



NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF CHEMICAL AND TEXTILE ENGINEERING
TEXTILE ENGINEERING PROGRAM

PIT21 – THREAD FORMATION SYSTEMS I

I. GENERAL INFORMATION

CODE	: PIT21 Thread Formation Systems I
SEMESTER	: 3
CREDITS	: 3
HOURS PER WEEK	: 5 (Theory, Practice, Workshop)
PREREQUISITES	: PIT01 Introduction to Textile Engineering
CONDITION	: Compulsory
DEPARTMENT	: Textile Engineering

II. COURSE DESCRIPTION

The course prepares students for understanding and analyzing the process for converting natural threads into carded belt, as well as the corresponding quality control. The course focuses on cotton as raw material describing its opening, cleaning, spinning and carding processes, required machinery, and proper handling of materials, instruments and machinery.

III. COURSE OUTCOMES

At the end of the course, students:

1. Understand the characteristics of cotton as raw material for textile thread.
2. Understand the process of cotton opening and cleaning.
3. Understand the process of thread titling and spinning and required machinery.
4. Understand and describe carding process, carding intensity and required machinery.
5. Understand and explain quality control methods applied to spinning and carding processes.

IV. LEARNING UNITS

1. GENERALITIES

Textile terminology / Textile fiber basics / General characteristics of textile fibers / Fiber classification / Finer analysis systems / Comparison between HVI and AFIS and functions of each of them.

2. COTTON

Cotton characteristics / Cotton burling / Cotton uses / Handling and processing from cotton cultivation to burling / Relationship between fiber and thread regarding length, resistance, pilosity (hairiness) / Fiber length curve.

3. THREAD TITLE AND INTRODUCTION TO SPINNING

Direct and indirect systems for determining thread title / Production lines / Carded and combed thread / Open-end threads / Stretching, dubbing and torsion / Spinning limits / Waste.

4. BALES OPENING

Waste control / Shirley analyzer / Relative humidity / Regain / Fabrication climate conditions / Mixtures / Fineness / Computing the quantity of fibers in a thread / Spinability / Computing mixtures.

5. PRODUCTIVE PROCESSES

Description and general concepts of spinning systems / Production and stretching calculations / Machinery and instruments / Modern machinery models / Comparison with traditional machinery /

6. OPENING AND CLEANING

Opening concepts and principles / Location in plant layout / Required machinery / Settings and regulation / Process description / Swinging and carding elements / Process and production control / Strange materials detection system / Location / Fullers / Conventional and automatic types / Beat intensity (heat per fiber) / Beats per weight unit / Fuller defects and practical solutions.

7. CARDING PROCESS

Carding concept / Carding theory and fiber transportation / Fittings / Basic rules / Types / Fitting density / Card machine elements / Carding process / Partial and total stretching / Machinery election criteria / Carding intensity / Number of needles per mass unit of material / Carding defects / Neps / Computing the number of required neps / Card faults.

8. QUALITY CONTROL

Uster equipment / Measurement fundamentals and principles / Procedures / Modern measurement technologies / Data interpretation / Defects.

V. WORKSHOPS AND PRACTICAL EXPERIENCE

- Opening and loader
- Step washer
- Fuller
- Card

VI. METHODOLOGY

The course takes place in theory, practice and workshop sessions. In theory sessions, faculty presents the concepts, methods and applications. In practice sessions, students solve diverse problems related to thread formation systems including different types of machines used for formation. In workshop sessions, students set and use opening, cleaning, spinning and carding machinery in real operating conditions. Students visit textile industry plants to analyze thread formation processes. Student active participation is promoted along the course.

VII. GRADING FORMULA

The Final Grade PF is calculated as follow:

$$PF = (EP + 2*EF + PP) / 4$$

EP: Mid-term Exam EF: Final Exam

PP: Average grade of Practical and Experimental Work.

VIII. BIBLIOGRAPHY

1. KLEIN W.

A Practical Guide to Opening and Carding.

2. FELIU Marsal

Production and Quality Management in Textile Industry