TX- 701 Elective – I (TX- 701 (A) – Color Physics & Computer Color Matching)

Unit I Fundamentals of color science, what is colour, perception of color, color mixing laws confusion in color perception, meta-merism.

Unit II Color order system: Munsell system, color atlas system, CIE system, CIE tri-stimulus values, chromaticity co-ordinates , transform of the CIE system, Equation index for color spaces, whiteness assessment, yellowness index.

Unit III Optical theory for color matching: Reflectance curves of dyed specimens, Kubelka – Munk theory, application of K-M theory to textiles, Developments after K-M theory.

Unit IV Color measuring instruments: Principles of color measuring instruments, optical sensors signal processor, features of the available color instruments, selection of instrument and its utilization.

Unit V Color difference Pass/fail system and shade sorting: Color difference and chromaticity diagram, color difference equation, CIE color difference equations, Acceptability and perceptibility, modified color difference equations based on ABLAB. Pass/fail system, setting up tolerance limit.

References:

1. Instrumental Color Measurements & CA Color Matching for Textiles; H.S. Shah & .S. Gandhi
2. Color Physics for Industry – Roderick Mcdonald.
3. Computer Color Analysis – A.D. Sule
4. Color for Textiles – A user handbook – Wilfred Ingamells
5. Modern Concepts of Color and Appearance – Asim Kr. Roy Choudhary
6. The Theory of Coloration of Textiles – 2nd Edition – A. Johnson
7. Color Technology in the Textile Industry, 2nd Ed. Cairman, (P?B) AATCC

List of Experiments (Please expand it):

Recipe development, colour difference measurement, Pass fail analysis, Shade sorting, wash fastness, light fastness, crock fastness analysis.
Determination of purity of dye stuff.

TX- 701 Elective – I (TX- 701 (B) – Chemistry Of Intermediates And Dyestuffs

Unit I Benzene intermediates: The Benzene Aromatic system, Sulfonation, Nitration, Halogenations, Alkylation, Introduction of Formyl and Carboxylic groups, Hydroxylation, Reaction with ammonia, Oxidation and Reduction, Heterocylic Intermediates.
Naphthalene Intermediates: Sulfonation, Nitration, Halogenation, Hydroxylation Amination, Naphthalenesulfonic acid, Naphthols, Naphthyl amines, Aminonaphthols, Amino naphthalenesulfonic acid, Aminonaphtholosulfonic acid, 3-Hydroxy-2-naphtholic acid.

Unit II Anthraquinone Intermediates: Reactivity, Routes to Anthraquinone compounds, Halo anthraquinone, Nitro anthraquinone, anthraquinone sulphonic acids, anthraquinone carbo derivatives, amino anthraquinone, hydroxy anthraquinone, anthraquinone ethers, anthraquinone thiols and thio ethers, Leuco intermediates, Benzanthrones.

Unit III Azo Dyes: Mechanism of the diazotisation and the azo coupling reactions, the diazotization reaction, azo coupling reaction, conclusion, Benzidine dyes, Stilbene dyes, after treated dyes, dyes from amino napthol sulfonic acids, dyes from heterocyclic and acyclic intermediates.
Acid Dyes: Neutral dyeing, Milling dyes, chrome dyes, permetallised dyes.
Disperse Dyes: Mono azo dyes, Disazo dyes, water soluble dyes, spirit soluble dyes, food dyes

Unit IV Anthraquinone Acid Dyes: Sulfonic acid, Di-hydroxy compounds, diamino compounds, amino hydroxy compounds, heterocyclic dyes, Anthrimides and napthocarbazoles, Bromamine acid derivatives.
Disperse dyes: Yellow to orange structure, red structure, violet structure, blue to green structure, fused ring derivatives, water soluble dyes, and commercial product.
Vat Dyes: Carbocyclic dyes, Benzoquinones and naphthoquinones, Acylamino anthroquinones, Benzanthraquinones and pyrenediones, anthrathrones, pyranthrones, dibenzanthrones.
Solubilised vat dyes.

Unit V Phthalocyanine pigments: Structure, properties, synthesis, application, unsubstituted Phthalocyanine, substituted phthalocyanine.
Phthalocyanine dyes: Phthalocyanine direct dyes, sulfonic acids, sulfonic acid derivatives, carboxylic acid, amino Phthalocyanine, Phthalocyanine vat dyes, Phthalocyanine sulphur dyes, Phthalocyanine formation in the fiber.

References:
1. Chemistry of Dyes and Principle of Dyeing Vol. II – VA Shennoi
2. Dyes and their Intermediates E.N.Abrahart
3. The Chemistry of Synthetic Dyes and Pigments; H.A. Lubs.
4. Color Chemistry – Zollinger
5. Synthetic Dyes – Dr. Pope Sine
6. Chemical Testing of Textiles (CRC), Fan

TX- 701 Elective – I (TX- 701 (C) – Dyeing Of Synthetics And Blends

Unit I Classification and developments in disperse dyes, Various auxiliaries used in pet dyeing

Unit II Pretreatments and dyeing of polyester, pet/cellulose, pet/wool blends by batch, semicontinous, and continuous dyeing methods. Recent developments in dyeing techniques, problem associated with dyeing of such materials, common faults and their remedies

Unit III Dyeing of nylon with various classes of dyes , barre and its rectification, dyeing of nylon blends,leveling agents for nylon dyeing. Dyeing of acrylic fiber with new basic dyes, faults and remedy, retarders. Dyeing of micro fiber fabrics, textured yarn and fabrics. Dyeing of new fiber viz Lyocell, Lycra, Modal

Unit IV Mass coloration of polyester, nylon, acrylics, polypropylene and viscose fibers, Thermosol method of dyeing

Unit V Dyeing machines for synthetic fibers e.g. high temperature high pressure, Beam dyeing, jet dyeing, soft flow machines, Development in dyeing machines, Dyeing of loose fibers, yarns

References:

1. Technology of printing Vol. IV Shennai
2. Technology textile finishing Vol. X Shennai
3. Shennai; Scoring And Bleaching
4. Shennai; Dyeing
5. Tiotman; Textile Scoring & Bleaching
6. John Shore; Cellulosic Dyeingp
7. Engg. of Textile Colouration C. Duck Worth
8. Textile Finishing W.S.Murphy
9. Printing on Textiles by direct and transfer technique R.W. Lee
10. Electronics Control for Textile Machines Hiren Joshi, Gouri Joshi (NCUTE Pub.)
11. A Glimpse of the Chemical Technology of Textile Fibres R.R. Chakraverty

TX- 702 Elective – II (TX- 702 (A) – Knitting Technology

Unit I Introduction to knitting and its comparison with weaving. Weft Knitting classification, specification of various knitting machines, elements of machine knitting, needle gaiting, principle of operation of different single jersey and double jersey machines, knitting cycle, positive yarn feeder, production calculation.

Unit II Basic single jersey and double jersey structures and their derivatives, horizontal stripping and plating, application of electronics and automation in knitting machines. Designing by different, mechanisms e.g. pattern wheel, pattern drum and jacquard.

Unit III Warp knitting - Introduction to warp knitting, working principle and patterning in Tricot and Raschel Machines, control of yarn feeding in warp knitting machines; requirement of yarn quality; parameters for knitting; quality control in knitting and dimensional stability of knitted structures.

References:

1. Knitting Technology Prof. D. B. Ajgaonkar
2. Knitting Technology - Spencer
3. Knitting Technology - Pitman
4. Knitted Clothing Technology Terry Brackenbury
5. Machine Knitted Fabrics Felting Techniques Janet Natney

TX- 702 Elective – II (TX- 702 (B) – Technical Textiles

Unit I Sewing Threads: Properties; Manufacture of cotton, viscose, polyester, nylon and polypropylene threads.
Glass Threads: Manufacture of glass filaments and staple fibre - manufacture of staple fibre yarn .properties and application of filament and staple fibre yarns.
Asbestos Thread : Manufacturing process : properties and applications of asbestos yarn.

Unit II High Tech. Fibers: Carbon fibers - Aramid and related fibers.
Tire Cords and Fabrics: Requirement of tire cord - suitability of various fibers - polyester and Nylon tire cords - Manufacture of tire cords - Physical and Mechanical property requirements to tire cord fabrics - Fabrics Design - Specifications. Rubberized; textiles.

Unit III BELTS: Conveyor belts - power transmission belts.
HOSE: Construction and applications.

Unit IV Filter Fabrics: General Consideration of filtration of solids from liquids, solids from gases; Solids from solids, liquids from gases and gases from gases.
Non-Woven In Filtration: Filtration in paper, cotton textile industry and viscose manufacturing industry - cigarette filters.

Unit V Functional Fabrics: Fire protection - thermal and electrical insulation -base cloth commonly used - materials -coating techniques - Waterproof fabrics - Gauze fabrics.
Medical Textiles: Surgical Textiles - Suture Threads. Cardio Vascular Textiles - Knitted cardiac biological valves. Dialysis Textiles -Hollow fibers as dialysis membrane. Hospital Textiles - operation and post operating clothing - disposable drapes. Sanitary applications.
GEO Textiles: Geo Textile functions - raw material - woven, non-woven and knitted geo textile - Application of geo textiles for drainage application, separation application, soil reinforcement and filtration and erosion control.

References:
1. Technical Textiles - NCUTE Programme Report 2002 - Prof. P.A.Khatwani, S.S.Yardi
2. Guide to Geotextiles Testing - J.N. Mandal, D.G.Divshikar
3. Coated and Laminated Textiles - Walter Fung
4. Advances in Fibre Science - S. K. MukhopadhyayComposite Technologies - Stuart M. Lee
5. Handbook of Fibre Rope Technology - H.A. Mckenna et.al. Textile Inst. Pub.
6. Smart Fibres fabrics and clothing - Xiaoming Tao
7. Fibre and Whisker Reinforce Ceramics for Structural Applications - David Belitskus
8. Mechanics of Textile & Laminated Composites - A.E.Bogdanovich & C.M.Pastore
9. Hand book of nonwovens, S. J. Russell, Woodhead 2007
10. Geosynthetics in civil engineering, R. W. Sarsby, Woodhead 2007
11. Handbook of Technical Textiles, Anand

List of Experiments (Please expand it):
Testing of Sewing Threads, Filter fabrics, Geo Textiles, Non-woven fabrics, tyre cord fabrics,. Study;of Medical Textiles.

TX- 702 Elective – II (TX- 702 (C) – Finishing Of Synthetics And Blends

Unit I Developments in finishing machines. Finishing of synthetics and union fabrics e.g. 100% polyester, nylons, acrylics and their blends with cotton, viscose, wool

Unit II Heat setting of various synthetics and union fabrics. Weight reduction of polyester fabrics, silk like polyester. Finishing of sarees, dress materials

Unit III Mass density, specific weight, relative density, specific volume. Antistatic finishes, soil release finishes, water proofing and breathable fabrics. Formaldehyde free finishes. Durable press finish

Unit IV Flame retardant finishes for polyester, nylon and their blends, FR fibers

Unit V Study of latest finishing chemicals and auxiliaries viz. eco friendly finishes developments in silicone finishes. Protective clothing, anti microbial finishes, ballistic protection, nano-finishing chemicals, plasma treatments, microencapsulation

References:

1. Technology of printing Vol. IV Shennai
2. Technology textile finishing Vol. X Shennai
3. Shennai; Scoring And Bleaching
4. Shennai; Dyeing
5. Tiotman; Textile Scoring & Bleaching
6. John Shore; Cellulosic Dyeingp
7. Engg. of Textile Colouration C. Duck Worth
8. Textile Finishing W.S.Murphy
9. Printing on Textiles by direct and transfer technique R.W. Lee
10. Electronics Control for Textile Machines Hiren Joshi, Gouri Joshi (NCUTE Pub.)
11. A Glimpse of the Chemical Technology of Textile Fibres R.R. Chakraverty
12. Textile Finishing, R. S. Prayag,

TX- 703 – Textile Chemistry-II

Unit I Introduction to printing different methods and styles of printing on natural and synthetic fibre fabrics and blends. Detailed study of different types of printing machines e.g. block, flat screen, roller and rotary screen printing.
Different modern techniques of printing; paste preparation of different dyes, Advance development in printing machine operation; After treatment of different printing materials; Printing use in plastic materials.

Unit II Introduction to finishing of natural and man-made fiber fabrics; Classifications of various finishes, finishing materials - their chemistry and application; Mangles drying ranges, IR drying, stainr, calendars, raising and milling machines.

Unit III Permanent and semi permanent finishes, silicon softening, milling, crease resistant, anti shrink, water repellent, water proof, flame proofing, setting of synthetic fibre fabrics, antistatic and soil release finishes. Easy care finishing of cotton and polyester / cotton blends.

Unit IV Textile preservatives, miscellaneous finishings.

TEXTILE CHEMICAL PROCESSING PRACTICAL-II

Scouring and dyeing of silk, wool, polyester, polyamide and blends. Identification of dyestuffs from dyed samples. Determination of different fastness properties of dyed samples. Printing with different dyestuffs on cotton, silk and polyester.

References:
1. Technology of printing Vol. IV Shennai
2. Technology textile finishing Vol. X Shennai
3. Engg. of Textile Colouration C. Duck Worth
4. Textile Finishing W.S.Murphy
5. Printing on Textiles by direct and transfer technique R.W. Lee
6. Electronics Control for Textile Machines Hiren Joshi, Gouri Joshi (NCUTE Pub.)
7. A Glimpse of the Chemical Technology of Textile Fibres R.R. Chakraverty
8. Trouble shooting in wet processing : Acetate, Rayon/Lycocell and Spandex Blends, Dunes

List of Experiments (Please expand it):
1. Scouring and dyeing of silk
2. Scouring and dyeing of wool
3. Scouring and dyeing of polyester
4. Scouring and dyeing of polyamide and blends
5. Identification of dyestuff from dyed samples.
6. Determination of different fastness properties of dyed samples
7. Printing with different dyestuff on cotton, silk and polyester.

TX- 704 – Advance Yarn Manufacturing

UNIT-I Limitations of conventional methods of spinning, summer of different new spinning process and their possibilities and limitations;
Rotor spinning- Overview, objects, developments, principle and speed; Raw material requirements and preparation; Method of operation - opening unit, yarn formation, structure and aspects of rotor and its influence on yarn, yarn withdrawal and winding system, automation. Calculation related to twist, production etc. Yarn characteristics - structure and its difference wit ring spun yarn, brief idea about the end products; Production of fancy yarn/core spun yarn in rotor spinning.

UNIT-II Air Jet Spinning - Principle, raw material requirements, yarn characteristic and yarn structure, comparison with ring spun yarn, inter-relationships in spinning technology, end use of yarn.

UNIT-III Friction spinning - Principle, raw material requirements, yarn structure and its comparison with ring spun yarn, end uses of yarn.
Wrap spinning and False twist spinning - Operating principle, yarn structure.

ADVANCED YARN MANUFACTURE PRACTICAL
Detailed study of modern yarn manufacturing machines. Constructional details, setting and gauging, controls and change places. Calculations of speeds, production.

References:

1. The Textile Institute-Short Staple Spinning, Series-Kleiwn. (Vol.5)
2. Spinning - P.R.Lord
3. New Spinning Systems - R.V. Mahendra Gowda (NCUTE Pub.)
4. Handbook of yarn production, Peter R. Lord, Woodhead 2003
5. Spinning in 70's - P.R. Lord
6. Rotor Spinning-ATIRA
7. Cotton Spinning calculatious-Taggart.
8. Recent Advances in Spinning Technology - BTRA International Technical Conference Report
9. Yarn Production Theoretical Aspects, P Grosberg, C Iype, Woodhead 1999

List of Experiments (Please expand it):

1. Detailed study of Open End Spinning
2. Detailed study of friction spinning.
3. Detailed study of air-jet spinning
4. Detailed study of constructional details, setting and gauging, controls and change places
5. Calculations of speeds, drafts, production etc.

TX- 705 – Advance Fabric Manufacturing

Unit I Introduction: to different weft insertion systems on shuttle less weaving machines e.g., projectile, jet and rapier looms; Weft velocity curves and comparison of different weft insertion system, Beat-up mechanism of different shuttle less weaving machines; Control of picking energy on shuttle-less weaving machines.

Unit II Sulzer Projectile Loom, Rapier loom - different types, yarn transfer systems and their features, rapier head.

Unit III Jet loom - principles of air and water jet weft insertion, weft buckling and jet control. Different types of selvedges used in shuttleless weaving machines; Introduction to multiphase, triaxial, circular and narrow fabric weaving; Essential requirements of filament weaving.

Unit IV Power of picking, velocity and acceleration of picking element, energy consume, timings, drive to sley and healds, fabric quality on Sulzer Projectile, Rapier, Air jet and Water jet looms.

References:

1. Shuttleless Weaving - Dr. M. K. Talukdar
2. Principle of Weaving - Marks & Robinson
3. Textile Science & Technology Shuttleless Weaving Machines Oldrich, Talavasek & Vladimir Svaty
4. Modern Preparation and Weaving Machinery - A. Ormerod.
5. Hndbook of Weaving, Sabit Adanur, Ph. D.
6. Weaving Technology & Operation - A. Ormerod & Walter S. Sondhelm
7. Rapier Loom - WIRA
8. Filament Weaving NCUTE HRD Programme Coordinator Prof. P.A.Khatwani, Mr. S. S. Yardi,
9. Innovations in Weaving Machinery - (The Course of Loom Development) - Dr. Teruo Ishila
10. Modern Weaving Theory & Practice- R. B. Singh

List of Experiments (Please expand it):

ADVANCE FABRIC MANUFACTURE PRACTICAL

1. Detailed study of different shittleless weaving machines.
2. Suggested list of experiments:
3. Detailed study of different Projectile Loom
4. Detailed study of different Air Jet Loom
5. Detailed Study of different Rapier Loom
6. Detailed study of different Water Jet Loom
7. Detailed study of Circular Loom
8. Detailed study of Knitting Machine

TX- 706 – Advance CAD in Textiles

List of Experiments (Please expand it):

Principles of design, elements of design, marker planning, grading system, size chart, silhoueltes, shape and sizes, relationship to fashion, different dart system, black measurement, basic information regarding software, study latest software system.

Practice block making on garment software, variant file, adjustment of different view of garment components, making of different patterns with seam allowances, different techniques of pattern making, notches, curve, etc. marker creation.

Mood board, story board making, simulation, use of yarn library, knit and weave structure, weave library.

Vector, use of different drawing tools, bitmap pictures, different studios, color pallatte.

References:

1. Mens wear pattern making, Alam Parwez Khan, Punkaj Pub. Delhi, 2007
2. Ten steps to fashion freedom, Mayfield

TX- 707 – Industrial Training

Objective of Industrial Training

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies:

Duration: Minimum 2 weeks in summer break after VI semester, assessment to be done in VII semester

Scheme of Examination:

For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term Work in Industry	**Marks Allotted**
Attendance and General Discipline	5
Daily diary Maintenance	5
Initiative and participative attitude during training	10
Assessment of training by Industrial Supervisor	10
Total	30*

(b) Practical/Oral Examination (Viva-Voce) in Institution	**Marks Allotted**
1. Training Report	15
2. Seminar and cross questioning (defense)	15
Total	30

* - Marks of various components in industry should be awarded by the I/c of training in Industry but in special circumstances if not awarded by the industry then faculty in charge /T.P.O. will give the marks.

During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of T.P.O. /Faculty of the Institute.

Then they will present a seminar on their training and they will face viva-voce on training in the Institute.

Learning through Industrial Training

During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organisational structure and inter personal communication.
- Machines/equipment/instrument-their working and specifications.
- Product development procedure and phases.
- Project Planning, monitoring and control.
- Quality control and assurance.
- Maintenance system
- Costing system
- Stores and purchase systems.
- Layout of Computer/EDP/MIS centers.
- Roles and responsibilities of different categories of personnel.
- Customer services.
- Problems related to various areas of work etc.

Students are supposed to acquire the knowledge on above by-

- Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time
- Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- "Hand's on" experience
- Undertaking/assisting project work.
- Solving problems at the work place.
- Presenting a seminar
- Participating in group meeting/discussion.
- Gathering primary and secondary data/information through various sources, storage, retrieval and analysis of the gathered data.
- Assisting official and managers in their working
- Undertaking a short action research work.
- Consulting current technical journals and periodicals in the library.
- Discussion with peers.

Daily Diary- Industrial Training

Name of the Trainee---------- College ----------
Industry / work place ----------. Week No----------.
Department /Section ---------- Date ----------

Dates Brief of observations made, work done, problem/project undertaken, discussion held, literature consulted etc.

Signature of Supervisor (TPO/Faculty)	Signature of Trainee	Signature of Official in charge for Trg. In Indutry.

Supervision of Industrial Training

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above area in the field.
One faculty member or TPO will plan industrial training of students in consultation with training manager of the industry (work place) as per the predefined objectives of training.
Monitoring visits will be made by training and placement officer/faculty in-charge for the group of students, of the college during training.

Guidance to the faculty / TPO for Planning and implementing the Industrial Training

Keeping in view the need of the contents, the industrial training program, which is spread to minimum 2 weeks duration, has to be designed in consultation with the authorities of the work place; Following are some of the salient points:

- Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) authorities of the work place and 3) supervising faculty members.
- Discussing and preparing students for the training for which meetings with the students has to be planned.
- Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the program.
- Correspondence with the authorities of the work place.
- Orientation classes for students on how to make the training most beneficial- monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information form the workplace, ethics etc.
- Guiding students to make individual plans (week wise/ day wise) to undertake industrial training.,
- Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.
- Inviting industrial personnel to deliver lectures on some aspects of training.

Action plan for planning stages at the Institutional Level

S.No.	Activity	Commencing Week	Finishing week	Remark
1.	Meeting with Principal			
2.	Meeting with colleagues			
3.	Correspondence with work place(Industry concerned)			
4.	Meeting with authorities of work place			
5.	Orientation of students for industry training			
6.	Scrutinizing individual training plan of students.			
7.	Commencement of individual training			
8.	First monitoring of industrial training			
9.	Second monitoring of industrial training			

10. Finalization of Training report
11. Evaluation of performance at industry level
12. Evaluation of Industry Program in the Institutions.