National Diploma in Technology

Curriculum

Textile & Clothing Technology

Institute of Technology
University of Moratuwa

August 2004

First Year Syllabi

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Second Year Syllabi

1. DCE 102 Engineering Mechanics and Strength of Materials

Code : DCE 102			Division: Mechanical Eng. & Civil Eng.		
Title : Engineering Mechanics and Strength of Materials					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
2x30	2x15	2x15	2	2/2	2/2
Method of Assessment : - 3 Hour Question Paper & Course Works					

General Objectives

On completion of this module, the students will be able to

- gain sufficient theoretical knowledge to deal with Statics and Dynamics of Mechanical Engineering components in machinery and
- apply the principles of strength of materials on simple objects under different load conditions.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1	**Engineering Mechanics** Introductory Topics	04	04
2	Energy	04	-
3	Friction and Friction Drives	12	06
4	Gears	02	
5	Dynamics	08	04
6	**Strength of Materials** Elasticity of Materials under Different Load Conditions	11	06
7	Sectional Properties	03	-
8	Shear Force and Bending Moment Diagrams for Beams	10	-
9	Torsion in Simple Practical Applications	04	06
10	Slope and Deflection of Beams	02	04
	Total	**30**	**30**

Summary Syllabus

Engineering Mechanics

1. Introductory Topics (04 hours)

- Review - Units and dimensions, statics of a rigid body
  - Scalar and vector quantities.
  - Force, couple and moment with graphical representation.
  - The principle of equilibrium
  - Necessary and sufficient conditions for the equilibrium
  - Free body diagrams
- Simple Machines
  - Load, effort, mechanical advantage, velocity ratio, and mechanical efficiency.
  - Introduction to simple machine, lifting machine and reversible machine, self-locking machine and compound machine.
  - Condition for the self-locking machine.
  - Law of a simple machine P = aW +b.
  - Maximum mechanical advantage and maximum mechanical efficiency

2. Energy – Work & Power (04 hours)

- Introduction, work, energy.
- Potential energy, Kinetic energy and strain energy.
- Kinetic energy of rotating body, rotating about a fixed axis.
- Power, efficiency law of conservation of energy theore

3. Friction (12 hours)

- Introduction, dry friction, fluid friction, semi lubricated friction.
  - Static friction, dynamic friction
  - Laws of dry friction, coefficient of static and kinetic friction
  - Rolling and slipping
- Screw friction
  - Introduction, pitch, thread angle, lead, no of starts.
  - Friction formulae for square and V-threads
  - Mechanical efficiency and the maximum efficiency.
  - Engineering applications, such as screw jack, nuts and bolts, turn buckles, presses and power screws.
- Simple clutches
  - Introduction, type of clutches
  - Simple clutch in uniform wear and uniform pressure conditions.
- Bearings
  - Introduction, frictional losses in thrust bearings
  - Flat pivot and collar bearings with uniform wear and uniform pressure.
- Belt drives
  - Introduction, frictional formulae for flat belt and ‘V’ belts drives
  - Power transmission, via belts, band brakes

4. Simple Gar Dives (02 hours)

- Introduction, spur gearing between parallel shafts, external and internal gearing
- Pitch, module, pitch circle diameter, dedendum circle, addendum circle

5. Dynamics (08 hours)

- Kinematics
  - Introduction, kinematics of a particle in linear motion with constant acceleration condition, graphical representation of velocity and acceleration.
  - Kinematics of a particle in curvilinear motion in polar co-ordinates.
- Kinetics
  - Introduction, rigid body in motion.
  - Newton' laws of motion, De Alembert's principle.
  - Newton's second law for system of particles.
  - Motion of a particle in a circular motion.
- Inertia
  - Introduction, mass moment of inertia, radius of gyration
  - Parallel axis theorem, perpendicular axis theorem.
  - Motion of a rotating body about a fixed axis, plane motion of a rigid body.

Strength of Materials

1. Elasticity of Materials under Different Load Conditions (11 hours)

- Review of fundamentals
  - The nature of rigidity, elasticity and plasticity of materials, Hooke's law, Linear elastic stress strain analysis.
- Composite members
  - Principles of elasticity in stress-strain analysis of composite bars under; direct tensile or compressive loads and thermal stresses.
- Shear stress and shear strain
  - Complementary and diagonal shear stresses.
  - Shear modulus.
  - Applications of shear – lap joints and butt joints (design & analysing)
- Volumetric stress and strain
  - Bulk Modulus, Poisson's Ratio and Relationship between the elastic moduli.

2. Sectional Properties (03 hours)

- First moment of area and second moment of area.
- Perpendicular axes theorem and parallel axes theorem.
- 2nd moment of area for different standard shapes and their combinations.

3. Shear Force and Bending Moment Diagrams for Beams (10 hours)

- Types of loads and supports.
- Shear force and bending moment.
- Relationship between load, shear force and bending moment.
- Shear force and bending moment diagrams for different conditions of loads and supports.
- Bending of beams.
- Bending formula for simple applications.

4. Torsion in Simple Practical Applications (04 hours)

- Torsional shear stresses in solid and hollow circular shafts.
- Applications of torsion, Transmission of power and Helical springs.
- Torsion formula for closed coil helical spring.

5. Slope and Deflection of Beams (02 hours)

- Slope and deflection of cantilevers and simple supported beams.

List of Practicals : (30 hours)

Engineering Mechanics (14 hours)

1. Rotating Beams Apparatus
2. Inclined Plane
3. Compound Pendulum
4. Worm and Wheel Drive
5. Belt and Rope Friction
6. Screw Jack

Strength of Materials (16 hours)

1. Tensile test - Stress strain relationship of mild steel
2. Beam Deflection - Determination of Young's Modulus of timber
3. Torsion test - Determination of Modulus of Rigidity of steel
4. Helical Springs - Deformation of a helical spring under axial tension

Recommended Text Books :

1. Engineering Mechanics – Dynamics; R S Hibbler
2. Engineering Mechanics – Statics; J L Meriam and L G Kraige
3. Applied Mechanics; H Hannah, M J Hillier
4. Applied Mechanics and Strength of Materials; R S Khurmi
5. Theory of Machines; R S Khurmi and J K Gupta
6. Strength of Materials; G H Ryder
7. Strength & Elasticity of materials and Theory of Structures; W H Brooks
8. Mechanics of Solids and Structures; P P Benham and F V Warnock
9. Strength of Materials; John Case and A H Chilver
10. Problems in Strength of Materials; W V Sirk

2. DCH 102 Properties of Materials

Subject Code: DCH 102			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Properties of Materials					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**-**	**2**	**1**	**-**
Method of Assessment :- 3 Hour Question Paper					

General Objectives :

On the completion of this module students will be able to understand the structure, behavior and properties of materials in engineering applications.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Crystal Structure	08	-
2.	Phase Equilibria	10	-
3.	Mechanical Properties of Materials	04	-
4.	Electrical Properties of Materials	08	-
5.	Thermal Properties of Materials	03	-
6.	Polymers, Ceramics and Composites	09	-
7.	Treatment of Water	08	-
8.	Corrosion	10	-
	Total	**60**	**00**

Summary Syllabus

1. **Crystal Structure (08 hours)**
   - Crystal systems, Crystal lattices, Unit cells.
   - Lattice types of metals, their detailed study.
   - Lattice transformation of Iron with temperature.
2. **Phase Equilibria (10 hours)**
   - Definitions: Phase, Component, Degrees of freedom
   - One component systems.
   - Gibb's Phase rule.
   - Two component systems : Alloys, solid solutions, intermetallic compounds
   - Iron-Carbon phase diagram.
3. **Mechanical Properties of Materials (04 hours)**
   - Stress Vs. strain curves.
   - Creep.
   - Fatigue.
4. **Electrical Properties of Materials (08 hours)**
   - Conductivity, Resistivity.
   - Conductors, Semiconductors and Insulators: Properties, structure and bonding, band structure.
5. **Thermal Properties of Material (03 hours)**
   - Heat Capacity, Specific Heat, Thermal Conductivity.
6. **Polymers, Ceramics and Composites (09 hours)**
   - Homopolymer, copolymer.
   - Thermoplastic polymers
   - Thermosetting polymers
   - Elastomers
   - Their structure and formation.
   - Glass transition temperature.
   - Degradation of polymers.
   - Structure of Ceramics, bonding and related properties.
   - Composites : Fibre reinforced, particle reinforced and dispersion strengthened.
7. **Treatment of Water (08 hours)**
   - Impurities present in water.
   - Removal of impurities.
   - Hard water and Soft water.
   - Units used to express hardness of water.
   - Removal of hardness.
   - Boiler types and importance of blow down.

8. Corrosion (10 hours)

- Difference between an electrolytic cell and an electrochemical cell.
- Direct corrosion
- Indirect corrosion.
- Prevention of corrosion.

List of Practicals: Nil

Recommended Text Books :

1. Elements of Materials Science, 6th Edition; Van Vlack (Addison Wesley)
2. Introductions to Materials Science for Engineers, 4th Edition; Shackleford (Prentice Hall International)
3. The Science of Engineering materials; Smith (Prentice Hall International)
4. Materials Science and Engineering, 4th Edition; Callister (Wiley)

3. DEE 101 Electro Technology

Subject Code : DEE 101			Division : Electrical & Electronic Engineering Technology		
Title : Electro Technology					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**30**	**2**	**1**	**2/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

On the completion of this module the student will be able to:

- acquire the fundamental knowledge of Basic Electricity & Electronics
- develop a basis for specialist studies to undertaken in the 2nd Year.

No	Subject Outlines	Lecture (hr.)	Practical (hr.)
01	**Basic Electricity** Electric Circuits	04	05
02	Fundamental Laws of Electricity	06	05
03	Electric Power & Energy	06	05
04	Electrostatics	04	05
05	Electromagnetic Induction	04	-
06	Alternating Voltages and Currents	06	05
07	Electrical Installations	04	-
08	**Basic Electronics** Semi-Conductor Materials	04	-
09	Transistor and its Applications	08	05
10	Analogue and Digital Systems	08	-
11	Transducers	06	-
	Total	**60**	**30**

Summary Syllabus

Basic Electricity

1. Electric Circuits (04 hours)

- Electricity, DC and AC current
- Conductors, semi conductors and insulators
- Cells, temperature coefficient of resistance

2. Fundamental Laws of Electricity (06 hours)

- Coulomb, Ampere, Volt, Joule and watt
- Ohm's law, resistivity, conductivity and their units
- Series and parallel circuits, Kirchoff's laws
- Ideal source (voltage and current)
- DC distribution systems

3. Electric Power and Energy (06 hours)

- Energy conversion, heating effects of electricity, heat sink and fuses

4. Electrostatics (04 hours)

- Static electricity, Coulombs law, capacitor (parallel plate)
- Charge and voltage, parallel plate capacitor with composite dielectrics
- Parallel/series connected capacitance, Electric force, Electric flux density
- Potential gradient

5. Electromagnetic Induction (04 hours)

- Magnetic field, direction of the field, magnetic flux
- Right hand grip rule/cork screw rule
- Solenoid, toroid, induced emf, Flemming's right hand rule and Lenz's law
- Composite magnetic circuits, B-H curve, Hysterisis laws on magnetic circuits

6. Alternating Voltages and Currents (06 hours)

- Generation of an Alternating emf (single phase)
- Magnetic coil, frequency, speed and no. of pole pairs
- Average, peak and rms values of an ac current
- Rotating vector concept, sinusoidal AC quantities
- Single phase circuits, LRC circuits, phasor diagrams

7. Electrical Installation (04 hours)

- Wiring regulations, Domestic wiring installation ,two way switch, ring circuits, radial circuit of socket outlets

Basic Electronics

8. Semiconductor Materials (04 hours)

- Semiconductor categorization
- n-type and p-type semi conductors
- p-n junction, forward bias and reverse bias
- Diodes characteristics, half /full wave rectification
- Voltage clipping/clamping circuits
- Zener diode

9. Transistor and its Applications (08 hours)

- Transistors types, transistor characteristics
- Biasing & amplification

10. Analogue and Digital Systems (08 hours)

- Analogue circuits, digital circuits, set theory, combinational logics

11. Transducers (06 hours)

- Temperature, pressure and position transducers

List of Practicals: (30 hours)

1. Efficiency of energy conversion
2. Determination of RC – Time Constants
3. Study of simple AC circuits
4. Verification of Kirchoff's Laws
5. Familiarisation of electronic computers
6. Diode applications
7. Transistor characteristics

Recommended Texts :

1. Electrical Fundamentals; John Ryder, Prentice Hall International
2. Electrical Measurements & Measuring Instruments; E W Golding
3. Electronic Principles; Gray & Searle, Wily International Electrical Engineering
4. Electrical Engineering; G Hughes
5. Electrical Technology; H Cotton
6. Electronic Engineering; Schelling & Belove
7. Electronic Circuits; Milman & Haukias
8. Principles of Electronics; JE Holding & MR Garvin
9. Digital Systems; RJ Tocci, Prentice Hall International
10. Pulse & Digital Circuits; Milman & Taub, Mcgraw Hill
11. Electrical Technology; Schaum Series

4. DIS 101 English

Subject Code : DIS 101			Division: Interdisciplinary Studies		
Title : English					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	-	2	1	-
Method of Assessment :- Nine Assignments & 3 Hour question paper at the year end examination					

General Objectives

On Completion of this module the students will be able to

- Learn technical vocabulary and language necessary for scientific enquiry.
- Deal with concepts used in scientific discussion and writing in English.
- Develop an understanding of the English grammatical system at work.
- Produce language which look / sound natural.
- Develop writing skills.
- Get accustomed to various speech styles / situations and extract meaning.
- Achieve basic speaking skills needed to survive in speech situations.
- Achieve proficiency in social interaction.
- Develop presentation skills.
- Read and understand text.
- Read for specific information.
- Appreciate literary texts.

No.	Subject Outline	Lectures (hr.)	Practicals (hr.)
1	Core-Text - Basic English for Science	10	-
3	Listening	-	10
4	Speaking	10	20
5	Reading	15	-
6	Writing	25	-
	Total	**60**	**30**

* The first stage (foundation) of the course, which is the basic stage, is conducted prior to the commencement of the academic year & the 'foundation syllabus' is annexed.

Summary Syllabus

1. Technical vocabulary & concepts used in scientific discussion and writing in English.

(10 hours)

Core-Text - Basic English For Science (Peter Donovan - Oxford University Press)

- Giving simple instructions
- Reporting actions, observations & results, stating conclusions, accounting for results
- Understanding explanations, describing apparatus & experiments, interpreting results, describing attributes
- Describing experiment, stating results, describing & accounting for phenomenon
- Description of processes in detail

2.. Listening (10 hours)

- Listening activities
- Listening & Note-taking

4. Speaking (30 hours)

- Language of discussion
- Group discussions
- Basic Presentation skills
- Formal Presentations –individual / group

5. Reading (15 hours)

- Reading Comprehension
- Extracting contextual meaning of words
- Stated main ideas / implied main ideas
- Skimming and scanning a text to extract main idea / specific details
- Appreciating literary texts
- Reading & Note-taking

6. Writing (25 hours)

- Construction of sentences
- Paragraph writing – topic sentence / supporting details
- Simple compositions –narrative, descriptive, explanatory etc.
- Task-based assignments - report of experiment, description of process etc.
- Notices, invitations, notes, messages.
- Letter writing - Personal & Formal letters
- Report writing
- Job applications

Recommended Text Books :

1. Basic English for Science; Peter Donovan, OUP.
2. English for Physical Science; Allen & Widdowson, OUP.
3. Intermediate English Grammar; Raymond Murphy, Cambridge.
4. Advanced English Grammar; Raymond Murphy, Cambridge.

5. DIS 102 Introduction to Information Technology

Subject Code : DIS 102			Division : - Interdisciplinary Studies		
Title : Introduction to Information Technology					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
15	-	15	1/2	-	1/2
Method of Assessment: - Through Continues Assessment					

General Objective

On completion of this module the students will be able to:

- acquire a fundamental knowledge of computer systems and computer programming
- create professional quality spreadsheets and technical drawings.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Introduction to Computers	02	-
2.	Data Representation	01	-
3.	Secondary Storage Devices	01	-
4.	Categories of Software	01	-
5.	Spreadsheet Applications	-	02
6.	Use of CAD in Engineering	02	08
7.	Fundamentals of Computer Programming	05	05
8.	Introduction to PC Network and Internet	03	-
	Total	**15**	**15**

Note: The subject will be evaluated by assignments and not by a year-end examination.

Summary Syllabus

1. Introduction to Computers (02 hours)

- Types of computers
- Main Components of a Computer
  - Central Processing Unit
  - Main Memory
  - Input and Output Devices

2. Data Representation in the Computer (01 hour)

- Numerical Data Representation
- Character Representation
- Memory Capacity
- Information storage in the main memory.

3. Secondary Storage Devices (01 hour)

- Use of secondary storage devices.
- Hard Disks, Floppy Disks, Optical Disks and Magnetic Tapes

4. Categories of Software (01 hour)

- Hardware, Software and Firmware
- System Software and Application Software.
- Types of system software
- Packaged Software and Custom-Written Software

5. Spreadsheet Applications* (02 hours)

- Work sheet, work book, row number, column letter, cell and an active cell, reference area.
- Numbers, Label and Formulae.
- Copying data, moving data, inserting, deleting, moving columns and rows, formatting cells
- Functions.
- Macros.
- Multiple work sheets.
- Charts.

6. Use of CAD in Engineering* (10 hours)

- Components of the AutoCAD window.
- Giving commands
- Function keys
- Creating a new drawing.
- Basic entities
- Basic Editing
- Display Control
- Aids to construction
- Drawing limits
- Advanced Editing
- Object Snap
- Layers
- Polylines
- Blocks
- Hatching
- Simple three-dimensional views

7. Fundamentals of Computer Programming* (10 hours)

- Visual development environment
- Event driven programming
- Variables and variable types.
- Input and Output
- Sequence control structure, Selection control structure and Loop control structure.
- Arrays.
- Modular programming.

8. Introduction to PC Networks and Internet (03 hours)

- Introduction to a PC Network
- Types of networks
- Network based applications and advantages of networks.
- Hardware requirements and software requirements.
- Internet its resources.

List of Practicals: (15 hours)

* Topics covered are listed under items 5, 6 and 7

Recommended Text Books :

1. Developing Applications With Visual Basic, P R Reed JR,
2. Teach Yourself Visual Basic 6 in 21 Days, G Perry.
3. Using the World Wide Web D A Wall
4. AutoCAD For Architects and Engineers: A Practical Guide to Design, John M Albright.& Elizabeth H Schaeffer
5. An AutoCAD workbook, A Yarwood
6. Computer Networks - Second Edition, Tanenbaum, S Andrew
7. Microsoft Office 97 Professional Edition, M L Swanson
8. Information Technology; A practical course, Harriet.Hraper
9. Introducing Computers: Concepts, Systems and Applications.
10. Computer and Information Processing, D D Spencer

6. DIS 103 Mathematics

Subject Code: DIS 103			Division : Interdisciplinary Studies		
Title : Mathematics					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
90	30	-	3	1	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- understand the basic concepts of mathematics
- develop rational thinking in formulating engineering problems
- use mathematical symbols and formulae
- apply mathematical knowledge in solving practical problems
- appreciate tidiness and orderliness

No.	Subject Outline	Lecture (hr.)	Tutorial (hr.)
1.	**Algebra and Differential Equations** Determinants and Matrices	15	05
2.	Ordinary Differential Equations	15	05
3.	Vector Algebra	08	03
4.	Complex Numbers	06	02
5.	**Calculus** Functions	04	01
6.	Application of Differentiation	06	02
7.	Application of Integration	04	01
8.	**Probability and Statistics** Probability	05	02
9.	Statistics	12	04
10.	**Numerical Methods** Numerical Methods	15	05
	Total	**90**	**30**

Summary Syllabus

Algebra and Differential Equations

1. Determinants and Matrices (15 hours)

- Determinants
- Types of matrices,
- Algebra of matrices,
- Adjoint
- Method of inversion,
- Solution of simultaneous equations,
- Echelon form,
- Gauss elimination method,
- Consistency

2. Ordinary Differential Equations (15 hours)

- Formulation,
- Solution of first order differential equations and second order differential equations with constant coefficients,
- Use of D-operators, simple applications

3. Vector Algebra (08 hours)

- Vector notations,
- Scalar and vector products,
- Triple products,
- 3-D geometrical applications

4. Complex Numbers (06 hours)

- Algebra of complex numbers,
- De Moivre's theorem,
- Argand diagram,
- Roots of complex numbers
- Algebraic equations

Calculus

5. Functions (04 hours)

- Exponential,
- Hyperbolic and logarithmic functions,
- Inverse functions and implicit functions.

6. Application of Differentiation (06 hours)

- Stationary points and curve sketching,
- Mean value theorem,
- L'Hospital's rule for limits,
- Leibnitz's theorem,
- Partial differentiation and error calculations,
- Taylor series in one or two variables.

7. Application of Integration (04 hours)

- Areas and volumes,
- Moments,
- Lengths of arcs,
- Radius of curvature.

Probability and Statistics

8. Probability (05 hours)

- Elementary probability theory,
- Conditional probability and Bayer's theorem.

9. Statistics (15 hours)

- Classification, tabulation and presentation of data,
- Measures of location and dispersion,
- Discrete and continuous probability distributions: Binomial, Poisons and Normal with simple applications.

Numerical Methods

10. Numerical Methods (15 hours)

- Solution of equations in one variable
- Successive substitution method
- Method of false position
- Simple iterative method
- Newton-Raphson method
- Solution of simultaneous linear equations; Jacobi method, Gauss – Seidal method
- Finite differences and interpolation,
- Numerical differentiation,
- Numerical integration: Trapezoidal and Simpson's rules,

<u>Recommended Text Books</u> :

1. Advanced Calculus; Murray R Spiegel, Schaum's Outline Series
2. College Algebra; Murray R Spiegel, Schaum's Outline Series
3. Fourier Series; Murray R Spiegel, Schaum's Outline Series
4. Laplase Transforms; Murray R Spiegel, Schaum's Outline Series
5. Probability and Statistics; Murray R Spiegel , Schaum's Outline Series
6. 1st Year College Mathematics; Frank Ayres, Schaum's Outline Series
7. Calculus; Frank Ayres, Schaum's Outline Series
8. Differential Equations; Frank Ayres, Schaum's Outline Series
9. Matrices; Frank Ayres, Schaum's Outline Series
10. Engineering Mathematics; K A Stroud, Macmillan
11. Introduction to University Mathematics; J L Smyrl, Hodder and Stoughton
12. Intermediate Mathematics; Blakey, Oxford Press

7. DME 103 Engineering Drawing

Subject Code : DME 103			Division : Mech. Eng. Tech. & Maritime Studies		
Title :- Engineering Drawing					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
30		90	1	-	3
Method of Assessment: - 4 Hour Question Paper & Continuous Assessments					

General Objectives

On completion of this subject the students will be able to:

- understand the need of Engineering Drawings in Industry.
- read and understand Engineering Drawings.
- produce Engineering Drawings conforming to Engineering Drawing Standards.
- express ideas on paper quickly and clearly by sketches.

No.	Subject Outline	Lecture (hr.)	Practical* (hr.)
1.	Introduction to Engineering Drawing & Equipment	01	03
2.	Orthographic Projection	02	06
3.	Dimensioning	01	03
4.	Completing Third View from Two Given Views	01	09
5.	Sectional Views	02	12
6.	Screw Threads & General Engineering Terms	01	03
7.	Assembly Drawings	10	21
8.	Conic Sections	02	06
9.	Pictorial Views	02	06
10.	Loci - Rectification of Arcs, Involutes & Cycloids	02	03
11.	Helix & Mechanisms	01	03
12.	True Lengths & Inclinations	01	03
13.	Developments	02	06
14.	Interpenetration Curves	02	06
	Total	**30**	**90**

* **Practicals** – Drawing Office Practice

Summary Syllabus

1. Introduction to Engineering Drawing and Equipment (01 hour)

- Engineering Drawing as a International Language, graphical communication
- Standards used – *SLS 409:1977 – Engineering Drawing Practice and ISO Standards Handbook on Technical Drawing*
- Types of Line, Lettering used in Engineering Drawing Standards
- Use and care of Drawing equipment
- Layout of drawing paper

2. Orthographic Projection (02 hour)

- Principles of Orthographic Projection
- First Angle Projection, labeling of views and standard symbol of projection
- Third Angle Projection, labeling of views and standard symbol of projection
- Freehand sketching of Orthographic Views from pictorial views of simple objects
- Setting out an Orthographic Views of simple solids

3. Dimensioning (01 hour)

- Principles and terms used in dimensioning of engineering component
- Properties of dimensioning and why they are needed
- Principles of dimensioning according to SLS and ISO standards

4. Completing Third View from Two Given Views (01 hour)

- Projecting details from one view to the other and completing the third view when two views are given

5. Sectional Views (02 hour)

- Sectioning of engineering parts in terms of clarification of interior details
- Imaginary cutting plane, direction of view, labeling a Sectional View and Section lines
- Rules governing cutting plane through Web/Rib, Standard parts and common features etc.
- Local sectioning, Half section, Thin section, Successive sections, Revolved section and Section in two intersecting planes

6. Screw Threads and General Engineering Terms (01 hour)

- Screw threads and ISO Metric Thread designations
- Internal and external screw threads and to draw them using standard methods
- Application of General Engineering Terms

7. Assembly Drawings (10 hours)

- Temporary and Permanent fastening methods
- Nuts, Bolts and Washers using standard ratios used for drawing purposes
- Section plane through assembled component
- Exploded Views – use and applications
- Couplings, Bearings, Valves use and applications
- Assembly when the parts are scattered in a given drawing

8. Conic Sections (02 hours)

- Conic Sections – Cone, Section Plane and True Shape – Section of a cone
- Conics using locus of point, fixed point, fixed straight line and eccentricity and to draw tangents and normal
- Parabola using Rectangular method and to find the Focus
- Ellipse by common construction methods

9. Pictorial Views (02 hours)

- Principles of Pictorial projection
- Isometric Views
- Explain Isometric Scale

10. Loci - Rectification of Arcs, Involutes & Cycloids (02 hours)

- Involutes and applications, Involute of a circle
- Cycloids and applications

11. Helix and Mechanisms (01 hours)

- Helix and applications
- Locus of a point on a moving mechanism and profile of safety guard for a mechanism

12. True Lengths & Inclinations (01 hour)

- Point and Line in space
- True length of a line and inclination to Vertical Plane and Horizontal Plane

13. Developments (02 hours)

- Use and applications of Developments
- Developments be the following methods
  - - Parallel line method
  - - Radial line method
  - - Triangulation method

14. Interpenetration Curves (02 hours)

- Interpenetration Curves
- Interpenetration line of two plane surfaces – two prisms
- Construct Interpenetration Curves: Cylinder to Cylinder, Cone and Cylinder, Cone and Plane, Cone and Sphere, Sphere and Plane, Machine Parts

<u>List of Practicals</u> (Drawing Office Practice): (90 hours)

Machine Drawing

1. Solids 1
2. Solids 2
3. Bracket
4. Bearing
5. Bearing Bracket
6. Steering Gear Bracket
7. Column Bearing
8. Carburetor Body
9. Disc Crank
10. Plummer Block
11. G Clamp
12. Machine Vice
13. Cross Head for a Vertical Steam Engine
14. Gate Valve

Graphics

15. Conics
16. Ellipse
17. Isometric Views
18. Loci
19. Helix & Mechanisms
20. True Lengths & Inclinations
21. Developments
22. Interpenetration Curves

Recommended Text Books :

1. Sri Lanka Standard 409: 1977 Engineering Drawing Practice
2. Technical Drawing; A Yardwood
3. Technical Drawing for G.C.E. & C.S.E ; J N Green
4. Engineering Drawing I with worked examples ; F Pickup & M A Parker
5. Engineering Drawing II with worked examples ; F Pickup & M A Parker
6. Engineering Drawing Volume I; K R Gopalakrishna
7. Engineering Drawing Volume II; K R Gopalakrishna
8. Engineering Drawing with Problems & Solutions; K R Hart
9. Engineering Drawing for Technicians Volume 1; O Ostrowsky
10. Engineering Drawing for Technicians Volume 2; O Ostrowsky
11. Engineering Drawing with CAD Applications; O Ostrowsky

8. DME 104 Workshop Technology I

Subject Code : DME 103			Division : Mech. Eng. Tech. & Maritime Studies		
Title : Workshop Technology I					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
30	-	90	1	-	3
Method of Assessment :- 3 Hour Question Paper & Continuous Assessments					

General Objectives

On completion of this module, students will be able to;

- understand the fundamentals of workshop theory and practice
- describe and appreciate the methods of production and properties of engineering materials
- gain skills and experience in handling machine tools and carrying out metal cutting and welding operations

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Introduction to Workshop Technology	01	-
2.	Safety	01	-
3.	Engineering Materials	04	-
4.	Production of Pig Iron, Cast Iron and Steels	04	-
5.	Mechanical Properties of Materials	04	-
6.	Heat Treatment of Metals	04	-
7.	Classification of Manufacturing Processes	02	-
8.	Metal Cutting	03	-
9.	Screw Threads	01	-
10.	Machine Tools	04	-
11.	Joining of Materials	02	-
12.	Carpentry and Joinery	-	21
13.	Sheet Metal, Welding and Smithy	-	21
14.	Machining	-	24
15.	Fitting	-	24
	Total	**30**	**90**

Note:- Engineering Safety will be covered in relevant practical classes.

Summary Syllabus

1. **Introduction to Workshop Technology and Practice (01 hour)**
   - Techniques of manufacturing
2. **Safety (01 hour)**
   - Causes of accidents, precautions to be taken and safety practices
3. **Introduction to Engineering Materials (04 hours)**
   - Metals, non-metals, composites and their applications
   - Ferrous metals : Cast iron, plain carbon steels, alloy steels
   - Non-ferrous metals and alloys
4. **Production of Pig Iron, Cast Iron and Steels (04 hours)**
   - Constructional details and operation of Blast furnace, Cupola, Electric arc furnace and other common furnaces
5. **Mechanical Properties of Materials (04 hours)**
   - Tensile, compressive and shear forces
   - Elasticity, plasticity, malleability, ductility, hardness, brittleness and toughness
   - Stress – strain curve, ultimate tensile strength, yield strength.
6. **Heat Treatment of Metals (04 hours)**
   - Iron – carbon diagram
   - Heat treatment and surface treatment processes of metals
7. **Classification of Manufacturing Processes (02 hours)**
   - Classification of manufacturing processes
   - Casting, forging, bending, rolling, drawing, extruding and shaping by cutting
8. **Metal Cutting (03 hours)**
   - Cutting tool materials, characteristics of cutting tools, cutting tool geometry, tool life, machinability
   - Gas and electric arc cutting processes
9. **Screw Threads (01 hour)**
   - Elements, forms, uses, production and thread cutting calculations.
   - Types and uses of tapers and production methods.
10. **Introduction to Machine Tools (04 hours)**
    - Lathe and classification of lathes, components and their functions
    - Holding and supporting the work piece and the cutting tool
    - Grinding machines, abrasives, bond types and wheel classification.
    - Drilling machines, drills and drilling operations.
11. **Joining of Materials (02 hours)**
    - Joining by deformation
    - Soldering, Brazing and Welding
    - Adhesives

List of Practicals : (90 hours)

1. Carpentry & Joints
   - Construction of ten different joints

2. Sheet Metal, Welding, Smithy and Casting
   - Construction of Funnel and Gauge
   - Arc and Gas welding practices
   - Construction of Chisel and Mild Steel Ring

3. Machining
   - Turning, Thread cutting, Taper Turning and Knurling

4. Fitting
   - Construction of a Cube, Nut & Bolts

Recommended Text Books :

1. Workshop Technology Part I, Part II and Part III; W A Chapman
2. Production Technology , Processes Materials and Planning; W Bolton

9. DTT 101 Raw Materials and Fibre Science

Subject Code: DTT 101			Division: -Polymer, Textile and Chemical Engineering Technology		
Title: Raw Materials and Fibre Science					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**-**	**30**	**2**	**-**	**3/3**
Method of Assessment: - 3 Hour Question Paper & Course Works					

General Objectives

On completion of this module, the students will be able to understand the use of raw materials and fibre science connected with fibre manufacturing.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Introduction	05	-
2.	Concepts of Polymer Chemistry.	10	-
3.	Fibre and Filament Manufacturing Processes	10	-
4.	Textile Fibre Identification	10	30
5.	Chemical Structure, Physical and Chemical Properties of Fibers	25	-
	Total	**60**	**30**

Summary Syllabus

1. Introduction (05 hours)

- The basic requirements of textile fibres.
  - Fibre length: Definition of staple fibre and filament.
  - Fibre diameter: Definition of micron air value
  - Fibre length: Fibre diameter ratio
  - Fibre fineness
  - Tenacity
  - Elasticity
- The physical and chemical properties of textile fibres
  - Macro structure of fibre (physical properties such as length, cross section, surface appearance, colour and light reflection)
  - Microstructure of fibre (types and arrangements of molecules in fibre) and its effects on the physical properties such as strength, elasticity and moisture absorbance and chemical properties such as dye fixation, sunlight resistant and resistance to mold and moth.
- The textile fibre classification: origin and generic types.

2. Concepts of Polymer Chemistry (10 hours)

- The definition and classification of polymerization (condensation and addition polymerization)
- Co-polymers
- Degree of Polymerization (DP)
- The involvements of polymer chemistry in textile fibres and define the crystalline and amorphous regions.

3. Fibre and Filament Manufacturing Processes (Principles of Spinning) (10 hours)

- The following processes with example;
  - The process of Wet spinning
  - The process of Dry spinning
  - The process of Melt spinning

4. Textile Fibre Identification Methods (10 hours)

- Discuss the advantages and disadvantages of fibre identification methods; Burning test, Staining test, Microscopic appearance, Moisture regain and content, Solubility test

5. Chemical Structure, Physical and Chemical Properties of Fibres (25 hours)

- Effects of fibres on fabric performance: Cotton, Wool, Silk, Linen, Viscose, Acetate and Triacetate, Polyester, Nylon

List of Practicals : (30 hours)

1. Textile fibres / types of fibre identification by following methods.
   (i) Burning behaviour
   (ii) Microscopic examination
   (iii) Moisture content and moisture regain value
   (iv) Solubility in various solutions
   (v) Colour developed in reaction with a staining agent

2. Quantitative analysis of blended fabric.

Recommended Text Books :

1. Microscopy of Textile Fibres; P H Greaves & B P Saville
2. Fibre Science & Technology; V I Kostikov (editor)
3. New Fibres (Second Edition); Tatsuya Hongu & Glyn O Phillips
4. Textiles in Perspective; Betty F Smith / Ira Block
5. Technology of Textile Properties (Third Edition); Majorie A Taylor

10. DTT 102 Yarn Manufacture

Subject Code: DTT 102			Division: Polymer, Textile and Chemical Engineering Technology		
Title: Yarn Manufacture					
Annual Workload			**Weekly Workload**		
Lecture	**Tutorial**	**Practicals**	**Lecture**	**Tutorials**	**Practicals**
60	**30**	**30**	**2**	**1**	**3/3**
Method of Assessment: - 3 Hrs Question Paper & Course Works					

General Objectives

On completion of this module the students will be able to:

- understand the basic concepts of Blending Fibers.
- understand the process of yarn Manufacture.
- identify the process controls in the production of spun yarn.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	General Introduction	10	-
2.	Opening and Cleaning	10	03
3.	Carding	04	06
4.	Roller Drafting	04	03
5.	Combing	04	03
6.	Speed Frame	04	03
7.	Ring Spinning	10	06
8.	Blended Yarn Production	04	03
9.	Modern Spinning Systems	05	-
10.	Doubling and Cabling	03	03
11.	Sewing Thread Manufacturing	02	-
	Total	**60**	**30**

Summary Syllabus

1. General Introduction (10 hours)

- Identify the position of spinning in Fabric Manufacture.
- Process of spinning staple Yarn.
- Cotton growing in relation to fibre characteristics
- The process of Ginning.
- Numbering systems in relation to fibres, filaments, and Yarn.

2. Opening and Cleaning (10 hours)

- The principles of Opening and Cleaning.
- Blow-Room machinery and how they perform their objectives.
- Factors influencing the opening and cleaning efficiency.

3. Carding (04 hours)

- Principles of Carding.
- Main actions in a Card.
- The Revolving Flat Card,
- High Production Cards and Chute feeding.
- Card Clothing and its effect on sliver quality.

4. Roller Drafting (04 hours)

- Principle of Roller drafting.
- Working of the Draw Frame.
- Identify the draft irregularities.
- The recent developments in the Draw Frame.

5. Combing (04 hours)

- Objects of cotton combing and lap preparation for combing.
- Identify the Combing actions.
- The factors which influence, the comber waste, the sliver quality and production.

6. Speed Frame (04 hours)

- Drafting, twisting and package formation in Speed Frame.
- Differentiate, Conventional and high drafting systems.
- Recent developments.

7. Ring Spinning (10 hours)

- The drafting, twisting and winding.
- High drafting systems.
- Calculate draft, twist, and production details.
- End-Breakages and limitations in Ring Spinning.
- Identify the recent developments.

8. Blended Yarn Production (04 hours)

- Describe the purpose of blending, methods of blending, blending efficiency and tolerances.
- Discuss the blending irregularity.

9. Modern Spinning Systems (06 hours)

- Discuss Open-End, Self-twist, Twist less and Friction spinning processes of Yarn manufacture and their properties.
- Discuss the Core Spun, Covered and Fancy Yarn.
- Compare Ring Spun with Open-End Yarns and the economics of production.
- Describe the production, properties and uses of Textured Yarn

10. Doubling and Cabling (04 hours)

- Discuss the principles of doubling and cabling.
- Discuss the production of folded Yarn and Sewing thread.
- Sewing thread production.
- Synthetic yarn production.

11. Sewing Thread Manufacturing (02 hours)

List of Practicals : (30 hours)

1. Material path and machine parts in conventional and modern Cards
2. Machine diagram and speed calculations of conventional Card
3. Machine diagram and speed calculations of modern Card and comparisons between conventional and modern Cards
4. Material path and machine parts in Draw Frame.
5. Machine diagram and speed calculations of Draw Frame
6. Material path, machine parts and speed calculations in Speed Frame
7. Material path and machine parts in Ring Frame
8. Machine diagram and speed calculations of Ring frame
9. Material path and machine parts in Splicer Winder
10. Material path and machine parts in Doubler Winder and Two for One Twister

Recommended Text Books :

1. The Technology of short-staple spinning (Vol 1); W Klein
2. A practicle guide to the blowroom and carding (Vol – 2); W Klein
3. A practicle guide to combing, drawing and the roving frame (Vol – 3); W Klein
4. A particle guide ring spinning (Vol - 4); W Klein
5. New spinning systems (Vol - 5); W Klein
6. Yarn Evenness (Textile progress - Vol. 14 No 3\4); K Slater
7. Yarn Preparation: Handbook (SSTS); J Iredale

11. DIS 202 Mathematics

Subject Code: DIS 202			Division : Interdisciplinary Studies		
Title : Mathematics					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	-	2	1	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- Understand the basic concepts of mathematics
- Develop rational thinking in formulating engineering problems
- Use mathematical symbols and formulae
- Apply mathematical knowledge in solving practical problems
- Appreciate tidiness and orderliness

No.	Subject Outline	Lecture (hr.)
1.	Fourier Series and Laplase Transformations	10
2.	Integrals	05
3.	Statistics	20
4.	Vector Calculus	10
5.	Differential Equations	14
	Total	**60**

Summary Syllabus

1. Fourier Series and Laplase Transformations (10 hours)

Periodic functions,
Fourier expansion of a periodic function,
Odd and even functions,
Half range Fourier series,
Complex notation for Fourier series.
Laplase transform of elementary functions and basic theorems

2. Integrals (05 hours)

Brief introduction to improper integral,
Differential of integral,
Functions of two or three variables,
Multiple integrals,
Constraint maxima and minima,
Langrange multipliers,
Introduction to Fourier series.

3. Statistics (20 hours)

Techniques and methods of statistics with practical applications,
Description and handling of numerical data,
Sampling theory
Estimation theory
Hypothesis testing,
Correlation and regression,
Non-parametric methods.

4. Vector Calculus (10 hours)

Vector differentiation and differential operators,
Space curves and line integral,
Surface and surface integrals,
Divergence theorem, Stroke's theorem, Green's theorem in a plane and their basic applications.

5. Differential Equations (15 hours)

Ordinary linear differential equations with variable coefficients,
Bessel, Legendre special functions, singular points, existence and uniqueness of the solution.
Laplase transform of elementary functions and basic theorems,
Application to solution of differential equations and their systems,
Transfer functions, convolution theorem, concepts of stability and controllability.

Recommended Text Books :

1. Advanced Calculus; Murray R Spiegel, Schaum's Outline Series
2. College Algebra; Murray R Spiegel, Schaum's Outline Series
3. Fourier Series; Murray R Spiegel, Schaum's Outline Series
4. Laplase Transforms; Murray R Spiegel, Schaum's Outline Series
5. Probality and Statistics; Murray R Spiegel, Schaum's Outline Series
6. !st Year College Mathematics; Frank Ayres, Schaum's Outline Series
7. Calculus; Frank Ayres**,** Schaum's Outline Series
8. Differential Equations; Frank Ayres, Schaum's Outline Series
9. Matrices; Frank Ayres, Schaum's Outline Series
10. Engineering Mathematics; K A Stroud, Macmillan
11. Introduction to University Mathematics; J L Smyrl, Hodder and Stoughton
12. Intermediate Mathematics; Blakey, Oxford Press

12. DME 204 Industrial Management

Subject Code: DME 204			Division : Mech. Eng. Tech. & Maritime Studies		
Title : Industrial Management					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	-	2	-	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- understand and appreciate management theory and develop management skills.
- develop decision making skills.
- handle resources in a most appropriate manner.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Principles of Economics	06	-
2.	Principles of Management	08	-
3.	Financial Accounting	08	-
4.	Cost Accounting	08	-
5.	Materials Management	04	-
6.	Planning of Projects	09	-
7.	Work Improvement and Work Measurement	08	-
8.	Introduction to Maintenance Management	02	-
9.	Organisational Behaviour	06	-
10.	Law of Contract	08	-
11.	Management Case Study Discussions	02	-
	Total	**60**	--

Summary Syllabus

1. Principles of Economics (06 hours)

Basic elements.
Demand and supply.
Market competition.
Economy of Sri Lanka.

2. Principles of Management (08 hours)

Organisational Chart.
Design of an organization.
Scientific management thought.
Line and staff organization.
Span of control, authority, responsibility, power and accountability.

3. Financial Accounting (08 hours)

Business transactions.
Book-keeping procedures.
Balance sheet.
Final accounts.
Financial statements
Manufacturing accounts.

4. Cost Accounting (08 hours)

Cost components.
Application of costing procedures, depreciation.
Break-even analysis and its application.

5. Materials Management (04 hours)

Organisation of stores.
Economic order quantity.
Quality control.

6. Planning of Projects (09 hours)

Network diagrams.
Critical path analysis.
Gantt charts.
Resource allocation.

7. Work Improvement and Work Measurement (08 hours)

Job analysis.
Job evaluation.
Work study.
Performance standards, incentive scheme.
Labour regulations.
Industrial safety.

8. Introduction to Maintenance Management (02 hours)

Preventive and break-down maintenance.
Replacement policies.

9. Organisational Behaviour (06 hours)

Formation of groups in organizations.
Group behaviour and group dynamics.
Basic concepts in 'motivation'.
Organisational politics.
Introduction to leadership concept.

10. Law of Contract (08 hours)

How a contract is formed. 'offer' and 'acceptance'.
Conditions affect a contract.
Termination of a contract.

11. Management Case Study Discussions (02 hours)

List of Practicals:

Nil

Recommended Text Books :

1. Management – Don Hellriegel & John W Slocum
2. Advanced Accountancy – RL Gupta & M Radhaswamy
3. Organisational Behaviour and Human Behaviour at Work – John W Newstrone & Keith Davis
4. Introduction to Economics – Carin Cross & Sinclair
5. Production Planning Control and Industrial Management – K C Jain

13. DTT 201 Colouration and Finishing Technology

Subject Code: DTT 201			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Colouration and Finishing Technology					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	30	2	1	3/3
Method of Assessment :- 3 Hour Question Paper & Course Work					

General Objectives

On completion of this module the students will be able to carryout the pre treatment, colouration and finishing methods in a factory constructions.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Pre Treatment	15	12
2.	Dyeing	15	09
3.	Printing	15	03
4.	Finishing	15	06
	Total	**60**	**30**

Summary Syllabus

1. Pre Treatment (15 hours)

Impurities of fibres , properties of starch and their removal methods
Theory of detergency and dispersing action
Action of caustic soda on cellulosic fibres
Bleaching agents and optical brightening agents
Machineries and equipments

2. Dyeing (15 hours)

Introduction to chemistry of dyes and their classification
Direct dyes and their applications
Application of vat, solubalized vat, reactive, acid, basic and sulphur dyes.
Application of disperse dyes
Determining of colour fastness

3. Printing (15 hours)

Definition of printing and preparation methods
Printing recipes and function of constituents
Styles of printing
Printing with various types of dyes
Drying methods and types of driers
Fixation techniques
Washing and finishing methods

4. Finishing (15 hours)

Purpose of finishing
Mechanical treatment, machineries and their effects
Chemical treatments, machineries and their effects

List of Practicals: (30 hours)

1. Absobtivity of cotton fabrics in different states of purity
2. Determination of the effect of temperature, time, PH and concentration on desizing process with amylase.
3. Determination of the effect of temperature, time, detergent and concentration of caustic soda [NaOH] on the scouring process.
4. The effect of liquor ratio, exhausting agent and temperature on the depth of shade.
5. Bleaching with cotton with hydrogen peroxide \ optical brightening agent.
6. Produce 4 % dyeing of reactive dye on cotton material.
7. Dyeing polyester fibres with disperse dyes at high temperature [H T 130 ˚C] and study the fastness to dry heat [Ironing].
8. Produce 10 % dyeing of sulphur dye on cotton material.
9. Printing cotton material with reactive dye using steam fixation.
10. Colour fastness to washing
    I S O 105 C01 /C02/C03/C04/C05
    Colourfastness to rubbing
    Colourfastness to perpiration
    Colourfastness to light

Recommended Text Books :

1. Cellulosic Dyeing; John Shore (Editor), Society of dyers and colourists 1995
2. The Dyeing of Textile Materials; Jose Cegarra, Publio Puente, Jose Valldeperas
3. Textile Printing; Leslie W C Miles
4. Chemical Principles of Synthetic Fibre Dyeing; S M Burkinshaw
5. Blends Dyeing; John Shore
6. Textile Colouration and Finishing; Warren S Perkins
7. Batchwise Dyeing of Woven Cellulosic Fabrics; G W Madaras , G J Parish, J Shore

14. DTT 202 Knitting Technology

Subject Code: DTT 202			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Knitting Technology					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	30	2	-	3/3
Method of Assessment :- 3 Hour Question Paper & Course Work					

General Objectives

On completion of this module the students will be able to understand the basic principles of knitting.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Weft Knitting Fundamentals	06	03
2.	Characteristics of Circular Knitting Machines	06	-
3.	Needle Control and Its Equipment	03	-
4.	Circular Knitting Machines for Garment Length Fabric	03	06
5.	Knitted Fabric Structures	09	-
6.	Fabric Analysis	02	09
7.	Quality and Production Monitoring	03	-
8.	Machine Classification	04	-
9.	The Structure of Warp Knits	02	06
10.	Fabric Quality Control	02	-
11.	Basic Designing Principles	03	-
12.	Yarn Preparation	02	03
13.	Fabric Defects	02	03
14.	Production Calculations	02	-
15.	Non-Woven Fabrics	11	-
	Total	**60**	**30**

Summary Syllabus

1. Weft Knitting Fundamentals (06 Hours)

An outline of knitting machines
Fundamentals of stitch formation (knitted, tuck and float)

2. Characteristics of Circular Knitting Machines (06 hours)

Machine elements
Knitting elements
Yarn feeder and its correct setting
Needle and sinker control units
Fabric take down
Yarn supply
Monitoring and maintenance systems

3. Needle Control and Its Equipment (03 hours)

Direct Needle Control
Indirect Needle control
Electronically controlled needle selection

4. Circular Knitting Machines for Garment Length Fabric (03 hours)

Knitting Techniques
Stitch density and Quality

5. Knitted Fabric Structures (09 hours)

Basic structures; single jersey, rib, interlock
Pattrened structures; single jersey, rib, interlock
Specially structures; fleecy, plush
Jacquard structures

6. Fabric Analysis (02 hour)

Methodical pattern analysis
Tools and technical aids
Symbols used for representation of needles

7. Quality and Production Monitoring (03 hours)

Faults and its causes in circular knitting
General production conditions for knitting

Warp Knitting Fundamentals

8. Machine Classification (04 hours)

Tricot machines – Knitting elements, The basic knitting action of the compund needle machine
Raschel machine - – Knitting elements, The basic knitting action of the compund needle machine, Driving mechanisms of the knitting elements

9. The Structure of Warp Knits (02 hours)

A course
A wall
Loop parts
Open and closed loops

10. Fabric Quality Control (02 Hours)

Run in
Yarn feeding and tension control
Yarn let-off

11. Basic Designing Principles (03 hours)

Fabric types
Lapping diagram and chain notations
Tricot and Raschel pattern links
Laying –in
Fall plate
Weft insertion

13. Yarn Preparation (02 hour)

Methods of yarn preparation – Direct and Indirect

14. Fabric Defects (02 hours)

15. Production Calculations (02 hours)

16. Non-Woven Fabrics (11 hours)

List of Practicals: (30 hours)

1. Study primary knitting elements on a weft-knitting machine.
2. Analyse of knitted fabric structures provided.
3. Study patterning mechanism on a knitting machine.
4. Study the warping knitting machine.

Recommended Text Books :

1. Weft Knitting; Ras
2. Knitting Technology; J D Spencer

15. DTT 203 Product Initiation

Subject Code: DTT 203			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Product Initiation					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	180	2	-	3x2
Method of Assessment :- 3 Hour Question Paper & Course Work					

General Objectives

On completion of this module the students will be able to prepare the materials and necessary patterns to start the garment production.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Types of Stitch	03	-
2.	Types of Seam	03	-
3.	Stitch-less Seams	02	-
4.	Properties of Seams	04	-
5.	Sewing Threads	03	-
6.	Interlining	03	-
7.	Garment Pressing	03	-
8.	Garment Accessories	04	-
9.	Product Development	06	-
10.	Sample Development	09	-
11.	Development of Ladies Wear	09	90
12.	Development of Men's Wear	06	50
13.	Pattern Grading	05	-
14.	Industrial Size Specifications and Pattern Constructions	-	40
	Total	**60**	**180**

Summary Syllabus

1. **Types of Stitch (03 hours)**
   Classification
   Stitch formation methods
   Characteristics and general uses
   Thread consumption

2. **Types of Seam (03 hours)**

   Seam classification
   Construction methods
   General application in garments
   Seam finishing methods
   Factors governing the width of seam allowances.

3. **Stitch-less Seams (02 hours)**

   Adhesive seam & applications
   Moulding seam & applications
   Weld seam & applications

4. **Physical Properties of Seams (04 hours)**

   Seam Strength
   Seam Elasticity
   Seam Security
   Seam Durability
   Seam Appearance
   Seam Comfort

5. **Sewing Threads (03 hours)**

   Classification according to the fibres & construction
   Application & size of the sewing thread
   Properties of sewing thread

6. **Interlining (03 hours)**

   Reasons for use of interlining
   Classification
   Characteristics of a good interlininig
   Problems encountered in usage

7. **Garment Pressing (03 hours)**

   Reasons for pressing
   Quality points of pressing
   Pressing equipments
   Pressing in relation to different fabrics

8. **Garment Accessories (04 hours)**

   Types of accessories
   General uses of them

9. Product Development (06 hours)

Process of product development
Elements of fashions
Product life cycle

- Different stages of fashion cycle
- Fashion changes

Duties of different people engaged in developing a product in the Garment industry.

10. Sample Development (09 hour)

Methods of pattern development
An introduction to tools and equipment and block patterns
Identification of tools, equipment and material used in pattern making
Designers sketch, basic block patterns, working patterns, sample patterns, production pattern
Body Measurements and Size Chart

- Identification of body sections for pattern construction
- Vertical, width and girth measurements
- Ways of taking and recording body measurements
- Size charts

Sampling process

11. Development of Ladies Wear (09 hours)

Construction of basic blocks – skirts, bodice, sleeve
Styling - skirts, bodice, sleeves, collars, pockets
One piece dress and styling
Lingeries – Bras, briefs

12. Development of Men's Wear (06 hours)

Construction of basic patterns – Shirt, Trouser, Jacket
Styling – Shirt, Trouser, Jacket

13. Pattern Grading (05 hours)

Making graded and sectional size charts
Grading the patterns

14. Industrial Size Specifications and Pattern Constructions (Practicals only)

List of Practicals: (30 hours)

1. An Introduction to tools and equipment, measurements and block patterns (P1)

2. Development of ladies wear
   i. Basic skirt block (P2)
   ii. Skirt styling (P3 & P4)
   iii. Pleats, pockets, waist band stylings (P5)
   iv. Basic bodice block (P6)
   v. Dart manipulation and Bodice styling (P7)
   vi. Collar styling (P8)
   vii. Basic ans semi fitted sleeve (P9)
   viii. Sleeve styling (P10)
   ix. One piece dress and styling (P11)

3. Ladies – lingeries
   i Basic bra and styling (P12)
   ii Brief styling (P13)

4. Development of men's wear
   i Basic shirt and styling (P14 &P15)
   ii Basic trouser and styling (P16 & P17)

5. Pattern Grading (P18)

6. Industrial size specification practices (P19 & P20)
   i ladies wear
   ii shirt
   iii trouser/ short
   iv lingerie

Recommended Text Books :

1. Apparel Manufacturing Hand Book; Jacob Solinger
2. Metric pattern Cutting; Winifred Aldrich
3. The Technology of Clothing Manufacturing; Harrold Carr & Barbara Lathem

16. DTT 204 Production Organisation & Management

Subject Code: DTT 204			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Production Organisation & Management					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**-**	**2**	**1**	**-**
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to organize the Garment factory in the view of improving the manufacturing process.

No.	Subject Outline	Lectures (hr.)	Practical (hr.)
1.	Introduction and Merchandising	04	-
2.	Work-study	14	-
3.	Sewing Room Design	11	-
4.	Garment Analysis	04	-
5.	The Importance of Material Handling in the Sewing Room	04	-
6.	Production Planning, Scheduling and Progressing in the Sewing Room and Cutting Room	08	-
7.	Wages, Incentive Plans, Working Condition And Welfare Arrangements	03	-
8.	Cost Controlling in Sewing Room	04	-
9.	Cleaning and Packaging	02	-
10.	Labour Management	06	-
	Total	**60**	**00**

Summary Syllabus

1. Introduction and Merchandising (04 hours)

Organization structure of a garment factory.
Understanding buyer and merchandiser
Order negotiation, Placement and monitoring
Material sourcing
Factory sourcing
Raw material ordering

2. Work-study (14 hours)

Introduction.
Method study.
Work measurement.
Pre determined Motion Systems.
Performance of operators

3. Sewing Room Design (11 hours)

Work in progress, through put time and lead-time.
Line balancing.
Division of labour.
Types of sewing room systems

4. Garment Analysis (04 hours)

Work systems.
Analyse various garments.
Choice of machinery

5. The Importance of Material Handling in the Sewing Room (04 hours)

Handling units

6. Production Planning, Scheduling and Progressing in the Sewing Room and Cutting Room (08 hours)

Methods of planning.
Objectives of scheduling.
Scheduling techniques.
Cut order plan.
Cutting schedule

7. Wages, Incentive Plans, Working Condition And Welfare Arrangements (03 hours)

Introduce salary and wages.
Welfare facilities.
Medical facilities

8. Cost Controlling in Sewing Room (04 hours)

Costing methods.
Garment costing considerations
Cost reduction techniques

9. Cleaning and Packaging (02 hours)

Cleaning methods.
Different forms of packaging.
Packaging material

10. Labour Management (06 hours)

Recruitment, selections, training
Human problems and public relationship
Labour Laws
Environmental Regulations
Compliance

List of Practicals:

Nil

Recommended Text Books:

1. Introduction to Clothing Production; A J Chuter
2. Introduction to Work Study; International Labour Organisation
3. Material Management in Clothing Manufacture; Tyler
4. The Organisation, Planning and Control of production in Clothing manufacture; Harrold Carr
5. The Clothing factory; Harrold Carr

17. DTT 205 Statistics and Quality Control

Subject Code: DTT 205			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Statistics and Quality Control					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	-	2	1	-
Method of Assessment :- 3 Hrs Question Paper & Course Works					

General Objectives

On completion of this module the students will be able to:

- Apply basic concepts upon which statistical decisions are made in industry
- Apply basic quality control techniques in batch inspection and process control

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	**Statistics** Application of Discrete and Continuous Distributions	08	-
2.	Application to Basic Statistical Inference	08	-
3.	Regression	06	-
4.	Quality Control	08	-
5.	**Quality Control** Introduction to Quality Assurance	03	-
6.	Methods of Quality Assurance in Garment Manufacturing	04	-
7.	Methods of Quality Control in Garment Manufacturing	04	-
8.	Specifications	02	-
9.	Quality Records Used in Clothing Industry	04	-
10.	Cost of Quality	03	-
11.	Defects Classification	03	-
12.	Sampling Inspection	04	-
13.	Quality Systems & House Keeping Procedures use in the Clothing Industry	03	-
	Total	**60**	**00**

Summary Syllabus

Statistics

1. Application of Discrete and Continuous Distributions (08 hours)

Expectation (Mean), Variation & Standard deviation
Binomial Distribution
Poisson Distribution
Poisson approximation to Binomial
Normal approximation to Binomial
Normal approximation to Poisson

2. Application to Basic Statistical Inference (08 hours)

Estimation, Sampling Distribution and Hypothesis Tests for

- Means
- Propotions
- Variance
- Comparison of two Population means
- Comparison of two Population Propotions
- Comparison of two Population variances

Goodness of fit test
Contigency table

3. Regression (06 hours)

Scatter diagram
Correlation
Linear Regression

4. Quality Control (08 hours)

Brief Introduction of sampling methods
Sampling inspection and its advantages
Process control
Control Charts for means and range
Operating Characteristic Curve
Single Sampling plane
Double Sampling plane

Quality Control

5. Introduction to Quality Assurance (03 hours)

Quality
Quality assurance and control
Benefits of quality assurance and control
The Quality of Design

- Definition
- The quality of conformance
- Designer's responsibility of quality
- Variables and attributes

6. **Methods of Quality Assurance in Garment Manufacturing (04 hours)**
7. **Methods of Quality Control in Garment Manufacturing(04 hours)**
8. **Specifications (02 hours)**

   Fabric specification
   Garment specification
   Manufacturing specification

9. **Quality Records Used in Clothing Industry (04 hours)**
10. **Cost of Quality (03 hours)**

    Types of quality costs
    Classification of quality costs

11. **Defects Classification (03 hours)**
12. **Sampling Inspection (04 hours)**

    Single sampling plan
    Double sampling plan
    Multiple sampling plan
    Sequential sampling plan

13. **Quality Systems & House Keeping Procedures use in the Clothing Industry (03 hours)**

List of Tutorial: (30 hours)

1. Presentation of data in different ways (tables, charts, graphs etc.)
2. Classification of data into frequency tables, drawing Histograms, Orgive Curve, calculation of measures of Locations, Measures of Dispersions.
3. Scatter plot, Correlation Matrix and fitting a Linear Regression line
4. Construction of control charts of mean and range

Recommended Text Books :

1. Statistics for technology, Christopher Chatfield
2. Introduction to Probability and Statistics; Shaum's outlines
3. Statistics explained; J P Lewis & Alasdair Traill
4. An Introduction to Quality Control for the Apparel Industry; Pradip Mehta
5. An approach to Quality Control in the Clothing Industry; J Lowe, P D Lowlock

18. DTT 206 Textile Testing & Equipment Technology

Subject Code: DTT 206			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Textile Testing & Equipment Technology					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2 x 30	**-**	**2x3x10**	**2**	**-**	**2x3/3**
Method of Assessment :- 3 Hour Question Paper & Course Work					

General Objectives

On completion of this module the students will be able to use different types of equipment used in garment manufacturing process.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Lay Planning and Marker Making	03	-
2.	Fabric Spreading	02	-
3.	Methods of Fabric Cutting	03	-
4.	Sewing Machine	05	16
5.	Common Sewing Problems	03	-
6.	Control Systems	08	-
7.	Pneumatics	06	14
8.	Physical Testing	12	-
9.	General Properties of Fabrics	08	-
10.	Colour and Colour Measurement	04	-
11.	Testing of Textile Materials	06	30
	Total	**30**	**60**

Summary Syllabus

Equipment Technology

1. Lay Planning and Marker Making (04 hours)

Types of Markers
Marker efficiency
Different methods of maker making
Advantages and disadvantages of them
Methods of marker duplication
Technical requirement for marker making

2. Fabric Spreading (02 hours)

Requirements for fabric spreading
Methods of fabric spreading
Types of spreads

3. Methods of Fabric Cutting (04 hours)

Different methods of fabric cutting
Advantages and disadvantages of them
Cutting knives

4. Sewing Machine (04 hours)

Basic sewing machines
Principles of sewing machine design
Stitch formation
Sawing machine needle
Feeding mechanisms
Pressure feet
Sewing machine attachments

5. Common Sewing Problems (03 hours)

6. Pneumatics

7. Control Systems

Textile Testing

8. Physical Testing (12 hours)

Atmospheric humidity and effect of humidity on textile testing, Tests for moisture content of textile materials.
Test for count and twist of yarns, measurement of irregularity of yarns and rovings, Uster tester.
Test on cotton fibres.
Tensile testing of textile materials, sampling effects and adaptation of instruments and methods for fibres, yarns and fabrics.

9. General Properties of Fabrics (08 hours)

Weight, thickness, threads slippage, bending length, flexural rigidity, formability and resistance to shear.
Resistance of fabrics to pilling and abrasion.
Tests for retention of applied creases, air permeability, porosity, water resistance and water proofing properties of fabrics

10. Colour and Colour Measurement (04 hours)

Human eye and colour perception, Absorbency by solutions, "Beer, Lambert" laws and its application and limitations.
Laws of colour mixing, colorimeters and photometers, light sources.
Spectral sensitivity, Hue sensitivity and Luminosity sensitivity of the eye and of CIE standard observer, Development of CIE bichromatic coordinate system
Colour atlases (Munsel and Ostwald) and colour difference formula AN lab and CIE lab. Instrumental colour matching.

11. Testing of Textile Materials (06 hours)

Colour fastness to Light, Rubbing and Washing
Blend analysis- qualitative and quantitative
Dimensional stability to laundering.

<u>List of Practicals: (60 hours)</u>

1. High Speed Single Needle Lock Stitch Machine (06 hours)
   i. Introduction of high speed single needle L/S M/C
   ii. Height of the feed dog –to adjust the height of the feed dog
   iii. Needle to hook re;ationship – adjusting the eneedle bar height
   iv. Threading the m/c
   v. Adjusting the feeding time – Standard feed time, Advanced feed time, Delayed feeding time

2. Over lock Machine (06 hours)
   i. Height of the needle
   ii. Setting loopers: Lower looper, Upper looper
   iii. Position of the looper thread take up and the looper thread guide
   iv. Threading

3. Introduction and threading of (09 hours)
   i. Chain Stitch m/c
   ii. Button hole m/c
   iii. Bar tack m/c
   iv. Feed off the arm m/c

4. Cutting Equipments (03 hours)
   i. Identify the basic components of cutting equipments
   ii. Aware of the safety and safety precausions
   iii. Different types of basic cutting functions performed by cutting equipments and their scope of applications.

5. Introduction to control Panels (06 hours)
   a) With single pilot value and double acting cylinder design a circuit when push button pressed the advance & once it is released the cylinder retreats.
   b) With single pilot value and double acting cylinder design a circuit when push button is pressed cylinder start reciprocating motion & it will remain till the push button releases.
   c) Using double pilot value and double acting cylinder design the following circuits.
      i) Cylinder reciprocates when either push button or toggle switch is get activated.
      ii) For reciprocating motion of cylinder it is necessary to activate push button & toggle switch simultaneously.

d) As push button pressed double acting cylinder advanced and after certain time interval it retreats back. Time delay can be adjusted with the screw in the shutter value.
e) Design the following circuit to illustrate the combined use of pneumatics with electric circuits.
When one switch is activated, double acting cylinder advances and two switches are active simultaneously the cylinder retreats back irrespective of the position of the advancing switch.

6. Trash content of cotton.
7. Comb Sorter.
8. Yarn Count
9. Yarn twist.
10. Instron – Single Yarn Strength.
11. Good Brand - Single Yarn Strength.
12. Lea Strength and Count Strength Product value.
13. Yarn evenness using Uster Tester.
14. Yarn Examination using tapered board
15. Pilling Test
16. Abrasion test
17. Instron - Fabric Strength test
18. Tearing Strength Test
19. Bursting Strength Test
20. Seam slippage test
21. Crease recovery angle test

Recommended Text Books :

1. The Technology of Clothing Manufactuing; Harrold Carr & Barbara Lathem
2. Principle of textile testing; J E Booth
3. Technology of Textile Properties; Marjori A Taylor

19. DTT 207 Weaving Technology

Subject Code: DTT 207			Division : Polymer, Textile and Chemical Engineering Technology		
Title : Weaving Technology					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**60**	**2**		**2 x 3/3**
Method of Assessment :- 3 Hour Question Paper & Course Work					

General Objectives

On completion of this module the students will be able to:

- work in a weaving factory.
- analyze and identify any woven fabric structure

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Weaving preparation	06	03
2.	Sizing	04	03
3.	Weaving	07	06
4.	Weft Preparation	03	03
5.	Control Mechanisms	05	09
6.	Shuttleless Weaving	04	06
7.	Weaving Calculation	03	-
8.	Basic Woven Structures	07	24
9.	Development of Patterns in Single Ply Fabrics	09	-
10.	Development of Patterns in Double Ply fabrics	09	-
11.	Jacquard Designing	03	06
	Total	**60**	**60**

Summary Syllabus

1. Weaving preparation (06 hours)

Basic principles of cross winding and precision winding.
Warping, Type of Creels and attachments.
Direct beam warper, Sectional warper

2. Sizing (04 hours)

Purpose of sizing.
Properties of sizing agents and preparation of size mixture.
Type of machines in

3. Weaving (07 hours)

Types of machines and classifications of looms.
Primary motions on conventional looms.
Secondary motions on conventional looms.

4. Weft Preparation (03 hours)

Purpose of weft preparation, different methods available and economic consideration in choosing a system.
Conventional weft preparation system.
Working of Unifil Units

5. Control Mechanisms (05 hours)

Shuttle changing mechanisms.
Warp and weft stop motions.
Shuttle protecting device.
Temple rollers and its functions

6. Shuttleless Weaving (04 hours)

Rapier Loom-rigid and flexible
Sulzer Loom.
Hydraulic and pneumatic looms (air and water jet looms)

7. Weaving Calculation (03 hours)

Warping calculations.
Production calculations.
Yarn consumption calculations

8. Basic Woven Structures (07 hours)

Ornamentation of plain weave fabrics – colour count, twist and soft variations, fancy yarns.
Meaning of “Warp faced” and “Weft faced” fabrics
Cover factor
Twist

9. Development of Patterns in Single Ply Fabrics (09 hours)

Figured twills
Patterns based on the satin and sateen weaves
Combined twills. Diamond
Honey comb
Huck - a – back, mock – leno and other simple weaves
Crepe fabrics
Colour and weave effects in single ply fabrics
Bedford cords and pique weaves

10. Development of Patterns in Double Ply Fabrics (09 hours)

Simple backed and reversible fabrics,
Double cloths.
Fabrics figured with extra warp and extra weft.
The structure of simple warp and weft pile fabrics,
Brocades.

11. Jacquard Designing (03 hours)

- Different harness ties.
- Construction and development of jacquard designs.

List of Practicals: (30 hours)

1. Familiarise with the yarn path and working of the Sectional warping machine.
2. Familiarise with the yarn path and working of the single yarn sizing machine.
3. Study the process in drawing- in, leasing-in and warp tying machines.
4. Study the automatic pirn winding machine.
5. Study shedding mechanisms on power looms.
6. Study picking and beat-up mechanisms on power looms.
7. Familiarise with the modern weft insertion systems.
8. Study the let off and take-up motion on a power loom.
9. Study control mechanisms and automation of conventional looms.
10. Analyze plain and matt woven fabric samples
11. Analyse twill and variation of twill woven fabric samples
12. Analyse satin/sateen and variation of satin/sateen woven fabric samples
13. Analyse crepe and crinkle woven fabric samples
14. Analyse mock leno and honey comb woven fabric samples
15. Analyse figuring with extra warp woven fabric samples
16. Analyse double ply woven fabric samples
17. Construct a jacquard design

Recommended Text Books :

1. Principles of Weaving; Marks and Robinson, Textile Institute
2. Weaving – Conversion of yarn to Fabric; Lord and Mohammed
3. Shuttleless Looms; J J Vincent, Textile Institute
4. Weaving – Technology and Operation; Allan Ormerod and Walter Sondhelm, Textile Institute
5. Technology of Textile Properties; D J Spencer
6. Woven cloth construction; A T C Robinson, The Textile Institute