# Study and Evaluation Scheme

**Year: 4th, Semester-VII**

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<td>Elective III Carpet analysis &amp; testing / Home Textile Manufacture-II/ Textile design concept</td>
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<td>NACT-751 NHTT-751 NTDT-751</td>
<td>Textile lab II* Carpet testing lab/ Home textile lab II/ Textile CAD lab</td>
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* for textile subjects related to each elective groups

**Open Electives-I & open elective -II, the Course (s) will be offered on the basis of available resources in the Institute.**

**OPEN ELECTIVE I**
NOE071 Entrepreneurship Development
NOE072 Quality Management
NOE073 Operations Research
NOE074 Introduction to Biotechnology

**OPEN ELECTIVE II**
NOE075C Emerging Technology

**Note:**
In departmental electives NACT, NHTT & NTDT are for groups pertaining to specialization in Advances in Carpet Technology (ACT) Home Textile Technology (HTT) and Textile Design Technology(TDT).
UNIT I [8]
Identification of emerging Technologies in the field of fibers and brief acquaintance including
Smart Textiles.

UNIT II [8]
Identification of emerging Technologies in the field of yarn manufacturing and brief acquaintance.

UNIT III [8]
Identification of emerging Technologies in the field of Carpet and Fabric Manufacturing and brief
acquaintance.

UNIT IV [8]
Identification of emerging Technologies in the field of Wet Processing and brief acquaintance.

UNIT V [8]
Identification of emerging Technologies for application in the technical fields:
a) Protective Clothing,
b) Industrial Textiles
c) Medical Textiles,
d) Geo Textiles,
e) Textile for agriculture,
f) Defence Textiles

Reference Book:
1. Nano fibres and Nano technology by P Brown and K Stevens
2. Hand book of technical textiles by Mukhopadhyay and Partridge
3. Smart textiles for medicine and healthcare by Van Langenhove
4. Textile processing with enzymes by A Cavaco Paulo
5. High performance fibres by JWS Hearle
6. Related Journals, Magazines & Websites
NCT-701 Structural Properties of Fibres L:T:P::3:1:0

UNIT I [8]
Amorphous and crystalline phases, Glass Transition, Plasticization, Crystallization, Melting, factors affecting Tg & Tm, Role of molecular entanglement on fibre formation.

UNIT II [8]
Differential heat of sorption, integral heat of sorption, Moisture absorption, effect of hydrophilic groups, moisture absorption in crystalline and non crystalline region, directly and indirectly attached water.

UNIT III [8]
Mechanical properties of fibres, Relation between structure and mechanical properties of fibres, Basic mechanical properties (tenacity elongation, modulus, work of rupture, Elastic recovery, time effects.

UNIT IV [8]
Thermal behaviour of textile fibres by DSC, TGA, Thermal Mechanical Analysis, Density Gradient Column, Preparation of density gradient column.

UNIT V [8]
Optical properties of fibres, Birefringence behaviour, dielectric properties, fibre friction, fibre friction measurement and static charge measurement.

Reference Book:
1. Manufactured fibre technology by V.B. Gupta, V.K. Kothari
2. Physical properties of fibre by J.W.S. Hearle
3. Thermal behavior of material by Turi
4. Modern yarn production by Ray
5. Textile fibres by ATIRA
6. ASTM Standard books
UNIT I
Need for carpet testing. Different aspects of quality testing & performance assessment of carpets, Norms for various performance parameters of carpet

UNIT – II
Testing of functional properties of carpet and floor coverings- (a) Appearance retention (b) Carpet durability including Soilability, carpet abrasion resistance (c) Resilience (d) Tendency of pilling and fuzzing (e) Other properties like insulation properties, acoustic properties, electrostatic properties etc.

UNIT – III
Brief Description and principle operation of following Carpet Testing Equipments: Dynamic Loading Machine, Tuft Withdrawal Tensometer, Pilfuz Carpet Tester, Usometer, Hexapod Tumble Tester, Courtaulds Tetrapod Walker

UNIT – IV
Brief Description and principle operation of following Carpet Testing Equipments: Digital Thickness Gauge, Portable Carpet Thickness Gauge, Drum Testing Device, Roller Chair Testing Device, Carpet Static Loading Device, Carpet Wear and Abrasion Tester, Types of Carpet Flammability Tester

UNIT-V
Carpet analysis and reproduction for knotted, tufted pile carpets, flat woven daries, table tufted, shaggy. Cross section analysis of loom made pile carpet- v tuft, w-tuft.

References:
1. IWS Test Standard 1, 2, 3
3. Carpet Manufacture by Crawshaw
UNIT I
Introduction to Home Textiles, Areas of Application, Fabric Properties for Home Textile.
Curtains: - Definition, Various Styles, Choices of Fabrics, Calculating the amount of material needed, Manufacturing Steps of Curtains, Casings, Methods of furnishing draperies at the top with pleats .Use of drapery rods, Hooks, tapes rings and pins.

UNIT-II
Pillows: Types of Pillows, Knife-edge Pillow, Box-edge Pillow, Basic Measurements, Constructing a Knife-edge Pillow Covers, Tufting Pillows, Pillow Shams, Ruffled Pillow, Pillow Sham with flat self-border, Box-edge Pillow Cover: Rectangular box-edge cover, Boxed effect without boxing strip, Circular box-edge cover, Bolster and its covers: Round bolster and Wedge bolster.
Cushions: Various styles and its manufacturing.

UNIT-III
Blankets: Definition, blankets types.
Bed Sheet: - Definition, raw materials, styles.

UNIT-IV
Upholsteries, Slipcovers: Introduction, taking measurements for yardage, fitting and cutting slipcovers, special shaping techniques, sewing the slipcover, finishing bottom slipcover edge. Window textiles/ vertical blinds.

UNIT-V
Table Cloth: Various styles and its manufacturing.
Terry Towel: - Definition, The Parts of a Conventional Terry Towel, Classification of Terry Towels, Structure of a Towel, Physical Properties of a Towel, Quality Defects, Technology of terry towel production.
Kitchen textiles – features and applications

Reference:-
2. Soft furnishing by saarah Campbell and Hilary More, MacDonald books, QED publishers Limited London.
4. Home Fashion
5. Cloths line (Journal)
6. House & Garden (Journal)
7. Textiles Para El Hogar (Journal) Distribution & Subsription – Ecuador, 75, entresuelo, 08029 Barcelona, Espane, e.mail: publica@publica.es, castellon@publica.es
8. process control in home textiles manufacturing K K Goswami, Abhishek publishing, Chandigarh.
UNIT 1
Principle and elements of textile design, commercial aspects of design.
Indian Sculpture, Architecture, Jewellery & Painting, Pre-Historic Cave Painting of the World
(Europe, Africa, India), Indus Valley Civilization-Sculpture, Terracotta & Pottery

UNIT II
Textile design functions. Design Concept from Textiles: Bagh Phulkari, Kantha, Chikankari,
Jamawar Shawls, Kashmiri Kashida, Chamba Rumal, Banarasi Brocades, Motif of design &
drawing (Historical, aesthetical); Indian Motif (Indiya Collection);

UNIT III
History & origin of carpet; William Morris Design; Concept of Modern Design; Chinese,
Japanese Baluchari, Jamdani, Ikat & Patola, Kalamkari, Bandhani, Bagroo, Sanganer;

UNIT IV
Brief discussion on traditional carpet & floor covering, Mir, Prayer rug, Abusson, Herati,
Isfahan, Kirman, Kazak, Heriz, Kashan, Saroukh, Bidjar, Tabriz, Tufted Tibbettan, Dhurries &
Natural, Shaggies etc.;

References:
2. Traditional Needle Arts Embroidery by Katrin Cargill, Great Britain.
4. The Costumes and Textiles of India by Jamila Brij Bhushan, D.B.Taraporevala Sons &
   Co., Bombay
5. Traditional Embroideries of India by Dr. Shailaja. D. Naik, A.P.H. Publishing
   Corporation-New Delhi.
7. Saris of India by RTA Kapur & Amba Sanyal, Wiley Eastern Ltd., New Delhi
8. World Costume by Angela Bradshaw, Adams and Charles Black, London.
10. Bhartiya Kala by Vasudev sharan Shastri, Prithivi Prakashan (in Hindi Language)
11. Prachin Bharat Ka Itihas by Jha & Shrimali (in Hindi Language)
12. Prachin Bharat ka Rajnaitik anvam Sanskritik Itihas, by Radha Krishan Chaudhari (in
    Hindi Language)
13. Watson’s Textile Design and Colour by Z Grosicki; Universal Publishing Corporation,
    Bombay (India)
14. Textile Design by Thames & Hudson
15. Soft Surfaces by Thames & Hudson
16. Persian Carpets by Dr. Seyed
17. Hand Crafted Indian Textile by Roli Books
18. Heritage by Design Point
19. Carpet Style by Phillips, Barty
20. Carpet Manufacture by Crawshaw, G.H.
21. Carpets by Sotheby's.
22. Carpets and Textiles by Spuhler, Friedrich
23. Carpets : Techniques, Traditions and History by Anquetil, Jacques
25. History of Textile Design by Shenai, V.A.
26. The Indian Textile Journal (ITJ) [Periodical].
27. Woven Cargoes : Indian Textiles in the East by Guy, John
28. Ancient Indian Textile Designs - Part – I by Mishra, Jai Shankar
29. Positive Design - I Flower by Shoin, Kyoto
30. Fine Oriental & European carpets by Sotheby's
31. Rugs & Carpets from the Collection of Dildarian by Sotheby's
32. Floral patterns by Roojen, P.V.
33. Ikat Textiles Of India by Desai, Chelna
34. Carpet and Textile Patterns by Purdon, Nicholas
35. Advance carpet manufacturing, K K goswami, wood head publisher UK.
UNIT I
Marketing – Concept, Strategic Operations & Strategy, Supply Chain Management (SCM), Marketing Mix, Business Plan & Strategic Business Units (SBU)

UNIT II
Merchandising-Concept, Function of merchandiser, Retailing, Vendors, Source of buying information.

UNIT III

UNIT IV
Cost Management: Cost Reduction & Cost Control-Handmade Carpet Industry, Unit Value Realisation, statistics, inter-firm comparison & Control

UNIT V
Performance Management-Identification of Key Factors, Method and statistics, Target fixation, Measurement, System Modeling &Evaluation, USP of Handmade Carpet & Promotional activities

REFERENCE:
1. Principles of Marketing by Kolter
5. Relevant publications
NHTT706  Quality Control in Home Textiles  L:T:P::3:1:0

UNIT – I  [8]
Raw Material Inspection: Fabric Inspection, 4-point system, fabric defects, sewing threads, zippers,

UNIT – II  [8]

UNIT – III  [8]
Textile Testing & Production Evaluation.

UNIT – IV - Textile Testing & Production Evaluation  [8]

UNIT-V: Shade Sorting & Care Labeling  [8]
Process control : Factors & measures includes statistical, ecological, social, maintenance, HRD and buyer’s requirements.

Reference:

3. Principles of textile testing by J.E. Booth, C.B.S., publishers and distributors, New Delhi,1996
4. Process control in home textile manufacturing by KK Goswami, Abhishekk Publisher Chandigarh, India.
NTDT707  Advance Textile Design  L:T:P::3:1:0

UNIT I  [8]
Trends in woven designs – leno designs, ondule fabrics, 3D fabric structure, fabric hand evaluation

UNIT II  [8]
Trends in knitted design – gloves, socks, garments of knitted structures, 3D knitted structures

UNIT III  [8]
Trends in printed design - conventional and digital printing and mass customization, textile printing systems, fabric coloration

UNIT IV  [8]
Fabric ornamentation by embroidery- traditional Indian embroideries like Kantha of Bengal, Phulkari of Punjab, Kasuti of Karnataka, Kasida of Kashmir, Chamba Rumal of Himachal Pradesh, Chikankari & zardozi of Uttar Pradesh, Sindhi and Abla Bhart of Gujarat, Appliqué work of Orissa, Manipuri Embroidery etc. other latest trends

UNIT V  [8]
Trends in designing technology – computers in textile designs, electronic devices and CAD

Reference:
1. Journals & Magazines
2. Color Forecasting Books
4. digital printing of textiles edited by H Ujiie, woodhead publishing.
5. textile printing edited by Leslie W C Miles. Woodhead publishing
6. specialized yarn and fabric structure . developments and applications edited by R H Gong wood head publishing.
Carpet Testing Lab
1. Determination of tuft withdrawal force using tuft withdrawal tensometer.  
2. Determination of thickness of carpet and carpet backing using portable thickness gauge.  
3. Determination of dimensional stability of carpet  
5. Determination of compressibility and % recovery by Digital thickness gauge.  
7. Determination of degree of appearance retention of a carpet.

NHTT-751
Home Textile Lab II
1. Preparation of samples for different types of patchworks.  
2. Preparation of samples for different types of appliqués.  
3. Preparation of samples for different types of quilting.  
4. Prototypes development of various home textile products.  
5. Embroidering any one furnishing item (table cloth / Table runners /Pillow covers 
   /Cushion cover / others)  
   i. Sample preparation for seam finishes and self-finish seams.  
      ii. Seam finishes (Clean finish, Bias binding, Bound finish, Hand overcast).  
      iii. Self finished seam (Standing fell, Drapery French, Single needle, Quick 
           flat seam, Lap seam)  
2. Preparation of samples for following fullness tools: -  
   a. Darts.  
   b. Tucks.  
   c. Pleats.  
   d. Godets.  
   e. Gathers.  
   f. Shirrs.  
   g. Frills.  
3. Preparation of samples for different types of Plackets.  
4. Sample preparation for hand embroidery stitches.  
   (Running, Stem, Single lace, Double lace, Chain, Satin, Lock, Whip, Cross, Pipe, 
   Loop, Flat, Knotted).  
5. Sample preparation on embroidery machine.

NTDT-751
TEXTILE CAD LAB :
To create a design from scanned photo/ sketches of textile & carpet design for tufted, tibbetan, 
dhurrie, traditional, modern abstract contemporary, transitional, using computer.  
1. Introduction of computer, transfer of designs to point paper: various steps involved.
2. colours & colour palette pixel-resolution and its relation with threads and thread per inch, x and y in designing,
3. different drawing tools in CAD.
4. Weave creation: creation of weaves and saving.
5. principle of creating motifs in computer- drawing tools, motif scanning, scanning parameters, colours & attributes. Editing the image for graph making – scaling, rotating, reversing, dropping etc.
6. Colour library – creating new colour library, dpi calculations, colour masking & protecting (picking of one colour from more colours, protecting of a colour from other colour),
7. repeat setting to see the joining; methods of different style and forms of design using computer i.e. horizontal and vertical, all over designs, half drop & half drop reverse designs.
8. Preparation of computerized graph designs from edited motif with suitable weaves; float control & float checking; printing of graph simulation and real scale design, comparison of manual graph making & computer aided graph making.
10. Basics of CAD Printing: Printing Designs – usage of CAD in textile printing; editing of scanned image by using different cad tools. Design calculation as per given parameters for print i.e. size of screen, number of screen etc. colour separation to make screen, block etc.
11. Creation of design direct on computer screen by using cad tools (mouse / digitizer), creation of different textures with the help of CAD.
12. Tracing a graph- naksha /design plate print out, wool consumption print out.

NOTE:
Experiments shall be decided on factors like:
- Facilities installed at Institute.
- Accessibility to Industry & nearby Institutes.
- Trend of Technological Developments in National & International perspective.

Reference of Practicals:
1. Manual for Autotex software (PLC consultancy)
2. User Manual for Texcelles (Ned graphics)
**Study and Evaluation Scheme:**

**Year: 4th, Semester-VIII**

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**THEORY SUBJECTS**

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**PRACTICAL/ DESIGN/ DRAWING**

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**In Open Electives-III, the Course (s) will be offered on the basis of available resources in the Institute.**

NOE081 Non Conventional Energy Resources  
NOE082 Nonlinear Dynamic Systems  
NOE083 Product Development  
NOE084 Automation and Robotics

**Note:**  
In departmental electives NACT, NHTT & NTDT are for groups pertaining to specialization in Advances in Carpet Technology (ACT) Home Textile Technology (HTT) and Textile Design Technology(TDT).
UNIT – I

Yarn geometry-idealised yarn geometry, relationship of yarn number and twist factor. Twist contraction, limit of twist.

Packing of fiber in yarn. Ideal packing, hexagonal close packing and to other forms. Packing factor and its measurement. Yarn diameter.

UNIT – II

Fiber migration- mechanism of migration, condition for migration to occur, frequency of migration, migration in blended yarns.

Mechanics of staple fibre yarns, the practical and experimental studies. Mechanics of staple fibre yarns, Hambureger model and later modifications. Spinnability and torsional behavior of Fibres and yarns.

UNIT – III

Translation of fibres properties into yarn properties, extension of continuous filament yarn for small strains and large strains; prediction of breakage.

UNIT – IV

Elements of fabric geometry, cloth setting theories. Fabric cover and fractional cover, fabric cover and fabric weight relationship. Fabric firmness,

UNIT – V

Pierce concept of fabric geometry and its application, Flexible and elastic threads model, crimp interchange & crimp balance equation

Uniaxial and biaxial tensile behavior of cloth.

Reference

1. Textile yarn by Goswami
2. Textile mathematics by J.E. Booth
3. Pierce papers in Journal of textile institute 1930, 1937
4. Watson’s textile design
5. AATCC review, October, 8 (10), 30-34
UNIT I [8]
Printing ingredients, Preparation of paste for printing- various thickening agents and their functions, auxiliaries, and other assistants including their function and uses. Purpose of Steaming; Various Steamers and agers.

UNIT II [8]
Different styles of printing e.g. Direct, Resist and Discharge, Printing process for different fibres with direct dyes, acid dyes, sulphur dyes, vat dyes, azoic colours, reactive dyes, pigments, disperse dyes etc. Different methods of printing e.g.- screen, flat bed & rotary screen printing machineries and equipments. Common printing faults their causes and remedies.

UNIT III [8]
Chemistry of dyes and chemicals : Classification of dyes , chemicals including auxiliaries according to chemical constitution , features and specification , manufacturing principle and standards in eco term.

UNIT IV [8]
Functional finishes
Type of Nano finishes, preparation, application to textiles, lotus leaf effect, UV protection, Anti-bacterial nano finish, advantages and disadvantages.

UNIT V [8]
Colour Theory:
Theory of colour, quantification of colours, CIE colour system colour difference, whiteness & yellowness in dyes, CIE lab formula, 555 sort. Application of spectrophotometer; Reflectance & Transmittance: K/S Curve, Theory of computer colour matching & colour prediction.

REFERENCES
1. Technology of Printing by Dr. V. A. Shenai
2. An introduction to Textile Printing by W Clarke.
3. Textile Printing by L.W.C. Miles.
6. Instrumental colour measurements and Computer Aided Colour matching for textiles by Dr.H.S. Shah & Dr.R.S. Gandhi.
7. Dyeing of Natural dyes on carpet wool and silk by IIT, Delhi.
8. Dying and chemical technology of fibres by E.K.Frotan
9. Process of dye chemistry by Fierz, David & Ballengray
10. Chemistry of synthetic dyes by Venkatraman
11. Process control in home textiles by Goswami K.K.
NACT -803 Advance Carpet Manufacture

UNIT – I [8]
Classification and product specifications of machine made carpets; Yarn requirement, their impact of functional properties of carpet.
Woven Carpets, brief description on characteristic features and manufacturing processes of various types of woven carpets with special reference to Wilton and Axminster looms.

UNIT II [8]
Description on characteristic features and manufacturing process of machine made tufted carpet. Study of various steps involved in the machine tufting. Advancement of tufting process, electric gun and scissor, techniques of designing, tufting machines such as kibby, M-tuft etc

UNIT III [8]
Non Woven Carpet: Types of non woven carpet, their construction and end use, Brief description of process and machineries involved in manufacturing of Needle Punched, Adhesive Bonded, Electrostatically flocked carpet. Carpet tiles

UNIT – IV [8]
Care and Maintenance of Carpets; Final Inspection, Labelling and packaging of Carpet, installation of carpet

UNIT – V [8]
Carpet tiles , Printed carpet, Speciality Carpets, CAD for carpet

References:
1. Advances in Carpet Manufacture by K. K. Goswami, Woodhead Publishing
2. Journals & Magazines
3. Carpet-e-World
4. Carpet Manufacture by Crawshaw
5. Tufted Carpet by Von Moody
7. Process control in carpet manufacture by K K goswami, Abhishek Publisher Chandigarh India.
UNIT I [8]

Introduction to clothing comfort, psychology and comfort, neurophysiological processes in clothing comfort, tactile aspects of clothing comfort, thermal transmission, moisture transmission, dynamic heat and mass transmission, garment fit and comfort.

UNIT II [8]

Introduction to rigid composites, requirements, raw material, manufacturing of rigid composites, advancements and uses.

UNIT III [8]

Smart textiles, classification of smart textiles, stages of incorporation smartness in textiles, microcapsulated phase change materials, shape memory materials, chromic materials, conductive materials, smart textiles for seating.

UNIT IV [8]

Introduction to automotive textiles, fibres used, textile for upholstery, carpet, preformed, tyres, safety device, filters, textile in engine.

UNIT V [8]

Functional clothing, classification of functional clothing, Introduction to protective clothing, thermal protection, pesticide protection clothing, chemical protection, antimicrobial protection, ballistic protection.

References:

1. Improving comfort in clothing Edited by G. Song, Woodhead Publishing Series in Textiles no. 106.
NTDT-805  Design management  L:T:P::3:1:0

UNIT I  [8]
Difference between design and development, Aspects of home textiles design, Sources of design ideas / inputs, Design requirements pertaining to different countries, Product life cycle, Characteristics of industry during various phases of product life cycle

UNIT II  [8]
Stages in Textile Design process, Design planning – Design output, Design inputs, Selection of raw material and accessories, Customer involvement in design process, Inter phase in the design process

UNIT III  [8]
Design for manufacturing (DFM), Value analysis theory and application, Failure mode effect analysis (FMEA), Quality function deployment (QFD), Design and development system requirements as per ISO 9001:2000

UNIT IV  [8]
Validation and verification of designs, Time management in designing, Basics of network analysis (PERT & CPM), Cost of design – Elements of cost, Standard costing methods professional practices of designing, designing for future

UNIT V  [8]
Presentation of designs, Design related records and their maintenance, Design catalogue – preparation, need and maintenance, Evaluation of performance of designs; Define Elements and their Aesthetic value and marketing prospect.

References:
1. Design Management by Brigitte de Mozota
2. Design Project Management by Griff Boyle
3. Principles and Practice of Management by Prasad, L M.
4. Principle of Management by Tripathi & Reddy, P.N.
5. Production Operation Management by Heizer, Joy.
7. Textile Designing: Theory & Concept by Jain, Tanya
8. Watson’s Textile Design and Colour by Grosicki, Z. J.
9. Hand book of textile design, Jacquie Wilson, wood head, publishing UK

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