

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE:-ADVANCED KNITTING TECHNOLOGY
(COURSE CODE: 3362906)

Diploma Program in which this course is offered	Semester in which offered
Textile Manufacturing Technology	Sixth

1. RATIONALE

Due to continuous research and development, new inventions have taken place in the area of knitting. New technologies and equipment have entered the market, to produce better quality fabric at cheaper costs. The aim of this course is to develop the competency of operating such advanced knitting technological equipment used in the industry. This course is important for textile engineers as liking for knitted textile is increasing day by day due to better comfort provide by knitted textile as compared to weaved textile.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in students so that they are able to acquire the following competency required by the industry:

- **Apply advanced knitting technologies to develop different design structures of knitted fabrics.**

3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

- Employ warp and weft knitting techniques.
- Knit using latch, beard and compound needles.
- Use different weft knitted structures.
- Select needles to maintain weft knit quality.
- Use different warp knitted structures.
- Calculate the production of weft and warp knitting machines.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P –Practical; C – Credit;; ESE -End Semester Examination; PA - Progressive Assessment.

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
Unit – I Knitting	1a. Explain the general terms used in knitting. 1b. Describe the principle of warp knitting. 1c. Describe the principle of weft knitting. 1d. Differentiate warp and weft knitting. 1e. Describe the working principle of warp and weft knitting machines	1.1 General terms and definition used in knitting- Stitch, stitch length, stitch density, course, wale. 1.2 Necessity of knitting. 1.3 Principle of weft knitting. 1.4 Principle of warp knitting.
Unit– II Knitting Needles	2a. Describe the functions of beard needle, its merits and demerits 2b. Describe the functions of latch needle, its merits and demerits 2c. Describe the functions of compound needle, its merits and demerits	2.1 Beard needle. 2.2 Latch needle. 2.3 Compound needle.
Unit–III Weft knitting	3a. Explain the weft knitting structural elements. 3b. Differentiate types of yarns used for weft knitting. 3c. Describe the function of the weft knitting machine elements. 3d. Describe the function of sinker. 3e. Describe the function of cam system. 3f. Describe knitting cycle in weft knitting by latch needle. 3g. Interpret the different weft knitted stitches. 3h. Interpret the design features and properties of various weft knitted structure. 3i. Explain the different weft knitted structures with sketches. 3j. Explain the ornamentation of single and double jersey structure. 3k. Explain derivatives of single	3.1 Weft knitting structural elements, Needle loop, sinker loop, technical back, technical face, close loop, open loop. 3.2 Yarns for weft knitting, passage of material through simple circular weft knitting machine. 3.3 Construction and function of sinker. 3.4 Cam system. 3.5 Knitting cycle in weft knitting by latch needle. 3.6 Formation of various weft knitted stitches: Knit, Tuck, Miss or Float 3.7 Design features and properties of various weft knitted structure. 3.8 Basic weft knitted structures: Plain , Rib, Interlock, Purl 3.9 Non-jacquard double jersey structure: Single pique, Double pique, Ponto-de-roma, Milano Rib, abardine, Poplin 3.10 Ornamentation of weft knitted structure: Single jersey structures, Horizontal stripes, Twists, Fancy yarns , double jersey structures Accordion type structure.

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
	and double jersey structures.	3.11 Derivatives of weft knitted structure - Single jersey; Knit and Float; Knit and Tuck; Knit, Float and Tuck 3.12 Double jersey - Rib structures, Half cardigan, Full cardigan, Interlock structures, Eight lock.
	3l. Calculate production of weft knitting machine.	3.13 Production of circular weft knitting machine.
Unit– IV Needle Selection and Quality of Weft Knit Design.	4a. Differentiate needle selection for weft knit design. 4b. Describe the test for weft knit quality. 4c. Explain weft knitted fabric defects.	4.1 Needle selection for weft knit design. - Non-Jacquard, Jacquard. 4.2 Use of computer in designing and patterning. 4.3 Quality of weft knit fabrics. 4.4 Test for weft knit quality. 4.5 Weft knitted fabric defects causes and remedies.
Unit– V Warp Knitting	5a. Describe types of yarn used for warp knitting. 5b. Differentiate warp knitting elements 5c. Describe knitting cycle in warp knitting by beard needle. 5d. Describe guide bar swinging and shogging mechanism. 5e. Construct the chain link for warp knitted structure. 5f. Describe the various warp knitted structural elements. 5g. Interpret the different warp knitted structure with sketches	5.1 Yarns used for warp knitting, yarn preparation for warp knitting. 5.2 Warp knitting machine elements. 5.3 Knitting cycle in warp knitting by beard needle: Needle bar mechanism, Guide bar swinging mechanism, Guide bar shogging mechanism, Pattern mechanism for warp knit design - pattern chain links - chain link notations and preparation. 5.4 Warp knitted structural elements: open lap, closed lap, underlap, overlap, swinging, shogging. 5.5 Warp knitted structure, properties and their representation: Full tricot, Locknit, Reverse loknit, Satin, Loop raised, Queen's cord, Atlas and pillar, Sharkskin, Tulle, Morquissette, Voile.
	5h. Calculate production of warp knitting machine.	5.6 Production of circular warp knitting machine.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (Theory)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I	Knitting	03	2	2	2	06
II	Knitting Needles	04	2	6	2	10
III	Weft knitting	16	8	10	6	24
IV	Needle selection and Quality of weft knit design	06	2	6	2	10
V	Warp knitting	13	6	10	4	20
	Total	42	20	34	16	70

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

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

7. SUGGESTED EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical Experiment/Exercise (Outcomes in the Psychomotor Domain)	Approx. Hours Required
1	I	Obtain important features of knitting.	02
2	I	Draw and explain principle of warp and weft knitting	02
3	I	Compare warp and weft knitting technology.	02
4	II	Draw sketch demonstrate latch, beard and compound needle.	02
5	III	Draw and explain weft knitting cycle by latch needle.	02
6	III	Draw and explain the cam system for weft knitting machine to produce different weft knitted stitches.	02
7	III	Draw the design structure of the different primary based weft knitted structures.	04
8	III	Draw the design structure of the following weft knitted structures. (a) Single pique (b) Double pique(c) Ponto-de-roma (d)	02

S. No.	Unit No.	Practical Experiment/Exercise (Outcomes in the Psychomotor Domain)	Approx. Hours Required
		Milano Rib (a) Gabardine(b) Poplin	
9	III	Draw design structure of the derivatives of single and double jersey structure.	02
10	IV	Recognize the test for weft knit quality.	02
11	IV	Identify weft knitted fabric defects.	02
12	IV	Obtain important features of warp knitting machines	02
13	V	Draw and explain knitting cycle in warp knitting by beard needle.	02
14	V	Draw sketch and explain needle bar, shogging and swinging motions of warp knitting machine.	02
15	V	Draw the design structure of the following warp knitted structure.(a) Full tricot (b) Locknit (d) Reverse loknit (e) Satin (f) Loop raised (e) Queen's cord (g) Atlas and pillar (h) Sharkskin (i) Tulle (j)Morquissette (k) Voile.	04
16	V	Design the notations and prepare the chain link for the production of different warp knitted structures.	02
17	VI	Calculate production of weft knitting machine.	02
		Total	38
Note: Perform any of the practical exercises from above list for total of minimum 28 hours depending upon the availability of resources so that skills matching with the most of the outcomes of every unit are included.			

8. SUGGESTED STUDENT ACTIVITIES

- i. Prepare journals based on practical performed in laboratory.
- ii. Literature survey of knitting technology.
- iii. Collection of Sample of different warp and weft knitted sample.
- iv. Visit to knitting industry and preparing report with sketches.
- v. Prepare chart of different warp and weft knitted structure design, properties and Application.
- vi. Prepare course topic based seminar and mini internet based assignment.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Show educational video and CDs.
- ii. Prepare models.
- iii. Arrange Expert lectures by textile engineers
- iv. Arrange visit to nearby textile industry, which is using the latest technology.

10. SUGGESTED LEARNING RESOURCES

A) Books

S.No.	Author	Title of Books	Publication
1	Spencer, David J	Knitting Technology	Woodhead publisher limited, New Delhi
2	Ajgaonkar, D.B.	Knitting Technology	Universal Publishing corporation, Mumbai
3	Ray, Sadhan Chandra	Fundamental and Advances in Knitting Technology.	Woodhead publisher limited New Delhi
4	Paling, D.F.	Warp knitting Technology	Harlequin Press, Manchester and London
5	Au, K F	Advances in Knitting Technology	Woodhead publisher limited New Delhi
6	Iyer, C. Schach W. , Mallel B.	Circular Knitting: Technology Process, Structures, Yarns, Quality.	Hyperion Books, New York

B) Major Equipment/ Instrument with Broad Specifications

- i. Textile Laboratory – circular weft knitting machine, Tricot and Raschel warp knitting machine,

C) Software/Learning Websites

- i. http://en.wikipedia.org/wiki/Warp_knitting
- ii. <http://en.wikipedia.org/wiki/Knitting>
- iii. www.to-knit-knitting-stitches.com/related-knitting-websites.
- iv. nptel.ac.in/courses/116102008/download/m4faq.pdf
- v. <http://en.wikipedia.org/wiki/Knitting>
- vi. textilefashionstudy.com/knitting-technology-definition-and-types-of-knit
- vii. www.slideshare.net/suniltalekar1/warp-and-weft-knitting
- viii. www.tex.tuiasi.ro/biblioteca/carti/CARTI/Textile/.../008.pdf

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. V. N. Soni**, HOD Textile Manufacturing , R.C T I, Ahmedabad
- **Prof. R. T. Patel**, Lecturer in Textile Manufacturing, R.C T I, Ahmedabad
- **Prof. (Ms.) S. S. Parmar**, Lecturer in Textile Manufacturing, R.C T I, Ahmedabad
- **Prof. (Smt.) P. M. Parmar**, Lecturer in Textile Manufacturing, R.C.T I, Ahmadaba

Course Coordinators and Faculty Members from NITTTR Bhopal

- **Dr. C. K. Chugh**, Professor, Department of Mechanical Engineering
- **Dr. Joshua Earnest**, Professor Department of Electrical and Electronics Engineering