work. This includes the compilation of results, results and discussions, conclusions

Guidelines for Dissertation Phase II:

1. Students should complete and compile the trials, testing.
2. Students should propose a complete thesis writing with given guidelines
3. Students will be ready for the internal Viva with synopsis, objectives, plan of work and results and discussion.
4. The results and discussion will be as per in line with the plan of work. No deviation is allowed.
5. Project Evaluation will be done at the end of Semester.

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OPEN ELECTIVE

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
OEC-801	**Business Analytics**	**03**	**0**	**0**

Course Contents Objectives:

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights.

Course Contents Outcome :-

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Mange business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Course Contents

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5:
Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Unit 6:
Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Reference:

1. *Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.*
2. *Business Analytics by James Evans, persons Education.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
OEC-802	**Industrial Safety**	**03**	**00**	**00**

Course Contents

Unit 1: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit 2: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost and its relation with replacement economy, Service life of equipment.

Unit 3: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit 4: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit 5: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.

Unit 6: Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference:

1. *Maintenance Engineering Handbook, Higgins and Morrow, Da Information Services.*
2. *Maintenance Engineering, H. P. Garg, S. Chand and Company.*
3. *Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.*
4. *Foundation Engineering Handbook, Winterkorn, Hans, Chapman and Hall London.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
OEC-803	**Operations Research**			

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it

Course Contents

Unit 1:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2

Formulation of a LPP - Graphical solution revised simplex method - duality theory – dual simplex method - sensitivity analysis - parametric programming

Unit 3:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5

Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. *H.A. Taha, Operations Research, An Introduction, PHI, 2008*
2. *H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.*
3. *J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008*
4. *Hitler Libermann Operations Research: McGraw Hill Pub. 2009*
5. *Pannerselvam, Operations Research: Prentice Hall of India 2010*
6. *Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
OEC-804	**Cost Management of Engineering Projects**	**03**		

Course Contents

Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

1. *Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi*
2. *Charles T. Horngren and George Foster, Advanced Management Accounting*
3. *Robert S Kaplan Anthony A. Alkinson, Management and Cost Accounting*
4. *Ashish K. Bhattacharya, Principles and Practices of Cost Accounting A. H. Wheeler publisher*
5. *N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
OEC-805	**Composite Materials**	**03**		

Course Contents

UNIT–I:

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II:

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III:

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV:

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V:

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. *Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.*
2. *Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley and Sons, NY, Indian edition, 2007.*

References:

1. *Hand Book of Composite Materials-ed-Lubin.*
2. *Composite Materials – K.K.Chawla.*
3. *Composite Materials Science and Applications – Deborah D.L. Chung.*
4. *Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
OEC-806	**Waste to Energy**	**03**		

Course Contents

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. *Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.*
2. *Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I and II, Tata McGraw Hill Publishing Co. Ltd., 1983.*
3. *Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.*
4. *Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley and Sons, 1996.*

AUDIT COURSE CONTENTS

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-901	**Project Management**	**0**		

Course Contents Objectives:

1. Understand the fundamental principles of Software Project management and also have a good knowledge of responsibilities of project manager and how to handle these.
2. Be familiar with the different methods and techniques used for project management
3. To do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques.
4. To highlight different techniques for software cost estimation and activity planning.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Understand the concept of concepts of project management, Managing requirements, and Software lifecycles.
2. Deliver successful software projects that support organization's strategic goals.
3. Apply the project plan; monitoring the project.
4. Analyze organizational needs to the most effective software development model.
5. Design and develop projects at each stage of the software development life cycle (SDLC).

Course Contents

Unit 1: Project Evaluation and Project Planning

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

Unit 2: Project Life Cycle and Effort Estimation

Software process and Process Models – Choice of Process models - mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II A Parametric Productivity Model - Staffing Pattern.

Unit 3: ACTIVITY PLANNING AND RISK MANAGEMENT

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules.

Unit 4: PROJECT MANAGEMENT AND CONTROL

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management.

Unit 5: STAFFING IN SOFTWARE PROJECTS

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.

Unit 6: Topics of current research.

References:

1. *Robert K. Wysocki "Effective Software Project Management" – Wiley Publication,2011.*
2. *Walker Royce: "Software Project Management"- Addison-Wesley, 1998.*
3. *Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
MAC-591	**English for Research Paper Writing**	**0**		

Course Contents Objectives:

1. Understand that how to improve your writing skills and level of readability.
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title.
4. Ensure the good quality of paper at very first-time submission.

Course Contents

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit 4: Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit 5: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

Unit 6: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:

1. *Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)*
2. *Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press*
3. *Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .*
4. *Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-902	**Disaster Management**	**0**		

Course Contents Objectives:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Course Contents

Unit 1: Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Unit 2: Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit 3: Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases and Epidemics.

Unit 4: Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Unit 5: Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Unit 6: Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Suggested Readings:

1. *R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.*
2. *Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.*
3. *Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep andDeep Publication Pvt. Ltd., New Delhi.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-903	**Sanskrit for Technical Knowledge**	**0**		

Course Contents Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
2. Learning of Sanskrit to improve brain functioning.
3. Learning of Sanskrit to develop the logic in mathematics, science and other subjects enhancing the memory power.
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Understanding basic Sanskrit language.
2. Ancient Sanskrit literature about science and technology can be understood.
3. Being a logical language will help to develop logic in students.

Course Contents

Unit 1: Alphabets in Sanskrit,

Unit 2: Past/Present/Future Tense

Unit 3: Simple Sentences, Order

Unit 4: Introduction of roots

Unit 5: Technical information about Sanskrit Literature

Unit 6: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Suggested reading

1. *"Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi*
2. *"Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication*
3. *"India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-904	**Value Education**			

Course Contents Objectives:

1. Understand value of education and self- development.
2. Imbibe good values in students.
3. Let the students know about the importance of character.

Course Contents Outcomes:

1. Knowledge of self-development.
2. Learn the importance of Human values.
3. Developing the overall personality.

Course Contents

Unit 1: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.

Moral and non- moral valuation. Standards and principles.

Value judgements

Unit 2: Importance of cultivation of values.

Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.

Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit 3: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.

Punctuality, Love and Kindness.

Avoid fault Thinking.

Free from anger, Dignity of labour.

Unit 4: Universal brotherhood and religious tolerance.

True friendship.

Happiness Vs suffering, love for truth.

Aware of self-destructive habits. Association and Cooperation.

Doing best for saving nature

Unit 5: Character and Competence –Holy books vs Blind faith.

Self-management and Good health.

Science of reincarnation.

Unit 6: Equality, Nonviolence, Humility, Role of Women.

All religions and same message. Mind your Mind, Self-control.

Honesty, Studying effectively

Suggested reading

1. *Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-905	**Constitution of India**	**0**		

Course Contents Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Contents Outcomes:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956..

Course Contents

Unit 1: History of Making of the Indian Constitution:

History

Drafting Committee, (Composition and Working)

Unit 2: Philosophy of the Indian Constitution:

Preamble

Salient Features

Unit 3: Contours of Constitutional Rights and Duties:

- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit 4: Organs of Governance:

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions

- Executive
- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

Unit 5: Local Administration:

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: Zila Pachayat.
- Elected officials and their roles, CEO Zila Pachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

Unit 6: Election Commission:

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. *The Constitution of India, 1950 (Bare Act), Government Publication.*
2. *Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.*
3. *M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.*
4. *D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-906	**Pedagogy Studies**	**0**		

Course Contents Objectives:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Course Contents

Unit 1: Introduction and Methodology:

- Aims and rationale, Policy background, Conceptual framework and terminology
- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions**.**
- Overview of methodology and Searching.

Unit 2:

- Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
- Curriculum, Teacher education.

Unit 3:

- Evidence on the effectiveness of pedagogical practices
- Methodology for the in depth stage: quality assessment of included studies.
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Unit 4:

- Theory of change.
- Strength and nature of the body of evidence for effective pedagogical practices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 5:

- Professional development: alignment with classroom practices and follow-up support
- Peer support
- Support from the head teacher and the community.

- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

Unit 6: Research gaps and future directions

- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

Suggested reading

1. *Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.*
2. *Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.*
3. *Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.*
4. *Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.*
5. *Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.*
6. *Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.*
7. *www.pratham.org/images/resource%20working%20paper%202.pdf.*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-907	**Stress Management By Yoga**	**0**		

Course Contents Objectives:

1. To achieve overall health of body and mind.
2. To overcome stress.

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Develop healthy mind in a healthy body thus improving social health also.
2. Improve efficiency.

Course Contents

Unit 1: Definitions of Eight parts of yog. (Ashtanga)

Unit 2: Yam and Niyam.

Unit 3: Do‘s and Don’t’s in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

Unit 4: Do‘s and Don’t’s in life.

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 5: Asan and Pranayam

i) Various yog poses and their benefits for mind and body

Unit 6: Asan and Pranayam

Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading

1. *‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur.*
2. *“Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata*

Code	Name of the Course Contents	Total credits	Lectures /week	Practical/ Week
AUD-908	**Personality Development Through Life Enlightenment Skills**	**0**		

Course Contents Objectives:

1. To learn to achieve the highest goal happily.
2. To become a person with stable mind, pleasing personality and determination.
3. To awaken wisdom in students

Course Contents Outcomes:

At the end of the Course Contents students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
3. Study of Neetishatakam will help in developing versatile personality of students.

Course Contents

Unit 1: Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride and heroism)
- Verses- 26,28,63,65 (virtue)

Unit 2:

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

Unit 3: Approach to day to day work and duties.

- Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,

Unit 4:

- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

Unit 5: Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18

Unit 6:

- Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Suggested reading

1. *"Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata*
2. *Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,*
3. *Rashtriya Sanskrit Sansthanam, New Delhi.*