# Curriculum

**for**

# Bachelor of Textile Engineering Technology

# Degree

**(2022)**


**Higher Education Commission**
**Islamabad**

# Acronyms, Abbreviations & Definitions

| Acronym/Abbreviation | Definition |
|---|---|
| **HEC** | Higher Education Commission |
| **NTC** | National Technology Council |
| **NCRC** | National Curriculum Review Committee |
| **IDEE** | Integration of Data in Engineering Environment |
| **IEA** | International Engineering Alliance |
| **IDTE** | Inter Disciplinary Technology Elective |
| **MATLAB** | Matrix Laboratory |
| **HEI** | Higher Education Institution |
| **RIC** | Resistance, Inductance, Capacitance |
| **IEEE** | Institute of Electrical and Electronics Engineers |
| **SIT** | Supervised Industrial Training |
| **LTI** | Linear Time-Invariant System |
| **BJT** | Bipolar Junction Transistor |
| **MOSFET** | Metal–Oxide–Semiconductor Field-Effect Transistor |
| **IGBT** | Insulated-Gate Bipolar Transistor |
| **Th** | Theory |
| **Lab** | Laboratory |
| **Cr. Hrs.** | Credit Hours |
| **PLO** | Program Learning Outcome |
| **CLO** | Course Learning Outcome |
| **ICT** | Information and Communications Technology |
| **OSI** | Open Systems Interconnection |
| **LAN** | Local Area Network |
| **WAN** | Wide Area Network |

| | |
|---|---|
| **MAN** | Metropolitan Area Network |
| **RMS** | Root Mean Square |
| **Hb** | Hemoglobin |
| **CBC** | Complete blood count |
| **WBC** | White Blood Cells |
| **pH** | Potential of Hydrogen |
| **TLC** | Thin-Layer Chromatography |
| **HPLC** | High Performance Liquid Chromatography |
| **DNA** | Deoxyribonucleic acid |
| **RNA** | Ribonucleic acid |
| **ATP** | Adenosine Triphosphate |
| **OGTT** | Oral Glucose Tolerance Test |
| **ODEs** | Ordinary Differential Equations |

# Contents

# 1. Introduction

Curriculum is the total learning experience of a student that occurs in the educational process. The term refers specifically to a planned sequence of instruction, and to the student's experiences in terms of the educator's or institutions instructional goals. Curriculum is a systematic and intended packaging of competencies (i.e., knowledge, skills, and attitudes, underpinned by values) that learners should acquire through organized learning experiences.

Curriculum forges in learners' life-long learning competencies, as well as social attitudes and skills, such as tolerance and respect, constructive handling of diversity, peaceful conflict management, promotion and respect of Human Rights, gender equality, justice, and inclusiveness. At the same time, curriculum must be singularly aligned to national development goals, and produce human resource that becomes an effective factor of production in the economy.

Curriculum is thus the foundation on which rests the edifice of academic programs designed for focused outcomes that equip graduates with desired skill sets. Engineering technology curriculum aims to produce proficient engineering technology graduates who meet demands of both national and international job markets. The curriculum conforms substantially to the Sydney Accord – the international accreditation body regulating local accrediting institutions of partnering countries -- and is in consonance with the essence of Graduates Attributes and Professional Competence defined by International Engineering Alliance (IEA). [See Appendix A through C]

Curriculum is developed and reviewed by HEC's National Curriculum and Review Committee (NCRC).

# 2. Curriculum Development Methodology

## 2.1 Benchmarking

Curriculum for Textile Engineering Technology is benchmarked to HEC's Undergraduate Policy and in accordance with NTC Curriculum Framework. It conforms substantially to the standards laid out by the Sydney Accord and the International Engineering Alliance pertaining to engineering technology programs [See Appendix A through C].

The course of studies clearly defines and differentiates the program from Textile Engineering by contact hours spent in classrooms, laboratories, and industry.

Ideally an engineering program is designed with classroom to practical training ratio of 70:30 contact hours with emphasis on design aspects. Whereas for engineering technology programs, the ratio of contact hours is reversed to 30:70, providing more opportunity for hands on and psychomotor training.

## 2.2 Curriculum Development Cycle

Curriculum development is a rigorous process and entails the following steps:

- Nominations are requested from academic circles and relevant industry forums to constitute a National Curriculum Review Committee (NCRC) comprising of leading national experts.

- From the nominations received, NCRC is finalized and notified by NTC(HEC).

- HEC/NTC selects a Team Leader for program curriculum development to work under the aegis of NCRC through mutual consultation with NCRC Members.

- Preliminary Meeting of NCRC spanning three days is held to establish framework and benchmarking issues and assign different facets of curriculum development to smaller teams within the NCRC.

- A draft of program curriculum is prepared by NCRC at the end of the Preliminary Meeting and sent to relevant foreign experts for review and feedback.

- After foreign expert's review, a Final NCRC Meeting lasting up to three days is held to finalize the recommendations and prepare final curriculum document.

- The entire cycle of curriculum development is completed in two months.

## 2.3 Historical Timeline of Meetings

Historical Timeline of meetings carried out in this context are enlisted below:

- Preliminary Meeting of NCRC [See Appendix D]

- Final Meeting of NCRC [See Appendix E]

# 3. Curriculum Details

| **Bachelor of Textile Engineering Technology Program** | | | |
|---|---|---|---|
| **Parameter** | **HEC Framework** | **Framework - A (SIT in Semester 07 & 08)** | **Framework - B (SIT in Semester 08 Only)** |
| **Program Type** | Semester System | Semester System | Semester System |
| **Program Duration** | 8 Semesters<br>Min: 4 Years<br>Max: 7 Years | 8 Semesters<br>Min: 4 Years<br>Max: 7 Years | 8 Semesters<br>Min: 4 Years<br>Max: 7 Years |
| **Semester Duration** | 16 weeks of Teaching<br>2 weeks for Exams | 16 weeks of Teaching<br>2 weeks for Exams | 16 weeks of Teaching<br>2 weeks for Exams |
| **Total Number of Courses** | 39-47 | 39 | 45 (Opt.**) |
| **Engineering Technology Domain Courses** | 25-34 | 26 | + 6 (Opt.) |
| **Non-Engineering Technology Domain Courses** | 13 | 13 | 13 (Opt.) |
| **Total Credit Hours** | 124-136 | 136 | 136 |
| **Engineering Technology Domain Credit Hours** | - | 104 | 104 (opt) |
| **Percentage of Engineering Technology Domain Courses** | - | 76.48 % | 76.48 % |
| **Percentage of Non-Engineering Technology Domain Courses** | 31.45% | 23.52 % | 23.52 % |
| **Non-Engineering Technology Domain Credit Hours** | 39 | 32 | 32 |
| **No. of Credit Hours per Semester** | 15 – 18 | 16-18 | 16-18 |
| ** Optional Courses may be included for Framework B (SIT in Semester 08 only) | | | |

| **Engineering Technology Domain Courses in Recommended Schemes of Studies as per Framework** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Knowledge Area** | **Name of Course** | **Credit Hours** (Th+Lab) | **Contact Hours** (Th+Lab) | **Total Credit Hours** | | **Number of Courses** | |
| | | | | **As per Scheme of Studies** | **As per Framework** | **As per Scheme of Studies** | **As per Framework** |
| **Computing** | Introduction to Computing | 1+1=2 | 1+3=4 | 4 | - | 2 | 2-3 |
| | Computer Programming | 1+1=2 | 1+3=4 | | | | |
| **Textile Engineering Technology (Foundation)** | Introduction to Textile Technology | 2+0=2 | 2+0=2 | 23 | - | 9 | 7-10 |
| | Technical Drawing & CADs | 0+1=1 | 0+3=3 | | | | |
| | Textile Raw Materials | 3+0=3 | 3+0=3 | | | | |
| | Fiber Science & Technology | 2+1=3 | 2+3=5 | | | | |
| | Mechanics of Fibrous Structures | 1+1=2 | 1+3=4 | | | | |
| | Yarn Preparatory Process | 2+1=3 | 2+3=5 | | | | |
| | Fabric Manufacturing Preparatory Process | 2+1=3 | 2+3=5 | | | | |
| | Pretreatment of Textiles | 2+1=3 | 2+3=5 | | | | |
| | Anthropometry and Garment Construction | 1+1=2 | 1+3=4 | | | | |
| **Textile Engineering Technology (Breadth)** | Textile Dyeing | 2+1=3 | 2+3=5 | 20 | - | 8 | 7-10 |
| | Industrial Cutting & Sewing | 2+1=3 | 2+3=5 | | | | |
| | Yarn Manufacturing Technology | 2+1=3 | 2+3=5 | | | | |
| | Fabric Manufacturing Technology | 2+1=3 | 2+3=5 | | | | |
| | Textile Testing | 1+1=2 | 1+3=4 | | | | |
| | Apparel Merchandizing & Sourcing | 2+0=2 | 2+0=2 | | | | |
| | Spinning Calculations | 2+0=2 | 2+0=2 | | | | |
| | Fabric Manufacturing Calculations | 2+0=2 | 2+0=2 | | | | |
| **Textile Engineering Technology (Depth)** | Textile Printing | 2+1=3 | 2+3=5 | 15 / 31 Opt. | - | 5 / 11 Opt. | 5-7 |
| | Sewn Product Technology | 2+1=3 | 2+3=5 | | | | |
| | Specialty Engineered Yarns | 2+1=3 | 2+3=5 | | | | |
| | Specialty Fabric Manufacturing & Design | 2+1=3 | 2+3=5 | | | | |
| | Finishing & Coating | 2+1=3 | 2+3=5 | | | | |
| | Depth Elective-I (Optional) | 2+1=3 | 2+3=5 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Depth Elective-II (Optional) | 2+1=3 | 2+3=5 | | | | |
| | Depth Elective-III (Optional) | 3+0=3 | 3+0=3 | | | | |
| | Depth Elective-IV (Optional) | 3+0=3 | 3+0=3 | | | | |
| | Depth Elective-V (Optional) | 2+0=2 | 2+0=2 | | | | |
| | Depth Elective-VI (Optional) | 2+0=2 | 2+0=2 | | | | |
| **IDTE** | Workshop Practices | 0+2=2 | 0+6=6 | 4 | 5 | 2 | 2 |
| | Electrical & Electronic Technology | 2+1=3 | 2+3=5 | | | | |
| **Senior Design Project** | Project Part-I | 0+3=3 | 0+9=9 | 6 | 6 | 2 | 2 |
| | Project Part-II | 0+3=3 | 0+9=9 | | | | |
| **Training** | Supervised Industrial Training-(Opt.) | 0+16=16 | 0+16=16 | 16** | | 0 | |
| | Supervised Industrial Training | 0+16=16 | 0+16=16 | 16 | | 0 | |
| **Total Credit Hours and Courses (For Engineering Technology Domain Courses)** | | 103 | 160-164 | 103/ 103 (Opt.) | | 28 / 34 (Opt.) Courses | |

** Optional Courses may be included for Framework B (SIT in Semester 08 only)

**Non-Engineering Technology Domain Courses in**

**Recommended Schemes of Studies as per Framework**

| Knowledge Area | Sub Area | Name of Course | Credit Hours (Th+Lab) | Contact Hours (Th+Lab) | Total Credit Hours | | Number of Courses | |
|---|---|---|---|---|---|---|---|---|
| | | | | | As per Scheme of Studies | As per Framework | As per Scheme of Studies | As per Framework |
| **Humanities and Social Sciences** | English (Expository Writing) | Communication & Presentation Skills | 3+0=3 | 3+0=3 | 6 | 6 | 2 | 2 |
| | | Functional English | 3+0=3 | 3+0=3 | | | | |
| | Culture | Islamic Studies / Ethics | 3+0=3 | 3+0=3 | 6 | 6 | 2 | 2 |
| | | Pakistan Studies | 3+0=3 | 3+0=3 | | | | |
| | Social Sciences Electives | Professional Ethics | 3+0=3 | 3+0=3 | 8 | 9 | 3 | 5 |
| | | Social Sciences / Management Sciences Elective | 2+0=2 | 2+0=2 | | | | |
| **Management Sciences** | Management Sciences | Total Quality Management | 3+0=3 | 3+0=3 | | | | |
| **Natural Sciences** | Quantitative Reasoning | Applied Mathematics | 3+0=3 | 3+0=3 | 5 | 6 | 2 | 2 |
| | | Applied Statistics | 3+0=3 | 3+0=3 | | | | |
| | Physics | Applied Physics | 2+1=3 | 2+3=5 | 3 | 3 | 1 | 1 |
| | Chemistry | Applied Chemistry | 2+1=3 | 2+3=5 | 3 | 3 | 1 | 1 |
| **Total Credit Hours and Courses**<br>** Optional Courses may be included for Framework B (SIT in Semester 08 only) | | | | | Cr. Hrs.<br>**32/35** | | Courses<br>**11 /13** | |

<table>
<tr><th colspan="2">List of Elective Topics</th></tr>
<tr><td>Social Sciences</td><td>Management Sciences</td></tr>
<tr><td>➢ Professional Ethics<br>➢ Sociology for Technologist<br>➢ Critical Thinking<br>➢ Organizational Behavior<br>➢ Professional Psychology<br>➢ Elective Courses by HEI*</td><td>➢ Operations Management<br>➢ Project Management<br>➢ Entrepreneurship<br>➢ Leadership and Personal Grooming<br>➢ Elective Courses by HEI*</td></tr>
<tr><td>Natural Sciences*</td><td>Depth Electives*</td></tr>
<tr><td>➢ Multivariable Calculus<br>➢ Discrete Mathematics<br>➢ Numerical Analysis<br>➢ Chemistry<br>➢ Biology<br>➢ Elective Courses by HEI*</td><td rowspan="3">➢ Advances in Spinning Technologies<br>➢ Synthetic Fiber Production<br>➢ Denim Processing Technology<br>➢ Elective Courses by HEI*</td></tr>
<tr><td>Breadth Electives*</td></tr>
<tr><td>➢ Ginning Technology<br>➢ High Performance Fibers<br>➢ Nonwoven and Technical Textiles<br>➢ Elective Courses by HEI*</td></tr>
<tr><td colspan="2">*Any related course can be included with approval of the HEI's Statutory Bodies (maximum: 3 courses per elective knowledge area)</td></tr>
</table>

# 4. Admission Criteria

Criteria for admission in Bachelor of Electronics Engineering Technology program is defined in NTC's Accreditation Manual, Clause 3.2.4.1. Salient features for eligibility for admission are:

1. At least 50% marks in DAE/FSc (Pre-engineering) or other equivalent qualifications such as A-level/ICS/B.Sc. (sports and Hafiz-e-Quran marks are not counted), and
2. Entrance Test

Weighted average score for admission is calculated by:

1. 70% for academics (DAE/FSc etc.)
2. 30% for Entrance Test

# 5. Semester-wise Scheme of Studies

Semester-wise scheme of studies for the Bachelor of Textile Engineering Technology program spanning 04 years, spread over 08 semesters, and encompassing 136 credit hours is presented below:

| **SEMESTER-I** | | | | |
|---|---|---|---|---|
| **Course Codes** | **Course Title** | **Knowledge Area/Domain** | **Credit Hrs. (Th+Lab)** | **Contact Hrs. (Th+Lab)** |
| | Islamic Studies/Ethics | Art & Humanities | 3+0 | 3+0 |
| | Functional English | Expository Writing | 3+0 | 3+0 |
| | Applied Mathematics | Quantitative Reasoning | 3+0 | 3+0 |
| | Applied Physics | Natural Sciences | 2+1 | 2+3 |
| | Introduction to Computing | Computing | 1+1 | 1+3 |
| | Fundamentals of Textile Technology | Textile Engineering Technology Foundation | 2+0 | 2+0 |
| | Technical drawing and CADs | Textile Engineering Technology Foundation | 0+1 | 0+3 |
| | **Total** | | **14+3 =17** | **14+9 =23** |

| | | | | |
|---|---|---|---|---|
| **SEMESTER-II** | | | | |
| | Pakistan Studies | Art & Humanities | 3+0 | 3+0 |
| | Workshop Practices | Inter Disciplinary Technology | 0+2 | 0+6 |
| | Communication & Presentation Skills | Expository Writing | 3+0 | 3+0 |
| | Applied Statistics | Quantitative Reasoning | 3+0 | 3+0 |
| | Textile Raw Materials | Textile Engineering Technology Foundation | 3+0 | 3+0 |
| | Applied Chemistry | Natural Sciences | 2+1 | 2+3 |
| | **Total** | | **14+3=17** | **14+9 =23** |
| **SEMESTER-III** | | | | |
| **Course Codes** | **Course Title** | **Knowledge Area** | **Credit Hrs. (Th+Lab)** | **Contact Hrs. (Th+Lab)** |
| | Electrical & Electronic Technology | Inter Disciplinary Technology | 2+1 | 2+3 |
| | Fiber Science & Technology | Textile Engineering Technology Foundation | 2+1 | 2+3 |
| | Yarn Preparatory Process | Textile Engineering Technology Foundation | 2+1 | 2+3 |
| | Fabric manufacturing Preparatory Process | Textile Engineering Technology Foundation | 2+1 | 2+3 |
| | Pretreatment of Textiles | Textile Engineering Technology Foundation | 2+1 | 2+3 |
| | Anthropometry and Garment Construction | Textile Engineering Technology Foundation | 1+1 | 1+3 |
| | **Total** | | **11+6 =17** | **11+18 =29** |

| | | | | |
|---|---|---|---|---|
| **SEMESTER-IV** | | | | |
| | Computer Programming | Computing | 1+1 | 1+3 |
| | Social Sciences / Management Sciences Elective | Social Sciences | 2+0 | 2+0 |
| | Mechanics of Fibrous Structures | Textile Engineering Technology Foundation | 1+1 | 1+3 |
| | Textile Dyeing | Textile Engineering Technology Breadth | 2+1 | 2+3 |
| | Industrial Cutting & Sewing | Textile Engineering Technology Breadth | 2+1 | 2+3 |
| | Yarn Manufacturing Technology | Textile Engineering Technology Breadth | 2+1 | 2+3 |
| | Fabric Manufacturing Technology | Textile Engineering Technology Breadth | 2+1 | 2+3 |
| | **Total** | | **12+6 =18** | **12+18 =30** |
| **SEMESTER-V** | | | | |
| **Course Codes** | **Course Title** | **Knowledge Area** | **Credit Hrs. (Th+Lab)** | **Contact Hrs. (Th+Lab)** |
| | Spinning Calculations | Textile Engineering Technology Breadth | 2+0 | 2+0 |
| | Fabric Manufacturing Calculations | Textile Engineering Technology Breadth | 2+0 | 2+0 |
| | Professional Ethics | Social Sciences | 3+0 | 3+0 |
| | Textile Testing | Textile Engineering Technology Breadth | 1+1 | 1+3 |
| | Textile Printing | Textile Engineering Technology Depth | 2+1 | 2+3 |
| | Apparel Merchandizing and Sourcing | Textile Engineering Technology Breadth | 2+0 | 2+0 |
| | Project-I | Textile Engineering Technology Domain Project | 0+3 | 0+9 |
| | **Total** | | **12+5 =17** | **12+15 =27** |

| | | | | |
|---|---|---|---|---|
| **SEMESTER-VI** | | | | |
| | Total Quality Management (Elective Mgt Course) | Social Sciences | 3+0 | 3+0 |
| | Sewn Product Technology | Textile Engineering Technology Depth | 2+1 | 2+3 |
| | Speciality engineered yarns | Textile Engineering Technology Depth | 2+1 | 2+3 |
| | Speciality fabric manufacturing and design | Textile Engineering Technology Depth | 2+1 | 2+3 |
| | Finishing & Coating | Textile Engineering Technology Depth | 2+1 | 2+3 |
| | Project-II | Textile Engineering Technology Domain Project | 0+3 | 0+9 |
| | **Total** | | **11+7 =18** | **11+21 =32** |
| **SEMESTER-VII** | | | | |
| **Course Codes** | **Course Title** | **Knowledge Area** | **Credit Hrs.** (Th+Lab) | **Contact Hrs.** (Th+Lab) |
| | Supervised Industrial Training/ Electives | | 0+16 | |
| | **Total** | | **0+16=16** | |
| **SEMESTER-VIII** | | | | |
| | Supervised Industrial Training | | **0+16** | |
| | **Total** | | **0+16= 16** | |
| **Total Credit Hours & Contact Hours in Four Years** (When SIT conducted in both 7th and 8th Semester) | | | **74+62 = 136** | **74+186=260** |
| Theory vs Practical with respect to Contact Hours | | | Theory<br>Practical | 74 (28.46%)<br>186 (71.54%) |
| **Total Credit Hours & Contact Hours in Four Years** (When optional courses conducted instead of SIT in 7th Semester**)** | | | **88+48 = 136** | **88+144 =232** |
| Theory vs Practical with respect to Contact Hours | | | Theory<br>Practical | 88 (37.93%)<br>144 (62.07%) |

# 6. Course Codes

Details pertinent to course code are presented below:

- Each course has a unique three letter prefix, followed by three-digit code.
- Letters are acronyms for course description, and numbers define the chronological position in the academic year and sequence number in the program.
- Program will span over 4 years, with 2 semesters per year, Spring and Fall (with possible inclusion of Summer Semester).

Digits in course-code are defined in table below:

| 1st Digit | 2nd Digit | 3rd Digit |
|---|---|---|
| Denotes Year (1,2,3,4) | Denotes Semester (1,2,3…) | Denotes Sequence (1, 2, 3…) |

Letters in course-code prefix are defined below:

- First two letters pertain to the program (e.g., TE for Textile)
- Third letter pertains to specifics of the course (e.g., T for technology, E for expository writing etc.)

| Sr. | Course Code Prefix | Description |
|---|---|---|
| 1 | TE**T** | Textile Engineering Technology Foundation/ Breadth/ Depth |
| 2 | TE**E** | Expository Writing |
| 3 | TE**H** | Art & Humanities |
| 4 | TE**S** | Social Sciences |
| 5 | TE**Q** | Quantitative Reasoning |
| 6 | TE**N** | Natural Sciences |
| 7 | TE**C** | Computing |
| 8 | TE**M** | Management Sciences |
| 9 | TE**I** | Inter Disciplinary Technology Elective |

# 7. Elective Courses

The lists of elective courses – grouped across depth and breadth categories – are presented below:

| **Elective Breadth Courses** | | | | |
|---|---|---|---|---|
| **Course Code** | **Title** | **Knowledge Area** | **Credit Hrs.** (Th+Lab) | **Contact Hrs.** (Th+Lab) |
| | Ginning Technology | Textile Engineering Technology Breadth Elective-I | 2+1 | 2+3 |
| | High Performance Fibers | Textile Engineering Technology Breadth Elective-II | 2+0 | 2+0 |
| | Nonwoven and Technical Textiles | Textile Engineering Technology Breadth Elective-III | 3+0 | 3+0 |

| **Elective Depth Courses** | | | | |
|---|---|---|---|---|
| **Course Code** | **Title** | **Knowledge Area** | **Credit Hrs.** (Th+Lab) | **Contact Hrs.** (Th+Lab) |
| | Advances in Spinning Technologies | Depth Elective-I | 3+0 | 3+0 |
| | Synthetic Fiber Production | Depth Elective-II | 2+0 | 2+0 |
| | Denim Processing Technology | Depth Elective-III | 2+1 | 2+3 |

# 8. Course Contents

Primary goal of this curriculum is to be substantially in compliance with international standards set by relevant agencies such as the International Engineering Alliance (IEA) and the Sydney Accord.

Program Learning Objectives (PLO's), Course Learning Objectives (CLO's) and Bloom's Taxonomy Levels are expected learning outcomes and are aligned to standards set by the Sydney Accord and the International Engineering Alliance.

# 1. Islamic Studies/ Social Ethics

| COURSE TITLE<br><br>Islamic Studies/ Social Ethics | CREDITS HOURS<br>(3+0)<br>48 Theory + 0 Lab Sessions | KNOWLEDGE AREA/ DOMAIN<br><br>Art & Humanities | |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Recite** Holy Quran with correct pronunciation. | C-1 | 6 |
| **CLO-2** | **Apply** understanding of basic concepts of teaching of Islam (faith, pillars, Dawit, preaching and Seerat). | C-3 | 8 |
| **CLO-3** | **Present** Islam as a complete code of life. | A-3 | 12 |

**Course Outline for theory**

**History of Islam:** Compilation of the Holy Quran and Hadith, Fundamental doctrines of Islam i.e., Tawheed, oneness of Allah, Prophet hood, the day of Judgment, Revealed books, Ibadaat (worship) Philosophy of Ibadaat, Namaz, Zakat, Hajj & Sawm, Importance of preaching of Islam, its needs and effects, Difficulties in the ways of preaching of Islam, sectarianism, its causes and effects in Muslim society, definition of Right, classification of Right, importance of Rights, Khutba Hajjatul Wida (last address of the Holy Prophet, peace be upon him), Seeratun-Nabi (Peace be upon him).

**Life of Holy Prophet (Peace be upon him):** The life of the Holy Prophet before and after prophet hood. The Hijra (Migration to Madina), Treaty of Al Madina, Makki and Madani life of Holy Prophet Muhammad (Peace be upon him), importance of peace and causes of terrorism.

**Islam and Civilization:** Definition of civilization, Impacts of Islamic civilization on the Sub-continents, international impacts of Islamic civilization, Impacts of Human thoughts, social and humanistic effects, Importance of Ethics, Human rights (Hoqooq Ul Ibad) with detail.

**Knowledge and Islam:** Definition of Knowledge, Classification of knowledge, Importance of technology in the light of Holy Quran and Sunnah, relevant verses of the Holy Quran about Technology (Baqara 28,30,33,201, Nahal:76, Jasia: 13, Araf: 32, Noor: 55 etc), Islamic and scientific knowledge.

**Recommended Books**

1. "A Guidebook for Muslims", by Syed. Abul Hasan Ali Nadvi. (Latest Edition)
2. "An Introduction to Islam", by Dr. Muhammad Hameedullah. (Latest Edition)
3. "What is Islam?" by Maulana Manzoor Nomani. (Latest Edition)
4. "Islamiat: A standard book for CSS", Prof. Dr. Arif Naseem. (Latest Edition)
5. "Islamiat: for Students O levels", Farkhanda Noor Muhammad. (Latest Edition)

# 2. Functional English

| **COURSE TITLE**<br><br>**Functional English** | | **CREDITS HOURS**<br>(3+0)<br>**48 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Expository Writing** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Use** language skills and strategies in different situations for variety of functions. | A3 | 3 |
| **CLO-2** | **Complete** academic writing tasks by following writing process and appropriate strategies to suit the context and genre. | C3 | 10 |
| **CLO-3** | **Deliver** effective presentations and participate actively in group discussions at acceptable level of oral proficiency. | A4 | 12 |
| **Course Outline for Theory** | | | |
| Greetings; Reading skills: importance & strategies; Previewing; Reading practice through variety of reading texts and comprehension exercises; Skimming & Scanning; Summarizing; Types of listening: active: content: critical: selective Problems in listening and coping strategies; Listening skills and sub skills; Note Taking; Techniques for taking notes from lectures; from books; different forms paragraphs; points; figures; processes; tables; graphs; Vocabulary Development; Inferring meaning from context; Process of Writing and informal Writing strategies; Writing correctly: sentence structure and punctuation; error correction; Paragraphs writing; Unity; adequate development and coherence in paragraphs; Essays: Types of essays; narrative; descriptive; argumentative: Structure of essays; thesis statement and the paragraphs; informational and analytical reports; Letters: routine requests and intimation; invitation; thank you and condolence letters etc.; Presentation skills | | | |
| **Recommended Books** | | | |
| 1) Kakarla, Gupta, Pundir, 2019, Functional English for Communication, ISBN: 9789353282073, Sage | | | |

# 3. Applied Mathematics

| **COURSE TITLE**<br><br>**Applied Mathematics** | | **CREDITS HOURS**<br>(3+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Quantitative Reasoning** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Explain** ideas of rate of change, derivatives, and its basic applications | C-2 | 1 |
| **CLO-2** | **Apply** techniques of integration for solving and analyzing problems in integral calculus | C-3 | 2 |
| **CLO-3** | **Describe** vector calculus and analytical geometry in multiple dimensions for investigation of different problems. | C-2 | 4 |

**Course Outline for Theory**

Basic definition of derivatives: differentiation of different function, rule of differentiation, chain rule implicit differentiation,

Applications: slope, equation of tangent and normal. maxima, minima and point of inflection

Indefinite integral: different technique fhttps://askaribank.com or integration i.e integration by parts, integration by substitution, by partial fraction, integration of different trigonometric identity

Definite integral: application of definite integral, i.e., area under the curve; area between the curve, mean value theorem, finding the volume by slicing, volume of solid revolution; Disk and Washer method, moment, and center of mass etc.

Vector in space: vector calculus, divergence, curl of vector field, Directional derivatives, multivariable function partial derivatives, spherical, polar, cylindrical coordinates

Vector in plane: dot product and cross products, line, and plane in space; application: work, angle between two vectors, area of triangle, area of parallelogram etc.

**Recommended Books**

H. Anton, I. C. Bivens, S. Davis, "Calculus, Early Transcendental", 11th edition (or Latest Edition), John Wiley, New York, 2016.

Essential Calculus by James Stewart, 2nd Edition (or Latest Edition)

G. B. Thomas, A. R. Finney, "Calculus", 14th edition (or Latest Edition), Pearson, USA, 2017.

S.M Yousaf, "Calculus and Analytic Geometry" (or Latest Edition).

Advanced Engineering Mathematics by Erwin Kreyszig, 10th Ed. (or Latest Edition) Willey 2014.

# 4. Applied Physics

| **COURSE TITLE**<br><br>**Applied Physics** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Natural Sciences** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Explain** the fundamental physical principles. | | C2 | 1 |
| **CLO-2** | **Apply** these principles, together with logical and mathematical reasoning, to situations of the physical world. | | C3 | 2 |
| **CLO-3** | **Analyze** different physical problems using the laws of physics. | | C4 | 3 |
| **CLO-4 Lab** | **Construct** basic circuits and demonstrate relevant theorems using Resistors and Capacitors | | P1 | 2 |
| **CLO-5 Lab** | **Differentiate** classroom knowledge and laboratory techniques for learning of basic principle used in magnetism | | P1 | 4 |

**Course Outline for Theory**

Electric charge, Conductors and insulators, Coulomb's law, Electric field, Field due to a point-charge Electric dipole and line of charge, Flux of an electric field, Permittivity of a medium, Gauss's law, Application of Gauss's Law,

Electric potential, calculating the potential from electric field, Potential due to a point-charge and a group of point-charges. Potential due to a dipole, Potential due to a continuous charge distribution,

Capacitors, calculating capacitance, Capacitors in series and parallel, Factors affecting capacitance, Application of Capacitors, Current and Conductors, Electric current and current density, Resistance and resistivity, Ohm's law, The Steady Magnetic Field, Resistors in series and parallel, Temperature dependence of resistance and other factors affecting resistance, Application of resistors, The magnetic field, Magnetic force on a current carrying conductor, Torque on a current-loop. Magnetic field due to current, Force between two parallel current-carrying conductors, Biot Savart law and its applications, Ampere's law, Inductance and inductors, Factors affecting inductance Permeability Faraday's law of induction, Lenz's law, Energy stored in a magnetic field, Self-induction, Mutual Induction, Magnets and magnetic materials, Di-magnetic material, Para-magnetic material, Ferromagnetism.

**Recommended Books**

1. Halliday, Resnick and Walker, "Fundamentals of Physics" (Latest Edition)
2. Hugh D. Young and R.A. Freedman, University Physics. (Latest Edition)
3. Raymond A Serway and John W. Jawett, Jr. Physics for Scientists and Engineers with modern Physics, (Latest Edition)
4. Fundamentals of Electromagnetic Phenomenon by D. Corson & Lorrain. (Latest Edition)

# 5. Introduction to Computing

| **COURSE TITLE**<br><br>**Introduction to Computing** | | **CREDITS HOURS**<br>**(1+1)**<br>**16 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Computing** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Know** the working of computer hardware and software. | C1 | 1 |
| **CLO-2** | **Possess** problem-solving skills and develop small scale computer programs. | C2 | 3 |
| **CLO-3** | **Assess** the concepts of data communication and networks. | C3 | 2 |
| **CLO-1 Lab** | **Describe** the working of hardware components of computer. | P1 | 2 |

**Course Outline for Theory**

Introducing Computer Systems: Basic Definitions, Computer and Communication Technology, the applications of ICT - particularly for engineering technology. Basic Operations and Components of a Generic Computer System: Basic operations: Input, Processing, output, storage Basic components: Hardware, Software, Data, Users, types of storage devices. Processing Data: Transforming data into information, how computers represent and process data, Processing Devices, CPU architectures

The Internet: The Internet and the World Wide Web- browsers, HTML, URLs/ How DNS works, Email and other programs. Introduction to Embedded Systems: What is an Embedded System, Applications, Components, Programming Languages, Popular Development Platforms. Networking Basics: Uses of networks, Common types of networks (LAN, WAN, MAN etc.), Introduction to OSI Model, Future of Networks

Database Management: Hierarchy of Data, Maintaining Data, Database Management Systems. Exposure to ICT Tools and Blogs (Student Assignment)

Protecting your privacy, your computer and your data: Basic Security Concepts, threats to users, threats to hardware, threats to Data

**Recommended Books**

1. "Introduction to Computers", Peter Norton, McGraw-Hill. (Latest Edition)
2. "Computing Essentials", Timothy O'Leary and Linda O'Leary, McGraw-Hill. (Latest Edition)
3. Using Information Technology: A Practical Introduction to Computers & Communications", Williams Sawyer, McGraw-Hill. (Latest Edition)
4. "Discovering Computers, Complete: Your Interactive Guide to the Digital World. Cengage Learning" Shelly GB, Vermaat ME, (Latest Edition)

# 6. Introduction to Textile Technology

| **COURSE TITLE**<br><br>**Introduction to Textile Technology** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Foundation** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Explain** the properties and uses of textile fibers, fabrics, and garments | C2 | 1 |
| **CLO-2** | **Define** the various applications of fibers, fabrics, and garments | C1 | 4 |
| **CLO-3** | **Understand** the basic operations involved in fabrication and quality control of fibers, fabrics, and garments. | C2 | 2 |

**Course Outline for Theory**

General Introduction:

- Define Textiles (Fiber, Yarn, Fabric and Garment) and basic terms and definitions
- Brief the divisions of Textile products (Apparel, Home and Furnishing Textiles and Technical Textiles).
- Explain about the current Pakistani and International Textile Production, import and export and growth.

Textile raw materials-Natural Fibers:

- Classify and differentiate plant, animal fibers and mineral fibers
- Explain the sources or origins of natural fibers.
- Explain general properties and common uses of natural fibers.

Textile raw materials-Synthetic Fibers:

- Classify manmade fibers and differentiate between regenerated and synthetic fibers.
- Explain the sources or origins of manmade fibers.
- Explain general properties and common uses of manmade fibers.

Yarn Manufacturing:

- Classify textile yarns
- Understand process flow charts of basic operations of yarn manufacturing.
- Describe basic operation for staple yarn manufacturing
- Identify fiber preparatory and yarn manufacturing machines and their inputs and outputs.
- Differentiate basic types of spinning e.g. Rotor and Ring.
- Explain the yarn numbering systems

Woven Fabric Manufacturing:

Understand process flow of manufacturing woven fabrics.

Briefly explain the preparatory processes of woven fabric manufacturing.

Understand basic operations of weaving e.g shedding, picking and beat up.

Differentiate weaving machines based on picking mechanism e.g., shuttle and shuttle-less weaving

Differentiate different shuttle-less weaving machines.

Understand basics of construction of woven fabric (Basic Weaves).

Knitted fabric manufacturing:

Understand the basics and classify knitting technology.

Compare the properties of woven and knitted fabrics and understand weft knitting mechanism.

Warp and Weft knitted fabrics:

Classify weft knitting and identify main parts of weft knitting machine and their functions.

Explain the basic terms used in weft knitting and loop formation cycle

Classify warp knitting and describe its process flow.

Understand the mechanism of loop formation in warp knitting and identify the loop formation elements.

Differentiate warp and weft knitting and applications of knitted fabrics.

Nonwovens production and applications:

Define the nonwovens and describe the application areas of nonwovens.

Explain the nonwovens markets and their world production.

Briefly explain the raw materials used in the production of nonwovens.

**Recommended Books**

Y. Nawab, Textile Engineering: An Introduction, 2016

Butola, Advanced Textile Engineering Materials, 2018

ACIMIT, Textile Reference book for Spinning, 2002

ACIMIT, Textile Reference book for Weaving, 2000

ACIMIT, Textile Reference book for Knitting, 2001

Jenny Udale, Textiles and fashion, 2008

# 7. Technical drawing and CADs

| **COURSE TITLE**<br><br>**Technical drawing and CADs** | | **CREDITS HOURS**<br>(0+2)<br>**0 Theory + 32 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Foundation** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1 (Lab)** | **Prepare** CAD models from technical drawings. | C3 | 5 |
| **CLO-2 (Lab)** | **Perform** and execute different commands in CAD software for modelling of mechanical components. | P4 | 4 |
| **CLO-2 (Lab)** | **Actively** contribute while performing assigned lab work and follow provided instructions whether working individually or in groups. | A4 | 9 |

**Course Outline for Theory**

Introduction to Engineering Drawing: covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular, Hyperbola, Cycloid, Epicycloid, Hypocycloid, and Involute; Scales – Plain, Diagonal and Vernier Scales

Technical Drawing Standards: General principles of presentation, conventional representation of dimensioning and sectioning, threaded parts, gears, springs, and common features. Abbreviations and symbols used in technical drawings. Symbols and method of indication on the drawing for surface finish, welding, and riveted joints

Orthographic Projections covering: Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes, inclined Planes - Auxiliary Planes

Projections of Regular Solids: covering, those inclined to both the Planes- Auxiliary Views

Sections and Sectional Views of Right Angular Solids covering: Prism, Cylinder, Pyramid, Cone – Auxiliary Views;

Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone

Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

Fits And Tolerances: Tolerance types and representation on the drawing – Fit types and selection for different applications – Basic hole systems - Basic shaft systems – Allowances. Geometric tolerances – Form and positional. Datum and datum

| **Recommended Books** |
| --- |
| 1. Engineering Drawing. by French & Vierck.<br>2. Geometrical Drawing by N.D. Bhatt. (1St Edition) |

# 8. Pakistan Studies

| **COURSE TITLE**<br><br>**Pakistan Studies** | | **CREDITS HOURS**<br>(3+0)<br>**48 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Art & Humanities** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Describe** the difference between ideological and non-ideological state. | A-1 | 10 |
| **CLO-2** | **Discuss** Pakistan Movement, political and constitutional history of Pakistan. | A-3 | 9 |
| **CLO-3** | **Study** current issues of Pakistan, their causes and solution. | A-4 | 11 |

**Course Outline for Theory**

Pakistan ideology: Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah, Aims and objective of the creation of Pakistan. Indus Civilization, Location and Geo-Physical features, Reformist Movement in Subcontinent. Muslim League 1906, Lahore Resolution 1940, 3rd June plan and Independence 1947, Constitution and Law, Constitutional Assembly, Nature and Structure of Constitution, Features of 1956, 1973 Constitutions. Amendments in the Constitution (17th, 18th, 19th and 20th), Foreign Policy, Objectives, Contemporary Pakistan, Economic institutions and issues, Society and social structure, Ethnicity, Determinants of Pakistan Foreign Policy and challenges, Futuristic stance of Pakistan

**Recommended Books**

1. Amin, Tahir. Ethno – National Movement in Pakistan, Islamabad: Institute of Policy Studies, Islamabad. (Latest Edition)
2. Afzal, M. Rafique. Political Parties in Pakistan, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, (Latest Edition)
3. Struggle for Pakistan by Mr. Ishtiaq Hussain Qureshi (Latest Edition)

# 9. Workshop Practices

| **COURSE TITLE**<br><br>**Workshop Practices** | | **CREDITS HOURS**<br>(0+2)<br>**0 Theory + 32 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Inter Disciplinary Technology** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1 (Lab)** | **Describe** the basic workshop tools and practices. | C2 | 1 |
| **CLO-2 (Lab)** | **Demonstrate** positive individualism for performing machining operations in workshop with safety and precision. | P3 | 6 |
| **CLO-3 (Lab)** | **Conform** to the safety precautions in various workshops and in case of groups share the work by contributing actively while performing operations in workshop. | A4 | 9 |

**Course Outline for Theory**

Workshop Safety precaution for each workshop, Introduction to Machining theory & practice.
Bench fitting, like filling, sizing marking etc. Lathe & Milling Types Construction & Operation's.
Planning, Shaping, Broaching & Gear Hobbing Operations. Principle, Tools, Applications.
Carpentry tools, and procedure, types of woodworking joints. Precision Machining.
Introduction of NC CNC & DNC Machines, Coordinate Measuring Machine (CMM).
High Speed Machining, Mass Production through Machining.
Introduction of Grinding, Honing, Lapping, Polishing and Buffing.
Welding Techniques Welding Theory & types: Arc welding Tig & Mig Welding, Gas Welding, Spot Welding soldering & brazing. Fusion welding process:

**Recommended Books**

1. Fundamentals of Modern Manufacturing, 2nd Edition by M.P. Groover
2. Chapman W.A.J. "Workshop Technology (Part I, II & III)
3. Manufacturing Technology By M.L Begeman, Hazel Hurs (5th Edition)
4. Workshop Technology by Hajira Chohdry (2nd Edition)

# 10. Communication & Presentation Skills

| **COURSE TITLE**<br><br>**Communication & Presentation Skills** | | **CREDITS HOURS**<br>(3+0)<br>**48 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Expository Writing** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Explain** basic theories of communications | | C2 | 9 |
| **CLO-2** | **Present** and report technical contents both orally and in writing | | C2 | 10 |
| **CLO-3** | **Participate** in group discussions while practicing professional ethics | | A3 | 8 |
| **Course Outline for Theory** | | | | |
| Importance; Theories; Barriers and components of communication; The seven C's of effective communication; Listening skills; Notes taking; Giving feedback; Active reading techniques; Skimming; General and careful reading; Planning; Drafting and editing; Emphasis and connections in writing; Technical and business vocabulary; Constructing formal sentences; Communication as a Tool For Effective Interpersonal Engagement; Communication barriers and their mitigation strategies; Preparing and presenting using modern tools. | | | | |
| **Recommended Books** | | | | |
| Murphy H. A., Hildebrandt H. W. and Thomas J.P. "Effective Business Communications". McGraw Hill, USA<br>Norman S. "We're in Business" Longman Group Ltd., UK 3. Thomson A. J. and Martinet A.V. "A practical English Grammar" Oxford University Press, UK. | | | | |

# 11. Applied Statistics

| COURSE TITLE | CREDITS HOURS | KNOWLEDGE AREA/ DOMAIN |
|---|---|---|
| **Applied Statistics** | (3+0)<br>**48 Theory + 0 Lab Sessions** | **Quantitative Reasoning** |

| | After completion of this course students will be able to: | Bloom's Taxonomy Level | PLO |
|---|---|---|---|
| **CLO-1** | **Understand** the statistical knowledge to solve and analyze the engineering problems | C-2 | 1 |
| **CLO-2** | **Capable** of applying rules and algorithm of probability and statistics to their relevant engineering problems | C-2 | 2 |
| **CLO-3** | **Identify, analyze, and interpret** the complex problems by using statistical techniques for validation of results | C-3 | 3 |

**Course Outline for Theory**

Introduction of statistics, Summation sign, properties of summation sign, Data types, individual item data, discrete frequency distribution, grouped data, Representation of statistical data, Formation of frequency distribution, grouped data, continuous and discontinuous grouped data, Graphical representation of data

Measures of central tendency or averages, Arithmetic mean, arithmetic mean of ungrouped data, A.M of grouped data, properties of A.M., Geometric mean, definition, exercise of G.M, Harmonic mean, median, formula of median for grouped data, mode, Measures of dispersion, absolute measures and relative measure of dispersion, Computation of absolute and relative measures of dispersion, Range, Quartiles deviation

Mean deviation, standard deviation, variance, properties of S.D and Variance, combined mean and combined variance, Introduction and basic concepts of probability, Random experiment, trial, outcomes, sample space, Event, types of events, definition of probability

Classical definition of probability, Exercise on classical probability, Counting rules, Permutation, combination, Exercise on permutation and combination, Axiomatic definition of probability, laws of probability, Conditional probability, Bayes theorem, Random variable, types of random variable, Discrete random variables and its properties, Discrete probability distribution, mathematical expectation, mean and variance of discrete random variable, Continuous probability distribution, mathematical expectation, mean and variance of continuous random variable

Discrete Probability Distributions, Binomial probability distribution, derivation of formula of binomial distribution. Exercise on binomial probability distribution Derivation of mean and variance of binomial distribution, Discrete probability distributions: Poisson probability distribution, derivation of formula of Poisson distribution. Exercise on Poisson probability distribution, Derivation of mean and variance of Poisson distribution, Hypergeometric probability distribution, derivation of formula of Hypergeometric distribution,

Exercise on Hypergeometric probability distribution, Derivation of mean and variance of Hypergeometric distribution, Continuous probability distributions, Normal probability distribution, finding the probability of normal distribution

using standard normal table, Properties of normal distribution, application of normal distribution, Exercise of normal probability distribution, Exponential probability distributions: Properties of normal distribution, application of normal distribution,

Exercise of Exponential probability distribution, Basic concepts and definition about statistical inference Testing of hypotheses and confidence interval about population mean using Z-test and t-test, Testing of hypotheses and confidence interval about difference of two population means using Z-test, Testing of hypotheses and confidence interval about difference of two population means using t-test, Simple linear regression, model fitting of simple linear regression, Testing of hypothesis about regression coefficients,

Simple linear correlation and testing of hypothesis about 'r', Multiple linear regression and polynomial regression, model fitting using least square method, Multiple linear regression and polynomial regression, model fitting using matrices approach, Polynomial regression model fitting using Minitab, Application of multiple and polynomial regression, Analysis of variance (ANOVA)

**Recommended Books**

1. Susan Milton and Jesse C Arnold, "Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences," Fourth Edition, 2003, McGraw-Hill.
2. Introduction to Statistics by David Lane, Rice University ( 2003).
3. Statistics for Management by D. Levin and David S. Rubin (2011) Seventh Edition.
4. All of Statistics: A Concise Course in Statistical Inference by Larry A. Wasserman (2004)

# 12. Textile Raw Materials

| **COURSE TITLE**<br><br>**Textile Raw Materials** | | **CREDITS HOURS**<br>(3+0)<br>**48 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Foundation** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the sources**,** structure, properties, and end use of textile fibers along with their manufacturing and processing methods | | C2 | 1 |
| **CLO-2** | **Explain** the preparation**,** properties, and uses of synthetic and high-performance textile fibers based on scientific approaches. | | C2 | 2 |
| **CLO-3** | **Differentiate** various physical and mechanical properties of different natural and synthetic fibers | | C4 | 3 |

**Course Outline for Theory**

Introduction of Textiles and Fibers, Classification of textile fiber

Plant Fibers:

Introduction, production, processing, structure, properties, and uses of Cotton fiber products.

Introduction, production, processing, structure, properties, and uses of Jute fiber products

Introduction, production, processing, structure, and properties of Flax fiber products

Introduction, production, processing, structure, properties, and uses of Sisal fiber products

Introduction, production and processing, structure, and properties of Henequen fiber

Animal Fibers:

Introduction and production of Wool fiber

Structure, properties, and uses of Wool fiber products

Introduction and production of Silk fiber

Processing, structure, properties, and uses of Silk fiber products

Mineral Fibers:

Introduction and production of Asbestos fiber

Processing of Asbestos fiber

Structure, properties, and uses of Asbestos fiber products

Spinning Techniques:

Introduction of Manmade fibers and their spinning techniques

Dry Spinning, Wet Spinning, Melt Spinning

Manmade Fibers:

Introduction and production of Viscose Rayon fiber

Processing, structure, properties, and uses of viscose Rayon fiber products

Introduction and production of Acetate Rayon fiber

Processing, structure, properties, and uses of Acetate Rayon fiber products

Synthetic Fibers:

Introduction, production, processing, structure, properties, and uses of polyester fiber products

Introduction, production, processing, structure, properties, and uses of acrylic fiber products

Introduction, production, processing, structure, properties, and uses of nylon fiber products

High Performance Fibers:

Introduction, production, processing, structure, properties, and uses of C

carbon fiber products

Introduction, production, processing, structure, properties, and uses of glass fiber products

**Recommended Books**

1. Ivana Markova, Textile Fiber Microscopy, A Practical Approach, 2019
2. J.W.S. Hearle, Fiber Structure 2013
3. J.W.S Hearle, Handbook of Textile Fibers Structures (vol. 1 and 2), 2009
4. S. Gordon and You-Lohsieh, Cotton Science and Technology, 2007
5. C. Woodings, Regenerated Cellulosic Fibers, 2001
6. Morton, W.E. and J.W.S. Hearle, Physical Properties of Textile Fibers, 2008

# 13. Applied Chemistry

| **COURSE TITLE**<br><br>**Applied Chemistry** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Natural Sciences** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** different rules and principles of chemistry governing physical and chemical properties of materials. | C2 | 1 |
| **CLO-2** | **Explain** the differences among acids, bases and organic chemicals using fundamental principles of chemistry | C4 | 3 |
| **CLO-3** | **Apply** the acquired knowledge to identify, formulate and solve engineering problems of chemical nature in field of mechanical engineering. | C3 | 2 |
| **CLO-4 Lab** | **Perform** different experiments to measure physical properties purity and detection of various chemicals. | P3 | 4 |
| **CLO-5 Lab** | **Measure** the percentage yield of some organic compounds after their preparation, effect of optimum conditions on yield of product and identification of organic and biochemical compound using laboratory apparatus. | P5 | 5 |

**Course Outline for Theory**

Chemical kinematics and catalysis: Introduction to rate equation and reaction order, reaction mechanism, relation between rate equation and reaction mechanism, thermodynamics, and electrochemical phenomenon: Heat, work and energy, reversible and irreversible processes, work done in an isothermal reversible expansion of ideal gas. Enthalpy, entropy, electrochemical and galvanic series, polarization, decomposition potential, over voltage. Theories of corrosion. Types of corrosion and corrosion control of corrosion. Sources and conservation of fresh water, impurities in water and their effects. WHO guideline and BIS guideline for drinking water. Chemistry involved in sedimentation, coagulation, and sterilization. Softening of water, lime-soda, ion-exchange process. Engineering materials: glass, ceramics, refractory, composites, magnetic materials, polymers, and structure property relationship. Thermoplastic and thermosetting plastics. Preparation, properties and applications of some commodity and engineering polymers. Conducting polymers

**Recommended Books**

1. Brown and Holmes, 2018, Chemistry for Engineering Students 4th Edition, ISBN-13: 978-0357026991, Cengage
2. Atkins, Paula and Keeler, 2014, Atkins' Physical Chemistry 11th Edition, Oxford.

# 14. Electrical & Electronic Technology

| **COURSE TITLE**<br><br>**Electrical & Electronic Technology** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Inter Disciplinary Technology** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1 (Theory)** | **Explain** the basic concepts of voltage, current, resistance, capacitance, inductance, series circuits, parallel circuits, series-parallel combination, and Ohm's law | C2 | 1 |
| **CLO-2 (Theory)** | **Choose** suitable DC and AC circuits solving techniques based on their properties. | C3 | 2 |
| **CLO-1 (Lab)** | **Operate** the lab equipment correctly during experiments of electrical and electronics. | P2 | 5 |
| **CLO-2 (Lab)** | **Comply** with the lab protocols related to conduct of experiments in individually assigned tasks and equally contribute in group tasks. | A3 | 10 |

**Course Outline for Theory**

Basic concepts of voltage, current, resistance, capacitance,

Inductance, series circuits, parallel circuits, series parallel combination, calculations, Ohm law, law of resistance.

Construction and Working principles of DC Machines and their types,

Speed control of DC motors, working principles and applications of AC machines.

Construction and working principles of single and three phase transformers. Insulators, semiconductors,

Type of semiconductors, doping, PN-junction diode,

Rectifier and their types, construction and working principles of Bipolar junction transistors,

Construction and working principles of BJT amplifiers.

**Recommended Books**

1. B.L. Theraja A textbook of Electrical Technology Vol-2
2. Edward Huges- Electrical Technology (10th-edition)
3. Electronics devices By Floyd (11th edition)
4. Lab Manuals for lab practice

# 15. Fiber Science and Technology

| **COURSE TITLE**<br><br>**Fiber Science and Technology** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Foundation** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Identify** the basic structures of different textile fibers | | C2 | 1 |
| **CLO-2** | **Use** various structural parameters of textile fibers with physical and mechanical properties | | C3 | 3 |
| **CLO-3** | **Analyze** the different properties of textile fibers based on their different structures | | C4 | 2 |
| **CLO-1 Lab** | **Observe** different fiber properties to select an appropriate fiber for a certain application | | P1 | 1 |
| **CLO-2 Lab** | **Produce** and report the data of various properties of textile fibers | | P4 | 4 |

**Course Outline for Theory**

General Introduction:

The importance of studying the fiber structure

The factor which has influence on strength of matter due to different bonds

Investigation of Fiber Structure:

The basic principle used in infra-red absorption, optical and x-ray diffraction methods to study the structure of fiber.

The fine structure of fiber using infra-red absorption, optical and x-ray diffraction methods.

General problems in Fiber Structure:

The requirements of fiber formation.

The order and disorder in the fiber structure.

The limiting values of different values while studying fiber structure.

The fine structure of cellulosic fibers

The structure of synthetic fibers

Moisture in textile materials:

Give the Introduction of the moisture absorption of water.

Define the heat of sorption and basic concepts

Understand the measurement of heat of sorption

Discuss the introduction of swelling.

Defining the swelling in terms of its length, diameter, area and volume.

Mechanical properties of fibers:

Describe basic principle of stress and strain

Compare the regenerated cellulose fibers with respect to the crystalline and non-crystalline structure.

Discuss the fibers strength.

Asses the structural effect on wool and hair fibers on applying mechanical forces

Electrical properties:

Define the dielectric property

Compare of dielectric properties of different fibers.

Define the electric resistance.

Measure the electric resistance with experiments.

Measure the electric resistance of different fibers

Explain the effect of static electricity with magnitude of charge

Explain the effect of static electricity with antistatic treatment.

Explain the generation of charge.

Optical properties of fibers:

Give the introduction of optical properties.

Define the refractive index and bifringes.

Measure of refractive index of fibers

Discuss the relation of refractive index, density and swelling of fibers.

Thermal properties of fibers:

Give the introduction of thermal properties.

Discuss the thermal parameters.

Define the specific heat, latent heat of melting and thermal conductivity.

Discuss the specific heat of different fibers with their changing fiber structure

Discuss the thermal expansion and contraction

Database Management

| **Recommended Books** |
| --- |
| 1. Physical properties of textile fibers" by W.E.Morton & J.W.S. Hearle, The Textile Institute and Woodhead Publishing, UK. Fourth Edition, 2008<br>2. Fiber structure by Hearle and Peters" by textile institute, 1963 |

# 16. Yarn Preparatory Process

| **COURSE TITLE**<br><br>**Yarn Preparatory Process** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Foundation** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the working mechanisms of different spinning preparatory processes and identify the related problems. | C1 | 1 |
| **CLO-2** | **Analyze** material and machine interaction of different spinning preparatory machines to obtain optimum performance parameters. | C4 | 2 |
| **CLO-1 Lab** | **Recognize** the problems related to process parameters and propose their possible solutions. | P1 | 4 |
| **CLO-2 Lab** | **Sketch** the gearing diagram of the pre-spinning machine. | P2 | 1 |

**Course Outline for Theory**

Yarn quality w.r.t textile fibers:

Discuss fiber fineness and fiber length, Influence of fineness and fiber length on yarn quality

Discuss fiber strength, elongation, cleanliness, and impurities

Influence of fiber characteristics on yarn quality

Explain cleaning, cleaning aids, and factors influencing cleaning, Degree of cleaning, blending types and operation

Introduction of blow room:

Explain the objectives of blow room

Describe the flow of material through different machines in blow room.

Illustrate the basic operations in blow room

Discuss the components of blow room machines

Zones of blow room:

Discuss the Zone 1 of blow room machines.

Discuss the Zone 2 of blow room machines

Discuss the Zone 3 of blow room machines.

Discuss the Zone 4 & 5 of blow room machines

Discuss the Zone 6 of blow room machines

Accessories and auxiliary equipment for blow room:

Explain various accessories and auxiliary equipment

Recycling of raw material in blow room

Introduction to carding process:

Define Carding and describe the objectives of carding

Illustrate the Flow of material through carding machine by sketches

Explain the working of machine.

Differentiate the carding process for cotton and manmade fibers.

Regions of Card machine:

Operating regions of card (back)

Operating regions of card (middle)

Operating regions of card (front)

Card clothing auto-levelling equipment

The combing process:

Objectives of combing process, degree of Combing.

Illustrate the passage of material through comber machine.

Discuss the combing machine parts and their operation.

Describe the functions of different parts of comber machine.

Influence of material characteristics on combing.

The Drawing process:

Define doubling and drafting and illustrate the objectives of drawing frame.

Explain the working of machine,

Discuss different operating devices of draw frame

Auto leveling systems and their working operations in draw frame,

Influence of draw frame on quality of produced yarn

**Recommended Books**

1. The Rieter Manual of Spinning (volume 1 and 2) Werner Klein Rieter Machine Works Ltd. Switzerland (2008) (latest edition), 2016.
2. Handbook of Yarn Production by Peter R. Lord, Woodhead publishing Ltd England (2003).

# 17. Fabric manufacturing Preparatory Process

| **COURSE TITLE**<br>**Fabric manufacturing Preparatory Process** | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Foundation** | |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Describe** the working mechanism of different preparatory processes and identify related problems | C2 | 2 |
| **CLO-2** | **Illustrate** the warp yarn properties for weaving process with optimum size formulation | C3 | 3 |
| **CLO-3** | **Differentiate** between knitting processes and explain their preparatory mechanisms | C4 | 4 |
| **CLO-1 Lab** | **Observe** working mechanisms of preparatory machines | P1 | 1 |
| **CLO-2 Lab** | **Operate** machines for better performance and efficiency | P3 | 3 |
| **CLO-3 Lab** | **Participate** in lab discussions for timely completion of lab work | A2 | 9 |

**Course Outline for Theory**

Introduction to Fabric Manufacturing:

Discuss types of fabric forming methods

History of Fabric manufacturing

Status of fabric manufacturing

General applications

Weaving, Winding and Warping:

Flow chart of Weaving.

Describe the objectives of winding.

Fabric construction

Define the Objectives of Warping,

Types of warping

Identify different parts of warping machine

Sizing, Weave Design and Drawing:

Understand the process of application of size materials

Understand the working of a sizing machine

Identify the basic weave designs such as plain, twill, & satin

Understand how weave design is represented on paper

Understand the Drawing In draft, Peg Plan, Reed plan and repeat unit of a weave design

Looming, Non-conventional Woven Products

Identify different parts of a loom

Identify the primary & secondary motions of a loom

Explain shedding and different types of shedding systems

Explain picking and different weft insertion types

Carpets

Towels

3D weaving

Introduction to Knitting, Weft Knitting:

Define basic concepts of knitting

Types of knitting

Functioning of circular weft knitting machines

Machine knitting elements

Types of needles

Types of stitches

Basic Structure

Warp and Weft Knitting:

Functioning of Flat weft knitting machines

Machine knitting elements

Basic Structures

Fully Fashioned machines

Analyze different types of warp knitted structures

Identify Warp Knitting machine elements

Understand the working of warp knitting machines

Nonwoven and Braiding:

Define basic concepts and features of Nonwoven

General Manufacturing process for Nonwoven fabric

Define basic concepts and features of Braiding

General Manufacturing process for braided fabric.

| |
|---|
| Fabric Defects and Value Loss:<br>Common fabric defects<br>Causes of fabric defects and value loss<br>Overview of different fabric manufacturing techniques and products |
| **Recommended Books** |
| 1. Fabric structure and design By: N. Gokarneshan, 2004<br>2. Handbook of technical textiles By: A R Horrocks & S C Anand<br>3. Textile - Reference Book for Weaving Fondazione ACIMIT Pub, 2000<br>4. Textile – Reference book for Knitting Fondazione ACIMIT Pub, 2000. |

# 18. Pretreatment of Textiles

| **COURSE TITLE**<br><br>**Pretreatment of Textiles** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Foundation** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Describe** the pre-treatment processes of various textiles by learning mechanisms and basic concepts. | | C2 | 1 |
| **CLO-2** | **Demonstrate** different techniques to find solutions to the problems pertaining to pre-treatment processes | | C3 | 3 |
| **CLO-3** | **Analyze** different processing routes to find solutions of pretreatment processes | | C4 | 2 |
| **CLO-1 Lab** | **Imitate** recipes and process parameters to conduct experiments of various pre-treatments followed by interpretation of results. | | P3 | 4 |
| **CLO-2 Lab** | **Use** proper safety gadgets, safety precautions and other resources including dressing | | A3 | 8 |
| **CLO-3 Lab** | **Inspect** data and interpret results in pretreatment processes | | P3 | 2 |

**Course Outline for Theory**

Greige Inspection and QC:

Greige receiving and Recording

Greige faults and their grading systems

2-point and 10-point System

Fabric inspection machinery and its description

Fabric packing & storage

Shearing and Singeing:

Principle, method and machinery for shearing

Principle, method and machinery for singeing

Common shearing & singeing faults and their countermeasures

Testing & Q.C. of singed & sheared fabric

Faults and remedies

De-sizing:

Principle, method, and machinery

Chemical composition of Sizes and their identification

De-sizing mechanisms and methods

De-sizing Recipes & Process Design

Testing & Q.C. of De-sized fabrics

Faults and remedies

Scouring:

Principle, method, and machinery

Mechanism of scouring

Chemical and bio-scouring of cotton, flax, jute, wool, manmade fibers and their blends

Scouring Recipes & Process Design

Testing & Q.C. of scoured textiles

Faults and remedies

Heat-setting:

Principle and machinery

Mechanism of heat-setting

Dimensional stability of synthetic fiber

Structural changes taking place in fiber during heat treatment

Methods of heat setting

Heat-setting Process Design

Testing & Q.C. of heat set fabrics

Faults and remedies

Bleaching:

Principle, method, and machinery

Mechanism of Bleaching

Chemistry and mechanism of different bleaching agents: Hydrogen peroxide; Sodium hypochlorite; Sodium Chlorite;

Bleaching of cotton, flax, jute, wool, manmade fibers, and their blends

Bleaching Recipes & Process Design

Testing & Q. C. of bleached textiles

Faults and remedies

Mercerization and Causticization:

Principle and methods

Mechanism and effects of Mercerization

| |
|---|
| Yarn and Fabric Mercerization |
| Slack & Tension Mercerization both in the cold and hot conditions |
| Mercerization machines and their description |
| Caustic Weight reduction of Polyester |
| Mercerization & Causticization Process Design |
| Testing & Q. C. of Mercerized textiles |
| Faults and remedies |
| Liquid Ammonia Treatment: |
| Cotton treated with Liquid Ammonia |
| Physical and chemical modification taking place during the process |
| Liquid Ammonia treatment machinery and its description |
| Testing & Q. C. of Ammonia treated fabrics |
| Faults and remedies |
| **Recommended Books** |
| 1. Chemical Technology in the Pre-treatment Processes of Textiles by S. R. Karmakar, (1999)<br>2. Cellulosic Dyeing by John Shore (1995)<br>3. Chemistry and Technology of Fabric Preparation & Finishing by Charles Tomasino, (1992)<br>4. Scouring and Bleaching by E. R. Trotman<br>5. Advance Textile Testing Techniques by Sheraz Ahmed, (2017) |

# 19. Anthropometry and Garment Construction

| **COURSE TITLE**<br>**Anthropometry and Garment Construction** | | **CREDITS HOURS**<br>(1+1)<br>**16 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Foundation** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** basic terminologies related to garments | | C2 | 1 |
| **CLO-2** | **Interpret** sizing system to develop the basic pattern of garments | | C3 | 2 |
| **CLO-3** | **Categorize** grading systems for marker making | | C4 | 3 |
| **CLO-1 Lab** | **Design** and create pattern grading | | P1 | 3 |
| **CLO-2 Lab** | **Design** and develop complete basic patterns according to the given body measurements | | P3 | 4 |
| **CLO-3 Lab** | **Perform** experiment to construct bodice block with addition of darts | | P4 | 2 |

**Course Outline for Theory**

Anthropometry and Human Figure:

Anthropometry and new trends

Human anatomy

Figure types, ideal standard figure and body landmarks

Sizing System:

Sizing systems and development

Methods to decide Size intervals

Sizing system for Pakistani population

Imaginary Lines in Fabric and Collars:

Grain line, length and crosswise grain, bias grain, true bias and selvedge.

Collar terms, types & Collar classification

Basic shirt collar foundation

Basic Block Pattern, Paneled Bodice and Contouring:

Measurements to construct a basic block

Basic block Pattern & its Different Types.

Development of paneled, princess style and wing seamed bodice

Principles of contouring and contour guide pattern

Surplice/wrap and off shoulder designs

Dart Manipulation, Gather, Pleats, Sleeves, Cuffs, Plackets and Pockets:

Dart, objectives of dart, types of dart and its manipulation techniques

Pleats, Gathers & flares

Types of pleats and development of pleat cluster

Types of sleeves & cuffs

Types of plackets & Pockets

Skirts:

Types of skirts with respect to design and length

Measurements to construct a skirt's pattern

Basics of Skirt patterns

Skirt lengths and silhouettes

Measurement Chart and Grading:

Development of chart for a sewn product measurement

Developing before-wash measurements for a denim trouser

Grading and manual pattern grading process

Impact of Fabric/Lining Properties on Patterns:

Manipulating fabric stretch and shrinkage in pattern making

Dart-less stretch fabric foundations

Types of lining/interlining

Cut-out necklines and armholes

Draping:

Introduction to 2D and 3D pattern making

Comparison of draping and drafting

Sketch understanding

Identification of different elements

Pattern design using draping

Development of basic dress (ladies) pattern by draping

| **Recommended Books** |
|---|
| 1. Sizing in Clothing: Developing Effective Sizing Systems for Ready-to-Wear Clothing by S. P. Ashdown (2007).<br>2. Fashion Patternmaking Techniques (volume 1) by Antonio, Donnanno (2017).<br>3. Fashion Patternmaking Techniques (volume 2) by Antonio, Donnanno (2021).<br>4. Patternmaking for Fashion Design by Helen Joseph Armstrong (2013).<br>5. Fabric and Pattern Cutting: Fabric, Form and Flat Pattern Cutting by Winifred Aldrich (2009).<br>6. Pattern Cutting and Making Up: The Professional Approach by Shoben and Matin (1987).<br>7. Guide to Basic Garment Assembly by Jayne Smith (2013). |

# 20. Computer Programming

| **COURSE TITLE**<br><br>**Computer Programming** | | **CREDITS HOURS**<br>(1+1)<br>**16 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Computing** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Know** the working of computer hardware and software. | C1 | 1 |
| **CLO-2** | **Express** problem-solving skills and develop small scale computer programs. | C2 | 3 |
| **CLO-3** | **Assess** the concepts of data communication and networks. | C3 | 2 |
| **CLO-4 Lab** | **Describe** the working of hardware components of computer. | P1 | 2 |
| **CLO-5 Lab** | **Demonstrate** the typing speed and develop office application skills. | P3 | 3 |
| **CLO-6** | **Build** problem-solving skills by developing computer programs. | P2 | 4 |

**Course Outline for Theory**

Introducing Computer Systems: Basic Definitions, Computer and Communication Technology, the applications of ICT - particularly for engineering technology

Basic Operations and Components of a Generic Computer System: Basic operations: Input, Processing, output, storage Basic components: Hardware, Software, Data, Users, types of storage devices

Processing Data: Transforming data into information, how computers represent and process data, Processing Devices, CPU architectures

The Internet: The Internet and the World Wide Web- browsers, HTML, URLs/ How DNS works, Email and other programs

Introduction to Embedded Systems: What is an Embedded System, Applications, Components, Programming Languages, Popular Development Platforms.

Networking Basics: Uses of networks, Common types of networks (LAN, WAN, MAN etc.), Introduction to OSI Model, Future of Networks

Database Management: Hierarchy of Data, Maintaining Data, Database Management Systems

Exposure to ICT Tools and Blogs: (Student Assignment)

Protecting your privacy, your computer, and your data: Basic Security Concepts, threats to users, threats to hardware, threats to Data

**Recommended Books**

1. "Introduction to Computers", Peter Norton, McGraw-Hill. (Latest Edition)
2. "Computing Essentials", Timothy O'Leary and Linda O'Leary, McGraw-Hill. (Latest Edition)
3. Using Information Technology: A Practical Introduction to Computers & Communications", Williams Sawyer, McGraw-Hill. (Latest Edition)
4. "Discovering Computers, Complete: Your Interactive Guide to the Digital World. Cengage Learning" Shelly GB, Vermaat ME, (Latest Edition)

# 21. Social Sciences / Management Sciences Elective

| **COURSE TITLE**<br>**Social Sciences / Management Sciences Elective** | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Social Sciences** | |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Develop** network models and apply techniques to solve Project Scheduling problems | C-4 | 3 |
| **CLO-2** | **Demonstrate** understanding of operations management in the overall business strategy of the firm by applying relevant techniques. | C-3 | 11 |
| **CLO-3** | **Apply** methods of statistical quality control for process improvement | C-3 | 4 |

**Course Outline for Theory**

Define the term operations management, Identify the three major functional areas of organizations and describe how they interrelate.

Identify similarities and differences between manufacturing (production) and service operations. Explain the characteristics of goods and services Describe the operations function and the nature of the operations manager's job. Identify the critical decisions and activities of operation managers. Elaborate the transformation process. Define the term Strategy and how it is formulated and implemented? What is the difference between an order winner and an order qualifier? Tell how you have used the two concepts in a purchasing decision.

What is the balanced scorecard? How does it relate to operations? Explain the Key performance indicators (KPI's) and its application. Define the role of industrial globalization in competitiveness. Define productivity and competitiveness Identify the multiple measures of productivity.
Explain the Industrial Revolution in operations management. What makes a good design and how to measure design quality?
To learn about rapid prototyping, concurrent design, quality function deployment and other tools and techniques for improving the design process. To explore the sustainability considerations in design such as design for environment and design for robustness.

Describe the design of working systems: learning curves. Explain service design? List eight characteristics of services and explain what impact each characteristic has on the design process.
List the elements that define a queuing system. How can the results of queuing analysis be used by a decision maker for making decisions? What is the major cost factors considered in process selection? How is breakeven analysis used for process selection? Discuss the types of decisions that are involved in creating a process strategy. Explain the concept of Decision Making, Transportation models, waiting lines models, Learning curves
Explain the concept of Decision Making, Transportation models, waiting lines models, Learning curves, List some of the operations and functions in a company that are dependent on a forecast for product demand.

Discuss the role of forecasting in supply chain management. Describe the difference between short- and long-range forecasts. What is the difference between quantitative forecast methods and qualitative forecast methods? What kinds of forecasting methods are used for long-range strategic planning? What is the difference between a trend and a cycle and a seasonal pattern? How is the moving average method similar to exponential smoothing?
How does the linear trend line forecasting model differ from a linear regression model for forecasting?

The role of inventory management and types. Explain the ABC inventory classification system and indicate its advantages. Explain how the order quantity is determined using the basic EOQ model.

Define the term Scheduling and its objectives Discuss the concept of JIT & MRP and its application. How is a master production schedule created, and how is it used?
Explore the advance planning and scheduling systems.
What is the importance of good quality and the cost of poor quality? To understand how quality management systems have evolved.

What is the difference between acceptance sampling and process control?
Describe and use of the different quality-control methods/charts. Explain the difference between attribute control charts and variable control charts. How are mean and range charts used for analyzing process? How are mean and range charts used for analyzing process?

How are c-chart and p-chart charts used for analyzing process? How are c-chart and p-chart charts used for analyzing process? What determines the width of the control limits in a process chart?
Under what circumstances a c-chart should be used instead of a p-chart? Define the strategic goals of supply chain management.

Indicate how transportation and distribution have an impact on supply chain goals.
Identify the types of facilities. Explain the location analysis techniques. Explore the factors that are important to consider when locating facility national/ international level.
Define project management and why it is important. Identify the different ways for structuring the projects. What is purpose of lean production? Describe value stream mapping. How calculate lead time, cycle time and Takt time? What is Poka-yoke?

**Recommended Books**

1. Operations Management by Jay Heizer & Barry Render (12th Edition)
2. Contemporary Management by Garwth . Jones and Jennefir M. Jeorge (7th Edition)
3. Management by Robbins and Coulter 11th Edition
4. Operations Management: Processes and Supply Chains by Larry P. Ritzman, Lee J. Krajewski, and Manoj K. Malhotra (12th Edition)

# 22. Mechanics of Fibrous Structures

| **COURSE TITLE**<br><br>**Mechanics of Fibrous Structures** | | **CREDITS HOURS**<br>(1+1)<br>**16 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Foundation** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the fundamental concepts of mechanics and their application to different textile structures | | C1 | 1 |
| **CLO-2** | **Apply** structural mechanics to different textile structures namely fibers, yarns, and fabrics (woven, knitted, non-woven) | | C3 | 2 |
| **CLO-3** | **Analyze** the various factors to understand the relationship between structure and properties of fibers, yarns, and fabric | | C4 | 3 |
| **CLO-1 Lab** | **Inspect** the physical and mechanical behavior of fibrous, yarns and fabric structures. | | P3 | 2 |
| **CLO-2 Lab** | **Observe** and record the data to access the functional characteristics of fiber. | | P1 | 4 |
| **CLO-3 Lab** | **Comply** with the lab protocols related to conduct of experiments in individually assigned tasks and equally contribute to group tasks. | | A3 | 9 |

**Course Outline for Theory**

Introduction to Mechanics of Materials:

Explain the role of Mechanics of materials in Engineering

Define the Stresses and Deformations

Distinguish between True Stress & Strain.

Understand mechanics of materials with reference to stress & strains.

Study of Stress and Strain:

Compare the Stress-Strain diagrams of ductile and brittle materials

Differentiate the Isotropic & Anisotropic materials

Discuss the Modulus of Elasticity

Explain the Modulus of Rigidity

Calculate the Stress and Strain in Changed Thermal Condition

Explain the Repeated loading

Differentiate between types of materials, phenomenon of fatigue and creep and analysis of stress and strain curves.

Sizing, Weave Design and Drawing:

Understand the process of application of size materials

Understand the working of a sizing machine

Identify the basic weave designs such as plain, twill, & satin

Study of Fracture and Time Effects:

Illustrate the Fracture and Types of Fracture

Explain the Embrittlement

Discuss the Time Dependence & Relaxation of Stress

Forces in Various Directions:

Illustrate the Bending and Twisting of Fibers

Discuss the Elastic Deformation

Explain the Compression Stress on Fiber

Classify the Abrasion, Wear and Flexing

Understand fiber intrinsic properties like flexural and twisting rigidity.

Structure & Mechanics of Yarn:

Analyze the yarn Structure

Summarize the Theoretical Treatment of Yarn Tensile Strength

Interpret the Strength-Comfort-Twist Relationship

Demonstrate the Practical Aspects of Yarn Strength

Theory of Extension of Continuous Filament Yarn:

Explain the Variation of Fiber Extension

Calculate the Stress-Strain Relationship of Filament

Analyze the Breakage Prediction & Load-Extension Curve near Break

Calculate the equation between filament extension and yarn extension

Structure & Mechanics of Woven & Knitted Fabrics:

Discuss the Structural Properties of Woven Fabrics

Illustrate the Tensile, Shear and Bending Properties of Woven Fabrics

Overview of different fabric manufacturing techniques and products

Examine the Relation between Fabric Structure & Surface Properties

Structure & Mechanics of Nonwoven Fabric:

Illustrate the Structural Properties of Nonwoven Fabrics

Analyze the Structure property relationship

Discuss the Failure Mechanism of Nonwovens

| **Recommended Books** |
|---|
| 1. J.W.S. Hearle. "Structural Mechanics of Fibers Yarns and Fabrics" (2004)<br>2. J.W.S. Hearle, Fiber Structure 2013<br>3. Jinlian, Hu. "Structure and Mechanics of Woven Fabrics" (2004)<br>4. Thormen H Courty. "Mechanical Behavior of Materials" (2005)<br>5. E.J.Hearn. "Mechanics of Materials" (2001)<br>6. P. Schwartz " Structure & Mechanics of Textile Assemblies" (2003) |

# 23. Textile Dyeing

| **COURSE TITLE**<br><br>**Textile Dyeing** | | **CREDITS HOURS**<br>**(2+1)**<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Demonstrate** various techniques, methods and machinery used in textile dyeing | | C3 | 1 |
| **CLO-2** | **Analyze** the dyeing mechanisms of natural and synthetic fibers | | C4 | 2 |
| **CLO-3** | **Apply** different techniques to optimize process parameters related to textile dyeing | | C3 | 4 |
| **CLO-1 Lab** | **Formulate** the recipes and methods of different dyeing techniques | | P4 | 1 |
| **CLO-2 Lab** | **Measure** the data and interpretation of results in dyeing processes. | | P3 | 4 |
| **CLO-3 Lab** | **Use** proper safety gadgets, safety precautions and other resources including dressing | | A3 | 8 |

**Course Outline for Theory**

Theory of Coloration of Textiles:

Characteristics of fibers, dye molecules and water pertinent to dyeing; Relationship between fiber structure and dyes during the dyeing process.

Dyeing equilibrium and kinetics: adsorption isotherms, affinities, electrolytic effects, heat and dyeing entropy

Essential dyeing characteristics and evaluation: color yield, dye exhaustion, dye diffusion, dye migration, dye fixation and colorfastness

Color assessment tools and techniques

Dyeing Machinery and Methods:

Fundamentals of functional design of coloration machines

Exhaust dyeing (Fiber dyeing, Yarn dyeing, Fabric dyeing and Garment dyeing)

Semi-continuous and Continuous dyeing methods

Dyeing with Direct Dyes:

Principles and methods of dyeing cellulose with direct dyes

After-treatment of textiles dyed with direct dyes

Design of recipe and process for dyeing cellulose with direct dyes

Dyeing control and corrections for the key faults

Dyeing with Reactive Dyes:

Principles of dyeing cellulose with reactive dyes

Reactive dyeing mechanisms

Methods and processes

Washing-off

Colorfastness

Design of recipe and process for dyeing cellulose with direct dyes

Dyeing control and corrections for the key faults

Dyeing with Vat and Indigo Dyes:

Principles of dyeing cellulose with vat dyes

Dyeing methods and processes

Dyeing of denim yarn with indigo dyes

After-treatment of textiles dyed with vat dyes

Design of recipe and process for dyeing cellulosics with vat dyes

Dyeing control and corrections for the key faults

Dyeing with Sulphur Dyes:

Principles and methods of dyeing cellulose with Sulphur dyes

After-treatment of textiles dyed with Sulphur dyes

Design of recipe and process for dyeing cellulose with Sulphur dyes

Dyeing control and corrections for the key faults

Dyeing with Disperse Dyes:

Principles of dyeing with disperse dyes

Methods for dyeing polyester and dyeing cellulose acetate and other fibers

Carrier dyeing; High temperature/pressure dyeing

Design of recipe and process for dyeing with disperse dyes

Dyeing control and corrections for the key faults

Dyeing of Protein and Polyamide Fibers:

Principles of dyeing protein fiber with acid dyes

Methods of dyeing of wool

Methods of dyeing of silk

Design of recipe and process for dyeing protein fibers

Principles and methods of dyeing of polyamide with acid dyes

Dyeing of polyamide carpets

Dyeing control and corrections for the key faults.

Blend Dyeing and Pigment Dyeing:

Objective and need of blending

Commercially important blends

Dyeing of polyester/cotton blend with different dye combinations by various methods/processes

Dyeing of other important blends such as polyester/viscose, polyester/acrylic, wool/acrylic…etc.

Design of recipes and processes for dyeing different blends

Dyeing control and corrections for the key faults

**Recommended Books**

1. Advances in Reactive Dyeing of Cotton by Awais Khatri (2015)
2. Handbook of Textile Coloration & Finishing M. Shahid et al. (2018)
3. Fundamentals and Practices in Coloration of Textiles by Chakraborty (2009)
4. Basic principles of Textile Coloration by A. D. Broadbent (2005)
5. Critical Solutions in Dyeing of Cotton Textile Materials by R. Shamey and T. Hussain (2005)
6. Cellulosic Dyeing by John Shore (1995)
7. Blends Dyeing by John Shore (1995)
8. Wool Dyeing by D. M. Lewis (1992)

# 24. Industrial Cutting & Sewing

| **COURSE TITLE**<br><br>**Industrial Cutting & Sewing** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the different technological processes, tools and equipment used in cutting and sewing department of apparel industry. | | C2 | 1 |
| **CLO-2** | **Discuss** different types of seams, stitches and sewing threads and their functions. | | C2 | 2 |
| **CLO-3** | **Analyze** the causes of various problems in cutting and sewing department. | | C4 | 4 |
| **CLO-1 Lab** | **Investigate** different parts of cutting and sewing machine. | | P3 | 1 |
| **CLO-2 Lab** | **Inspect** technical sheets of garment along with utility of modern tools in cutting department. | | P3 | 5 |
| **CLO-3 Lab** | **Comply** with the lab protocols related to conduct of experiments in individually assigned tasks and equally contribute to group tasks. | | A3 | 9 |
| **Course Outline for Theory** | | | | |
| Introduction of Apparel industry and Role of PPC:<br>Introduction to Apparel Industry<br>Role of Production Planning and Control in PPC Natural Protein Fibers<br>Introduction to Cutting room and initial preparations in cutting room:<br>General characteristics of spreading process<br>Fabric spreading modes and their applications<br>Explain different types of materials used in cutting room<br>Storage and counting the delivered textile materials<br>Basic principles of lay planning<br>Number of articles ordered for each size<br>General characteristics of marker making<br>Principles and methods of textile spreading: | | | | |

Characteristics of manual spreading process

Disadvantages of manual spreading process

Classification of automatic spreading machines

Semi-automated and fully automated process

Cutting process:

Classifications of Industrial cutting Machines

With different automated cutting options

Understand manual and automated cutting processes.

Differentiate between automated and manual cutting and discuss its advantages and disadvantages.

Understand placement of manual spreading and cutting equipment/workstations in cutting room

Understand placement of automated spreading and cutting equipment/workstation in the cutting room.

Final working operations in cutting room, Sewing machine fundamentals:

Analyze different quality problems in cut components and their related solution

Understand different types of machine beds

Casting and lubrication systems

Different types of stitch mechanisms Glass Transition

Stitches and Seams:

Stitches and stitch properties

Classification of stitches

Seams and Seam dimensions

Classification of seams

Sewing Thread:

Functions of sewing thread

Classification of threads and Thread size

Thread specification and costs

Needles & Work Aid:

Basic parts of needles

Types of Needles

Different types of faults in stitching

Different types of attachments

Automation in sewing room

| **Recommended Books** |
| --- |
| 1. Industrial cutting of textile materials by Vilumsone Nemes (2018).<br>2. Apparel Manufacturing (Sewn Product Analysis) by Ruth E Glock and Grace I Kunz (2005). |

# 25. Yarn Manufacturing Technology

| **COURSE TITLE**<br><br>**Yarn Manufacturing Technology** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Analyze** the operations and material/machine interactions in roving and ring spinning machines | | C4 | 1 |
| **CLO-2** | **Evaluate** the process parameters of roving and ring spinning machine to obtain their optimum performance | | C5 | 2 |
| **CLO-3** | **Compare** the machines setting and other parameters to process different textile fibers and their blends | | C5 | 5 |
| **CLO-1 Lab** | **Propose** the setting requirements of different parts on roving and ring frames, further manage the process through the integration of process parameters | | P5 | 3 |
| **CLO-2 Lab** | **Analyze** the date if various process parameters and machines settings of roving and ring frames by using modern tools | | P5 | 4 |
| **CLO-3 Lab** | **Participate** actively in class discussion for timely completion of class activities exhibiting ethical behavior | | A3 | 8 |

**Course Outline for Theory**

Introduction to Roving Frame:

Explain why the machine is necessary in the manufacture of short-staple ring spun yarn.

Describe the demands placed upon the modern roving frame

Illustrate the main tasks of the roving frame

Describe the operating sequence of the machine

Structure of Roving Frame:

Describe the structure of roving frame creel and the required perfect drive for its material transport roller.

Explain how slivers cans are placed in the creel to avoid false draft of drawn sliver

Describe 3-over-3 and 4-over-4 drafting systems and the specifications of various elements of them.

Explain the effects of draft distributions and roller setting on the roving quality and production

Twisting and Winding Mechanism of Roving Frame:

Explain how and why twist is imparted in the drafted material (role of twist)

Illustrate the design of various flyer types.

Explain the importance of flyer top and presser arm

Explain the winding principles of a roving frame.

Differentiate the flyer and bobbin lead systems

Illustrate the limitations of flyer lead system.

Introduction to Ring Spinning:

Functions and mode of operation, spinning geometry, balloon geometry, limitations of ring spinning.

Latest trends in ring spinning.

Components of Ring Spinning:

Structure of the machine, bobbin creel, drafting system, top rollers, roller covers, rollers pressure loading, fiber guidance devices. Spindle, thread guide devices, balloon control ring, separators.

Machine Structure and Function:

Ring structure and its functions. Traveler types, shape, mass, and traveler clearer. Machine drive and cop buildup.

Automation, the potential for automation. Monitoring systems and auxiliary equipment. Automatic doffing. Automatic transport to the winding machine.

Compact Ring Spinning:

Compact spinning: principle and advantages of compacting.

Different compacting systems.

Optimum process atmospheric conditions.

Advance Spinning Techniques:

Rotor Spinning

Friction Spinning

Air Jet Spinning

Vortex Spinning

Wrap Spinning

Winding Process at Ring Frame:

Objectives, working principle of yarn winding.

Yarn package types and their building.

Types of winding machines, uniform buildup of cones, waxing of yarn, splicing of yarn, splicing methods and difference, yarn length counter, automatic electronic yarn clearer and its settings, difference between optical and capacitive yarn clearer,

Yarn tensioners, patterning, reasons, and their remedies.

Yarn fault classifying systems. Basic features of various auto-winders. Latest developments in winding machinery. Optimum process atmospheric conditions.

**Recommended Books**

1. Fundamentals of Spun Yarn Technology by C. A. Lawrence, (2003)
2. The Rieter Manual of Spinning by W. Klein, (2016)
3. Advances in Yarn Spinning Technology by C. A. Lawrence, (2010)
4. Spun Yarn Technology by Eric Oxtoby,(1987).Engineering Fundamentals of Ring Spinning/ Twisting, Over-end Unwinding and Two-for-one Twisting in Textile Processes by Subhash Batra (2015)

# 26. Fabric Manufacturing Technology

| **COURSE TITLE**<br><br>**Fabric Manufacturing Technology** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO1** | **Understand** the working principle and process parameters of different fabric manufacturing techniques along with their specific properties | | C2 | 1 |
| **CLO2** | **Describe** the basic weaves and their derivatives | | C2 | 2 |
| **CLO3** | **Appraise** the various kinds of modern fabric manufacturing techniques, understand their operational principles and analysis the structural and physical properties | | C4 | 5 |
| **CLO-1 Lab** | **Operate** weaving machines to develop various woven fabric structures | | P3 | 3 |
| **CLO-2 Lab** | **Operate** knitting machines to develop various knitted fabric structures | | P3 | 4 |
| **CLO-3 Lab** | **Use** proper safety gadgets, safety precautions and other resources including dressing | | A3 | 8 |

**Course Outline for Theory**

Weaving and Woven Fabric:

Overview of weaving, weaving machines, woven fabrics

Process involved in weaving

Woven fabric analysis

Characteristics of warp and weft

Fabric count/density

Woven Fabric & Shedding:

Woven fabric balance

Woven fabric selvedges

Tappet, Dobby, and Jacquard shedding

Basics of construction and working.,

Beat up Picking & Control Motion:

| |
|---|
| Beat up motion and its types (main features)<br>Picking and its types (main features). Identify the basic weave designs such as plain, twill, & satin<br>Warp control motion<br>Cloth control motion, stop motions<br>Woven Fabric:<br>Weave representation, design, draft, peg-plan<br>Basic weaves (Plain, twill, satin)<br>Plain weave properties and derivatives<br>Twill weave properties and its derivatives<br>Satin/Sateen weave properties and their types<br>Color and Weave Effect:<br>Color and Weave Effect<br>Making design, using warp and weft color to make different effects<br>DB Weave<br>Practice on DB weave<br>Knitting Basics:<br>Basic Technology, mechanical principles<br>Types of needles, stitch formation etc<br>Knitting machines:<br>Flat knitting machines<br>Circular knitting machines<br>Full fashioned knitting machines<br>Warp knitting machines.<br>Nonwovens:<br>Introduction and features of nonwoven<br>Manufacturing processes and applications |
| **Recommended Books** |
| 1. Weaving Machines, mechanism & management ---By Mr.Talukdar.<br>2. Knitting - Reference Book of Textile Technologies by ACIMIT foundation, Published in 2001. |

# 27. Spinning Calculations

| **COURSE TITLE**<br><br>**Spinning Calculations** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Analyze** and calculate the requirement, quality, staking and mixing of different raw materials to spin the yarn | | C4 | 2 |
| **CLO-2** | **Illustrate** and calculate draft, twist, production, and yield for different machines for yarn manufacturing | | C3 | 1 |
| **CLO-3** | **Design** a spin plan for different counts and types of yarn | | C5 | 3 |

**Course Outline for Theory**

Materials Purchase, Arrival and Stacking:

Understand the moisture regain and content calculations

Calculate the correct condition invoice weight

Analyze the bale and godown dimensions for stacking

Machine Blow room and Card:

Do the calculation about bale stacking and multi-blending Calculate pipe requirements

Learn about air speed and ducts calculation

Understand the ventilating problems in blow room

Learn calculation regarding cleaning efficiency, waste, and yield

Calculate drafts and production of scutcher

Do calculations of lap calendaring and hardening pressure as well as lap length on Scutcher

Learn about chute feed system and material continuity

Do calculation regarding speed of different rollers and draft between different regions

Card Machine:

- Calculate Card production and production balancing with Scutcher
- Analyze the mechanical and actual draft on carding machine
- Coiler calculations, packing density and holding capacity of cans used in carding, drawing and comber
- Learn calculations regarding cleaning efficiency, waste, and yield

Drawing Frame:

Calculation regarding roller speeds, different types of draft on draw frame

Calculate drawing production

Learn calculations regarding waste on drawing

Apply law of addition of irregularities on draw frame

Learn about periodicity calculations on draw frame

Lap former and Combing:

Calculate speeds of different rollers, drafts, and production of lap former

Determine the speeds of different rollers, drafts, and production of Comber

Learn about calculation of noil percentage

Roving Frame:

Calculate the speeds of different rollers, drafts, twist, lay and production on Roving Frame

Various constant calculations such as: draft, twist, lifter, tension, and production constant

Learn about waste in roving frame.

Roving and Ring Frame:

Do calculations of various differentials

Calculate cone drum dimensions relating to bobbin diameters at roving frame

Derive the cone drum equation

Calculate speed of rollers, draft, twist, builder, and production of ring frame

Learn about twist contraction and its calculation

Ring and Winding:

Learn calculation of traveler constant and numbering

Correlate the spindle speed, yarn tension, mass of yarn, balloon height and traveler mass.

Determine the relationship between CLSP, single thread strength and spinning tension Yarn tensioners, patterning, reasons, and their remedies.

Learn calculations on modern winding and open-end spinning machine

Calculate the plied yarn count

Calculate production of doubling and reeling frames

Analyze and decide the yarn clearer settings

Optimize the yarn quality through clearer settings

Spin Planning and Costing:

Prepare spin plan of different set ups of mill machinery

Calculate the balancing of each department and the whole mill

Learn Individual and collective production balancing of the whole spinning machinery including total waste and yield calculations

Learn yarn cost calculations

Calculate diameter and number of fibers per cross-section of yarn

Determine average count calculations

| |
|---|
| Analyze the air conditioning system of each department<br>Calculate the air conditioning air circulations for different departments |
| **Recommended Books** |
| 1. Cotton spinning calculations by Scott-Taggart, Bolton<br>2. Manuals of cotton spinning by Gilbert R. Merrill.<br>3. Textile mathematics by J. E. Booth.<br>4. Cotton spinners handbook by Gupta |

# 28. Fabric Manufacturing Calculations

| **COURSE TITLE**<br><br>**Fabric Manufacturing Calculations** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the calculations related to yarn and woven fabric. | | C2 | 2 |
| **CLO-2** | **Perform** and solve the calculations related to knitted fabric. | | C3 | 3 |
| **CLO-3** | **Use** weaving calculations for fabric reproduction. | | C3 | 11 |

**Course Outline for Theory**

Yarn Count and Physical Conversion:

Derivation of formulae for direct & indirect count system.

Different hank length in indirect & direct systems

Conversion of physical & textile units

Determination of count in indirect system

Calculation of count in direct system

Conversion of count from indirect to direct system

Winding:

Calculation of the production of winding machine

Determination of no. of machines & spindles required for winding particular yarn

Module 3 Warping production

Determine warping production and efficiency.

Determine the warp weight, beam count & no. of ends in warp

Determine the breaks /10 MM & pound / break Determination of the efficiency of machine

Sizing calculations:

Determination of production & efficiency of sizing

Evaluation of sized count, size % age & weight of size on yarn

Determination of conc. of liquor, water volume & condensation allowance

Determination of size pick up % age.

Module 5 Woven Fabric

Calculation of warp & weft contractions

Determination of GSM of fabric

Derivation of a relation for cover factor

Cover factor for square constructions

Determination of fractional cover factor, relation b/w fractional cover factor & cover factor.

Weaving:

Weaving shed and reed calculations.

Production and shed management.

Air consumption calculations.

Fabric inspection and grading system

Fabric Geometry:

Structural parameters.

Fabric geometrical models and their limitations.

Module 8: Specialty Fabrics:

Terry fabrics.

General calculations

Knitting:

Knitting calculations.

Yarn composition and requirements

Different knitted fabric types.

Calculations for warp knitting.

General calculations for production.

Inspection and grading

Nonwovens:

Types of nonwovens.

General calculations.

**Recommended Books**

1. Fabric Manufacturing Calculations: Process and Product by Yasir Nawab, (2017)
2. Weaving Technology and Operations by Allan Ormsrod, (1995)
3. Shuttle less weaving machines by Idrich Talavasek (1981)
4. Weaving Calculations: A Guide to Calculations Relating to Cotton Yarn and Cloth and All Processes of Cotton Weaving, by C. P. Brooks, (2010)
5. Weaving: Machines, Mechanisms, Management. by Talukdar, Marinal Kanti, P. K. Sriramulu, and Dinkar Bapurao Ajgaonkar. Mahajan Publishers, (1998)

# 29. Professional Ethics

| COURSE TITLE<br><br>Professional Ethics | | CREDITS HOURS<br>(3+0)<br>48 Theory + 0 Lab Sessions | KNOWLEDGE AREA/ DOMAIN<br>Social Sciences |
|---|---|---|---|
| After completion of this course students will be able to: | | Bloom's Taxonomy Level | PLO |
| CLO-1 | **Comprehend** the basic understanding of a professional ethics, various moral and social issues in personal life and career. | C-1 | 8 |
| CLO-2 | **Acquire** knowledge of various roles of engineering technologist in applying ethical principles at various professional levels. | A-3 | 6 |
| CLO-3 | **Resolve** the ethical dilemmas using common ethical values and identify possible actions to be taken in response. | A-5 | 7 |

**Course Outline for Theory**

Introduction: Introduction to ethics, personal and professional ethics, the nature of engineering ethics.

Legal, professional and historical definitions; origin of professional ethics, profession and professionalism.

Professional accountability, professional success, professional risks, professional associations; benefits of acting ethically and consequences of acting unethically.

Value of Ethics: Values in professional ethics, central responsibility of engineering professionals, ethics in different fields of work.

IEEE code of ethics, ethical code for engineering professionals, global issues in professional ethics, ethics in manufacturing and marketing.

Intellectual property rights, business ethics and corporate governance.

Ethical Dilemmas: Common ethical dilemmas, resolution of ethical dilemmas.

Possible actions in response to dilemmas, probable consequences of these actions.

**Recommended Books**

1. Engineering Ethics Concepts & Cases by Charles E Harris, 5th Edition, Cengage 2014
2. Kenneth Blanchard, Professional Ethics, 4th Edition
3. Ethics in Engineering 4th edition, by Mike W. Martin, Roland Schinzinger, McGraw-Hill, New York, 2005.
4. The Seven Habits of Highly effective people by Stephan r. Covey
5. Engineering Ethics: Concepts and Cases, 4th edition, by Charles E. Harris, Michael S. Pritchard, Michael J. Rabins, Wadsworth, 2008
6. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
7. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

# 30. Textile Testing

| **COURSE TITLE**<br><br>**Textile Testing** | | **CREDITS HOURS**<br>(1+1)<br>**16 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Use** different textile testing techniques to hypothesize, identify, analyze, and solve problems in textile processes. | | C3 | 5 |
| **CLO-2** | **Demonstrate** the behavior of different textile materials and products. | | C3 | 1 |
| **CLO-3** | **Use** modern textile analysis techniques to solve broadly defined engineering problems involved in textile processes. | | C3 | 2 |
| **CLO-1 Lab** | **Determine** and document the quality parameters of different textile fibers and yarns. | | P2 | 2 |
| **CLO-2 Lab** | **Determine** and document the quality parameters of different textile fabrics. | | P2 | 3 |
| **CLO-3 Lab** | **Perform** different testing techniques to evaluate the processes in textile processing and products developed thereof. | | P4 | 4 |

**Course Outline for Theory**

Quality in spinning mill

Control of quality in pre-spinning processes

Control of quality in spinning process

Control of quality and productivity in spinning

Pilling test and Abrasion resistance

Determination of tensile and tear strength of fabric

Bursting strength and dimensional stability of fabric

Stretch & recovery and fabric faults identification

**Recommended Books**

1. A practical guide on quality management in spinning By B. Purushothama
2. Process control and yarn quality in spinning By G. Thilagavathi T. Karthik
3. A practical guide on quality management in spinning By B. Purushothama
4. Process control and yarn quality in spinning By G. Thilagavathi T. Karthik

5. Physical testing of textiles by B.P. Saville
6. Fundamental and advances in Knitting Technology by Sadhan Chandra Ray ASTM and ISO Standards

# 31. Textile Printing

| **COURSE TITLE**<br><br>**Textile Printing** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Depth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Demonstrate** various techniques, methods and machinery used in textile printing | | C1 | 1 |
| **CLO-2** | **Understand** and analyze the functions of various chemicals and their mechanism of reaction in textile printing | | C4 | 2 |
| **CLO-3** | **Understand** the printing paste and process requirement with respect to substrate | | C3 | 5 |
| **CLO-1 Lab** | **Design** and formulate recipes for different printing types to conduct experiments | | P3 | 3 |
| **CLO-2 Lab** | **Analyze** of data and interpretation of results in pretreatment processes | | P4 | 4 |
| **CLO-3 Lab** | **Participate** actively in lab demonstration and lab performance along with ethical behavior | | A3 | 8 |

**Course Outline for Theory**

Introduction:

Introduction, history, terminologies, and theory of Textile Printing

Process flow of printing (fabric preparation, print paste preparation, printing, drying, fixation, washing-off).

Textile Printing Methods:

Block printing, Roller printing, Hand screen printing, Semi-automatic flat screen printing, Fully automatic flat screen printing, Rotary screen printing, Digital printing.

Print Design Studio & Engraving:

Introduction to print design studio, CAD/CAM, Rotary screen engraving

Screen Printing Machines:

Mechanical aspects, design registration, blanket & screen synchronization & related concepts of rotary and flatbed screen printing machines.

Production & Properties of Printing Pastes

Stock printing paste preparation, IPS (Integrated paste preparation & dispensing systems), dispensing & manual dispensing techniques

Properties and types of ideal thickeners

Print Paste Rheology

Printing with Different Colorants:

Pigment printing,

Reactive printing of cotton,

Vat printing of cotton,

Disperse Printing of Polyester

Textile Printing Styles:

Direct printing

resist printing and Discharge printing, Burn out printing, Transfer printing

Print Fixation & After-treatment Processes:

Print paste fixation mechanisms & equipment

Curing, Ageing, Flash Ageing, Steaming

Washing off process & washing off equipment.

Digital Textile Printing:

Image capture & display

Digital control systems

Ink-jet printing

Variables affecting reproducibility

Module 10: Printing Faults & their Countermeasures

A study of the faults that may occur during and/or after printing and their countermeasures

**Recommended Books**

1. Novel processing in special finishing and printing of textile by F. Uddin and M. Lomas (2010)
2. Digital Printing of Textiles by H. Ujiie (2006)
3. Textile Printing by W. C. Miles (2003)

# 32. Apparel Merchandizing and Sourcing

| **COURSE TITLE**<br><br>**Apparel Merchandizing and Sourcing** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the structure and process flow of merchandising activities and sourcing strategies, pricing strategies in apparel industry | | C2 | 1 |
| **CLO-2** | **Investigate** of tech pack, product development process, communications and documentations involved in apparel merchandising process | | C4 | 2 |
| **CLO-3** | **Calculate** costing of different garment articles | | C4 | 3 |

**Course Outline for Theory**

Introduction to Marketing, Merchandising and Sourcing:

Define merchandising and sourcing

Differentiate merchandising and sourcing

Explain the merchandising at retail level

Explain the role of production merchandizer

Explain role of fashion merchandizer

Modern merchandizing & Market Knowledge:

Explain the profile of a successful merchandiser

Explain the traits required of a merchandiser in the high – tech competitive global apparel industry

Explain the function of planning and control in apparel industry

Define the five P's of marketing

Examine the factors involved in developing a detailed understanding of target markets.

Evaluate the importance of market segmentation and alternate marketing

Line Development: Principles, Process and Technologies:

Elaborate the requirement of order sheet and assortment plan

Explain style specifications given by the buyers

Develop the production planning and control work order sheet

Explain requirements of order inquiry

Explain the process from order inquiry to file development

Explain the process of sampling and stages requirements:

Styling samples

Size set samples

Pattern making

Advertising samples / Photo shoot samples

Pre- production samples

Production samples

Shipment samples

Explain the requirements of Fabric development

Lab dips development

Fabric sampling

Yarn

Knitting and weaving

Dyeing and printing

Explain the requirements of trims and accessories development

Explain the role of PPC

Explain the importance of quality audit

Costing and Pricing Strategies:

Examine pricing formulas

Explain the strategies used to determine export order costing

Analyze the costing principles and elements that make up the cost

Explain costing strategies and their effect on product mix

Develop costing sheet of different garment styles

Perform costing of different stages

Product development cost

Material cost

Trims and accessories cost

Develop costing sheet of different garment style

Perform costing of different stages

Production cost

Finishing cost

Freight cost

| |
|---|
| Administrative cost<br>Marketing cost<br>Shipment cost<br>Export procedure and documentation:<br>Terms of payment<br>L/C<br>CAD<br>Delivery Terms<br>Bills of Exchange<br>Bill of Lading<br>Commercial Invoice<br>Certificate of origin, Freight forwarders and packing list<br>Sourcing Strategies:<br>Classification of sourcing process<br>Sourcing strategies for decision making<br>Role of merchandizer in sourcing process<br>Factors affecting sourcing process<br>Supplier vendor management<br>Types of supplier for apparel industry<br>Future Directions:<br>Explore the new technologies to ease the merchandising process<br>R &D concept in merchandising<br>Importance of Information Technology in apparel merchandising |
| **Recommended Books** |
| 1. Apparel Merchandising: The Line Starts Here by Jeremy A. Rosenau and David L. Wilson (2014).<br>2. Fashion Merchandising by Virginia Grose (2011).<br>3. Textiles and Fashion Materials, Design and Technology by Rose Sinclair (2014).<br>4. Apparel Manufacturing Technology by T. Karthik, P. Ganesan & D. Gopalakrishnan (2020).<br>5. Sourcing Practices in the Apparel Industry by Marlon Lezama, Brian Webber and Charles Dagher (2004).<br>6. Rules for Sourcing and Manufacturing in China by Rosemary Coates (2013). |

# 33. Project-I

| **COURSE TITLE**<br><br>**Project-I** | | **CREDITS HOURS**<br>(0+3)<br>**0 Theory + 48 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology**<br>**Domain Project** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Apply** and Identify background knowledge of engineering fundamentals in proposed idea and compare with previous related | | C-3 | 1 |
| **CLO-2** | **Analyze** the problem statement through research and literature review | | C-4 | 2 |
| **CLO-3** | **Defend** the impact of proposed idea in societal and environmental contexts and demonstrate knowledge of sustainable development | | C-5 | 6 |
| **CLO-4** | **Develop** a wide range of technical skills by delivering a working prototype using latest design tools that has passed through the design, implementation, testing and evaluation stages | | C-6 | 3 |
| **CLO-5** | **Integrate** the solution of Broadly Defined Engineering Technology Problems for improvement of society or environment | | A-4 | 7 |
| **CLO-6** | **Practice** various methods to avoid plagiarism in reports to adapt ethical values | | A-5 | 8 |
| **CLO-7** | **Organize** effectiveness as an individual and in a teamwork management. | | A-4 | 9 |
| **CLO-8** | **Display** their communication skills through presentations, technical reports, and posters. | | A-5 | 10 |
| **CLO-9** | **Display** the results of Hardware components testing which could be used for SDP. | | P-5 | 5 |

# 34. Total Quality Management (Elective Mgt Course)

| **COURSE TITLE**<br><br>**Total Quality Management** | | **CREDITS HOURS**<br>(3+0)<br>**48 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Social Sciences** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Analyze** the total quality management and techniques for controlling, and implementation | C4 | 1 |
| **CLO-2** | **Assess** the effect of various textile activities on quality standards | C5 | 4 |

**Course Outline for Theory**

Basic concepts of quality management systems, quality control and quality assurance,

Historical background of quality management system. Total quality management (TQM), fundamentals of total quality management.

Role of international organization for standardization (ISO) for the implementation of total quality control system,

Necessary steps to be taken for the implementation of ISO.-9000 standards in textile mills.

Principles of ISO- 9000. Quality control circle,

Influence of quality management system upon production and quality of the textile mills,

Statistical quality control, quality assurance system in textile mills.

**Recommended Books**

1. Total Quality Management: Key Concepts and Case Studies (1st Edition
2. Total Quality Management International Edition
3. Quality Management: Introduction to Total Quality Management (2000)

# 35. Sewn Product Technology

| **COURSE TITLE**<br><br>**Sewn Product Technology** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Depth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** work-study techniques like method-study, time-study, and micro-motion-study along with terminologies related to industrial engineering | | C2 | 1 |
| **CLO-2** | **Perform** production relevant calculations, designing style bulletins, and evaluate the production rate | | C3 | 2 |
| **CLO-3** | **Use** modern production systems and management tools required for apparel sewing process | | C3 | 5 |
| **CLO-1 Lab** | **Perform** the analysis of sewn products | | P4 | 2 |
| **CLO-2 Lab** | **Inspect** different garments involving operation breakdown, thread consumption and process flow charts | | P3 | 4 |
| **CLO-3 Lab** | **Operate** sewing equipment/modern tools under supervision | | P3 | 5 |

**Course Outline for Theory**

Introduction:

Introduction and History

Importance and Basic terminologies of industrial engineering

Role of Industrial Engineer in Apparel Production:

Industrial engineering

History of industrial engineering and importance

Role of industrial engineering in manufacturing industry

Method and Time Study:

Work study and importance of work study

Method study and factors involved in method study

Time study

Work Measurement and Time Study:

Work measurement

Advantages and purpose of work measurement

Techniques of work measurements

Time study, basic time study equipment, steps in making time study,

Standardization of measured operation time.

Motion Economy and PDTMS:

Motion Study, Motion economy in apparel unit

PDTMS for work measurements

Importance of PDTMS

Advantages of PDTMS

Recording techniques of PDTMS

Job Design and Learning Curves:

Learning curves and history of learning curves

Different approaches of calculating time

Producing learning curves and setting standards

Time required to do a job

Learning rates of an organization

Process or individual using learning curves

Apparel Layout Planning:

Layout planning

Layout types and flexibility at work

Designing process and product layouts

Module 8 Material Handling and Apparel Production Systems:

Material handling

Principles of material handling

Selecting material handling methods

Progressive bundle system

Unit Production system

Modular production system.

**Recommended Books**

1. Industrial Engineering in Apparel Production by V. R. Babu (2020).
2. Introduction to Clothing Production Management by A. J. Chutter (1995).
3. Sewn Product Analysis by Ruth. E. Glock (2005).
4. Production Control Tools for Garment Industry, Sewing Research Institute Juki (2004).
5. Sewn Product Quality: A Management Perspective by Doris H. Kincade (2008).

6. The Entrepreneur's Guide to Sewn Product Manufacturing by Kathleen Fasanella (1998).
7. Apparel Manufacturing: Sewn Product Analysis by Ruth E. Glock and Grace I. Kunz (2005).

# 36. Specialty Engineered Yarns

| **COURSE TITLE**<br><br>**Specialty engineered yarns** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology**<br>**Depth** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Explain** various kinds of filament and staple spun yarns, textured and twisted yarns, specialty engineered and value-added yarns | C2 | 4 |
| **CLO-2** | **Analyze** the type of sewing threads, fiber ropes and demonstrate the technologies used to produce them | C4 | 2 |
| **CLO-3** | **Formulate** the various process parameters to produce the filament and staple spun yarns, textured and twisted yarns, specialty engineered and value-added yarns. | C5 | 3 |
| **CLO-1 Lab** | **Produce** of various types of value-added yarns like, Siro yarn, Neppy yarn, Chain yarn, Slub yarn, Core spun yarn, Melange yarn, Multi color yarn etc. | P4 | 3 |
| **CLO-2 Lab** | **Inspect** and report the data of process parameters to specialty engineered yarns | P3 | 4 |
| **CLO-3 Lab** | **Participate** actively in lab discussion for timely completion of lab work activities. | A3 | 11 |

**Course Outline for Theory**

Module 1 Introduction

- What is Yarn
- Specialty yarn versus conventional yarn

Module 2 Classification of yarns

- Yarn classification with respect to fiber length
- Yarn classification with respect to construction
- Yarn classification with respect to spinning techniques
- General classification of yarn

Module 3 Twisting and doubling of yarns

- Objectives of yarn twisting and doubling
- Characteristics of yarn doubling
- Abrasion resistance
- Direction of twist
- Balancing of twist

- F/S ratio and count correction

Module 4 Methods of yarn twisting

- Methods of yarn twisting
- Conventional ring twisting
- Two- for -One twisting
- Stage twisting

Module 5 Fancy yarns

- Definition and structural components of fancy yarns
- Structure application and uses of fancy yarns

Module 6 Novelty yarns

- Types of novelty yarn
- Ring spun novelty yarn

Module 7 Sewing thread

- Introduction and functions of sewing thread
- Types of sewing thread and its requirements

Module 8 Texturized yarns

- Filament yarn texturing, reasons of texturing
- Types of textured yarn
- Texturing methods

**Recommended Books**

1. W. Klein, The Reiter Manual of Spinning, vol. 1 to 7, 2018
2. Ephruim Lipson, The History of Woolen & Worsted Industry, 2015
3. R. Sunthil Kumar, Process Management in Spinning, 2014
4. E. Oxtoby, Spun Yarn Technology, 2013
5. C. A. Lawrence, Advances in Yarn Spinning Technology, 2010
6. S. Kershaw Dumville, The Worsted Industry 2010

# 37. Specialty Fabric Manufacturing and Design

| **COURSE TITLE**<br>**Specialty fabric manufacturing and design** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Depth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** fabric design fundamentals. | | C2 | 1 |
| **CLO-2** | **Apply** weave and knit designs and elements of woven fabric. | | C3 | 4 |
| **CLO-3** | **Analyze** fabric designs and their derivatives. | | C4 | 2 |
| **CLO-1 Lab** | **Perform** the development of woven fabric on lab scale as well as on production scale and trouble shoot the problems. | | P4 | 3 |
| **CLO-2 Lab** | **Perform** the development of knitted fabric on lab scale as well as on production scale and trouble shoot the problems. | | P4 | 4 |
| **CLO-3 Lab** | **Participate** actively in lab discussion for timely completion of lab work activities. | | A3 | 11 |

**Course Outline for Theory**

Introduction:

Introduction to weave designs and elements

Weave representation, design, draft, peg-plan

Plain and Twill Derivatives:

Plain and Twill weave derivatives, Satin/Sateen weave

Derivative /pointed/ herringbone

Honeycomb, Mockleno and Huckaback structures:

Honeycomb weave

Mockleno & Huckaback

Crepe, Cords and Pique Weave:

Crepe weave

Cords and pique weave

Terry Weave and Designs:

Terry towels weaving

Terry Designs

| |
|---|
| Module 6 Velvet, Leno, Sear sucker Fabric and Design<br>Velvet & velveteen with design<br>Leno fabric weaving<br>Sear sucker fabrics<br>Color and weave effect<br>Knitting Software's:<br>Knitting software (weft knit)<br>Patterning in weft knitting<br>Color and stitch effect<br>Specialized Knitting Structures:<br>Plated knitted fabrics<br>Laying-in knitted fabrics<br>Inlaid knitted fabrics |
| **Recommended Books** |
| 1. Handbook of Weaving by Sabit Adanur<br>2. Textiles, Concepts and Principles by Virginia Hencken<br>3. Fabric Structure and Design by N. Gokarneshan<br>4. Principles of Weaving 5. Textile Weaving and Design by W.S. Murphy<br>5. Weaving Machines, mechanism & management ---By Mr.Talukdar. 7<br>6. Knitting - Reference Book of Textile Technologies by ACIMIT foundation, Published in 2001.<br>7. Knitting Technology, a comprehensive handbook and practical guide by David J Spencer, Woodhead publishing Ltd. Englasd, 2001. |

# 38. Finishing & Coating

| **COURSE TITLE**<br><br>**Finishing & Coating** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Depth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Apply** knowledge of textile finishing chemicals, finishing processes, different coatings, finishing mechanisms, and machines | | C3 | 1 |
| **CLO-2** | **Analyze** problems and parameters related to finishing processes | | C4 | 3 |
| **CLO-3** | **Apply** textile coatings, chemicals, coating techniques, related mechanisms, and machines | | C3 | 2 |
| **CLO-1 Lab** | **Formulate** recipes and methods of different finishing and coating techniques | | P4 | 3 |
| **CLO-2 Lab** | **Perform** experiments, and interpret results in finishing processes | | P4 | 4 |
| **CLO-3 Lab** | **Use** proper safety gadgets, safety precautions and other resources including dressing | | A3 | 8 |

**Course Outline for Theory**

Introduction to Mechanical Finishing:

Objectives and classification of mechanical finishing.

Function, method, and mechanism of different mechanical finishes; Fabric drying, Heat setting, Calendaring, Raising, Emerizing/Sueding/Peaching, Shearing, Sanforizing, Compaction.

Coating Methods and Techniques:

Knife coating, Roller coating, Dip coating, Transfer coating, Coating with screens, Foam coating, Spray coating

Application Methods of Chemical Finishes:

Different methods to apply a chemical finish on fabric, Basic calculations for batch and continuous application, Wet pickup, percentage add-on, Critical application value, continues routs and low wet pick, Factors affecting the wet pick up, Low wet pick-up methods, Types of saturation removal methods, Types of topical application methods

Chemical Softening:

Objective, mechanism, classification, chemistries, properties and evaluation methods.

Easy care and Durable Press Finishes:

Objective, mechanism, classification, chemistries, properties, and evaluation methods.

Oil and Water Repellent and soil Release Finishes:

Objective, mechanism, classification, chemistries, properties, and evaluation methods.

Antimicrobial Finishes:

Objective, mechanism, classification, chemistries, properties, and evaluation methods.

Flame Retardant Finishes:

Objective, mechanism, classification, chemistries, properties, and evaluation methods.

Miscellaneous Finishes Methods:

Objective, mechanism, classification, chemistries, properties, and evaluation methods related to Anti-pilling Finishes, Non-slip Finishes, UV Protection Finishes and Bio Finishes, Insect resist and mite protection finishes

**Recommended Books**

1. Chemical Finishing of Textiles by W. D. Schindler and P. J. Hauser (2004)
2. Smart Textile Coatings and Laminates by William C Smith (2010)
3. Advanced Textile Engineering Materials by Shahid-ul-Islam et al. (2018)
4. Textile Finishing by Derek Heywood (2003)
5. Reference Book of Textile Finishing Technology by ACIMIT (2002)
6. Chemistry and Technology of Fabric Preparation and Finishing by Charles Tomasino (1992)

# 39. Project-II

| **COURSE TITLE**<br><br>**Project-II** | | **CREDITS HOURS**<br>(0+3)<br>**0 Theory + 48 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology**<br>**Domain Project** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Devise** an experimentally verified system which can solve a Broadly Define Engineering Technology Problem | | C6 | 2 |
| **CLO-2** | **Implement** proposed design using modern technology for solution of Broadly Define Engineering Technology Problem | | C3 | 3 |
| **CLO-3** | **Investigate** and analyze the results obtain from the implemented design | | C4 | 4 |
| **CLO-4** | **Practice** ethical principles with specific reference to solution of engineering technology related problems | | A5 | 8 |
| **CLO-5** | **Display** effectiveness as an individual and in a teamwork management | | A4 | 9 |
| **CLO-6** | **Display** communication skills through presentations, technical report, and posters | | A5 | 10 |
| **CLO-7** | **Demonstrate** management skills as a member or leader to manage the project | | A4 | 11 |
| **CLO-8** | **Alter** and modify conventional solutions by adapting modern technology | | P6 | 5 |

# 40. Advances in Spinning Technologies

| **COURSE TITLE**<br><br>**Advances in Spinning Technologies** | | **CREDITS HOURS**<br>(3+0)<br>**48 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Depth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the operations and mechanisms involved in different open-end spinning systems | | C2 | 1 |
| **CLO-2** | **Compare** the different open-end spinning systems based on methodologies and yarn structure | | C4 | 2 |
| **CLO-3** | **Assess** the quality of the yarn produced on different open-end spinning systems | | C5 | 4 |

**Course Outline for Theory**

Fiber characteristics requirements for different leading spinning technologies, possibilities and limitations of different spinning technologies.

Rotor Spinning: The principle of rotor spinning, structure and operation of the rotor spinning machine, spinning box, package formation, yarn waxing device, operating, and monitoring, quality control systems. Machine and transport automation, automatic piecing, automatic package change. Selection and influence of draft and yarn twist. Economics of rotor spinning. New developments in rotor spinning. Optimum process atmospheric conditions.

Air-jet Spinning: Principle of operation, raw material requirements, drafting unit, spinning nozzle, winding, automation, yarn structure and properties. False twist and its structure, downstream processing, and end products; Economics. Comparison of air-jet and vortex spinning systems. Optimum process atmospheric conditions.

Friction Spinning: Principle and raw material preparation, process and machine parameters affecting product quality. Assessment of DREF-II and DREF-III yarn structures and properties. Optimum process atmospheric conditions.

Other Spinning Techniques: Wrap spinning, Siro spinning, solo spinning, hollow spindle spinning, self-twist spinning.

**Recommended Books**

1. Board, N. 2009. Complete Technology Book of Textile Spinning, Weaving, Finishing and Printing. National Institute of Industrial Research, New Delhi, India.
2. Gong R.H. and R.M. Wright. 2002. Fancy Yarns: Their Manufacture and Application. Woodhead Publishing, Cambridge, England.
3. Klein, W. 2008. The Rieter Manual of Spinning, Publisher (New Spinning Systems), Rieter Machine Works Ltd. Winterthur, Switzerland.
4. Lawrence, C.A. 2016. Advances in Yarn Spinning Technology: Elsevier Science, Amsterdam, Netherlands.

# 41. Ginning Technology

| COURSE TITLE<br><br>Ginning Technology | CREDITS HOURS<br>(2+1)<br>32 Theory + 16 Lab Sessions | KNOWLEDGE AREA/ DOMAIN<br><br>Textile Engineering Technology Breadth | |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the working mechanisms of different Pre-Ginning, Ginning and Post-Ginning equipment and processes. | C2 | 1 |
| **CLO-2** | **Compare** the world cotton scenario with Pakistan in terms of cotton harvesting and handling practices | C4 | 2 |
| **CLO-3** | **Analyze** material and machine interaction of different ginning machines to obtain optimum performance parameters. | C4 | 4 |
| **CLO-1 Lab** | **Sketch** the Process diagram of the ginning machines and related equipment. | P2 | 1 |
| **CLO-2 Lab** | **Recognize** the problems related to ginning process parameters | P1 | 2 |
| **CLO-3 Lab** | **Determine** and document the influence of different ginning process parameters on fiber quality. | P2 | 4 |

**Course Outline for Theory**

Worldwide cotton production and consumption: major cotton growing countries in the world, cotton production in Pakistan. Different cotton varieties grown in Pakistan and their characteristics. Cotton harvesting, hand picking, machine picking, machine striping.

Lay-out of ginning factory, Cotton ginning process description, unloading system. Pre-ginning equipment: drier, green boll trap, cleaners. Extractor: stick and green leaf machine, Different types of ginning machines, saw ginning machine description and its working; roller ginning machine description and its working; Comparison of saw and roller ginning; post ginning equipments; lint cleaners; condensers and baling system; Packaging of lint; cotton bales and bales dimensions; Defects in ginning and their causes.

Influence of ginning on fiber; yarn and fabric quality; Ginning Industry of Pakistan; Issues related to Pakistan ginning industry.

**Recommended Books**

1. Logistics, 2011. Pakistan Central Cotton Committee, Karachi.
2. Munro. J.M. Cotton. 2nd Edition. Longman Scientific and Technical Publications New York, USA.
3. The Journal of Cotton Science 8:83-90 (2004). Engineering and Cotton Ginning.
4. Wulfhorst, B., and T. Gries. 2012. Textile Technology: Carl Hanser Verlag GmbH & Company KG, Munich, Germany.

5. COM, I. 2009. Egypt Clothing and Textile Industry Handbook - Strategic Information, Developments, Contacts: International Business Publications, San Francisco, CA, USA.
6. Lakwete, A. 2005. Inventing the Cotton Gin: Machine and Myth in Antebellum America: Johns Hopkins University Press, Hopkins, USA.

# 42. Synthetic Fiber Production

| **COURSE TITLE**<br><br>**Synthetic Fiber Production** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Depth** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the sources, structure, properties and end use of synthetic textile fibers and filaments along with their manufacturing and processing methods | C2 | 1 |
| **CLO-2** | **Explain** the preparation, properties, and uses of synthetic fibers and filaments based on scientific approaches. | C2 | 3 |
| **CLO-3** | **Differentiate** various physical and mechanical properties of different synthetic fibers | C4 | 4 |

**Course Outline for Theory**

Introduction:

History of development and classification of synthetic fibers; Textile terms and definitions related to synthetic fibers

Raw Materials:

Viscose, cuprammonium, acetate and triacetate rayon; Dimethyl Terephthalate (DMT), Monoethylene Glycol, Caprolactum, Adipic acid, Hexamethyline diamine and Acrylonitrile; Polymerization; General information about polymers; types of polymers and requirements for fiber forming polymers; Introduction and orientation of melt, wet and dry spinning; stretching or drawing; Texturing; false twist process; draw Texturing; Staple fiber production line; Modified synthetic fibers i:e Polyester; nylon acrylic polypropylene fibers; Dyeing of Synthetic fibers in loose and yarn form and their important aspects

Quality Control:

Testing of Raw materials i:e Testing of dimethyl terephlate (DMT), terephlic acid, monomethyl glycol, caprolactum, adipic acid, Hexamethyline diamenine, and testing of polymers (molecular weight, molecular weight distribution); Testing of filament yarns and staple fibers i:e denier, tenacity and elongation, spin finish oil content ; Fractional and antistatic properties; shrinkage%; viscosity; evenness; Crimp contraction etc. Waste of different synthetic fibers and their utilization; Pollution of different fibers and their remedies.

**Recommended Books**

1. Burkinshaw, S.M. 2013. Chemical Principles of Synthetic Fiber Dyeing: Springer, Berlin Germany.
2. Body, H.1994. Synthetic Fiber Materials, Lonman Pub.UK.
3. V.R.Gowarikar. 2008. Polymer Science. New Age International Publisher, New Delhi, India.
4. Burkinshaw, S.M. 2013. Chemical Principles of Synthetic Fiber Dyeing: Springer, Berlin Germany.

# 43. High Performance Fibers

| **COURSE TITLE**<br><br>**High Performance Fibers** | | **CREDITS HOURS**<br>(2+0)<br>**32 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Breadth** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** the sources, structure, properties, and end use of High-Performance fibers along with their manufacturing and processing methods | C2 | 1 |
| **CLO-2** | **Explain** the preparation, properties, and uses of High-Performance Fibers based on scientific approaches. | C2 | 3 |
| **CLO-3** | **Differentiate** various physical and mechanical properties of various High-Performance Fibers | C4 | 4 |

**Course Outline for Theory**

Introduction: new generation of fibers, molecular dimensionality, contrasting mechanical properties, economics

Aramids: Introduction, polymer preparation, spinning, structure and properties, applications.

Gel-spun high-performance polyethylene fibers: Introduction, manufacturing, fiber characteristics, yarn, and fabric processing. Other high modulus-high tenacity (HM-HT) fibers from linear polymers

Carbon fibers: Introduction, physical properties, PAN-based carbon fibers, pitch-based carbon fibers, vapor-grown carbon fibers, carbon nanotubes, applications.

Glass fibers: Introduction, glass for fibers, fiber manufacturing, fiber finishing, glass fiber properties, composites.

Ceramic fibers: Introduction, silicon carbide-based fibers, alumina-based fibers, single-crystal oxide fibers, manufacturing, structure, properties, end uses.

Chemically resistant fibers: Introduction, chlorinated fibers, fluorinated fibers, manufacturing, structure, properties, end uses.

Thermally resistant fibers: Introduction, thermosets, aromatic polyamides and polyaramids, semi-carbon fibers.

**Recommended Books**

1. Hearle, J. W. S. 2001. High-performance Fibers. CRC Press, Woodhead Publishing, Cambridge, UK.
2. Hongu, T. G.O. Phillips and M. Takigami, 2005. New Millennium Fibers, CRC Press, Woodhead Publishing, Cambridge, UK.
3. Horrocks, A.R. and S. Anand. 2000. Handbook of technical textiles, CRC Press, Woodhead Publishing, Cambridge, UK.
4. Starr, T. 2012. Carbon and High-Performance Fibers Directory and Databook: Springer, Berlin, Germany.

# 44. Nonwovens and Technical Textiles

| **COURSE TITLE**<br><br>**Nonwovens and Technical Textiles** | | **CREDITS HOURS**<br>(3+0)<br>**48 Theory + 0 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Textile Engineering Technology Breadth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Understand** and Classify the Technical Textiles based on their functionalities | | C2 | 1 |
| **CLO-2** | **Explain** the web forming and web laying methods and procedures | | C2 | 3 |
| **CLO-3** | **Differentiate** web bonding techniques based on structural and functional properties of non-wovens | | C4 | 4 |

**Course Outline for Theory**

Introduction to Non-Wovens:

Classification, dry, wet, and polymer-laid nonwovens. Dry-laid web formation, Selection of raw materials for carding, opening of fibers, mixing, and blending. Carding, working, and stripping principles, roller operations, card clothing.

Cross-lapping:

Vertically lapped (perpendicular-laid) web formation**:** airlaid web formation, bonding and web consolidation, physical properties and Practicals applications of airlaid fabrics. Wet-laid web formation, Polymer-laid web formation, Spunbond fabric production, spunbond production systems, spunbond fabric applications, meltblown fabric production, characteristics and properties of meltblown fabrics, meltblown fabric applications.

Mechanical Bonding:

Stitch bonding, needle punching, hydro-entanglement, applications of stitch bonded, needle punched and hydro-entangled fabrics. Thermal bonding, Principle of thermal bonding, thermally bonded fabric structure, applications of thermally bonded fabrics. Chemical bonding, mechanism of chemical bonding, methods of binder application, applications of chemically bonded nonwovens. Nonwoven fabric finishing, Wet finishing, lamination, mechanical finishing, surface finishing,

Introduction to Technical Textiles:

Classification of technical textiles, Agrotech, Buildtech, Geotech, Medtech, Mobiltech, Oekotech, Packtech, Protech, Sporttech, Indutech, Clothtech, Hometech. History and development of technical textiles; Global market of technical textiles; production and consumption statistics of technical textiles.

| **Recommended Books** |
|---|
| 1. Grayson, M. 1984. Encyclopedia of Textiles, Fibers and Non-Woven Fabrics. John Wiley and Sons, New York. USA.<br>2. Horrocks, A.R. and Anand, S.C. 2000. Handbook of Technical Textiles. CRC Press, Woodhead Publishing, Cambridge, UK.<br>3. Russell, S.J. 2007. Handbook of Non-wovens, CRC Press, Woodhead Publishing, Cambridge, UK.<br>4. Jeon, H.Y. 2016. Non-woven Fabrics: IntechOpen, London, UK |

# 45. Denim Processing Technology

| **COURSE TITLE**<br><br>**Denim Processing Technology** | | **CREDITS HOURS**<br>(2+1)<br>**32 Theory + 16 Lab Sessions** | **KNOWLEDGE AREA/ DOMAIN**<br><br>**Textile Engineering Technology Depth** | |
|---|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Explain** various techniques, methods and machinery used in denim manufacturing process | | C2 | 1 |
| **CLO-2** | **Illustrate** wet processing and dry processing of denim garments | | C3 | 2 |
| **CLO-3** | **Apply** acquired knowledge to optimize process parameters related to denim manufacturing | | C3 | 4 |
| **CLO-1 Lab** | **Inspect** data and interpret results in denim processes | | P3 | 4 |
| **CLO-2 Lab** | **Demonstrate** machine mechanisms and material processing through various departments in denim Industry | | P3 | 1 |
| **CLO-3 Lab** | **Practice** proper safety gadgets, safety precautions and other resources | | A5 | 6 |

**Course Outline for Theory**

Denim Processing flow charts; Cotton yarn manufacturing for denim.

Indigo dye and reduction techniques; Indigo dyeing technology for denim yarns; dyeing of denim yarns with non-indigo dyes.
Weaving technologies for denim manufacturing; finishing of denim fabric; stitching of denim fabric; Developing before-wash measurements for a denim trouser.

Washing techniques for denim jeans; Bio washing of denim jeans, reduction of water in washing of denim garments; Reduced water washing of denim garments: ozone fading.

Finishing of jeans and quality control; Role of denim and jeans in the fashion industry; Novel varieties of denim fabrics; Recovery and recycling of denim waste; Laser engraving of denim; Effluent treatment in denim and jeans manufacturing; Environmental impacts of denim manufacturing

**Recommended Books**

1. R. Paul, 2015. Denim: manufacture, finishing and applications, Woodhead Publishing. Cambridge United Kingdom.
2. S.S. Muthu. 2017. Sustainability in Denim, The Textile Institute, Manchester. United Kingdom.
3. Piero Turk. 2017. A Life with Denim Vol.2, Woodhead Publishing. Cambridge United Kingdom

# 46. Supervised Industrial Training/ Electives

| **COURSE TITLE**<br><br>**Supervised Industrial Training/ Electives** | | **CREDITS HOURS**<br>(0+16)( 0+16)<br>**Seventh Semester**<br>**Eight Semester** | **KNOWLEDGE AREA/ DOMAIN**<br>**Textile Engineering Technology Domain SIT** |
|---|---|---|---|
| **After completion of this course students will be able to:** | | | **Bloom's Taxonomy Level** | **PLO** |
| **CLO-1** | **Apply** knowledge of engineering technology fundamentals and industrial processes | | C6 | 1 |
| **CLO-2** | **Acquire** in-depth technical competence in the specific engineering technology discipline during the industrial training and write a report to present problem analysis and findings | | P5 | 3 |
| **CLO-3** | **Understand** environmental health & safety practices of industry | | C5 | 7 |
| **CLO-4** | **Apply** the relevant references, guidelines, and code of ethics related to engineering technology practices | | A5 | 8 |
| **CLO-5** | **Apply** interpersonal communication skill with technical or/and non-technical staff in the workplace | | A5 | 10 |
| **CLO-6** | **Plan** (industrial training) activities and execute in a systemic manner | | A5 | 11 |
| **CLO-7** | **Work** effectively as an individual or team player recognize the need to undertake life-long learning | | A5 | 9 |
| **CLO-8** | **Easily** learn new things | | A5 | 12 |

# 9. Supervised Industrial Training

## 9.1 Background

Supervised Industrial Training refers to students supervised hands-on experience in an environment where engineering is practiced, familiarizing them with professional engineering work prior to graduation. The training curriculum consists of minimum 16 weeks of continuous industrial training, comprised of 8 hours per day, 5 working days per week. A Bachelor of Engineering Technology student shall undergo mandatory SIT during the 8$^{th}$ semester (16 weeks), or 7$^{th}$ and 8$^{th}$ semesters (16 weeks mandatory and 16 weeks in 7$^{th}$ semester optional), after he/ she has passed all subjects up to the 6$^{th}$ semester.

SIT covers a range of activities, such as design implementation, production processes, laboratory experiments, on-site field works and maintenance. It also serves as a mechanism to integrate engineering practices and the curriculum to achieve Program Learning Outcomes that cover Engineering Technologists Graduate Attributes in line with the Sydney Accord. While SIT provides practical exposure to engineering processes and helps developing professional skills required for an Engineering Technologist, it also offers an opportunity to the prospective employers to assess potential skills of a future employee.

## 9.2 Objectives:

Through the SIT, students will:

a. Learn to apply engineering technology knowledge learned in classroom environment in real industrial situations.

b. Be provided exposure to professional practices in the industries.

c. Understand the role and responsibilities and code of ethics that Engineering Technologists should uphold.

d. Develop awareness about general workplace behavior and build interpersonal skills.

e. Maintain professional work records and reports.

f. Learn to write reports and network with probable future employers to increase employability.

## 9.3 Responsibility of HEI: Placement in SIT Program

During 7th (Optional) and 8th semester, Bachelor of Textile Engineering Technology students will be undergoing continuous SIT of 16 (or 32) weeks. This training shall be arranged by HEIs in leading industry, and preferably should sign am MoU for the SIT. A designated Administrator/Coordinator of HEI shall complete all necessary documentation, preferably 12 weeks prior to the commencement of the training, and issue Training Schedule for 16 (or 32) weeks so that all stakeholders and the students are aware and assured of undergoing SIT training in 7th (optional) and 8th semester according to a scheduled timeline.

## 9.4 Responsibilities of Students:

a. Bachelor of Engineering Technology students shall get enrolled for SIT during the 6th semester and before commencement of 7th semester.

b. Students shall have to undergo continuous training of 16 (or 32) credit hours. One week's training of 8 hours daily for 5 days (40 contact hours) will be counted as 1 credit hour. Accordingly, 16 weeks (One semester) will help earn students 16 credit hours.

c. Total contact hours per semester are: 16 weeks per semester x 5 working days per week x 8 hours per day = 640. If an HEI opts SIT in 2 semesters (7th and 8th), these credit hours and contact hours will be doubled.

d. Students will maintain a daily Logbook, signed by the SIT supervisor at site, Training Administrator appointed by HEI and the student.

e. Students must observe safety & security rules of the Organization where they receive Training.

f. Students must wear specified working dress during training.

g. Students must obey all rules and regulations of the organization.

h. Students must observe working timings of the training Organization. Students may be allowed 10 days leave during Training period of 16 (or 32) for genuine reasons. The leave shall only be availed to cater for emergency/s, with prior sanction from the training Administrator/Coordinator.

i. Leave will be deducted from training hours and required to be made up later.

j. Unsanctioned leaves shall be treated as “absent”, and liable to disciplinary action.

k. Public holiday and leaves should not be counted as working hours.

## 9.5 Training Progress Assessment and Review by HEI

Every HEI should appoint a focal person as SIT Administrator/Coordinator for each program who will monitor progress randomly through site visits, phone calls or emails to the industrial organization’s counter-part focal person. Progress reports will be maintained after coordination with training supervisor(s) as well as the students.

The purpose of monitoring of SIT by Training Administrator/Coordinator are:

a. To ensure the training organization is providing suitable and appropriate training to students.

b. To obtain feedback on students’ performance and training progress through discussion with training supervisor(s).

c. To make courtesy visits and establish industrial relations between the HEI and the industries where students will receive their SIT.

d. To discuss the possibility of students’ job placement with the training organization.

e. To survey for new industries as potential training placement locations in the future.

## 9.6 Changing Student Placement During SIT

a. Students are discouraged to change placement during the training period from one organization to another.

b. However, written permission may be granted by the training Administrator/Coordinator, if new placement of the student is available and confirmed in another organization, provided the student does not suffer loss of training hours due to this changeover.

c. After getting a written permission from the Training Administrator/Coordinator, a fresh approval should be applied for the new placement.

## 9.7 Daily Training Logbook

All training activities must be recorded on daily basis in the Training Logbook [See Appendix F]. Students must get it signed, on daily basis, by on-the-job Trainer.

The Training logbook must reflect:

a. The student's learning experience during the industrial training

b. Training records and evidence of supervised training, with evidence of participation of student, on- the-job Trainer and HEI's training Administrator/Coordinator.

c. Part of professional practice in engineering profession where incidence and evidence are properly documented.

d. Information that becomes a source of reference in preparing the Industrial Training Report [See Section 8.8].

e. The Logbook must be submitted along with the Industrial Training Report.

## 9.8 Industrial Training Report

An Industrial Training Report will be submitted upon completion of SIT. The Report must describe student's learning and development in technical knowledge, engineering practices and professional skills acquired through the practical experience. The Industrial Training Report should also reflect student's ability in communicating skills and understanding of engineering practices. Students should seek advice from their on-the-job Trainer at site, to ensure that no confidential materials are included in the report. The report shall be submitted to the Training Administrator. The student may present a copy of the report to the prospective employer. Any references made in preparation of the report should be recognized using standard referencing formats. Student should refer to the Industrial Training Report Template as provided [See Appendix G] and guidelines given below in preparing the Report. The Daily Training Logbook should be submitted together with the Report.

## 9.9 Guidelines for Preparation of Industrial Training Report

Under the guidance of supervisors, students need to properly document their experience and learning during the SIT in form of an Industrial Training Report. A properly prepared Report can portray their practical experience precisely in an orderly manner. The Report must be prepared according to the format and the guidelines below:

### 9.9.1 Contents of Industrial Training Report

#### (a) Table of Contents

This section of the report shall consist of:

i. Headings
ii. Sub-headings
iii. Page numbers

Every appendix requires a title and each page need to be numbered accordingly.

### (b) Background & Profile of the Training Organization

Brief and concise description of the organization in which the student is undertaking the SIT. The main items are:

i. Backgrounds/profile of the organization
ii. Vision and Mission
iii. Organogram.
iv. Title and position of the supervisor in charge
v. Other necessary information only (not more than three pages)

### (c) Schedule of Duties Performed as Trainee

This section briefly describes the time, duration and types of duties performed during the training. The description must follow the schedule of the training, i.e., in chronological order (for 16/32 weeks). The days when the student was not on duty must be properly recorded with cogent reasons.

### (d) Experience During SIT

In this section, the student must fully describe the industrial training experience gained. Some suggested areas include:

i. Project (s) carried out, if any.
ii. Supervisory works
iii. Problems encountered
iv. Problems solving process or approach
v. Hands-on skills acquired.
vi. How productivity can be further enhanced.
vii. Quality Management system in place.
viii. Safety at work.

### (e) Conclusion

Students provide an overall assessment in this section and arrive at a conclusion with regards to the SIT undergone. Content may include:

i. Types of major work performed during SIT
ii. Different modules of SIT
iii. Comments whether SIT met the training objectives
iv. Suggestions and recommendations for improvement of the SIT

### (f) References

A complete list of the references used in the report must be included according to standard referencing format.

### (g) Appendixes

Appendixes are additional information appended to support the main text of the Report. A copy of the letter of permission from the Training Organization must be attached as an appendix. Other suggested appendixes are:

i. Investigation and project report during SIT
ii. Technical drawings, so far these are not secret documents or proprietary etc.
iii. Any other document that adds to the Report

### (h) Figures and Tables

All figures, tables and similar content must be captioned, labeled, and mentioned in the main text of the Report.

### (i) Notations, Symbols & Acronyms

If the report contains notations, symbols, and acronyms, these must be defined before they first appear in the main text. It is good practice to put list of notations, symbols, and acronyms on a separate page, appropriately titled, and placed after 'Tables of Contents' page.

Every appendix must have a title and be mentioned in the main text of the Report. All page numbers for appendixes must be in continuation of page numbers of the main Report.

## 9.9.2 Format of the Report

### (a) General

i. Students are advised to start writing the SIT Report as soon as training commences to ensure a timely completion and submission.
ii. Do not include irrelevant materials, e.g., brochures from the organizations, or any publicity materials in the report.

iii. The Report must be typewritten on plain white A4 size paper, with 12-point Times New Roman font type and line spacing of 1.5.

**(b) Abstract or Preface**

The Report should start with an abstract of maximum 2 pages, and should briefly describe:

i. Description of Organization providing SIT
ii. Summary of the Report
iii. Acknowledgements

## 9.10 SIT Assessment

Assessment of the SIT should be based on the following parameter:

| | | |
|---|---|---|
| i. | On-the-Job Trainer Report | (20% marks) |
| ii. | Training Advisor Report through visits or survey | (10% marks) |
| iii. | Industrial Training Report | (50% marks) |
| iv. | Viva voce | (20% marks) |

It is also be noted that:

i. Minimum 50% marks are required to pass the SIT.
ii. Students are advised to be diligent in writing their Report.
iii. The Report must be of good quality and portray in full the industrial experience and knowledge gained.
iv. The Report should not be in the form of short note and figurative form.
v. If the Report is not satisfactory, students shall rewrite the Report until it is deemed satisfactory.

## 9.11 Completion of Industrial Training

i. Upon completion of a 16- or 32-week continuous SIT, a Confirmation Letter to this effect must be obtained from the training organization and/or probable employer.

ii. The Confirmation Letter must be submitted to the Industrial Training Administrator/Coordinator, together with the (1) On-the-Job Trainer's Report, (2) Student Feedback Form, and (3) Industrial Training Report for grading.

# APPENDIX A: Sydney Accord Knowledge and Attitude Profile

(Retrieved from www.ieagreements.org)

| A Sydney Accord program provides: |
|---|
| **SK1:** A systematic, theory-based understanding of the natural sciences applicable to the sub-discipline and awareness of relevant social sciences. |
| **SK2:** Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed consideration and use of models applicable to the sub-discipline. |
| **SK3:** A systematic, theory-based formulation of engineering fundamentals required in an accepted sub-discipline. |
| **SK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for an accepted sub-discipline. |
| **SK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations using the technologies of a practice area. |
| **SK6:** Knowledge of engineering technologies applicable in the sub-discipline. |
| **SK7:** Knowledge of the role of technology in society and identified issues in applying engineering technology, such as public safety and sustainable development (represented by the 17 UN-SDGs). |
| **SK8:** Engagement with the current technological literature of the discipline and awareness of the power of critical thinking. |
| **SK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes. |

# APPENDIX B: Engineering Technologist Graduate Attribute Profile

(Retrieved from www.ieagreements.org)

| |
|---|
| As per Sydney Accord, Engineering Technologist Graduate is expected to have the following attributes: |
| Engineering Knowledge<br>**SA1:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals and an engineering specialization as specified in SK1 to SK4 respectively to defined and applied engineering procedures, processes, systems, or methodologies. |
| Problem Analysis<br>**SA2:** Identify, formulate, research literature, and analyze broadly defined engineering problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialization. (SK1 to SK4). |
| Design/Development of Solutions<br>**SA3:** Design solutions for broadly defined engineering technology problems and contribute to the design of systems, components, or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (SK5). |
| Investigation<br>**SA4:** Conduct investigations of broadly defined engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions (SK8) |
| Tool Usage<br>**SA5:** Select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to broadly defined engineering problems (SK2 and SK6) |

| |
|---|
| The Engineer and the World<br><br>**SA6:** When solving broadly defined engineering problems, analyze and evaluate sustainable development impacts (represented by the 17 UN-SDGs) to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (SK1, SK5, and SK7) |
| Ethics<br><br>**SA7:** Understand and commit to professional ethics and norms of engineering technology practice including compliance with national and international laws. Demonstrate an understanding of the need for diversity and inclusion (SK9). |
| Individual and Collaborative Teamwork<br><br>**SA8:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote, and distributed settings (SK9). |
| Communication<br><br>**SA9:** Communicate effectively and inclusively on broadly defined engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences. |
| Project Management and Finance:<br><br>**SA10:** Apply knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a team and to manage projects in multidisciplinary environments. |
| Lifelong Learning:<br><br>**SA11:** Recognize the need for, and have the ability for (i) independent and life-long learning and (ii) critical thinking in the face of new specialist technologies (SK8) |

# APPENDIX C: Engineering Technologist Professional Competence Profile

(Retrieved from www.ieagreements.org)

| |
|---|
| As per Sydney Accord, Engineering Technologist Graduate is expected to demonstrate the following competencies: |
| Comprehend and apply universal knowledge:<br>**TC1:** Comprehend and apply the knowledge embodied in widely accepted and applied procedures, processes, systems, or methodologies. |
| Comprehend and apply local knowledge:<br>**TC2:** Comprehend and apply the knowledge embodied procedures, processes, systems, or methodologies that is specific to the jurisdiction of practice. |
| Problem analysis:<br>**TC3:** Identify, clarify, and analyze broadly defined problems using the support of computing and information technologies where applicable. |
| Design and development of solutions:<br>**TC4:** Design or develop solutions to broadly defined problems considering a variety of perspectives. |
| Evaluation:<br>**TC5:** Evaluate the outcomes and impacts of broadly defined activities. |
| Protection of society:<br>**TC6:** Recognize the foreseeable economic, social, and environmental effects of broadly defined activities and seek to achieve sustainable outcomes (represented by the 17 UN-SDGs). |
| Legal, regulatory, and cultural:<br>**TC7:** Meet all legal, regulatory, and cultural requirements and protect public health and safety during all activities. |
| Ethics:<br>**TC8:** Conduct activities ethically |

| |
|---|
| Manage engineering activities:<br><br>**TC9:** Manage part or all of one or more broadly defined activities. |
| Communication and Collaboration:<br><br>**TC10:** Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders during all activities. |
| Continuing Professional Development (CPD) and Lifelong learning:<br><br>**TC11:** Undertake CPD activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever-changing nature of work. |
| Judgement:<br><br>**TC12:** Choose appropriate technologies to deal with broadly defined problems. Exercise sound judgement in the course of all broadly defined activities. |
| Responsibility for decisions:<br><br>**TC13:** Be responsible for making decisions on part or all of one or more broadly defined activities. |

# APPENDIX D: Minutes of Preliminary Meeting of NCRC

The preliminary meeting of National Curriculum Review Committee (NCRC) in the discipline of Textile Engineering Technology for bachelor's degree program was held on 17-03-2022 to 19-03-2021 for 3 days at the National Textile University (NTU), Faisalabad.

Welcome session was started with recitation of Holy Quran and it was chaired by Honorable Engr. Imtiaz Hussain Gilani, Chairman NTC. In a welcome speech, objectives, and arrangements for NCRC were presented by the host respected Prof. Dr. Tanveer Hussain, Rector, NTU, Faisalabad. Then, the Chairman NTC explicitly elaborated importance of curriculum development for B.Sc. Engineering Technology Programs through more practical work engagement as well as keeping in view the futuristic approach, market demand and societal needs as per the scope of NTC and guidelines of Sydney Accord.

Mr. Hafiz Ghulam Muhammad represented NTC. He highlighted the agenda of this meeting and emphasized for adaptation of general rules of curriculum development and revision such as scope of the subject/program, horizontal & vertical alignment, rule of flexibility and adaptability. Moreover, scope and template for adopting new undergraduate policy was discussed to adopt for the uniformity and alignment of curriculum.

Later on, Honorable Prof. Dr. Tanveer Hussain, Rector, NTU, Faisalabad, shared the procedure and execution of agenda in NCRC. Then he invited the house to nominate the Convener, Co-Convener, and Secretary of the NCRC for smooth functioning. After discussion with Members Dr. Yasir Nawab was nominated as Convenor, and Dr. Assad Farooq, and Dr. Sheraz Ahmad were nominated as Co-Convener, and Secretary for the Committee, respectively. Following nominated Members represented various HEIs from all over the Pakistan in NCRC for B.Sc. Textile Engineering Technology.

| Sr. No. | Name | Role |
|---|---|---|
| 1. | Dr. Yasir Nawab<br>Associate Prof. / Dean<br>NTU, Faisalabad | Convenor |
| 2. | Dr. Assad Farooq<br>Associate Prof. / chairman<br>University of Agriculture (UAF), Faisalabad | Co-Convenor |
| 3. | Dr. Sheraz Ahmed | Secretary |

| | | |
|---|---|---|
| | Associate Prof. / Chairman<br>National Textile University (NTU), Faisalabad | |
| 4. | Eng. Prof. Dr. Mudassar Habib<br>Professor, UET Peshawar | Member |
| 5. | Prof. Dr. Muhammad Shahid Khalil<br>Professor, NSU, Islamabad | Member |
| 6. | Dr. Muhammad Mohsin<br>Professor/ Chairman<br>UET, Lahore (Faisalabad Campus) | Member |
| 7. | Dr. Naeem Akhtar Qaisrani<br>Assistant Prof.<br>KFUEIT, Rahim Yar Khan | Member |
| 8. | Prof. Dr. Abdul Aziz Mazhar<br>Ex-Dean<br>Institute of Space Technology (IST), Islamabad | Member |
| 9. | Dr. Saira Faisal<br>Associate Prof.<br>NED UET, Karachi | Member |
| 10. | Dr. Muhammad Owais Raza Siddiqui<br>Associate Prof.<br>NED UET, Karachi | Member |
| 11. | Dr. Ghulam Ullah Khan<br>Associate Prof<br>BUITEMS, Quetta | Member |
| 12. | Dr. Rehan Abbasi | Member |

| | | |
|---|---|---|
| | Associate Prof<br>BUITEMS, Quetta | |
| 13. | Hafiz Ghulam Muhammad<br>Accounts Officer | NTC Rep |

After taking charge by the nominated committee, Convenor, Dr. Yasir Nawab chaired the meeting and emphasized to ensure the reflection of Sydney Accord in curriculum and course titles as well as to develop curriculum that provides a unified framework for offering degrees under the title of Textile Engineering Technology. In continuation of above guidelines, Dr. Assad Farooq, Co-Convener and Dr. Sheraz Ahmad, Secretary also briefed the objectives to the participants as follows.

Recommendations:

All objectives of meeting were presented and assigned to sub-committees, where Honorable Members of NCRC thoroughly reviewed and after detailed discussion the following work was done, and the recommendations were made

1. An undergraduate curriculum of textile engineering technology should be at par with international standards in line with Sydney accord.
2. The Program mission was formulated.
3. Sample program education objective (PEOs) were prepared.
4. Course learning outcomes (CLOs) with Bloom's Taxonomy levels, and course contents aligned with program learning outcomes (PLOs).
5. The relevant latest reading materials/ references were incorporated. It was also decided that exact year of publication should be mentioned instead of writing latest edition.
6. It was decided that preferably CLOs for theory and lab should be 3 each.
7. It was also decided that number of labs should be in the range 12-16.
8. It was suggested that the contents having uniformity across other disciplines without overlapping.
9. The recommendations were shared keeping in view the futuristic needs of the society.
10. Preface, objectives of the programs, PLOs, methods of instruction and learning environment, assessment and operational framework. Furthermore, list of courses (core & elective) and semester wise breakup of courses were also discussed thoroughly and the same was unanimously finalized. Admission/intake criteria was discussed and adopted same as previous. Moreover, adoption of supervised industrial training (SIT) was discussed in detail, which included offering elective courses instead of offering SIT in the 7$^{th}$ semester, number of credit hours and other related issues. It was decided that it is the discretion of degree offering universities.
11. After long deliberation, the committee proposed the curriculum framework, the duration of the program, number of semesters, number of weeks per semester, total number of

credit hours, weightage of Technology domain and non-technology domain courses and weightage of theory and practical of undergraduate 4-years program in textile engineering technology.

12. Keeping in view the experience and expertise of the NCRC Members, the list of courses of various domains were distributed among the sub-committees. These committees were assigned responsibility for reviewing course objectives, adding course learning outcomes, appropriate mapping with Bloom's Taxonomy and PLOs, updating list of contents, adding teaching-learning methods and assessment, and updating bibliography/ references/ suggested books. Following core committee along with four sub-committees were constituted with their separate Convenors and Secretaries.

| **NCRC Textile Engineering Technology Core Committee** | | |
|---|---|---|
| **Sr#** | **Name** | **Role** |
| 1 | Dr. Yasir Nawab | Convenor |
| 2 | Dr. Assad Farooq | Co-Convenor |
| 3 | Prof. Dr. Abdul Aziz Mazhar | Member |
| 4 | Dr. Sheraz Ahmad | Secretary |
| **Sub-Committee: Computing, Humanities and Social Sciences Courses** | | |
| **Sr#** | **Name** | **Role** |
| 1 | Eng. Prof. Dr. Mudassar Habib | Convenor |
| 2 | Dr. Ghulam Muhammad | Member |
| **Sub-Committee: Textile Engineering Technology Foundation Courses** | | |
| **Sr#** | **Name** | **Role** |
| 1 | Prof. Dr. Muhammad Shahid Khalil | Convenor |
| 2 | Dr. Naeem Akhtar Qaisrani | Member |

| Sub-Committee: Textile Engineering Technology Core Courses | | |
|---|---|---|
| **Sr#** | **Name** | **Role** |
| 1 | Prof. Dr. Muhammad Mohsin | Convenor |
| 2 | Dr. Rehan Abbasi sb | Member |
| 3 | Dr. Saira Faisal | Member |
| 4 | Dr. Muhamad Owais Raza Siddiqui | Member |
| 5 | Dr. Sheraz Ahmad | Member |
| 6 | Dr. Faheem Ahmad, NTU | Co-Opt member |
| 7 | Dr. Abher Rasheed, NTU | Co-Opt member |
| 8 | Dr. Muhammad Awais, NTU | Co-Opt member |

14. It was further decided the following tentative deadlines for upcoming activities:

i) Final submission of contents – 1st April
ii) Compiling by Dr. Sheraz until 8th April and share with Members in one week
iii) Next meeting (online) – 21st April (tentative)
iv) Initial draft wet by foreign expert/ Bench marking
v) 2nd Meeting in May

The meeting was adjourned with vote of thanks.

# APPENDIX E: Minutes of the Final Meeting of NCRC

The second/final meeting of the National Curriculum Review Committee (NCRC) in the discipline of Textile Engineering Technology of a bachelor's degree program was held on 30-05-2022 to 01-06-2022 for 3 days at the National Textile University (NTU), Faisalabad.

Welcome session was started with recitation of Holy Quran and it was chaired by Honorable Engr. Imtiaz Hussain Gilani, Chairman NTC. In a welcome address, objectives, and arrangements for NCRC were presented by the host respected Prof. Dr. Tanveer Hussain, Rector, NTU, Faisalabad. Then, the Chairman NTC explicitly elaborated the importance of curriculum development for B.S Engineering Technology Programs through more practical work engagement as well as keeping in view the futuristic approach, market demand and societal needs as per the scope of NTC and guidelines of Sydney Accord. Mr. Hafiz Ghulam Muhammad represented NTC. Later on, Dr. Yasir Nawab, Convenor of NCRC, shared the status on the development of curriculum of BS Textile Engineering Technology.

Following Members attended the meeting:

| Sr. No. | Name | Role |
|---|---|---|
| 1. | Dr. Yasir Nawab<br>Associate Prof. / Dean<br>NTU, Faisalabad | Convener |
| 2. | Dr. Assad Farooq<br>Associate Prof. / chairman<br>University of Agriculture (UAF), Faisalabad | Co-Convenor |
| 3. | Dr. Sheraz Ahmed<br>Associate Prof. / Chairman<br>National Textile University (NTU), Faisalabad | Secretary |
| 4. | Eng. Prof. Dr. Mudassar Habib<br>Professor, UET Peshawar | Member |
| 5. | Prof. Dr. Muhammad Shahid Khalil<br>Professor, NSU, Islamabad | Member |
| 6. | Dr. Muhammad Mohsin<br>Professor/ Chairman | Member |

| | | |
|---|---|---|
| | UET, Lahore (Faisalabad Campus) | |
| 7. | Dr. Naeem Akhtar Qaisrani<br>Assistant Prof.<br>KFUEIT, Rahim Yar Khan | Member |
| 8. | Prof. Dr. Abdul Aziz Mazhar<br>Ex-Dean<br>Institute of Space Technology (IST), Islamabad | Member |
| 9. | Dr. Saira Faisal<br>Associate Prof.<br>NED UET, Karachi | Member |
| 10. | Dr. Muhammad Owais Raza Siddiqui<br>Associate Prof.<br>NED UET, Karachi | Member |
| 11. | Dr. Ghulam Ullah Khan<br>Associate Prof<br>BUITEMS, Quetta | Member |
| 12. | Dr. Rehan Abbasi<br>Associate Prof<br>BUITEMS, Quetta | Member (Attended online) |
| 13. | Hafiz Ghulam Muhammad<br>Accounts Officer | NTC Rep |

After the introductory session, the deliberation on the agenda of the second meeting formally commenced which was headed by Convener Dr. Yasir Nawab, Co-Convener Dr. Assad Farooq, and Secretary Dr. Sheraz Ahmad.

It was informed to Honorable Members that valuable feedback received from the following International Experts:

| Sr# | Foreign Expert Name | Affiliation |
|---|---|---|
| 1 | Prof. Dr. Mehmet Karahan | Bursa Uludag University, Turkey |
| 2 | Prof. Dr. Abdel Fattah Seyam | Wilson College of Textiles, NC State University, USA |

In this regard, international experts appreciated the efforts made by NCRC to compose a balanced and standardized curriculum for Textile Engineering Technology. However, their proposed suggestions are also incorporated.

**Recommendations:**

All objectives of meeting were presented and assigned to subcommittees, where Honorable Members of NCRC thoroughly reviewed and submitted following resolutions after detailed discussion

- Agreed upon curriculum preface, mission, vision, preamble, rationale, scope, course scheme etc.
- Finalized bench marking of the Recommended Scheme of Studies, Engineering Technology domain and non-Engineering technology domain courses in Comparison with HEC Framework.
- Approved the Semester-wise break-up of courses, credit hours allocations and Breadth & Depth courses for BS Textile Engineering Technology.
- Recommended the sample course profiles and contents of BS Textile Engineering Technology.

The final draft is compiled by Secretary Dr. Sheraz Ahmad. After review by the Members and with the approval of Convener Dr. Yasir Nawab and Co-Convener Dr. Assad Farooq is submitted to the NTC.

The meeting was adjourned with vote of thanks.

# APPENDIX F: Supervised Industrial Training Logbook Sample Format

**Personal Details:**
Student Name:
Student Roll Number:
Address:
Email:
Course of Study:
Year/Semester of Study:
Training Start Date:
Training End Date:

**Training Organization Details:**
Name:
Address:
Contact Person:
Contact Number:

**Daily Training Log**

Please specify training information by descriptive statements, tables, sketches, figures, photographs, and so forth. Feel free to incorporate attachments wherever necessary.

Training Week: _____

| Date | Time | Training Log |
|---|---|---|
| | | |
| | | |
| | | |

Declaration:

I, _____ student identification number _____, do hereby declare that all information provided above is true and correct to the best of my knowledge.

_____
Trainee signature with date

_____
Supervisor signature with date

# APPENDIX G: Supervised Industrial Training Report Sample Format

Sample table of content for supervised industrial training report is provided so that students can develop an understanding of what is expected of them when making the submission. Students are encouraged to expand upon the content presented below. A declaration page validating the originality of work duly signed by the student and the trainee is also to be attached at the beginning of the submitted report.