MODEL CURRICULUM

FOR

UNDERGRADUATE PROGRAMME

B.E./Tech.

IN

TEXTILE TECHNOLOGY

ALL INDIA COUNCIL FOR TECHNICAL EDUCATION
(A statutory Body of Government of India)
I.G. Sports Complex, I.P. Estate
New Delhi-110 002
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:

<table>
<thead>
<tr>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit = (L+(T=P)/2) Grade Awarded</th>
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<tbody>
<tr>
<td>I</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3 A</td>
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<td>II</td>
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<td>III</td>
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<td>4 A</td>
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<td>IV</td>
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<td>4 B</td>
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<td>V</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2 C</td>
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</table>

Semester Grade Point Average = \( \frac{3A + 5B + 4A + 4B + 2C}{3+5+4+4+2} \)
\[= \frac{(30+40+40+32+12)}{18} = 8.55 \]

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
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>SUBJECT</th>
<th>PERIODS</th>
<th>EVALUATION SCHEME</th>
<th>Credits</th>
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<td>1</td>
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<td>Language (professional Comm. in English)</td>
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<td>15 10 25</td>
<td>50 75</td>
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<tr>
<td>2</td>
<td></td>
<td>Engineering Chemistry</td>
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<td>15 10 25</td>
<td>50 75</td>
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<td>3</td>
<td></td>
<td>Engineering Physics I</td>
<td>3 1 -</td>
<td>30 20 50</td>
<td>100 150</td>
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<td>4</td>
<td></td>
<td>Mathematic I</td>
<td>3 1 -</td>
<td>30 20 50</td>
<td>100 150</td>
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<td>5</td>
<td></td>
<td>Engineering Mechanics</td>
<td>3 1 -</td>
<td>30 20 50</td>
<td>100 150</td>
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<td>6</td>
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<td>Basic Electrical Engineering</td>
<td>3 1 -</td>
<td>30 20 50</td>
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<td>Chemistry/Physics Lab. (To be taken in alternate weeks)</td>
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<td>10</td>
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<td>Workshop Practice - I</td>
<td>- - 3</td>
<td>25 - 25</td>
<td>50</td>
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<td>GP-I</td>
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<td>Total</td>
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<td>1000 32</td>
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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)

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<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
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<th>EVALUATION SCHEME</th>
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<td>Environment &amp; Ecology</td>
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<td>10</td>
<td>25</td>
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<tr>
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<td>Engineering Physics II</td>
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<td>30</td>
<td>20</td>
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<td>4</td>
<td>Mathematics II</td>
<td>3 1 -</td>
<td>30</td>
<td>20</td>
<td>50</td>
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<tr>
<td>5</td>
<td>Engineering Thermodynamics</td>
<td>3 1 -</td>
<td>30</td>
<td>20</td>
<td>50</td>
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<tr>
<td>6</td>
<td>Basic Electronics</td>
<td>3 1 -</td>
<td>30</td>
<td>20</td>
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(PRACTICAL/DRAWING/DESIGN)

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<td>7</td>
<td>-</td>
<td>Basic Electronics Lab.</td>
<td>- - 3</td>
<td>25 -</td>
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<td>-</td>
<td>Computer Programming Lab.</td>
<td>- - 3</td>
<td>25 -</td>
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<td>-</td>
<td>Workshop Practice II</td>
<td>- - 3</td>
<td>25 -</td>
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GP-II  GENERAL PROFICIENCY

Total 16 6 12 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
<table>
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<tr>
<th>Sl. No.</th>
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<td>Introduction to Textiles</td>
<td>3</td>
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<td>Textile Raw Materials</td>
<td>3</td>
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<tr>
<td>3</td>
<td></td>
<td>Yarn Manufacture – I</td>
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<td>4</td>
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<td>Fabric Manufacture - I</td>
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<td>5</td>
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<td>Textile Chemical Processing-I</td>
<td>3</td>
<td>1</td>
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</table>

(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

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<td>ESE SUB TOTAL</td>
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<tr>
<td>1</td>
<td>Yarn Manufacture – II</td>
<td>3 1 -</td>
<td>30 20 50</td>
<td>100 150</td>
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<tr>
<td>2</td>
<td>Fabric Manufacture - II</td>
<td>3 1 -</td>
<td>30 20 50</td>
<td>100 150</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Textile Chemical Processing-II</td>
<td>3 1 -</td>
<td>30 20 50</td>
<td>100 150</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Testing of Raw Material, Yarns &amp; Fabrics</td>
<td>3 1 -</td>
<td>30 20 50</td>
<td>100 150</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Man-made Fibres Technology</td>
<td>3 1 -</td>
<td>15 10 25</td>
<td>75 100</td>
<td>4</td>
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(PRACTICAL/DRAWING/DESIGN/CASE STUDY)

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<th>Sl. No.</th>
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<tr>
<td>6</td>
<td>Yarn Manufacture – II Lab</td>
<td>- - 3</td>
<td>25 -</td>
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<td>7</td>
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<td>Textile Chemical Processing –II Lab</td>
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<td>25 25 50</td>
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<td>Testing of Raw Materials, Yarn and Fabric Lab</td>
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<td>25 -</td>
<td>25 25 50</td>
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<td>10</td>
<td>Man Made Fibres Technology Lab</td>
<td>- - 2</td>
<td>25 -</td>
<td>25 25 50</td>
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<td>GP-I</td>
<td>GENERAL PROFICIENCY</td>
<td>50 -</td>
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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
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<th>Sl. No.</th>
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<tr>
<td>1</td>
<td></td>
<td>Fabric Structure and Design</td>
<td>3</td>
<td>1</td>
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<td>2</td>
<td></td>
<td>Knit Fabric Manufacture</td>
<td>3</td>
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<td>3</td>
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<td>Manufacture of Garments and Fashion Trends</td>
<td>3</td>
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<td>4</td>
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<td>Quality Management</td>
<td>3</td>
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<td>Technical Textiles</td>
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|        |            | (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
<table>
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<th>Sl. No.</th>
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(*) 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

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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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Group 6 : Silk Textiles

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Human Values 73
Science, Technology and Society 74
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 classroom.
- 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

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 Walls 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 H₂ O₂ 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.
3. ENGINEERING PHYSICS-I

Theory of Relativity
Inertial frame of reference, Noninertial frames and fictious 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 this 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

- 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, Libnitz’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

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

Suggested Text Books & References
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

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

- Shames, I.H., “Engineering Mechanics”, Prentice Hall of India
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 cure, solution of magnetic circuits; Hysteresis and eddy current loses; Relays, an application of magnetic force.

Transformers
Construction, EMF equation, ratings; Phasor diagram on no lad and full load; Equivalent circuit, regulation and efficiently 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**

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 interesting 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

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 are 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

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, compliers.
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.
Summation of N natural numbers.
Arranging numbers in ascending and descending orders.
Separation of odd and even numbers, etc.

Suggested Text Books & References
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 waster, recovery and conversion methods.

Noise Pollution
Sources, effects, standards and control.

Books & References
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 waves, 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
13. MATHEMATICS –II

Linear Algebra

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 homogenous and nonhomogenous 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

Suggested Text Books & References
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

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**

**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
- Milliman & Halkias, “Basic Electronics Principle”
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

Computer Aided Drafting
Basic concepts and used.

Suggested Text Books & References.
17. INTRODUCTION TO TEXTILES

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


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.
- “Cotton Spinning”, ATIRA Publication, Ahmedabad
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”.
- 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

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
● BTRA Report of Winding.
● BTRA Report on Warping and Sizing.
● Lord and Mohemad, “Conversion of Yarn to Fabric”.
● Hougton, “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
- “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

Suggested Text Books & References
- Nield, O., “Principles of Rotor Spinning”.
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 pin 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-looms, 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**
- 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., “Principle and Practice of Dyeing”, Sevak Publisher, Bombay
- Shenai, V.A., “Fundamentals of Principles of Textile Wet Processing”, Sevak Publisher, Bombay
- Prayag, C.R., “Dyeing of Silk and Manmade Fibre”.
- Prayag, C.R., “Bleaching, Mercerizing and Dyeing of Cotton”.
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
- Slater, “Textile Progress’ Physical Testing and Quality Control”, Textile Institute, Manchester.
● “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
- Mukhopadhyay, S., “Advances in Fibre Science”, Textile Institute, Manchester.


• Robinson, J.S., “Spinning and Extruding of Fibres”.

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 prominency 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

Suggested Text Books & References
- Ashnehurst, “Textile Calculation & Structure of Fabruic”.
- 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 knot machines and fabrics

Calculation and maintenance pertaining to the knitting machines.

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

Suggested Text Books & References
- David Spencer, “Knitting Technology”.
- 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.


Suggested Text Books & References
- Natalie Bray, “Dress Pattern Design”.
- Chuter, “Introduction of Clothing Production”.
- Ila Kantilal, “The Apparel Industry in India”.
- Mehta, “Managing Quality in the Apparel Industry”.
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
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

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
**Functional Fabrics**
Fire protection, thermal and electrical insulation, base cloth commonly used materials, coating techniques, Waterproof fabrics, Gauze fabrics.

**Medical Textiles**

**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**
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 is 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 x M and M x 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

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
34. TEXTILE MACHINE DESIGN

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

Form Design
Factors affecting from 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
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

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**

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

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

38. COST ACCOUNTING AND FINANCIAL MANAGEMENT

General Principles

Accounting Procedure

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

Income Accounting

Financial Management

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

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

- Srinivasan, Kastury, “India’s Textile Industry”.
- 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

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
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
42. PERSONALITY DEVELOPMENT

Organizational Behaviour
Interpersonal 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
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.

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.
11. Human Values.
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.
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.
5. Rapid technological growth and depletion of resources. Reports of the club of Rome. Limits to growth; sustainable development.
8. Technology and the arms race. The nuclear threat.
9. Appropriate technology movement Schumacher; later developments.