

MODEL CURRICULUM
FOR
UNDERGRADUATE PROGRAMME
B.E./Tech.
IN
TEXTILE TECHNOLOGY



ALL INDIA COUNCIL FOR TECHNICAL EDUCATION
(A statutory Body of Government of India)
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New Delhi-110 002

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PERFACE

The need to ensure minimum acceptable standards and quality in curricula of Engineering Colleges spread across the country and recent technological advances have necessitated development of Model Curriculum for various disciplines of first degree course in Engineering by All India Council for Technical Education. The planning of engineering curricula is a complex exercise since it involves integration of not only the current educational needs of the profession but also the anticipated needs arising out of the fast changing national and international technological scene. To make the curricula both dynamic, to meet the evolving needs of the profession and flexible to adjust to unforeseen developments, the first step is to identify the core part of the curriculum which embodies scientific and engineering knowledge basic to the profession. To this core is added, in different proportions, the other ingredients of professional knowledge of both current and emerging technological processes and systems. With proper balancing of the core, specialized and elective subjects and suitable integration of meaningful practical and field exercises and challenging project activity, the curriculum can, not only provide the students with relevant professional knowledge, but also develop in them the capacity to tackle unknown engineering problems and help them acquire sound professional ethics and an awareness of their obligations to society.

In 1996 the AICTE initiated program to upgrade the syllabi for undergraduate education in technical institutions in India. An exercise to develop detailed curricula which will serve as a model for the institutions was taken up. The emergence, on the national scene, of several new engineering colleges added a sense of urgency to this effort. Since QIP Centres were already intimately involved with the curriculum development activities sponsored by AICTE, they were requested to undertake this important task.

I am glad that Model Curricula for various disciplines which are both dynamic and flexible and provide a proper balance in the teaching of basic sciences, social sciences and management, engineering sciences, technologies and their applications have been finalized. I am sure that this work will serve as a useful guide to the universities and institutions in framing their curricula.

I take this opportunity to express my deep appreciation for the valuable work done by the various members of the Expert Committees and the persons entrusted with the responsibility of co-

coordinating the work in the respective disciplines. The initiative taken by Ministry of Textiles through its Nodal Centre for Upgradation of Textile Education (NCUTE) in updating the Textile Curriculum to match the current industry needs is greatly acknowledged.

June, 2001
New Delhi

Chairman
All India Council for Technical Education

INTRODUCTION

All India Council for Technical Education (AICTE) has been entrusted with the responsibility of coordinated development of technical education system through the country. Uniform growth of technical education requires continuous up-gradation of Curricula for courses at all levels in Technical Education. This need is further accentuated by the emergence of a large number of self-financing institutions in technical education where faculty does not have sufficient expertise. In pursuance of clause 10(1) of AICTE Act and with an objective of bringing about uniformity in the curriculum of Engineering, AICTE has initiated a programme to come up with the syllabi for undergraduate education in technical institutions.

The broad strategies for framing the curricula included the study and analysis of the existing curricula followed in various institutions with the country and also the feedback received in various work-shops involving faculty from different institutions. The draft Model Curriculum was discussed in a wide forum before coming up with the present version.

Based on the interaction and discussion with a number of experts the following recommendations were finalized.

- The duration of a degree level course should be limited to 4 years /8 semesters of about 90 working days each.
- A common first year syllabus with sufficient emphasis on Hum. & Science and Management subjects shall be adopted for all branches of engineering.
- The contact hours per week should normally be kept at about 30 hours.
- Weightage of 15-20% shall be given to non-professional (Basic Sciences and Humanities) subjects and about 10% to Management subjects.
- Normally the curriculum should include a Major Project of minimum 8 credits in Final Year (2 credits in 7th semester and 6 credits in 8th semester). Emphasis should be given to industry sponsored projects.

- Wherever possible the students in 3rd & 4th year should be involved in group discussions on topics of current trends in Engineering & Technology. (No credit).
- There should be continuous evaluation system. Various components of evaluation suggested are Teachers Assessment (TA), Class Tests (CT) also called minors in some of the institutions and End Semester Examination (ESE). To make the evaluation more objective, teachers assessment could be broken into various components like assignments, quizzes, attendance, group discussions, tutorials, etc. Similarly marks of Class Tests can be awarded by having at least two to three tests.
- These two components i.e. TA & CT put together would form the sessional components. End Semester Examination will have to be conducted by the Institute through concerned affiliating University, as per its regulations.
- On the basis of total marks (TA+CT+EST) in each subject obtained, a letter grade should be awarded where A=10, B=8, C=6, D=4, F=0. Normally top 5 - 10% should be awarded 'A' Grade and last 5 - 10% 'F' Grade.

In order to evaluate grade point average for a semester the same could be done using the following illustration:

Subjects	L	T	P	Credit = (L+(T+P)/2)	Grade Awarded
I	2	1	0	3	A
II	3	1	2	5	B
III	3	1	0	4	A
IV	3	1	0	4	B
V	0	0	3	2	C

$$\begin{aligned}
 \text{Semester Grade Point Average} &= \frac{3A + 5B + 4A + 4B + 2C}{3+5+4+4+2} \\
 &= \frac{(30+40+40+32+12)}{18} = 8.55
 \end{aligned}$$

L: Lecture

T: Tutorial

P: Practical

- In order to meet the demand of changing trends and emerging areas a student be given a choice to choose subjects offered as electives which consist of a professional elective (PE) of '12' Credits and an open elective (non departmental elective) of '8' Credits.
- Based on the recommendations a Model Curriculum has been framed. A model structure of the total courses to be undertaken by a student during his undergraduate programme in **Textile Technology** is shown in the subsequent tables. The institute may assign the course numbers depending upon the guidelines of the respective affiliating university.

This developmental exercise is underpinned by the philosophy that curriculum should transcend traditional instructional modes, embrace novel methods of teaching and enhance and embellish the learning process to produce quality engineers for the future. The success of the curriculum lies in its implementation. It is suggested that advantage be taken of modern technology by augmenting the role of a teacher with innovative audio-visual and digital teaching and learning aids. This curriculum is only a base line and institutions should aspire to develop over and above this

COURSE STRUCTURE

BRANCH: Textile Technology**YEAR : I****SEMESTER: I (Common to all branches)**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
1		Language (professional Comm. in English)	2	1	-	15	10	25	50	75	3
2.		Engineering Chemistry	2	1	-	15	10	25	50	75	3
3.		Engineering Physics I	3	1	-	30	20	50	100	150	4
4.		Mathematic I	3	1	-	30	20	50	100	150	4
5		Engineering Mechanics	3	1	-	30	20	50	100	150	4
6.		Basic Electrical Engineering	3	1	-	30	20	50	100	150	4
(PRACTICAL/DRAWING/DESIGN)											
7.		Chemistry/Physics Lab. (To be taken in alternate weeks)	-	-	3	25	-	25	25	50	2
8.		Engineering Mechanics/ Electrical Laboratory	-	-	3	25	-	25	25	50	2
9.		Engineering Graphic I	-	-	3	25	-	25	25	50	2
10.		Workshop Practice – I	-	-	3	25	-	25	25	50	2
	GP-I	GENERAL PROFICIENCY						50	-	50	2
		Total	16	6	12					1000	32

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks:

1000, Total Periods: 34, Total Credits: 32

BRANCH: Textile Technology**YEAR : I****SEMESTER: II****(Common to all branches)**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
1		Introduction to Computing	2	1	-	15	10	25	50	75	3
2.		Environment & Ecology	2	1	-	15	10	25	50	75	3
3.		Engineering Physics II	3	1	-	30	20	50	100	150	4
4.		Mathematics II	3	1	-	30	20	50	100	150	4
5		Engineering Thermodynamics	3	1	-	30	20	50	100	150	4
6.		Basic Electronics	3	1	-	30	20	50	100	150	4
(PRACTICAL/DRAWING/DESIGN)											
7.		Basic Electronics Lab.	-	-	3	25	-	25	25	50	2
8.		Computer Programming Lab.	-	-	3	25	-	25	25	50	2
9.		Engineering Graphics II Machine Drawing	-	-	3	25	-	25	25	50	2
10.		Workshop Practice II	-	-	3	25	-	25	25	50	2
	GP-II	GENERAL PROFICIENCY						50	-	50	2
		Total	16	6	12					1000	32

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks:

1000, Total Periods: 34, Total Credits: 32

BRANCH: Textile Technology**YEAR : II****SEMESTER: III**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
1		Introduction to Textiles	3	1	-	15	10	25	50	75	4
2.		Textile Raw Materials	3	1	-	30	20	50	50	100	4
3.		Yarn Manufacture – I	3	1	-	30	20	50	100	150	4
4		Fabric Manufacture - I	3	1	-	30	20	50	100	150	4
5.		Textile Chemical Processing-I	3	1	-	30	20	50	100	150	4
(PRACTICALS/DRAWING/DESIGN/CASE STUDY)											
6		Introduction to Textiles Case Study	-	-	3	25	-	25	25	50	2
7.		Textile Raw Materials Lab	-	-	2	25	-	25	25	50	2
8.		Yarn Manufacture – I	-	-	3	25	-	25	50	75	2
9.		Fabric Manufacture - I	-	-	3	25	-	25	50	75	2
10.		Textile Chemical Processing-I Lab	-	-	3	25	-	25	50	75	2
	GP-I	GENERAL PROFICIENCY						50	-	50	2
		Total	15	5	14					1000	32

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks: 1000,

Total Periods: 34, Total Credits: 32

BRANCH: Textile Technology**YEAR : II****SEMESTER: IV**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
1		Yarn Manufacture – II	3	1	-	30	20	50	100	150	4
2.		Fabric Manufacture - II	3	1	-	30	20	50	100	150	4
3.		Textile Chemical Processing-II	3	1	-	30	20	50	100	150	4
4.		Testing of Raw Material, Yarns & Fabrics	3	1	-	30	20	50	100	150	4
5		Man-made Fibres Technology	3	1	-	15	10	25	75	100	4
(PRACTICAL/DRAWING/DESIGN/CASE STUDY)											
6		Yarn Manufacture – II Lab				25	-	25	25	50	2
7.		Fabric Manufacture II Lab	-	-	3	25	-	25	25	50	2
8.		Textile Chemical Processing –II Lab	-	-	3	25	-	25	25	50	2
9.		Testing of Raw Materials, Yarn and Fabric Lab	-	-	3	25	-	25	25	50	2
10.		Man Made Fibres Technoloy Lab	-	-	2	25	-	25	25	50	2
	GP-I	GENERAL PROFICIENCY						50	-	50	2
		Total	15	5	14					1000	32

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks:

1000, Total Periods: 34, Total Credits: 32

BRANCH: Textile Technology**YEAR : III****SEMESTER: V**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
1		Fabric Structure and Design	3	1	-	30	20	50	100	150	4
2.		Knit Fabric Manufacture	3	1	-	30	20	50	100	150	4
3.		Manufacture of Garments and Fashion Trends	3	1	-	30	20	50	100	150	4
4.		Quality Management	3	1	-	15	10	25	75	100	4
5		Technical Textiles	3	1	-	30	20	50	100	150	4
(PRACTICAL/DRAWING/DESIGN/CASE STUDY)											
6		Fabric Structure and Design Lab	-	-	3	25	-	25	25	50	2
7.		Knit Fabric Manufacture Lab	-	-	3	25	-	25	25	50	2
8.		Manufacture of Garments and Fashion Trend Lab	-	-	3	25	-	25	25	50	2
9.		Quality Management Case Study	-	-	3	25	-	25	25	50	2
10.		Technical Textile Lab	-	-	2	25	-	25	25	50	2
	GP-I	GENERAL PROFICIENCY						50	-	50	2
		Total	15	5	14					1000	32

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks:

1000, Total Periods: 34, Total Credits: 32

BRANCH: Textile Technology**YEAR : III****SEMESTER: VI**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
(PRACTICAL/DRAWING/DESIGN/CASE STUDY)											
1		Industrial Internship	-	-	34	300(*)	-	300	700(**)	1000	32
		Total	-	-	34					1000	32

(*) Assessment Marks to be submitted by the training supervisor in each unit. Total marks to be normalized to Max. marks 300

(**) These marks will be awarded based on Report submitted, presentation and oral examination to be conducted by the Institute.

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks: 1000, Total Periods: 34, Total Credits: 32

BRANCH: Textile Technology**YEAR : IV****SEMESTER: VII**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
1		Operation Research and Inventory Control	3	1	-	15	10	25	75	100	4
2.		Human Resource Management	2	1	-	15	10	25	100	75	3
3.		Textile Machine Design	3	1	-	30	20	50	100	150	4
4.		Production Management	3	1	-	30	20	50	100	150	4
5		Marketing Management	3	1	-	30	20	50	100	150	4
6		Merchandising	3	1	-	15	10	25	75	100	4
(PRACTICAL/DRAWING/DESIGN/CASE STUDY/)											
7.		Human Resource Management Case Study	-	-	2	25	-	25	25	50	1
8.		Textile Machine Design Lab	-	-	3	25	-	25	50	75	2
9.		Production Management Case Study	-	-	3	10	-	25	25	50	2
10.		Marketing Management Case Study	-	-	3	10	-	25	25	50	2
	GP-I	GENERAL PROFICIENCY						50	-	50	2
		Total	17	6	11					1000	32

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks:

1000, Total Periods: 34, Total Credits: 32

BRANCH: Textile Technology**YEAR : IV****SEMESTER: VIII**

Sl. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME					Credits
			L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
						TA	CT	TOT			
(THEORY)											
1		Cost Accounting and Financial Management	3	1	-	15	10	25	50	75	4
2.		Textile Industry : Global Scenario	1	-	-	15	10	25	50	75	2
3.		Industrial Laws Including Company Laws	1	1	-	15	10	25	50	75	2
4.		Information Technology	2	1	-	30	20	50	100	75	3
5		Personality Development	1	1	-	15	10	25	25	50	2
6		Specialisation (Elective – I)	2	1	-	15	10	25	75	100	3
7		Specialisation (Elective _ II)	2	1	-	15	10	25	75	100	3
(PRACTICAL/DRAWING/DESIGN/CASE STUDY)											
8		Project	-	-	10	100	-	100	150	250	8
9		Information Technology Lab	-	-	2	25	-	25	25	50	1
10		Specialisation – Elective-I	-	-	2	25	-	25	25	50	1
11		Specialisation – Elective-II	-	-	2	25	-	25	25	50	1
	GP-I	GENERAL PROFICIENCY				50		50	-	50	2
		Total	12	6	16					1000	32

TA- Teachers Assessment, CT- Class Test, ESE – End Semester Examination, Total Marks:

1000, Total Periods: 34, Total Credits: 32

Total Credit of All the Four Year : 250

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1. ENGLISH FOR PROFESSIONAL COMMUNICATION

Objective of the Course

To impart basic skills of communication in English through intensive practice to the first year UG students of engineering so as to enable them to function confidently and effectively in that language in the professional sphere of their life.

Desired Entry Behaviour

The student must have some basic command of English so that the student must be able to:

- Write reasonably and grammatically
- Understand (if not use) at least some 2500 general purpose words of English
- Use some 2000 (at least 1500) general purpose words of English to express himself in writing and 1500 such words to talk about day-to-day events and experiences of life.
- Understand slowly-delivered spoken material in Standard Indian English, and
- Speak reasonably clearly (if not fluently) on routine matters with his fellow students.

Teaching Method

- The topics must be covered essentially through plenty of examples. Lecture classes must be conducted as lecture-cum-tutorial classes.
- It is a course that aims to develop skills. It is, therefore, “practical” in orientation. Plenty of exercises of various kinds must be done by the students both inside and outside the class-room.
- The teacher must not depend on a single or a set of two or three text books. He must choose his materials from diverse sources.
- Keeping in view the requirements of his students, the teacher may have to prepare some teaching and exercise materials.
- For practice in listening, good tape recorders can be used if the more advanced facilities (for example, language laboratory) are not available. In fact they can be used very fruitfully.
- The teacher must be function as a creative monitor in the class-room.
- Minimum time should be spent in teaching phonetic symbols, stress, intonation etc. The aim should be to enable the student to find out for himself the correct pronunciation of a word from a learner’s dictionary. In teaching speaking, emphasis should be on clarity,

intelligibility and reasonable fluency rather than on “correct” pronunciation of words. Classroom presentation and group discussion sessions should be used to teach speaking.

Some Key Concepts

Communication as sharing; context of communication: the speaker/writer and the listener/reader; Medium of communication; barriers to communication; accuracy, brevity, clarity and appropriateness in communication.

Writing

Selecting materials for expository, descriptive, and augmentative pieces; business letters; formal report, summarizing and abstracting; expressing ideas within a restricted word limit; paragraph division; the introduction and conclusion; listing reference material; use of charts; graphs and tables; punctuation and spelling; semantics of connectives, modifiers and modals; variety in sentences and paragraphs.

Reading Comprehension

Reading in various speeds (slow, fast, very fast); reading different kinds of texts for different purposes (for example, for relaxation, for information, for discussion at a later stage etc.); reading between the lines.

Speaking

Achieving desired clarity and fluency, manipulating paralinguistic features of speaking (voice quality, pitch, tone etc.); pausing for effectiveness while speaking; task-oriented, interpersonal, informal and semiformal speaking; making a short, classroom presentation.

Group Discussion

Use of persuasive strategies including some rhetorical devices (for emphasizing, for instance; being polite and firm; handling questions and taking in criticism of self; turn taking strategies and effective intervention; use of body language).

Telephonic Conversation

Listening Comprehension

Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English; intelligent listening in situations such as interview in which one is a candidate.

Suggested Text Books & References

- Bhaskar. W. W. S. and Prabhu, N.S. “English Through Reading”, Vol.-I 1978.
- D’Souza Eunice and Shahani, G. “Communication Skills in English”, Noble Publishing House, 1977.
- Sharma R.C. and Mohan, K., “Business Correspondence and Report Writing,” Tata Mcgraw Hill, New Delhi, 1994.
- Fiske, John “Introduction to Communication Studies”, Rotledge, London, 1990.
- Gartside, L. “Model Business Letters”, Pitman, London, 1992.
- Longman, “Longman Dictionary of Contemporary English”, (or ‘Oxford Advanced Learner’s Dictionary of Current English’, OUP), 1998.
- Nurnberg, Maxwell and Morris, Rosenblum “All About Words”, General Book Depot, New Delhi, 1995.

2. ENGINEERING CHEMISTRY

Atoms and Molecules

Particle in a box illustrating energy quantization, angular momentum quantization, radial and angular part of H atom, wave functions/orbitals, probability and charge distribution. Many electron atoms. Homonuclear and heteronuclear diatomics, covalent bonds, ionic bonds and electro-negativity concepts, hybridization and shapes of molecules. Non-covalent interaction (Van Der Waals and hydrogen bonding).

Solid State

Idea of spatial periodicity of lattices; elements of bond theory. Conductors, semiconductors and insulators.

Experimental methods of structure determination using spectroscopic techniques such as IR, UV-Vis, NMR and Mass Spectrometry.

Reaction Dynamics

Rate laws, mechanisms and theories of reaction rates (collision and transition state theory). Lasers in Chemistry.

Electrochemistry

Application of electrode potentials to predict redox reactions in solution with special reference to Lattimer and Frost diagrams.

Transition Metal Chemistry

Structures of coordination compounds corresponding to coordination numbers up to 6. Types of ligands. Isomerism (geometrical, optical, ionization, linkage and coordination). Theories of bonding in coordination compounds, viz. crystal field theory, valence bond theory. Chelation. Brief application in organic synthesis and medicines etc.

Organo Metallic Chemistry and Catalysis

Structure and bonding in organo metallic complexes, the sixteen and eighteen electron rules. Homogeneous catalysis, the role of metals in catalytic cycles during some chemical reaction (e.g. hydroformylation, hydrogenation etc.). Role of metals in biology, oxygen carrier, electron transfer.

Structure of Reactivity of Organic Molecules

Inductive effect, resonance, hyper conjugation, electrometric effect. Carbonation, carbanion and free radicals. Brief study of some addition, elimination and substitution reactions. Conformation analysis (acyclic and cyclic molecules), geometrical and optical isomerism; E, Z and R, S nomenclature.

Polymerization

Basic concepts, classification and industrial application.

Photochemistry

Photo excitation of carbon substrates (Norrish type I and type II reactions), selected examples of the application of photolysis. Photosynthesis (Z-diagram). Chemistry of vision.

List of Experiments

- Acid-base titration (estimation of commercial caustic soda).
- Redox titration (estimation of iron using permanganometry).
- Complex metric titration (estimation of hardness of water using EDTA titration).
- Preparation and analysis of a metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes).
- Chemical kinetics (determination of relative rates of reaction of iodide with H₂O₂ at room temperature (clock reaction)).
- Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
- Photochemical oxidation – reduction (study of photochemical reduction of ferric salt).
- Viscosity of solutions (determination of percentage composition of sugar solution from viscosity).
- Synthesis of aspirin.
- Synthesis of p-nitro aniline from acetanilide.
- Detection of functional groups in organic compounds.

- Utilization of paper/thin layer/column chromatographic techniques in the separation of organic compounds.
- Radical polymerization of vinyl monomers such as styrene, acrylonitrile etc.
- Conductometric titration (determination of the strength of a given HCl solution by titration against a standard NaOH solution).

Suggested Text Books & References

- “Blocks 1-5 of Chemistry Course”, Indira Gandhi Open University, IGNOU, New Delhi, 1996.
- Alberty, R.A. and Silbey, R.J. “Physical Chemistry”, John Wiley & Sons, Inc., Singapore, 1996.
- Cotton, F.A, Wilkinson, G. and Gaus, P.L. “Basic Inorganic Chemistry”, John Wiley & Sons, Inc., Singapore, 3rd Ed., 1996.
- Graham-Solomon, T.W. “Fundamentals of Organic Chemistry”, John Wiley & Sons, Inc., Singapore, 1997.
- Odian, G.G. “Principles of Polymerization” , John Wiley & Sons, Inc., New York, 1981.
- Sykes, P. “A Guidebook to Mechanism of Organic Chemistry”, Longman Inc., New York, 1981
- Dyer, J.R. “Application of absorption Spectroscopy of Organic Compounds”, Prentice Hall of India, 1965.
- Williams, D.H. and Fleming, I., “Spectroscopic Methods in Organic Chemistry”, Tata McGraw Hill edition, New Delhi, 4th Ed., 1988.
- Atkins, P.W. “Physical Chemistry”, Oxford Univ. Press, 4th Ed., 1990.
- Pine, S.H., “Organic Chemistry”, McGraw Hill Book Co., New Delhi, 5th Ed., 1987.
- Sharma, B.K., “Engineering Chemistry”, Krishna Prakashan Media (P) Ltd., Meerut, 1996.
- E.E. Conn, and Stumpf, P.K. “Outlines of Biochemistry”, Wiley Eastern Ltd., New Delhi, 4th Ed., 1985.
- Morrison, R.T. and Boyd, R.N. “Organic Chemistry”, Prentice Hall of India, 6th Ed., 1992.
- Rao, C.N.R. and Agarwala, U.C. “Experiments in General Chemistry”, East-West Press, New Delhi, 1969.
- Furnis, B.S., Hannaford, A.J., Smith, P.W.G. and Tatchell, A.R., Vogel’s “Textbook of Practical Organic Chemistry”, ELBS, 5th Ed., 1989.
- Vogel’s “Textbook of Quantitative Analysis”, Longman, New York, 4th Ed., 1978.

- Elias, A.J.Sundar Manoharan S. and Raj, H. “Laboratory Experiments for General Chemistry”, I.I.T. Kanpur, 1997.

3. ENGINEERING PHYSICS-I

Theory of Relativity

Inertial frame of reference, Noninertial frames and fictitious forces, Outline of relativity, Michelson-Morley experiment, Lorentz transformation of space and time, length contraction, variation of mass with velocity, equivalence of mass and energy.

Geometrical Optics

Combination of thin lenses, cardinal points of coaxial system of thin lenses, thick lenses location and properties of cardinal points, graphical construction of images.

Physical Optics

Interference-analytical treatment of interference, intensity distribution of fringe system, coherence and non-coherent sources, fundamental conditions of interference, Fresnel's biprism, displacement of fringes, wedge shaped films, Newton's rings. Diffraction-single slit and double slit diffraction, diffraction grating, Limit of resolution, resolving power of grating and image forming systems.

Polarization – Brewster's Law, double refraction, geometry of calcite crystal, optic axis, nicol prism, circularly and elliptically polarized light, retardation plates, production and analysis of planes, polarimeter.

Thermal Physics

Kinetic theory of gases, Maxwellian distribution, mean free path, transport phenomena in gases, Imperfect gases and Vander Waal's equation of state.

Acoustics

Production and applications of Ultrasonic, Acoustics of buildings.

Dynamics of fluids

Continuity equation, Bernoulli's theorem and its applications, Torcelli's theorem, Viscosity flow of liquid through a capillary tube, capillaries in series and parallel, Stoke's formula rotation viscometer

List of Experiments

- To determine the coefficient of viscosity of water by capillary flow.
- To determine the thermal conductivity of a bad and good conductor by Lee's method and Searl's method respectively.
- To determine the wave length of light by Newton's ring method.
- To determine the wave length of light by Fresnel's biprism.
- To determine the dispersive power of the given material of the prism.
- To determine the focal length of combination of two thin lenses by nodal slide assembly and its verification.
- Determination e/m by J.J. Thomson's method.
- Measurement of thermo emf between different types of thermocouples as a function of temperature difference between the junctions, measurement of an unknown temperature.
- Use of Carry Foster Bridge.
- Study of electromagnetic induction.
- Study of electromagnetic damping and determination of terminal velocity reached by a magnet falling in a metallic tube.
- Study of LCR circuits with AC current.
- Determination of Plank's Constant using photocells.

Suggested Text Books & References

- Jenkins and White, "Optics", McGraw-Hill Book Company.
- Mathur, D.S., "Mechanics".
- Saha and Srivastava "A Treatise on Heat"
- Singh, R.B. "Physics of Oscillations and Waves"
- Ghatak, A.K. "Optics"

4. MATHEMATICS – I

Calculus of Functions of One Variable

Successive differentiation, Leibnitz's theorem (without proof). Rolle's theorem, Mean value theorem and Taylor's theorem. Fundamental theorems of integral calculus, elementary reduction formulae for integrals. Applications to length, area, volume, surface area of revolution, moments and centers of gravity.

Infinite Series : Convergence, divergence, comparison test, ratio test, Cauchy Leibnitz's theorem, absolute and conditional convergence. Expansions of functions into Taylor and Maclaurin series.

Calculus of Functions of Several Variables

Partial derivatives, chain rule, gradient and directional derivative. Differentiation of implicit functions, exact differentials. Tangent planes and normals. Maxima, minima and saddle points. Simple problems in extrema of functions with constraints – method of Lagrange multipliers. Multiple integrals – double and triple integrals. Jacobians and transformations of coordinates. Applications of areas, volumes etc.

Vector Calculus.

Scalar and vector fields. Line and surface integrals. Gradient, divergence and curl. Line integrals independent of path. Green's theorem, divergence theorem and Stoke's theorem (without proofs) and their simple applications.

Suggested Text Books & References

- Thomas, G.B. and Finney, R.L. "Calculus and Analytic Geometry", 6th Edition, Addison-Wesley/Narosa, 1985
- Piskunov, "Differential and Integral Calculus", Vol-I & II, Mir Publishers, Moscow, 1979.

5. ENGINEERING MECHANICS

Fundamentals of Mechanics – Basic concepts

Force Systems and Equilibrium

Force, Moment and couple, Principle of Transmissibility, Varignon's theorem, Resultant of force systems-Concurrent and non-concurrent coplanar forces, Free body diagram, Equilibrium equation and their uses in solving elementary engineering problems.

Plane Trusses

The Structural model, simple trusses, analysis of simple trusses: method joints, method of sections graphical method.

Friction

Introduction laws of coulomb friction, simple contact friction problems, belt friction, the square screw thread, rolling resistance.

Properties of Surfaces

First moment of an area and centroid, second moment and product of area of a plane area, transfer theorems, relation between second moment and product of areas, polar moment of inertia, principle axes, mass moment of inertia.

Virtual Work

Work of a force, Principle of Virtual work and its application.

Kinematics of Rigid bodies

Plane motion, Absolute motion, Relative motion, Translating axes and rotating axes.

Kinetics of Rigid bodies.

Plane motion, Work and energy, Impulse and momentum.

List of Experiments

- To verify the Newton's second law of motion by Fletcher's trolley apparatus.
- To determine the moment of inertia of a flywheel about its axis of rotation.
- To verify : (a) the conditions of equilibrium of forces by parallel force apparatus.
(b) The principal of moments by crank lever.
- To find the compression in the rafters and tension in ties of simple roof truss models and to verify graphically.
- To determine the dry friction between inclined plane and slide boxes of different materials.
- To determine the coefficient of friction between the belt and rope and the fixed pulley.
- To determine the velocity ratio of a simple screw jack and to plot graph between (a) Effort-Load (b) Friction – Load. (c) Efficiency – Load.
- To measure the area of a figure with the help of a Polar Planimeter.

Suggested Text Books & References

- Beer, F.P. and Johnston, F.R., "Mechanics for Engineers", McGraw Hill,.
- Shames, I.H., "Engineering Mechanics", Prentice Hall of India
- Meriam, J.L., "Statics", John Wiley.
- Meriam, J.L., "Dynamics", John Wiley.

6. BASIC ELECTRICAL ENGINEERING

DC Networks

Kirchoff's laws, node voltage and mesh current methods; Delta-star and star delta conversion; Classification of Network Elements, Superposition principle, Thevenin's and Norton's theorems.

Single Phase AC Circuits

Single phase EMF generation, average and effective values of sinusoids; Solution of R, L, C series circuits, the J operator, complex representation of impedances; Phasor diagram, power factor, power in complex notation; Solution of parallel and series-parallel circuits; Resonance.

Three Phase AC Circuits

Three phase EMF generation, delta and Y-connection, line and phase quantities; Solution of three phase circuits, balanced supply voltage and balanced load; Phasor diagram, measurement of power in three phase circuits; Three phase four wire circuit; Unbalanced circuits.

Magnetic Circuits

Ampere's circuital law, B-H curve, solution of magnetic circuits; Hysteresis and eddy current losses; Relays, an application of magnetic force.

Transformers

Construction, EMF equation, ratings; Phasor diagram on no load and full load; Equivalent circuit, regulation and efficiency calculation; Open and short circuit test; Auto-transformers and three phase transformers.

Induction Motors

The revolving magnetic field, principle of operation, ratings; Equivalent circuit; Torque – speed characteristics; Starters for squirrel cage and wound rotor type induction motors; Single Phase induction motors.

DC Machines

Construction, EMF and torque equation; Characteristics of DC generators and motors; Speed control of DC motors and DC motor starters; Armature reaction and commutation.

Electrical Measuring Instruments

DC PMMC instruments, shunts and multipliers, multi-meters; moving iron ammeters and voltmeters; Dynamometer wattmeter's; AC watt-hour meters, Extension of instrument ranges.

Power Supply System

General structure of electrical power systems; Power transmission and distribution via overhead lines and underground cables, Steam, hydro, gas and nuclear power generation.

List of Experiments

- To measure the armature and field resistance of a DC machine.
- To calibrate a test (moving iron) ammeter and a (dynamometer) wattmeter with respect to standard (DC PMMC) ammeter and Voltmeters.
- Verification of circuit theorems, Thevenin's and Superposition theorems (with DC sources only).
- Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.
- Measurement of current, voltages and power in R-L-C series circuit excited by (single phase) AC supply.
- Open circuit and short circuit tests on a single-phase transformer.
- Connection and starting of a three-phase induction motor using direct on line (DOL), or star-delta starter.
- Connection and measurement of power consumption of a fluorescent lamp.
- Determination of open circuit characteristics (OCC) of a DC machine.
- Starting and speed control of a DC shunt motor.
- Connections and testing of a single-phase energy meter (unity power factor load only).
- Two –wattmeter method of measuring power in three –phase circuit (resistive load only).
- Measurement of thermo emf between different types of thermocouples as a function of temperature difference between the junction, measurement of an unknown temperature.
- Design and use of potentiometer.

- Study of LCR circuits with AC current.

Suggested Text Books & References

- Hughes Edward (revised by Ian McKenzie Smith), “Electrical Technology”, Seventh Edition, English Language Book Society Publication with Longman, 1995.
- Del Torro, Vincent “Electrical Engineering Fundamentals” Second Edition, Prentice Hall of India Pvt. Ltd. 1994.
- Cotton H. “Advanced Electrical Technology”, Isaac Pitman, London, 1967.
- Wildi, Theodore “Electrical Machines, Drives and Power Systems”, Second Edition, Prentice Hall, 1991.
- Cogdell, J.R. “Foundations of Electrical Engineering”, Second Edition, Prentice Hall, 1996.
- Parke Smith S. (Ed. Parker Smith N N), “Problems in Electrical Engineering”, Tenth Edition, Asia Publications, 1995.

7. ENGINEERING GRAPHICS-I

General

Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning. Different types of projections, Orthographic projections, B.I.S. Specifications

Projections of Points and Lines

Introduction of planes of projection, Reference and auxiliary planes, projections of points of lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance intersecting and non-intersecting lines.

Planes Other than the Reference Planes

Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of oblique plane into auxiliary plane and solution of related problem.

Projections of Plane Figures

Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.

Projection of Solids

Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of solid making given angles.

Development of Surface

Development of simple objects with and without sectioning.

Isometric Projection

Nomography

Basic concepts and use.

Suggested Text Books & References

- Narayana, K.L. and Kannaiah, P., “Engineering Graphics.” , Tata McGraw Hill, New Delhi, 1988.
- Bhatt, N.D., “Elementary Engineering Drawing”, Charator Book Stall, Anand, 1988
- Lakshminarayanan, V. and Vaish Wanar, R.S., “Engineering Graphics”, Jain Brothers, New Delhi, 1998.
- Chandra, A.M. and Chandra Satish, “Engineering Graphics”, Narosa, 1988

8. WORKSHOP PRACTICE I & II

Carpentry

Timber, definition, engineering applications, seasoning and preservation, plywood and plyboards.

Foundry

Moulding sands, constituents and characteristics. Pattern, definition, materials, types, core prints. Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions.

Metal Joining

Definitions of welding, brazing and soldering processes, and their applications. Oxy-acetylene gas welding process, equipments and techniques, types of flames and their applications. Manual metal arc welding technique and equipment, AC and DC welding, electrodes, constituents and functions of electrode coating. Welding positions. Type of weld joint. Common welding defects such as cracks, undercutting, slag inclusions, porosity.

Metal Cutting

Introduction to machining and common machining operations. Cutting tool materials. Definition of machine tools, specification and block diagram of lathe, shaper, drilling machine and grinder. Common lathe operations such as turning, parting, chamfering and facing. Quick return mechanism of shaper. Difference between drilling and boring. Files – material and classification.

Forging

Forging principle, materials, operations like drawing, upsetting, bending and forge welding, use of forged parts.

List of Jobs to be Made in the Workshop

Group A

- | | | | |
|----|-------------------------------|------------------|-------|
| 1. | T-Lap joint and Bridle joint | (Carpentry shop) | 4 hrs |
| 2. | Mould of any pattern | (Foundry shop) | 2 hrs |
| 3. | Casting of any simple pattern | (Foundry shop) | 2 hrs |

Group B

1. (a) Gas welding practice by students on mild steel flat 2 hrs
(b) Lap joint by Gas welding
2. (a) MMA Welding practice by students 2 hrs
(b) Square butt joint by MMA Welding
3. (a) Lap joint by MMA Welding 1 hrs
(b) Demonstration of brazing 1 hrs
4. Tin smithy for making mechanical joint and soldering of joints. 2 hrs

Group C

1. Job on lathe with one step turning and chamfering operations. 2 hrs
2. Job on shaper for finishing two sides of a job 2 hrs
3. (a) Drilling two holes of size 5 and 12 mm Diameter on job used/to be used for shaping
(b) Grinding a corner of above job on bench grinder 2 hrs
4. Finishing of two sides of a square piece by filing 2 hrs.

Suggested Text Books & References

- Begeman, M.L. and Amstead, B.H., “Manufacturing Process”, John Wiley, 1968.
- Chapman, W.A.J. and Arnold, E., “Workshop Technology”, Vol.I & III, Viva Low Priced Student Edition, 1998.
- Raghuwanshi, B.S., “Workshop Technology”, Vol. I & II, Dhanpat Rai and Sons, 1998.
- Chaudhary, Hajra, “Elements of Workshop Technology”, Media Promoters & Publishers, 1997.
- Crawford, S., “Basic Engineering Processes”, Hodder & Staughton, 1985.

9. INTRODUCTION OF COMPUTING

Introduction

Introduction to the computer devices such as keyboard, mouse, printers, disk, files, floppies, etc.

Concept of computing, contemporary OSs such as DOS, Window 95, MAC-OS, UNIX, etc. (Only brief user level description).

Introduction to the e-mail, ftp, rlogin and other network services, world wide web.

Introduction to the typesetting softwares such as Microsoft Office.

Introduction to Programming

Concept of algorithms, Example of Algorithms such as how to add ten numbers, roots of a quadratic equation. Concept of sequentially following up the steps of the algorithm.

Notion of Program, programmability and programming languages. Structure of programs, object codes, compilers.

Introduction to the Editing tools such as vi or MS-VC editors.

Concepts of the finite storage, bits bytes, kilo, mega and gigabytes. Concepts of character representation. Languages for system programming: study of Basics, Fortran, Pascal, Cobal, etc.

10. COMPUTER PROGRAMMING LAB

Concepts of flow charts and decision tables, Examples and practice problems. Introduction to Digital computers and its components, Introduction to DOS and UNIX operating systems.

Development of computer program for example

Roots of quadratic and Cubic equations.

Summatio of N natural numbers.

Arranging numbers in ascending and descending orders.

Separation of odd and even numbers, etc.

Suggested Text Books & References

- Kernighan, B.W., “The Elements of Programming Style”, Megraw-Hill.
- Yourdon, E., “Techniques of Program Structures and Design”, Prentice, Hall.
- Press, W.H., Teukolsky, S.A., Vetterling, W.T. & Flannery, B.P., “ Numerical Recipies in Fortran”, Cambridge University Press.
- Goterfried, B.S., “Schaum’s Outline of Theory & Programming With Basic”, McGraw Hill, New Delhi.
- Schied, F.S., “Theory and Problems of Computers & Programming”, McGraw Hill, New Delhi.

11. ENVIRONMENT AND ECOLOGY

General

Introduction, components of the environment, environment degradation.

Ecology

Elements of ecology: Ecological balance and consequences of change, principles of environmental impact assessment.

Air Pollution and Control

Atmosphere composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layers, standards and control measures.

Water Pollution and Control

Hydrosphere, natural water, pollutants their origin and effects, river/lake/ground water pollution, standards and control.

Land Pollution

Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wasters): their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

Noise Pollution

Sources, effects, standards and control.

Books & References

- Masters, G.M., "Introduction to Environmental Engineering and Sciences", Prentice-Hall of India Pvt. Ltd., 1991.
- Nebel, B.J., "Environmental Science", Prentice-Hall Inc., 1987.
- Odum, E.P., "Ecology: The Link Between the Natural and Social Sciences", IBH Publishing Com. Delhi.

12. ENGINEERING PHYSICS-II

Vector analysis

Scalar and vector fields, gradient of a scalar field, Divergence and curl of a vector fields, Line integral of a vector field, Gauss-divergence theorem, Stoke's theory

Electromagnetism

Quantization & Conservation of charge, Coulomb's law (vectorial form) and superposition principle, Concept of electric field lines, flux of E-field, Gauss' law, Electric Potential energy and potential, Conductors, capacitors and dielectric materials, Magnetic field, Force on a moving charge in a magnetic field, Force on current element, Torque on current loop, Biot-Savart law, Ampere's law, Electromagnetic induction and Faraday's law, magnetism in materials , Maxwell's equations, Electromagnetic Waves.

Thermoelectricity

Seebeck effect, law of successive temperatures, law of intermediate metals, politer effect, Thomson effect, Thermoelectric power, application of thermodynamics on thermocouple.

Modern Physics

Elements of wave properties of particles and particle properties of wavers, Nuclear Energy, Lasers- spontaneous and stimulated emission of radiation, Einstein coefficient, Parts of laser, types of laser and their application

Solid State Devices

Energy band diagram; covalent bonds; bound and free electrons, holes; electron and hole mobilities; intrinsic and extrinsic semiconductors; Fermi and impurity levels; impurity compensation, charge neutrality equation and semiconductors conductivity; Einstein relation; drift and diffusion current; photo conductivity and Hall effect.

Suggested Text Books & References

- Rangwala and Mahajan, "Electricity and Magnetism", Tata McGraw Hill, 1998.
- Verma, H.C., "Concepts of Physics, Part-2", Bharti Bhawan (P&D), 1998.

- Beiser, “Modern Physics”, McGraw-Hill Inc., New York, 1995.
- Mani and Mehta, G.K. “Modern Physics”, Affiliated East-West Press Pvt. Ltd., 1998.

13. MATHEMATICS –II

Linear Algebra

Vector spaces – linear independence and dependence of vectors, inner products, linear transformations. Matrices and determinants. Systems of linear equations- consistency and inconsistency. Gauss elimination, rank of a matrix, inverse of a matrix. Eigenvalues and eigenvectors of a matrix, diagonalization of a matrix.

Ordinary Differential Equations

Formation of ODE's, definition of order, degree and solutions. ODE's of first order: separable variables, homogeneous and nonhomogeneous equations, exactness and integrating factors, linear equations and Bernoulli equations. General linear ODE's of nth order: solutions of homogeneous and nonhomogeneous equations, operator method, methods of undetermined coefficients and of variation of parameters. Solutions of simple simultaneous ODE's.

Laplace Transforms

Transforms of elementary functions, transforms of derivatives and derivatives of transforms, inverse transforms, transforms of periodic functions, unit step function, shifting theorems, solutions of ODE's using Laplace transforms.

Numerical Methods

Difference operators – forward, backward, central, shift and average operations and relations between them. Newton's forward and backward interpolation. Lagrange interpolation and the error formula for interpolation. Numerical differentiation and integration – Trapezoidal rule and Simpson's one-third rule including error formulas.

Suggested Text Books & References

- Kreyszing, E., "Advanced Engineering Mathematics", 5th Ed., Wiley Eastern, 1985.
- V. Krishnamurthy, V., Mainra, V.P. and Arora, J.L., "An Introduction of Linear Algebra", Affiliated East-West, 1976.
- Boyce and DiPrima, R.C., "Elementary Differential Equations and Boundary Value Problems", 3rd Ed., Wiley, 1977.

14. ENGINEERING THERMODYNAMICS

Fundamentals and definitions

System Control Volume, properties, state, state change, and diagram, Dimensions and units.

Work

Mechanics and Thermodynamics definitions, Displacement work at part of a system boundary, Engine Indicator, Displacement work in various quasi-static processes, shaft work, electrical work.

Heat

Temperature, thermal equilibrium, Zeroth law of thermodynamics, sign convention for heat transfer.

First Law of Thermodynamics

Statement, Application to non-cyclic process, Energy, modes of energy, Pure Substance, Specific heats, First Law for Control Volumes.

Second Law of Thermodynamics

Direct and reversed heat engines, Kelvin-Planck and Clausius Statements and their equality, reversible and irreversible processes, Carnot cycle, Thermodynamic temperature scale.

Entropy

Definition, calculation through Tds relations, T-s diagrams, entropy as a measure of irreversibility Properties of pure substances – Use of steam Tables and Mollier Diagram.

Ideal gas

Properties of ideal gas and ideal gas mixtures with and without a condensable vapour-psychrometry.

Real gas

Equations of state, generalized charts for compressibility, enthalpy changes and fugacity.

Suggested Law Analysis of Engineering Process

Availability and irreversibility and their application in Thermal Engineering.

Suggested Text Books & References

- Spalding, D.B. and Cole, E.H., “Engineering Thermodynamics”, Edward Arnold, 1959.
- Hawkins, G. A., “Engineering Thermodynamics”, John Wiley and Sons, 1955.
- Van Wylen, G.J. and Sonntag, R.E., “Fundamentals of Classical Thermodynamics”, John Wiley and Sons, 4th Edition, 1997.
- Nag, P.K., “Engineering Thermodynamics”, Tata McGraw Hill 2nd Edition, 1998.

15. BASIC ELECTRONICS

Semiconductor Diodes

Introduction, Ideal diode, PN semiconductor diode, Diode equivalent circuits, Zener diode, Light diodes.

Bipolar Junction Transistor

Introduction, Transistor construction, Transistor operation, Common-base configuration, common emitter and common collector configuration.

Field Effect Transistor

Introduction, construction and characteristics of JFETs, Transfer characteristics, Depletion type MOSFET, Enhancement type MOSFET.

Operational Amplifier

Introduction, Differential and common mode operation, Constant gain multiplier, voltage summing, voltage buffer.

Semiconductor Devices

Introduction of Silicon controlled rectifier, GRO, TRIAC, DIAC, induction transistors, IGBT.

Cathode Ray Oscilloscope

Introduction, Cathode ray tube-theory & construction.

Electronic Instruments

Introduction, Electronic voltmeters, Vacuum type voltmeters, Differential amplifiers, D.C. Voltmeter with direct coupled amplifier, Electronic multimeter.

Transducers

Introduction, classification and types of electrical transducers.

Display Devices and Records.

Introduction, Digital instruments, Digital Vs Analog instruments, Recorders – Analog recorders, graphic recorders, strip-chart recorders.

Data Acquisition System

Introduction, Components and uses.

BASIC ELECTRONICS LAB.

- Characteristics Curve for common base emitter and common collector transducers.
- Characteristics of field effect transistors.
- Verification of properties of operational amplifiers.
- Study of CRO
- Study of working of data acquisition system.

Suggested Text Books & References

- Robert Boylesta & Louis Nashelsky, “Electronics Devices & Circuit Theory”, Prentice Hall of India.
- Milliman & Halkias, “Basic Electronics Principle”
- Sawhney, A.K., “Electrical & Electronics Measurement and Instrumentation”, Dhanpat Rai & Sons.

16. ENGINEERING GRAPHICS – II

Basic Concepts

I.S. drawing conventions line symbols, kinds of line, drawing sheet lay-out rules of printing, preferred scales.

Projections

Perspective, orthographic, isometric and oblique projections, isometric scale, isometric drawing. Technical sketching.

Shape Description (External)

Multiplanar representation in first and third angle systems of projections, glass-box concept, sketching of orthographic view from pictorial views, precedence of lines.

Sketching of pictorial (isometric and oblique) views from Multiplanar orthographic views. Reading exercise. Missing line and missing view exercises.

Shape Description (Internal)

Importance of sectioning, principles of sectioning, types of sections, cutting plane representation, section lines, conventional practices.

Size Description

Dimensioning, tools of dimensioning. Size and location dimensions. Principles and conventions of dimensioning. Dimensioning exercise.

Computer Aided Drafting

Basic concepts and used.

Suggested Text Books & References.

- French and Vireck, “The fundamental of Engineering Drawing and Graphic Technology”. McGraw Hill, 4th Ed., 1978.
- “IS : 696(1972) Code of Practice for General Engineering Drawing”, ISI New Delhi.

- Gill..P.S., “A Text Book of Machine Drawing”, Katson Publishing House, Ludhiana, 1980.
- Giesecke, Mitchell, Spener, Hill and Dygon, “Technical Drawing “, McMillian & Co., 7th Ed., 1980.
- George Omura, “Mastering AUTOCAD”, B.P.B. Publication, New Delhi.

17. INTRODUCTION TO TEXTILES

Textile Industry

Sectors of textile industry viz. organized mill sector, decentralized small scale sector.

Sectors based on technology : Handloom, Powerloom, Garment, Cotton, Silk, Wool, Jute and Synthetic Fibres.

Indian cotton: Production, quality and global competition.

Changing scenario of Indian Textile Industry in the wake of WTO Agreement.

Strengths and weaknesses of the Indian Textile Industry in the global scenario.

Research and technology support to the Indian Textile Industry.

Textile Technology

Introduction of fibre, yarn, fabrics.

Sequence of operations for conversion of natural and manmade fibres into finished fabrics.

Fabric construction technology: knitting, weaving and production of non woven.

Fabric to Garment. Importance of Design.

Quality aspects of yarns, fabrics and garments.

Processing and finishing of fabrics and garments.

Suggested Text Books & References.

- Corbmann, “Textiles Fibre to Fabric”, New York McGraw Hill Book. Co., 1983.
- “Cotton Spinning”, ATIRA Publication, Ahmedabad
- Aswani, K.T., “Plain Weaving Motions”, Mahangan Book Publishers, 1996.
- Shenai, V.A., “Fundamental Principles of textile Processing”, Sevak Publisher.

18. TEXTILE RAW MATERIALS

Fibres

Natural Fibres

Cotton – cultivation and harvesting practices, ginning, grading, baling etc.

Silk – moriculture, sericulture and pre and post cocoon operation etc.

Wool – sheep rearing, wool shearing, grading baling etc.

Jute- cultivation, retting, scotching etc.

Manmade fibres.

An overview of technology and application of various man-made fibres, such as – regenerated fibres : viscose, polyester, polyamide, acrylic, polypropylene, elastomeric fibres (Spandex), other specialty fibres.

Dyes, Finishes and Auxiliaries

Classification of various type of dyes, finishes an auxiliaries. Application procedures and properties, and their importance in value addition.

Sourcing and procurement of various type of fibres, dyes and chemicals.

Major producers and suppliers in India and abroad. Their cost comparisons and marketing and merchandising details.

Suggested Text Books & References

- Moncriff, W., “Textile Fibres”.
- Murthy, H.V.S., “Textile Fibres”.
- Morton, M. and Hearle, J.W.S., “Physical Properties of Textile Fibres”, Textile Institute, Manchester.
- Marjoury Joseph, “Introduction to Textiles”,

19. YARN MANUFACTURE - I

Mixing

Formulation of Cotton mixing – scientific bale management, Blending methods, volumetric gravimetric and mixing methods.

Opening and Cleaning

Principal actions in opening and cleaning and Sequence of blowroom machines.

Carding

Cotton carding practices – principles, working and process parameters.

Drafting

Principles of doubling and drafting, working, process parameters and drafting irregularities.

Combing

Preparatory process, combing and post combing operations and various types of combing machines.

Speed frame

Speed frame-principles, working and process parameters.

Ring frame

Ring frame – principles, working and process parameters.

Doubling and Winding

Doubling and Winding – principles, working and process parameters.

Evaluation and Maintenance

Process evaluation, maintenance and calculations of the above.

Suggested Text Books & References

- Klien, W., “Manual of Textile Technology : Vol. I. Technology of Short Staple Spinning”, Textile Institute, Manchester, 1989.
- Klien, W., “Manual of Textile Technology : Vol. II. A Practical Guide to Opening & Carding”, Textile Institute, Manchester, 1989.
- Klien, W., “Manual of Textile Technology : Vol. III. A Practical Guide to Combing & Drawing”, Textile Institute, Manchester, 1989.
- Klien, W., “Manual of Textile Technology : Vol. IV. Short Staple Spinning”, Textile Institute, Manchester, 1989.
- Klien, W., “Manual of Textile Technology : Vol. V. A Practical Guide to Ring Spinning”, Textile Institute, Manchester, 1989.
- Klien, W., “Manual of Cotton Spinning – Blowroom”, Textile Institute, Manchester, 1989.
- Zaloski, S., “The Institute of Textiles Technology USA series on Textile Processing – Vol. - I. Opening, Cleaning and Picking”.
- Taggart, W., “Handbook of Cotton Spinning” Universal Publishing Corporation, 1979.
- Coulson (Ed.), A.F.W., “Manual of Cotton Spinning, Vol. I to IV”, Textile Institute, Manchester, 1958.
- Osteby, “Spun Yarn Technology”, Butterworths, London, 1987.
- Happey (Ed.), F., “Contemporary Textile Engineering”, Academic Press, New York, 1981.
- Salhotra, K.R., Alagirusamy, R. and Chattopadhyay (Eds.) R., “Course Material of Pilot Programme on Spinning :Ring Spinning, Doubling and Twisting”, NCUTE Publication, 2000
- Chattopadhyay, R and Rengasamy (Eds.), R., “Course Material of Pilot Programme on Spinning: Drawing, Combing & Roving”, NCUTE Publication, 1999.
- Salhotra, K.R., and Chattopadhyay (Eds.) R., “Course Material of Pilot Programme on Spinning : Blowroom and Card”, NCUTE Publication, 1998.

20. FABRIC MANUFACTURE – I

Winding

Basic features, slub catchers, yarn tensioner, anti-patterning, knotting and splicing, classification and basic features of manual and automatic winders.

Warping

Basic features and comparison of various types of warping, creels.

Pirn Winding

Objectives, types, basic features and automation, winding parameters.

Sizing

Objectives, classification, features of sizing machines, machine elements, sizing materials, size preparation.

Drawing –in

Manual, automation, knotting and gaiting.

Calculations

Production efficiency and waste related to winding, warping, sizing processes. Yarn passage, working of various mechanism and adjusting points on manual winders, automatic winders, warpers and sizing machine. Maintenance of the machines studied.

Suggested Text Books & References

- Talukdar, M.K., “An Introduction to Winding and Warping”, Textile Trade Press, Mumbai.
- Ajgaonkar, D.B., “Sizing : Materials, Methods and Machines”, Textile Trade Press, Mumbai, 1982.
- Banerjee, P.K., “Industrial Practices in Yarn Winding”, NCUTE Publication, 1999.
- Ramsbottom, “Warp Sizing Mechanisms”, Columbia Press, Manchester, 1965.
- Ormerod, A., “Modern Preparation and Weaving Machinery”, Butterworths, 1983.
- Aitken, “Automatic Weaving”, Columbia Press, Manchester, 1969.
- Bennet, G.A., “An Introduction to Automatic Weaving”, Columbia Press, Manchester, 1958.

- Gorder, V. and Volkov, P., “Cotton Weaving”-Mir Publication, Moscow, 1987.
- Sengupta, R., “Yarn Preparation Vol & II”, Mahajan Publishers, Ahmedabad, 1970.
- Singh, R.B., “Modern Weaving Calculation, Vol.-I Preparatory “, Mahajan Book Distributor, Ahmedabad, 1994.
- SITRA Report on Work Methods of Conewinder Tenters.
- BTRA Report of Winding.
- BTRA Report on Warping and Sizing.
- Lord and Mohemad, “Conversion of Yarn to Fabric”.
- Houghton, “Hand Book of Cotton Warp Sizing”.

21.TEXTILE CHEMICAL PROCESSING – I

Preparatory Processes

Sequence of chemical processing of textiles, natural & added impurities in textiles. Introduction to various preparatory processes for cotton, wool, silk, nylon, polyester, acrylic and blends including optical whitening.

Dyeing

Introduction to dyeing of natural and synthetic fibre fabrics and blend fabric with various dye classes. Color measurement, fastness properties of dyed textiles.

Printing

Introduction of printing methods and styles of printing, natural and synthetic fibre fabrics and blends. Fastness properties of printed textiles.

Finishing

Introduction to finishing of natural and synthetic fibre fabrics and their blends including heat setting of synthetic fibre/fabrics. Softeners and stiffening finishes and their applications. Mechanical finishing stenters and mangles. Easy care finishing of cotton and polyester/cotton blends.

Wool Processing

Wool setting and milling, Mildew, rot and moth proofing.

Silk Processing

Degumming, Silk Dyeing, Silk Printing, Silk Finishing, Weighting of silk and scroop finish.

Suggested Text Books & References

- Shenai, V.A., “Technology of Textile Processing Vol. 2,3,4,6 and 10”, Sevak Publisher, Bombay.
- Marsh, J.T., “Mercerising”, Chapman Publication, London.
- Marsh, J.T., “An Introduction to Textile Finishing”, Chapman Publication, London.
- Trotman, E.R., “Textile Technology and Dyeing of Textile Fibres”, Griffin Publication, London.

- Shenai, V.A., “Principle and Practice of Dyeing”, Sevak Publisher, Bombay.
- Shenai, V.A., “Fundamentals of Principles of Textile Wet Processing”, Sevak Publisher, Bombay.
- Datye, K.V. and Vaidya, A.A., “Chemical Processing of Synthetic Fibres and Blends”, Wiley Publication, New York.
- Peter, R.H., “Textile Chemistry Vol. 2”, Elsevier Publishing, London,.
- Marsh, J.T., “Textile Science”, Chapman, London
- Garde, A.R., and Modi, “Chemical Processing of Cotton and Polyester Blend”, ATIRA, Ahmedabad.
- “Wet Processing”, - ATA Set, Textile Association of India.
- Prayag, C.R., “Dyeing of Silk and Manmade Fibre”.
- Prayga, C.R., “Bleaching, Mercerizing and Dyeing of Cotton”.

22. YARN MANUFACTURE - II

Spinning of systems other than cotton

Wool

Long Staple Spinning – Principles, working and process parameters of Woolen and Worsted systems.

Silk Spinning

Reeling, Yarn Doubling, Spun Silk.

Jute Spinning

Basic concepts of the spinning process and machinery.

Blends

Composition, homogeneity methods, processing on short and long staple spinning.

New Spinning Systems

New Spinning Systems – Principles, Mechanisms of yarn formation, Machines and process parameters and yarn properties for – Rotor Spinning, Air-Jet Spinning, Dref Spinning.

Suggested Text Books & References

- Salhotra K.R., “Spinning of Manmades and Blends”, NICTAS Publication, Ahmedabad.
- Nield, O., “Principles of Rotor Spinning”.
- Salhotra, K.R., “Rotor Spinning”, NICTAS Publication, Ahmedabad.
- Oxtoby, E., “Spun Yarn Technology”, Butterworths, London.
- Goswami, B.G., “Textile Yarns : Technology, Structure and Applications”, Textile Institute Manchester.

23. FABRIC MANUFACTURE – II

Basic Concepts

General loom elements, classification of looms, primary, secondary and auxiliary motions of looms, multiple boxes.

Automatic Looms

Automatic looms, advantages over plain looms, basic features, classification pirn changing mechanism, warp stop motion and weft feelers.

Introduction to Dobby, Jacquard and Terry Weaving

Function of Dobby and Jacquards, Electronic Jacquards, Computer controlled weaving.

Principles of Weft Insertion

Power of picking, velocity and acceleration of picking elements, energy consumed, timings, drive to sley and healds.

Shuttleless Looms

Gripper, air-jet, rapier and water-jet-loom, comparison of various weft insertion systems, fabric quality in shuttleless looms.

Special Weaves

Types of weavers, Principles of two-phase, multiphase, circular and narrow fabric weaving.

Weaving Calculations

Calculation pertaining to loom mechanism, production and efficiency.

Modern Weaving Machines.

Knowledge about the latest weaving machines, their comparative performance and cost factors.

Suggested Text Books & References

- Marks and Robinson, “Principles of Weaving”, Textile Institute, Manchester, 1986.
- Thomas Fox, “Mechanism of Weaving”, Bombay Universal Publishing Co., 1993.

- Lord and Mohamad, “Conversion of Yarn to Fabric”, Merrow Publishing Co., Ltd., England,, 1988.
- Aswani, K.T., “Plain Weaving Mechanism”, Mahajan Publishers, Ahmedabad, 1996.
- Aswani, K.T., “Fancy Weaving Mechanism”, Mahajan Publishers, Ahmedabad, 1990.
- Sengupta, R., “Weaving Calculations”, Taraporwala Sons, Bombay, 1990.
- Banerjee, N.N., “Weaving Mechanism Vo. – I & Vo. –II”, West Bengal, 1994.
- Rai, Has Mukh, “Fabric Forming”, S.S.M. Institute, Kuomarapalyam Tamil Nadiu, 1996.
- Talukdar, M.K., “Modern Weaving Technology”, NICTAS, Ahmedabad, 1998.
- Rapier Looms WIRA Researchh & Technical Service Manual for Industry.
- Katwani, P.A., “Weaving I Shuttle looms”, NCUTE Publication, 1999.
- Katwani, P.A., “Weaving II Shuttleless Looms”, NCUTE Publication, 1999.
- Katwani, P.A., “Filament Weaving”, NCUTE Publication, 2000.
- BTRA, “Loom Shed”.

24. TEXTILE CHEMICAL PROCESSING - II

Processing Machinery and New Processes

Development in machinery for preparatory, dyeing and finishing.

Development in dyeing

Recent developments in dyeing of natural fibres, synthetic fibres and their blends. Solvent assisted dyeing and solvent dyeing. Tie and dye, batik, mass coloration principle and technology. Problems in dyeing and their solutions.

Printing

Printing with kerosene and transfer printing.

Color measurement

Application of Computer Color Matching system to evaluate strength /purity of dye, shade matching, whiteness/yellowness index.

Finishing

Recent developments in mechanical and chemical finishing, emerising biopolishing, water proofing and water repellency, flame proofing and its evaluation. Application technique in finishing including foam finishing.

Quantitative chemical analysis of textile fibres and their blends. Identification and application of classes of dyes and bleaching agents.

Environmental Concern

Eco-friendly processing and effluent treatment.

Suggested Text Books & References

- Shenai, V.A., "Technology of Textile Processing Vol. 2,3,4,6 and 10", Sevak Publisher, Bombay.
- Marsh, J.T., "Mercerizing", Chapman Publication, London.
- Marsh J.T., "An Introduction to Textile Finishing", Chapman Publication, London.

- Trotman, E.R., “Textile Technology and Dyeing of Textile Fibres”, Griffin Publication, London
- Shenai, V.A., “Principle and Practice of Dyeing”, Sevak Publisher, Bombay
- Shenai, V.A., “Fundamentals of Principles of Textile Wet Processing”, Sevak Publisher, Bombay
- Datye, K.V. and Vaidya A.A., “Chemical Processing of Synthetic Fibres and Blends”, Wiley Publication, New York.
- Peter, R.H., “Textile Chemistry Vol.2”, Elsevier Publishing, London.
- Marsh, J.T., “Textile Science”, Chapman, London.
- Garde, A.R. and Modi, “Chemical Processing of Cotton and Polyester Blend”, ATIRA, Ahmedabad.
- Prayag, C.R., “Dyeing of Silk and Manmade Fibre”.
- Prayag, C.R., “Bleaching, Mercerizing and Dyeing of Cotton”.
 - Vankar, Padma, “Textile Effluents”, NCUTE Publication, 2001.

25. TESTING OF RAW MATERIALS, YARNS AND FABRICS

Cotton Fibre Testing

Length, fineness, maturity, strength, elongation, trash-contaminations. High volume instruments, Fibre Quality Index, etc.

Fibre Identification.

Man – made Fibres

Linear density, spin finish, strength and elongation, crimp, etc.

Textured yarn testing.

Yarn Testing

Linear density, strength and elongation, twist, evenness, imperfections, contaminations, hairiness etc.

Blend evaluation – qualitative and quantitative.

Fabric Properties

Tensile, tearing and bursting strength, air permeability, water repellency, shower proofness, drape, handle, crimp, pilling, fabric thickness. Areal density, stiffness, low stress mechanical properties.

Suggested Text Books & References

- Booth J.E., “Principles of Textile Testing”, Butterworths, London.
- Booth, J.E., “Textile Mathematics Vol. I, II, III”, Butterworths, London.
- Angappan, P. & Krishnan, Gopal, “Textile Testing”, SSM Institute of Technology, 1997.
- Grover, E. and Hamby, D.S., “Handbook of Textile Testing and Quality Control”, Wiley Eastern, New Delhi, 1969.
- Slater, “Textile Progress’ Physical Testing and Quality Control”, Textile Institute, Manchester.
- James, Lomak and Longmans, “Textile Testing”, Green & Co., London.
- “Handbook of Methods of Tests for Cotton Fibres, Yarns and Fabrics”, CTRL, Bombay.

- “Cotton Assessment and Appreciation”, SITRA Report, Coimbatore.

26. MAN-MADE FABRIC TECHNOLOGY

Polymerization

A detailed study of polycondensation with reference to polyamides and polyesters, polyaddition reactions viz. acrylics, polyolefins.

Spinning Process

General principles of spinning, Fluid flow through a capillary, die-swell, melt, dry and wet spinning, melt spinning process, melt extrusion, spinning conditions such as spinneret size, rate of extrusion, spinning stretch and its effect on filament structure and properties with special reference to Polypropylene; polyamide and polyester fibres, wet and dry spinning of viscose and acrylic fibres, dry jet wet spinning, effect of spinning variables on structure and properties of gel and final fibres, high shrinkage acrylic fibres, need for drawing and heat setting.

Textured Yarn Technology

Importance of texturing, methods of texturizing, basic principles of heat setting and texturizing, false twisting, process variables, developments of false twist texturing machines, structural geometry of textured yarns, characterization of textured yarns, stuffer box crimping, edge crimping and other methods of texturing thermoplastic yarns, textured yarn properties and fabric characteristics, principles of draw texturing, draw texturing machines, properties and draw textured yarns, principles of air bulking and properties of air textured yarns, texturing with the aid of solvents, yarns characteristics, morphological changes introduced by mechano-thermal and chemo-mechanical forms of texturing and their effects on properties of textured yarns, and their warping and weaving.

Suggested Text Books & References

- Gupta, V.B. & Kothari, V.K., “Manufactured Fiber Technology”, Chapman & Hall, London, 1977.
- Mukhopadhyay, S., “Advances in Fibre Science”, Textile Institute, Manchester.
- Deopura, B.L., “Course Material of Pilot Programme on Manmade Fibres”, NCUTE Publication, 1999.
- Mishra, S.P., “A Textbook of Fibre Science & Technology”, New Age International Publishers, New Delhi, 1999.

- Goswami, B.G., “Textile Yarna: Technology Structure and Application”, Textile Institute, Manchester.
- Pajart & Oldrich “ Textile Science & Technology – Processing of Polyster Fibres”, Elsevier Scientific Publishing Co., 1979.
- Robinson, J.S., “Spinning and Extruding of Fibres”.
- Pattabhram, T.K., “Spinning Fundamentals of Manmade Fibres”, Mahajan Publishing Pvt. Ltd., Ahmedabad, 1966.

27. FABRIC STRUCTURE & DESIGN

Basic Concepts

Importance of fabric structure, classification of fabrics, notation of weave, draft, peg plan and denting.

Simple Weaves

Plain weave and its derivatives, ornamentation, twill and its derivatives, effects of twist on prominence of twill lines, sateens, satin, their extensions, crepe weave, diamond, mock leno, cork-screw, honey comb, huck-a-back, bed ford cords, welt and piques fabrics.

Decorative Weaves

Extra wrap and weft figuring, backed clothes, treble and multi lay cloths, damask, brocades, terry pile structure, wrap and weft pile fabrics, cloth setting theories, and particulars of common varieties of fabrics.

Analysis

Basic principles of woven fabric analysis and estimation of loom particulars, wrap and weft used in their construction, weave analysis sett, cover factor count and weight calculations for simple and compound woven structures. Specifications for standard woven fabric.

Suggested Text Books & References

- Gosicki, Z.J., "Watson's Textile Design and Colour", Universal Publisher, Bombay, 1988.
- Gosicki, Z.J., "Watson's Advance Designs", Universal Publisher, Bombay, 1989.
- Nisbet, H., "Grammar of Textile Designs", Taraputwala & Sons, Bombay, 1994.
- Ashnehurst, "Textile Calculation & Structure of Fabric".
- Klibbe, J.W., "Structural Fabric Design", North Carolina State University, 1965.
- Bost, M.A., Yates and Marry Paul, "Methods of Creative Design".

28. KNIT FABRIC MANUFACTURE

Basic Concepts of Knitting

Hand knitting to machine knitting, weft and wrap knitting, knitting needles.

Weft Knitting

Classification of weft knit structures, basic weft knitting machines including plain knit, circular rib, circular interlock and purl knitting machines, float and tuck stitches. Designing of weft knit structures.

Wrap Knitting

Basic wrap knit structures, underlap and overlap knitting machines including tricot and raschel machines knitting elements and knitting cycle. Representation of wrap knit structure. Patterning mechanisms and modified wrap knit machines and fabrics

Calculation and maintenance pertaining to the knitting machines.

Latest developments in knitting technology and designing. Use of elastometric fabrics in knit fabrics etc.

Suggested Text Books & References

- David Spencer, “Knitting Technology”.
- Ajgaonkar, D.B., “Knitting Technology”, Universal Publishing Co. 1998.
- Brackenbury, “Knitted Clothing Technology”.

29. MANUFACTURE OF GARMENT AND FASHION TRENDS

Basic Concept

Introduction of the different types of machines and equipment and various seams and stitches.

Garment Manufacture

Overview of pattern making grading, size charts and garment construction along with cutting, layout and marker making.

Concepts of Fashion

Various terms used: fashion cycle, fad, classic, style etc. Principles and elements of design.

Functions of Various Departments

Storage, cutting, sewing, finishing and packaging, for woven and knits.

Costing of apparel products. Plant layout and product engineering. Global scenario of apparel industry.

Suggested Text Books & References

- Carr & Latham, "The Technology of Clothing Manufacture", Blackwell Science Ltd., 1994.
- Natalie Bray, "Dress Pattern Design".
- Cooklin, "Introduction of Clothing Manufacture", Blackwell Science Ltd, 1988.
- Carr, "Fashion Design and Product", Blackwell Science, London, 1992.
- Chuter, "Introduction of Clothing Production".
- Ila Kantilal, "The Apparel Industry in India".
- Mehta, "Managing Quality in the Apparel Industry".
- Gray & Stephens, "CAD / CAM in Clothing & Textiles", Grower Publishing, Hampshire, 1998.

30. QUALITY MANAGEMENT

Concept of Total Quality

Quality Management systems as a means of achieving total quality.

Linkage of Quality and Environment Management System.

Strategic concern for environment, need for proper environment management systems and their economic implications, environment management systems, green products and strategies, environment assessment, environment protection act.

Management Systems

Need and relevance of documentation and standardization of management systems, various tools of documenting and recording the management systems, various standards for management systems, flexibility and change in management systems and documented procedures.

Quality Management Systems

ISO 9000, quality policy, data, records and traceability, documenting the quality system, quality manual, quality audit, design and change control, ISO 9000 registration, ISO 14000.

Suggested Text Books & References

- Walsh Oren, "Quality Management Handbook", Marcel Dekker Publishers, New York, 1986.
- Casio Joseph, "ISO 14000 Guide: The New Environment Management Standards", McGraw Hill Publication, New York, 1996.
- Roothery Brian, "ISO 9000", Grower Publisher, U.K., 1991.
- 'Glossary and Tables for Stat. Quality Control, 3rd edn.', ASQC, 1996.
- Anderson, S.L., "Textile Fibre Testing and Quality Control", 1983.
- Bureau of Indian Standards, "Handbook of Quality Management", 1992.
- Enrick Nobert, L., "Quality Control & Reliability 6th edn.", 1972.
- Graniteville Co, "Manual of Standard Fabric Defects in the Textile Industry", 1978.
- Ishikawa Karou, "Introduction to Quality Control", 1994.

31. TECHNICAL TEXTILES

High Technology Fibres

(a) Glass Fibres

Manufacture of glass filaments and staple fibre – manufacture of staple fibre yarn – properties and application of filament and staple fibre yarns.

(b) Asbestos Fibres

Manufacturing process – Properties and applications of asbestos yarn.

(c) Carbon Fibres

Aramid and related fibres

Tyre Cords and Fabrics

Requirements of tyre code – suitability of various fibres – polyester and Nylon tyre cords – manufacture of tyre cords – Physical and mechanical property requirements for tyre cord fabrics – Fabrics Design – Specifications. Rubberized textiles.

Belts

Conveyor belts – physical and mechanical properties – construction of belts – manufacture of conveyor belts – power transmission belts.

Hoses

Weaving of Hose pipes. Different types and different applications. Construction and applications.

Filter Fabrics

General consideration of filtration of solids from liquids, solids from gases, solids from solids, liquid from liquids, liquids from gases and gases from gases and the respective types of filter fabrics used.

Non-Woven Textiles

Various uses of non-woven fabrics and their applications. Manufacture of non-woven fabric-adhesive bonding and needle punching techniques.

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. Dialyzer textiles, Hollow fibres as dialysis membrane. Hospital textile. Operating and post operating clothing. Disposable drapes. Sanitary applications.

Geo Textiles

Geo Textiles 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.

Suggested Text Books & References

- Moncrieff, R.W., “Man-made Fibre”, Newnes-Butterworths, London, 1975.
- Bajaj, P. and Sengupta, A.K., “High Performance Fibres”, The Textile Institute, Manchester.
- McDonald, M., “Non-Woven Fabric Technology”, Noyes Data Corporation, New Jersey, 1971.
- Gulrajani, M.L., “Non-Woven”, North India Textile Institute, New York, 1992.
- “Medical Textiles – International Conference on Medical Textiles”, Bolton, Woodhead Publication, Cambridge, 1997.
- Planck, H., “Medical Textiles for Implantation – International ITV Conference on Bio materials – 3rd Stuttgart 1989”, Springer Verlag Publication, Berlin 1990.
- John, N.W.M., “Geotextile”, Blackie Publication, Glasgow, 1987.

32. OPERATION RESEARCH AND INVENTORY CONTROL

Linear Programming Techniques

Operations research and decision making, types of mathematical models and constructing the model, role of computers in operations research, formulation of linear programming problem, applications and limitations, simplex method (analytical and graphical).

Distribution Methods

Vogel's approximation method, modified distribution method, optimization models, unbalance and degeneracy in transportation model.

Assignment Models

Hungarian algorithm, traveling salesman problem, routing problems, processing 'n' jobs through two machines and three machines, processing two jobs through 'm' machines.

Network Analysis

PERT and CPM. Total slack, free slack, probability of achieving completion date, cost analysis updating resource smoothing – role of computers in network analysis.

Inventory Method

Variables in an inventory problem, inventory problem, inventory models with penalty, storage and quantity discount, safety stock, inventory models with probability, demand, multi item deterministic model.

Queuing Theory

Poisson arrivals and exponential service times, waiting time and idle time cost, single channel multichannel problem, Monte Carlo technique applied to queuing problems, Poisson arrivals and service time.

Decision Theory Game

Examples on the application of theory of games $2 \times M$ and $M \times 2$ problems, graphic dominance and linear programming method for different problems, decision trees.

Replacement Model

Replacement of items that deteriorate, gradually, fail suddenly. Group replacement policy. Concept of system reliability.

Suggested Text Books & References

- Taha, H.A., “Operations Research”, Mc Millan Publication Co. Inc., New York.
- Hiller, F.S., Liberman, G.J., “Introduction to Operations Research 2nd Edition”, Holden – Day Inc, San Francisco, 1974.
- Rao, S.S., “Optimization – Theory and Applications”, Wiley Eastern, New Delhi, 1978.
- Rao, K.V., “Management Science”, Mc Graw Hill Singapore, 1986.
- Sesieni, M.A., Yaspan, A. and Friedman, L., “Operations Research : Methods and Problems”, John Wiley and Sons, New York, 1959.
- Wagner, N.B., “Principles of Operation Research”, NJ Prentice Hall, 1975.
- Lewis, C.D., “Scientific Inventory Control”, Butterworths, London, 1970.
- Love, S., “Inventory Control”, Mc Graw Hill, 1979.
- Naddor, E., “Inventory System”, Wiley New York, 1996.

33. HUMAN RESOURCE MANAGEMENT

Evolution in Human Resource Management

Influences on the approach of management of human resources, line the staff components of human resource management.

Importance and need of Human Resource Management

Role of human resource management in a competitive business environment, interpersonal dynamics, building a task-person fit, determining humane resource requirements, recruitment and selection process, training and development, team building, leadership, appraising employees performance, wage and salary administration, collective bargaining and industrial relations, quality of worklife.

Cost-benefit Analysis of HR Functions

Safety, health and employee assistance programmes, global reference points of human resources management.

Suggested Text Books & References

- Arnold, H.J. and Fieldman, D.C., “Organizational Behaviour”, Mc Graw Hill, New York, 1986.
- Cascio, W.F., “Managing Human Resources : Productivity, Quality of Work Life, Profits,” Mc Graw Hill, New York, 1995.
- Dessler, G., “Personnel Management”, Reston Publishing Company, Reston, V.A., 1984.
- Monappa and Saiyadain, M.S., “Personnel Management”, Tata Mc Graw Hill, New Delhi, 1979.
- Fornburn, Tichy, N.M. and Devanna, M.A., “Strategic Human Resource Management”, Wiley, New Delhi, 1984.
- Parikh, U. and Rao, “Designing and Management Human Resource Systems”, Oxford and IBN, New Delhi, 1992.

34. TEXTILE MACHINE DESIGN

Materials

Factors determining choice of materials – major types and properties of materials used for textile machineries.

Form Design

Factors affecting form design and their influence on form design.

Computer Aided Design

An overview of Computer Hardware, Classifications of computer used for design, hardware of Pentium and RISC based graphic work stations. Serial and parallel interfacing, display devices, Graphic input devices, output devices and operating system, Windows'95 and Windows '97.

Finite Element Analysis

Introduction, types of analysis, procedure of finite elements analysis – stiffness matrix, solution procedure, details of a finite element analysis package, model building, post processing and optimization.

Blow Room

Aerodynamic characteristic of lint and trash – factors governing design of openers and cleaners and scutchers.

Carding

Concepts of chute feed – factors influencing design of carding machine elements and effect of their speed on carding performance.

Drafting

Fibre characteristics and their influence on drafting element designs.

Twisting and Winding

Factors influencing design of fly frame spindle and flyer, ring frame spindle, ring and traveler.

Rotor Spinning

Design requirements of feed roller, opening roller, transfer tube, rotor, yarn delivery tube, navel and take-up mechanisms.

Winding

Design concept of Yarn tensioner and winding drum

Warping

Design concepts of warping creel and warper's beam drive.

Sizing

Design concept of creel, sow box, drying system, weavers beam drive.

Weaving Machines

Design concept of machine structure, shedding mechanism, shuttle and shuttleless weft insertion systems, beat-up mechanisms, weft selection devices, weft accumulators and take-up and let-off mechanisms.

Suggested Text Books & References

- Woodehouse, T., "Textile Machine Drawing", Blackie & Sons Ltd., 1961.
- Textile Institute, "Textile Machinery : Investing for the Future", The Textile Institute, 1988.
- Arther, R., "Textile Machinery & Heat Engines", Pitman, London, 1930.
- Slater, K., "Textile Mechanics", Textile Industries, Manchester 1987.
- Taggart, W.S., "Textile Mechanics", Indo-Overseas Trading, Bombay 1959.
- Woodehouse, T., "Textile Mechanics", Blackie Publisher, London 1921.
- Rengasamy, R.S., "Mechanics of Textile Machines", NCUTE Publication, 2001
- Geover, Mikell, P. CAD/CAM : "Computer Aided Design & Marketing", Prentice Hall Publishers, Eaglewood Cliffs, 1989.
- Rajasekaran, S., "Finite Element Analysis in Engineering Design", Whelier Publisher, Allahabad, 1993.
- Divakaran, S., "Strength of Material", Asia Publishing House, Bombay, 1969.
- Patel, R.C., "Machine Design", Acharya Book Depot, Baroda, 1968.

35. PRODUCTION MANAGEMENT

Production Information

Production Information of the entire unit, product range and quantity.

Production Information systems : feeding and retrieval of data.

Productivity Planning

Production Capacity and the productivity obtained from each machine.

Analysis of the data and planning of production.

Output of human resource : analysis and strategy.

Production Planning

Study of market demand and supply analysis.

Technology and product design for various textile products and forecasting future trends.

Work study, method study and work measurement. Application of time study in a textile mill.

Importance and use of snap study.

Inventory Control

Models, Replacement and maintenance problems, Techniques of project evaluation. Mill planning.

Forecasting, concept and time series models.

Production Planning in Spinning and Weaving

Spin plans for various counts and yarns. Production rates, waste, efficiency level of spinning machines. Estimation of number of machines for the given production of yarn. Balancing machines.

Production rates, efficiency etc. of preparatory and weaving shed. Estimation of number of machines in preparatory and weaving. Preparation of weaving plan.

Machinery Maintenance

Preventive and breakdown maintenance of machinery.

Air-conditioning, humidification and ventilation for a textile mill. Different systems of humidification and their efficiency. Temperatures, relative humidity and ventilation requirement for different sections of a textile mill.

Dust extraction in textile mill. Methods and equipments used in dust extraction. Lighting requirements and fittings, spacing of light fitting, illumination standards and measurements.

Suggested Text Books & References

- Krajewski, Lee J., Ritzman, Larry P., “Operations Management : Strategy and Analysis – Vth Edition”, Addison – Wesley Publishing Co., Inc.
- Chary, S.N., “Production and Operations Management – IInd Edition”, Tata Mc Graw Hill, New Delhi.
- Nair, N.G., “Production and Operation Management”, Tata Mc. Graw Hill, New Delhi.
- Chase, Aquilano and Jacobs, “Production and Operation Management : Manufacturing and services – VIIIth Edition”, Irwin Mc Graw Hill.

36. MARKETING MANAGEMENT

Introduction to Marketing

Genesis, the marketing concept, marketing management system: objectives, its interfaces with other functions in the organization.

Macro Environment

Economic environment, socio-cultural environment, legal environment, political environment, demographic environment.

Micro Environment

Company, Intermediaries, Consumer, Competitors etc.

Marketing Mix

Product planning, product life cycle, new product decisions, concept of unique selling proposition, product management.

Pricing

Price setting and adopting to price changes.

Positioning

Channels of distribution : Selection and management.

Promotion

Advertising, sales promotion and personal selling.

Marketing Programme

Sales forecasting, marketing and sales budgeting, sales management, management of sales force and evaluation of marketing performance.

Ethical issues in marketing, concept of marketing effort and marketing audit.

Suggested Text Books & References

- Stantan, W.J., Michael, J.E., Bruce, J.W., “Fundamentals of Marketing”, Mc Graw Hill, New York, 1991.
- Bennett, “Marketing”, Mc Graw Hill, New York, 1990.
- Guilttinan and Paul, “Marketing Management Strategies and Programs”, Mc Graw Hill, New York, 1992.
- Kotler, P., “Marketing Management, Analysis and Control”, Prentice Hall, Englewood Cliffs, HJ, No.9, 1980.
- Stantan, W.J., “Fundamentals of Marketing”, Mc. Graw Hill, Kogajusha, 1978.

37. MERCHANDISING

Merchandising course for textiles has to include sourcing of raw material, inventory planning and marketing of final products. Merchandising techniques and principles.

Requirement of raw material, their annual and monthly requirement, seasonal availability and price variation for each sector of the industry such as spinning mills, weaving units, processing houses and garment industry.

Merchandising according to domestic and international demand and supply. Information technology in merchandising.

Logistics support to merchandising of specific products and its relevance in costing.

Suggested Text Books & References

- Articles related to Merchandising published in Journals, Magazines & Newspapers.
- John Moritime, “Logistics in Manufacturing : an IFS executive briefing”, Springe Verlag, Berlin, 1988.
- Fabrycky, W.J., “Procurement & Inventory Systems: Theory & Analysis”, Reinhold New York, 1967.
- Blanchard, Benjamin, S., “Logistics Engineering & Management – 2nd Edition”, Prentice Hall, Eagle Cliffs, 1981.

38. COST ACCOUNTING AND FINANCIAL MANAGEMENT

General Principles

Origin and growth, cost concept, classification of cost, cost elements. Methods and techniques of costing. Cost-Volume Profit (CVP) relationship, profit planning and budgeting, variable costing.

Accounting Procedure

Definition of accountancy, book keeping and accounting, objectives of accounting, accounting principles, accounting conventions. Systems of accounting, Journalizing transactions : Journal rules –debit and credit. Compound journal entry, opening entry ledger posting. Journal and ledger rules.

Negotiable Instruments

Promissory notes, bills of exchange, cheques, accounting entries, bills sent for collection bills receivable etc.

Income Accounting

Income measurement, Concepts of depreciation, depreciation on replacement cost, depreciation policy. Receipts and payments accounts Income and expenditure accounting, Balance sheet.

Financial Management

Concepts of Financial Management, Time value of money, valuation of long-term securities, statement of financial position, presentation of cash flow statements and its benefits.

Financial Statement Analysis

Underlying principles of financial statement, preparation managerial uses of financial data, techniques of financial analysis – ratio analysis, statement of changes in financial position : cash, working capital, all resource basis, cases and problems, long-term investment decision, Risk analysis, capital budgeting, Identifying cash flows, data requirement.

Suggested Text Books & References

- Kahn, M.Y. and Jain, P.K., “Financial Management”, Tata Mc Graw Hill 1992.
- Maheshwari, S.N., “Advanced Accountancy Vol. I”, Vikas Publishing House 1999.
- Sharma R.K. and Gupta, S.K., “Management Accounting – Principles and Practice” Kalyani Publishers, 1998.
- Maheswari, A.N. and Mittal, S.N., “Elements of Cost Accounting”, Mahavir Publication, 1999.

39. TEXTILE INDUSTRY : GLOBAL SCENERIO

This course should prove the student knowledge about:

- Major textiles producing countries, their production capacities and variety of products.
- Raw Material producing countries, production quality and quantity and cost comparison.
- Machinery suppliers and their comparative studies.
- Research trends and emerging technologies and their impact on the future of the industry.
- Marketing trends and export prospects. Demand and supply scenario.
- Fashion trends and consumer preferences.
- Channels of distributions and procurement of textile goods and raw materials.

Suggested Text Books & References

- Murphy, W.S., “Textile Industries”, Gresham Publishing Company, London.
- Textile Industry, “Technical Conference on Textile Industry : Atlanta, 1978”, IEEE Publication, New York, 1978 (Conference Record).
- Srinivasan, Kastury, “India’s Textile Industry”.
- “World Textiles : Investment Innovation, Invention – Annual World Conference on World Textiles and Investment Innovation Invention”, The Textile Institute, London, 1985.
- Textiles Journals, Magazines and Topical Reports.

40. INDUSTRIAL LAWS INCLUDING COMPANY LAWS

Introduction to Industrial Relation

Systematic view of personnel, labour relation. Personal policies have industrial relation implications. Several of the aspects relating to the contractual relation between individual employee and employer are determined through legislation and collective agreement.

Different Acts pertaining to Industrial Law

Introduction to Indian trade unionism, industrial relation and conflict industries, into reduction of Labour Regulations Act, Factory Act, Trade Union Act, and Safety Act, role of industrial legislation, introduction of Industrial Dispute Act.

Industrial Relations Machinery

Industrial Dispute Act 1947, provides for conflicting resolution progressively through conciliation, arbitration and adjudication. Different jurisdiction of labour court, issues in recognition of unions, tribunal and national tribunal, strategies for solving industrial conflict, collective bargaining, works committee and joint consultative committee, negotiation process, influence of government regulations, third party intervention in industrial disputes, rules of grievances, discipline in industry, contribution of tripartite bodies, labour welfare participative management, Workman's Compensation Act, productivity in industry, healthy industrial relation and economic development.

Suggested Text Books & References

- Kornhauser, A. et al. (Ed.), "Industrial Conflict (Chapters 1 and 4)", Mc Graw Hill : New York, 1954.
- Ramaswamy, E.A. and Ramaswamy, Uma 1981, "Industry and Labour ", Oxford : New Delhi.
- Michael, Salamon, "Industrial Relations : Theory and Practice", Prentice Hall, Herfordshire, 1987.
- Venkata Ratnam, C.S., "Industrial Relations Environment in India", International Management Institute, India (Mimeo): New Delhi, 1986.
- Venkata Ratnam, C.S., "Employers' Dilemma", EFI-SOLAR Foundation, Bombay, 1989.
- Venkata Ratnam, C.S., "Industrial Relation and Productivity", Indian Management 1988.

41. INFORMATION TECHNOLOGY

Introduction to computers, digital electronic and microprocessors, computer architecture data, and file structure – C++, operating systems, database management, computer graphics, computer networks, software engineering, computer aided designing, information protection, enterprise resource planning.

Web Publishing

Web surfing and accessing information, Introduction to Dream Weaver, Frontpage, Internet Programming – FTP, HTML, DHTML, ASP, Java – Core Java including Threading and Applets and Advanced Java including Servlets, EJB and JSP, E-Commerce.

Suggested Text Books & References

- Bove & Tony, “Adobe Illustrator and Official Handbook of Design”, Bantam Books, New York, 1988.
- Brown, Dave, “Adobe “ Web Design and Publishing”, Techmedia Publishers, New Delhi, 1997.
- Robert Lafore, “Object Oriented Programming in C++”, Galgotia Publishers, New Delhi, 2000.
- Kenetkar, Y.P., “Let us C++”, BPB Publication, New Delhi, 1999.
- William Stallings, “Data and Computer Communication”, Prentice Hall, India, 2000.
- Reilly, O’, Internet in a Nutshell”, Shroff Publishers, Mumbai, 1998.
- Reilly, O’, Javascript”, Shroff Publishers, Mumbai, 1999.
- Reilly, O’, HTML”, Shroff Publishers, Mumbai, 1999.

42. PERSONALITY DEVELOPMENT

Organizational Behaviour

Inter personal behaviour, formal and informal communication, barriers, to communication, techniques of overcoming barriers, effective listening.

Communication Skills

Participation in an informal meeting, oral presentation, interview, group discussions, seminars, debates, managerial report writing.

Suggested Text Books & References

- Stephen P. Robbins, “Organizational Behaviour”.

ELECTIVE COURSES

Lists of suggested “Professional Electives” and “Open Electives” are given hereunder

PROFESSIONAL ELECTIVES

Note: 2 Courses of 4 credits each in one of the following groups pertaining to specific specialization related to textile industry to be included in Semester VII.

These courses will be developed by the respective universities / institutes depending on the infrastructure, expertise available, and the industrial needs of the region.

Students may be guided to opt courses from any one group so as to specialize for a chosen sector of the industry.

Group 1 – Spinning

Course 1: “Recent Developments in Spinning Machines”.

Course 2: “Latest Global Trends in Yarn Manufacture”.

Group 2 - Weaving

Course 1 : “Latest Trends in Fabric Manufacture”.

Course 2: “Non Woven Textiles”.

Course 3: “Recent Developments in Weaving Machinery”.

Group 3 - Textile Processing

Course 1 : “Global Trends in Dyeing and Finishing”.

Course 2 : “ Ecofriendly Processing of Textiles

Course 3 : “Garment Finishing

Group 4 - Knitting and Knitwear

Course 1 : “Advanced Course on Knitwear Technology”.

Course 2 : “Trends in Knitting Technology and Machines”.

Group 5 - Garment Technology

Course 1 : “Garment Manufacture and Quality Control”.

Course 2 : “Fashion and Market Trends”.

Group 6 - Silk Textiles

Course 1 : “Silk Raw Material Production”.

Course 2 : “Silk Weaving and Processing”.

Course 3 : “Silk Garment Technology”.

The institutions universities may frame syllabi of Professional Electives and Open Electives to be offered by them in the above suggested areas.

OPEN ELECTIVES

Limited number of Open Electives have to be offered, hence the students have to be guided accordingly. Course contents of some of these electives are given hereunder. Course contents of the remaining Open Electives may be developed by the respective institutes/universities to impart state-of-the-art knowledge of the subjects.

1. Enterprise Resource Management.
2. E-Commerce, Strategic IT.
3. Technology Management.
4. Decision Support and Executive Information System.
5. Software Technology.
6. Knowledge Management.
7. IT in Marketing Management.
8. IT in HR Management
9. IT in Finance Management.
10. Project Management and Software Tools.
11. Human Values.
12. Science Technology and Society.

HUMAN VALUES

The objectives of the course is an exploration of human values which go into making a 'good' human being, a 'good' human society and a 'good' life. The context is the work life and the personal life of modern Indian professionals.

1. The value-crisis in the contemporary Indian Society.
2. The nature of values; the value spectrum for a 'good' life.
3. The Indian system of values.
4. Material development and its values : the challenge of science and technology.
5. Psychological values: integrated personality; mental health.
6. Societal values : the modern search for a 'good society ; justice, democracy rule of law; values in the Indian constitution.
7. Aesthetic values: perception and enjoyment of beauty.
8. Moral and ethical values; nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics or responsibility.
9. Work ethics; professional ethics.
10. Spiritual values; different concepts; secular spirituality.
11. Relative and absolute values.
12. Human values: humanism and human values; human rights; human values as freedom, creativity, love and wisdom.
13. Management by values: professional excellence; inter-personal relationships at work place; leadership and team building; conflict resolution and stress management; management of power.

SCIENCE, TECHNOLOGY AND SOCIETY

It will be innovative course dealing with social, human and ethical implications of engineering and technology, with special reference to the Indian situation. Its three main components are:

- (i) Social and Cultural history of technology.
- (ii) Social and Human critiques of technology.
- (iii) Engineering Ethics and Professional Ethics.

The proposed course structure is as follow:

1. Science, Technology and Engineering, as knowledge and as social and professional activities.
2. Inter-relationship of technology growth and social, economic and cultural growth; historical perspective.
3. Ancient, medieval and modern technology/industrial revolution and its impact. The Indian Science and Technology.
4. Social and human critiques of Technology : Mumford and Ellul.
5. Rapid technological growth and depletion of resources. Reports of the club of Rome. Limits to growth; sustainable development.
6. Energy crisis, renewable energy resources.
7. Environmental degradation and pollution. Eco-friendly technologies, Environmental regulations. Environmental ethics.
8. Technology and the arms race. The nuclear threat.
9. Appropriate technology movement Schumacher; later developments.
10. Technology and the developing nations. Problems of technology transfer. Technology assessment /impact analysis.
11. Human operator in the engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centered technology.
12. Industrial hazards and safety. Safety regulations. Safety engineering.
13. Politics and technology. Authoritarian versus democratic control of technology. Social and ethical audit of industrial organizations.

14. Engineering profession. Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and Ethical responsibilities of the Engineer. Codes of professional ethics. Whistle blowing and beyond. Case studies.

