**GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**

**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**
Semester -IV

**Course Title: Weaving Technology-III**
(Course Code: 4342902)

| Diploma programmes in which this course is offered | Semester in which offered |
|---|---|
| Textile Manufacturing Technology | 4th semester |

## 1. RATIONALE

Fabric is final end product of mainline textile activity. Weaving is one of three important method of fabric formation. The main device for making woven fabric, loom, has undergone developments from non-automatic to latest generation shuttle-less looms. Also, various ways of manipulating warp and weft yarn for manufacturing various woven structures have evolved fully. Society requires large quantity and quality with different designs of fabrics. Traditional power looms are not the solution, engineering and technological changes have brought about automation in weaving looms to increase production rates, different designs and quality of fabrics. The diploma graduates are required to manage production in automated looms, jacquard looms, Drop Box loom and Terry loom in industries. This course aims at providing necessary knowledge and skills to the diploma students in automated looms, jacquard looms, Drop Box loom and Terry loom. In this course, the students are exposed to knowledge of automated looms, jacquard looms, Drop Box loom and Terry loom.

## 2. COMPETENCY

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Use Auto looms, Jacquard, Drop Box and Terry loom**.

## 3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

a) Use automatic loom for fabric production.
b) Create fabric with numerous weft patterns using a Drop Box loom.
c) Use Jacquard mechanism for producing large figure or pattern.
d) Use Terry loom for producing terry fabric.

## 4. TEACHING AND EXAMINATION SCHEME

| Teaching Scheme (In Hours) | | | Total Credits (L+T+P/2) | Examination Scheme | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | Total Marks |
| L | T | P | C | CA | ESE | CA | ESE | |
| 3 | - | 2 | 4 | 30* | 70 | 25 | 25 | 150 |

*(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for assessing the attainment of the cognitive domain UOs required for the attainment of the COs.*

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **CA** - Continuous Assessment; **ESE** -End Semester Examination.*

## 5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. *Some of the **PrOs** marked **'*'** (in approx. Hrs. column) are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'*.

| S. No. | Practical Outcomes (PrOs) | Unit No. | Approx. Hrs. required |
|---|---|---|---|
| 1 | Demonstrate working of different types of weft feelers of Auto-looms. | I | 04* |
| 2 | Use pirn changing mechanism on Auto-looms. | I | 04* |
| 3 | Demonstrate working of non-stop type shuttle change mechanism. | I | 02 |
| 4 | Demonstrate working of Bartlett Let-off motions. | I | 02* |
| 5 | Demonstrate working of Ruti Let-off motions. | I | 02 |
| 6 | Use Mechanical Warp stop motion on Auto-looms. | I | 02* |
| 7 | Demonstrate working of Eccle's Drop box motion | II | 04* |
| 8 | Prepare card chain for given weft pattern | II | 02* |
| 9 | Demonstrate working of Single lift single cylinder jacquard | III | 02* |
| 10 | Demonstrate working of Double lift single cylinder jacquard | III | 02* |
| 11 | Demonstrate working of Double lift Double cylinder jacquard | III | 02* |
| 12 | Demonstrate working principle of Electronic jacquard | III | 02 |
| 13 | Use different types of ties and Harness mounting | III | 04 |
| 14 | Demonstrate passage of material through of pile and ground warp through terry loom. | IV | 04* |
| | **Minimum 10 Practical Exercises** | | **28 Hrs.** |

***Note***

i. *More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

ii. *The following are some **sample** 'Process' and 'Product' related skills(more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course which are embedded in the COs and ultimately the competency.*

| S. No. | Sample Performance Indicators for the PrOs | Weightage in % |
|---|---|---|
| 1 | Identify components. | 20 |
| 2 | Prepare experimental setup. | 20 |
| 3 | Operate the equipment setup. | 20 |
| 4 | Follow safe practices. | 20 |
| 5 | Result/conclude. | 20 |
| **Total** | | **100** |

## 6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

This major equipment with broad specifications for the PrOsis a guide to procure them by the administrators to usher in uniformity of practical in all institutions across the state.

| S. No. | Equipment Name with Broad Specifications | PrO.No. |
|---|---|---|
| 1 | Automated loom with speed up to 120-140 RPM, negative tappet shedding using eight (8) Heald shafts, (7) seven-wheel take-up motion, positive let-off motion, mechanical serrated bar warp stop, weft stop, temple, brake, warp protector mechanism and shuttle or pirn changing mechanism with weft feeler. | 1 to 6 |
| 2 | Drop box loom with speed up to 120-140 RPM, negative tappet shedding using eight to twenty (8-20) Heald shafts, (7) seven-wheel take-up motion, positive let-off motion, mechanical serrated bar warp stop, weft stop, temple, brake and warp protector mechanism. | 7 to 8 |
| 3 | Single Lift Single Cylinder Jacquard loom of 600 hooks capacity with speed up to 120-160 RPM, picking mechanism, (7) seven-wheel take-up motion, positive let-off motion, mechanical serrated bar warp stop, weft stop, temple, brake and warp protector mechanism. | 9 to 13 |
| 4 | Terry loom with speed of 120-450RPM with other required mechanism such as shedding using eight to twenty (8-20) Heald shafts, colour selector 4-8 colour,terry mechanism,seven-wheel take-up motion, positive let-off motion, warp stop, weft stop, temple,brakeetc. | 14 |

## 7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfill the development of this course t competency.

e) Work as a leader/a team member.
f) Follow safety practices while using equipment.
g) Realize importance of green energy.

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

## 8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

| Unit | Unit Outcomes (UOs) | Topics and Sub-topics |
|---|---|---|

| | (4 to 6 UOs at different levels) | |
|---|---|---|
| **Unit – I**<br><br>**Automatic weaving machine** | 1a. Classify the looms automatic looms<br>1b. Describe types of Automatic looms.<br>1c. Explain the characteristic and advantages of automatic looms over non-automatic looms<br>1d. Compare automatic looms over non-automatic looms<br>1e. Compare cop changing over shuttle changing looms<br>1f. List the Accessories for pirn changing mechanism<br>1g. Differentiate Auto loom shuttle and Plain loom shuttle.<br>1h. List the types of weft feelers<br>1i. Differentiate / Compare Mechanical, Electrical, optical electronic types of Weft feelers.<br>1j. Explain working of Mechanical, Electrical, optical electronic types weft feeler.<br>1k. Explain working of pirn changing mechanism.<br>1l. Explain working of Let-off motion.<br>1m. Explain timing and setting of motion.<br>1n. List the types of Automatic Warp stop motion<br>1o. Describe need of warp stop motion.<br>1p. Explain working of Mechanical & Electrical type warp stop motion.<br>1q. Explain environmental aspects in weaving Dept | 1.1 Classification of Automatic looms Looms<br>1.2 Characteristics and advantages of Automatic loom over non-automatic loom.<br>1.3 Compare Automatic loom over non-automatic loom.<br>1.4Working of Pirn changing mechanism<br>1.5Types of Weft feelers<br>1.5.1 Mechanical(Midget)<br>1.5.2 Electrical(Two-pronged feeler)<br>1.5.3 Photo electrical (optical electronic)<br>1.6Non-stop Shuttle change mechanism<br>1.7Positive Let-off motion<br>1.7.1Bartlett<br>1.7.2 Ruti<br>1.8 Warp stop motion<br>1.8.1 Mechanical Northrop warp stop motion<br>1.8.2 Electrical warp stop motion<br>1.9 Environmental aspects in weaving Dept |
| **Unit – II**<br><br>**Multiple box loom** | 2a. Discuss use and need of Drop boxes loom.<br>2b. List types of box motion<br>2c. Give classification of Multiple box<br>2d. Explain in detail working of Drop box motion<br>2e. Explain working of Safety device In Cowburn and Peck's Dropbox motion<br>2f. Describe in brief about Card Saving device<br>2g. Describe in brief about Pick-at-Will motion<br>2h. List and describe the different types of pattern Card of Cowburn and Peck's Dropbox motion<br>2i. Prepare card chain for given | 2.1 Importance of Drop box loom<br>2.2 Types of box motion<br>2.3 Classification of Multiple box<br>2.4 Working of Cowburn and Peck's Drop box motion<br>2.5 Different devices of Drop box<br>2.5.1Safety device in Cowburn and Peck's Drop box motion<br>2.5.2Card saving device<br>2.6 Pick at will motion<br>2.7 Different types of pattern cards<br>2.8 Preparation of card chain for weft pattern design |

| | | |
|---|---|---|
| | weft pattern | |
| **Unit– III**<br><br>**Jacquard** | 3a. Explain need of jacquard<br>3b. Classify different types of jacquard<br>3c. Explain different parts of jacquard shedding.<br>3d. State sizes and figuring capacity of jacquard.<br>3e. Explain in detail working of different types of jacquard<br>3f. Give the advantages of Double lift jacquard over Single lift jacquard<br>3g. Describe different types of harness mounting.<br>3h. Describe different types of Tie-ups or Design tie.<br>3i. Describe the card cutting on Piano card cutting machine. | 3.1 Need & Classification of Jacquard<br>3.2 Important parts of jacquard<br>3.3 Sizes and figuring capacity of jacquard.<br>3.4 Construction & Working of following jacquard<br>3.4.1Single lift single cylinder jacquard<br>3.4.2Double lift single cylinder jacquard<br>3.4.3Double lift Double cylinder jacquard<br>3.4.4Electronic jacquard<br>3.5 Different Harness mounting<br>3.5.1Straight tie or Norwich tie<br>3.5.2 Cross tie or London tie<br>3.6 Types of Tie-ups or Design tie<br>3.6.1 Straight through or Repeating tie<br>3.6.2 Centered tie<br>3.6.3 Border and middle tie<br>3.6.4Mixed ties or Combination tie<br>3.7 Piano card cutting machine |
| **Unit– IV**<br><br>**Terry Loom** | 4a. List the uses of terry fabric.<br>4b. Classify woven terry fabric.<br>4c. Classify toweling fabrics.<br>4d. Give properties of terry fabric.<br>4e. List and explain in brief types of terry Pile.<br>4f. List types of terry pile structure.<br>4g. Describe passage of Passage of Pile warp and ground warp through Ruti terry loom.<br>4h.Explain the formation of Pile by Terry mechanism<br>4i. List the methods of creating gap between picks | 4.1 Introduction of terry fabric and its uses<br>4.2 Classification of Woven terry fabric<br>4.3 Classification of toweling fabric<br>4.4 Properties of terry fabric<br>4.5 Types of terry pile<br>4.5.1 Terry fabric with loop piles<br>4.5.2 Terry fabric with cut and opened pile<br>4.6 Types terry pile structures<br>4.7 Passage of pile and ground warp through Ruti terry loom.<br>4.8Formation of the Pile by Terry mechanism and methods of creating gap between picks |

## 9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

| Unit No. | Unit Title | Teaching Hours | Distribution of Theory Marks | | | |
|---|---|---|---|---|---|---|
| | | | R Level | U Level | A Level | Total Marks |

| Unit No. | Unit Title | Teaching Hours | Distribution of Theory Marks | | | |
|---|---|---|---|---|---|---|
| | | | R Level | U Level | A Level | Total Marks |
| I | Automatic weaving machine | 16 | 06 | 12 | 09 | 27 |
| II | Multiple box loom | 08 | 03 | 07 | 04 | 14 |
| III | Jacquard loom | 12 | 06 | 07 | 07 | 20 |
| IV | Terry Loom | 06 | 03 | 03 | 03 | 09 |
| **Total** | | **42** | **18** | **29** | **23** | **70** |

***Legends:*** *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

***Note****: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from above table.*

## 10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course. Students should conduct following activities in group and prepare reports of about 5 pages for each activity. They also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare report on different manufacturers' Automatic loom based on industrial visit.
b) Prepare report on Jacquard machine based on industrial visit.
c) Prepare report on Drop box loom based on industrial visit.
d) Prepare report on Terry loom based on industrial visit.

## 11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4***means different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide students on how to address issues on environment and sustainability.
g) Guide students for using data manuals.

## 12. SUGGESTED MICRO-PROJECTS

***Only one micro-project*** is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-projects are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the micro-project should be about **14-16** ***(fourteen to sixteen) student engagement hours*** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

a) **Automatic loom (Cop Changing)**: Prepare the report of different Automatic shuttle loom with their specifications.
b) **Automatic loom (Shuttle Changing)**: Prepare the report of pirn machines with their specifications.
c) **Drop box loom**: Prepare the report of different Drop box machines with their specifications.
d) **Multiple box loom:** Prepare the report of different of Multiple box loom and write features of each.
e) **Mechanical Jacquard:** Prepare the report of different of mechanical Jacquard.
f) **Electronic Jacquard:** Prepare the report of different electronically controlled jacquard.
g) **Terry loom**: Prepare the report of different terry loom manufacturer with its features.
h) **Terry Fabric:**Prepare a portfolio of samples of different types of terry fabric.
i) **Environmental aspect in weaving department**: Prepare the report of environmental aspect in weaving department.

## 13. SUGGESTED LEARNING RESOURCES

| S. No. | Title of Book | Author | Publication with place, year and ISBN |
|---|---|---|---|
| 1 | Woven Fabric Production – II | NCUTE | NCUTE Publications, 8th Floor, Main Building, IIT, hauzkhas, New Delhi-110016. 2002 |
| 2 | Woven Terry Fabrics: Manufacturing &Quality management | Jitendra Pratap Singh and Swadesh Verma | Wood head Publishing series in Textile, 2017 The Textile Institute, ISBN: 978-0-08-100686-3 |
| 3 | Principle of Weaving | Marks & Robinson | The Textile Institute, Manchester, England,1976 ISBN:0-900739258 |
| 4 | The mechanisms of Weaving | Thomas W. Fox | Textile Book Service, New Jersey, 1992, ISBN not available |
| 5 | Weaving machine, material & | Ajgaonakar D.B. | Mahajan Publisher Private Limited. Ahmedabad.1998. |

| S. No. | Title of Book | Author | Publication with place, year and ISBN |
|---|---|---|---|
| | management | &Talukdar | ISBN:81-85401-16-0 |
| 6 | Jacquard Looms - Harness Weaving | T. T. Bell | Herzberg Press LLC<br>107 Luigart Ct<br>Lexington, Kentucky, 40508<br>ISBN: 978-1445529066 |
| 7 | Performance of Home Textiles | Subrata Das | Wood head Publication India PVT Ltd., New Delhi, 2010<br>ISBN: 978-0-85709-007-2 |
| 8 | Hand book of Weaving | Sabit Adanur | CRC Press<br>Taylor & Francis Group<br>6000 Broken Sound Parkway NW, Year-2001<br>ISBN: 978-1-58716-013-4 |
| 9 | Principles of Woven Fabric Manufacturing | Abhijit Majumdar | CRC Press<br>Taylor & Francis Group<br>6000 Broken Sound Parkway NW, Year-2017<br>ISBN: 978-1-4987-5911-3 |

## 14. SOFTWARE/LEARNING WEBSITES

1. https://nptel.ac.in/courses/116102005
2. https://textilevaluechain.in/in-depth-analysis/articles/textile-articles/noise-pollution-and-its-control-in-a-weaving-plant/
3. https://docs.google.com/presentation/d/1RVYLIbP4qrEfEd_zpFmjvPPsbLgQkt_3cWCjLWdsWpo/htmlpresent
4. https://www.youtube.com/watch?v=j23BomL9prY
5. https://www.youtube.com/watch?v=jTK5l_ENOE4
6. https://www.youtube.com/watch?v=q8hv_zP8Z78
7. https://www.youtube.com/watch?v=awGjOGo_Mis
8. https://www.youtube.com/watch?v=8o1MTfF2MU0&list=PLA1B579D4986871E8
9. https://youtube.com/watch?v=n95rq-YcLw8&list=PLA1B579D4986871E8&index=9
10. https://www.youtube.com/watch?v=q8hv_zP8Z78&list=PLA1B579D4986871E8&index=10
11. https://www.youtube.com/watch?v=nQR47jIVLX0
12. https://www.youtube.com/watch?v=HNSu0q2z8uI
13. https://www.youtube.com/watch?v=CRnSuqnuaoM
14. https://m.youtube.com/watch?v=s5uGmOrrn_I
15. https://youtube.com/watch?v=BDAdD8887QE
16. https://youtube.com/watch?v=Jivr6n3FEY0
17. https://youtube.com/watch?v=zqS7yuQIJQg

## 15. PO-COMPETENCY-CO MAPPING

| Semester IV | Weaving Technology-III (Course Code: 4342902) | | | | | | |
|---|---|---|---|---|---|---|---|
| | POs | | | | | | |
| Competency & Course Outcomes | PO 1 Basic & Discipline specific knowledge | PO 2 Problem Analysis | PO 3 Design/ development of solutions | PO 4 Engineering Tools, Experimentation &Testing | PO 5 Engineering practices for society, sustainability & environment | PO 6 Project Management | PO 7 Life-long learning |
| Competency . | Use Autolooms, Jacquard, Drop Box and Terry loom. | | | | | | |
| Course Outcomes CO a) Use automatic loom for fabric production. | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO b) Create fabric with numerous weft patterns using a Drop Box loom. | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| CO c) Use Jacquard mechanism for producing large figure or pattern. | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| CO d) Use Terry loom for producing terry fabric. | 3 | 2 | 2 | 2 | 2 | 2 | 2 |

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

## 16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### GTU Resource Persons

| S. No. | Name and Designation | Institute | Contact No. | Email |
|---|---|---|---|---|
| 1 | Prajapati rohitJaswantlal, Lecturer | R. C. Technical Institute, Ahmedabad | 079-27664785 | rohit_prajapati15@yahoo.co.in |
| 2 | Sorani JaysukhGovindbhai, Lecturer | Sir Bhavsinhji Polytechnic Institute, Bhavnagar | 0278-2426742 | Jaysukh.sorani@gmail.com |