GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: TECHNICAL TEXTILE
(COURSE CODE: 3362904)

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

1. RATIONALE

The technical textiles sector represents one of the most rapidly growing areas in the industry. By the end of the century, technical textiles are likely to account for majority of all fiber based products in developed industrial economies. Technical textiles are being applied in a wide range of areas, like health care, automotive industry, Industrial application, marine industry, electronics, fishing, agriculture, construction and industrial packaging. Keeping in view, this wide scope, the curriculum is designed, which will be use full to the students.

2. COMPETENCY

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

- **Produce technical textiles for relevant applications.**

3. COURSE OUTCOMES

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:

i. Select the relevant technical textiles based on the properties.
ii. Choose the relevant Geo textiles and Medical textiles based on the applications
iii. Select the relevant Protective textiles, Industrial and Automotive Textiles.
iv. Select the raw material for nonwoven fabric for various applications.
v. Produce non-woven textiles by various web formation methods.
vi. Use different Bonding Methods and appropriate finishing process for producing non-woven fabric

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				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 Technical Textile	1a. Describe different segments of Technical Textiles. 1b. Describe the various applications of Technical Textiles. 1c. Describe fibres used for Technical Textiles. 1d. Explain the physical properties of various fibres use for Technical Textiles.	1.1 Definition and Classification of Technical Textile 1.2 Technical Textile" Agro-Textile, Construction Textile, Clothing Textile, Domestic Textile, Geo-textile, Industrial Textile, Medical Textile. Textile used in transport, Environmentally friendly Textile, Packaging Textile, Protective Textile, Sport Textile 1.3 Characteristics and Physical properties of different fibre used for Technical Textile 1.4 Raw material use for technical textile
Unit – II Geo Textiles and Medical Textiles	2a. Describe features of Geo textiles. 2b. Differentiate between Geo-textile and Geo synthetics with their applications 2c. Distinguish between natural fibre and synthetic fibre	2.1 Functional properties of Geo-textile: Separation, Drainage, Filter, Reinforce 2.2 Characteristics of Geo Textiles: Woven and non-Woven 2.3 Applications: Geo grids, Geo nets, Geo composite, Geo membranes, Geo Cell, Geo mattress 2.4 Natural Fibre: Jute and Coir 2.5 Synthetic Fibre: Polyester, Polypropylene, Polyamides, polyethylene
	2d. Describe medical requirement of medical textiles 2e. Describe the Fibre/ filaments used in medical textiles. 2f. Describe the application of medical textiles.	2.6 Characteristics of fibre/ yarn / fabric used for medical textile. 2.7 Applications: Different application of Medical textile: Clothing, Sutures, Surgical Dressing, Spare parts for human body.
Unit – III Protective Textiles, Industrial and Automotive Textiles	3a. Differentiate between protective, industrial and automotive textiles and the type fibres used in them. 3b. Describe the use of protective textile with their applications 3c. Describe the use of industrial textile with their applications 3d. Describe the use of automotive textile with their applications	3.1 Protective Textile: Bullet Proof Fabric, Fire Proof Fabric, Chemical protective fabric, High Visibility fabric 3.2 Industrial and Automotive Textile 3.3 Filter fabric. textile material in automotives.
Unit – IV Non Woven	4a. Describe the non-woven techniques of fabric	4.1 Application of Non Woven In Different Area

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
Fabric	manufacturing 4b. Explain the different application of non-woven fabric 4c. State the different fibre used to produced non-woven fabric 4d. Explain the important fibre properties for non-woven fabric 4e. state the process sequence of non-woven manufacturing process.	4.2 Raw Material used in Non Woven fabric 4.3 Fibre properties for consideration - Crimp, Denier, Length, Finish etc 4.4 Resultant Fabric property of non-woven (positive and negative) for various fibres 4.5 Flow chart of production cycle of non- woven process.
Unit – V Web Formation Methods	5a. Describe the different web formation methods 5b. Explain the fibre preparation for web formation. 5c. Describe machine used for fibre preparation. 5d. Explain different web formation the process in details. 5e.Explain the spun bond process in details 5f. Explain the melt blown process in details 5g. State the application of Spun bond non woven and melt blown process of non woven.	5.1 web formation methods 5.2 dry laid method: Fibre selection, fibre preparation 5.3 fibre preparation: opening, blending, cleaning 5.4 mechanical web formation: Carding, garneting 5.5 Layering method: Longitudinal Layering (Parallel Laid), Cross Layering (Cross Laid), Vertical Layering (perpendicular) 5.6 aero dynamic web formation 5.7 wet laid system: Diff. between paper and Non woven by wet laid, Raw Material, Manufacturing Process 5.8 Spun bond: Manufacturing process (Ducon , lutrauill, Recofill system), Polymers used, extruder, materials pump, spinneret, filament separation 5.9 Properties and Application of Spun bond Web non woven: 5.10 Melt blown Process: Properties and Application of melt blown web Manufacturing process (Important Parts/element extruder, material pump), Die assembly, Web formation, Process variable affect quality of web, Polymers used.
Unit – VI Bonding Methods and Finishing of Non-	6a. Describe the different bonding methods. 6b. Explain the each bonding methods in details. 6c. Describe different finishes used for non woven fabric.	6.1 Bonding Methods: Mechanical Bonding (Stitch bonding and Needle Punching), stitch bonding System 6.2 Needle Punching System Principle: needle loom, needle punching for different end use

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
Woven Web	6d. Explain the dry and wet finishing of nonwoven in details. 6e. Explain the splitting and winding methods.	6.3 Hydro Entangling /spun lace process 6.4 Properties of spun laced fabric, Material used, Parameter affecting product properties 6.5 Thermo Bonding: binder for thermo binding process, methods of thermal bonding (hot calendaring , belt calendaring ,air thermal binding, Ultra Sonic bonding) 6.6 Chemical Bonding: methods of application and properties of binder, 6.7 Saturation, Foaming, Spraying and Printing, powder binding 6.8 Types of finishes: Dry/ Mechanical 6.9 Finishing. Wet/ Chemical finish, 6.10 Splitting of Non Woven and winding

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	Technical Textile	02	02	02	01	05
II	Geo Textiles and Medical Textiles	10	04	08	04	16
III	Protective textiles, Industrial and Automotive Textile	06	04	05	03	12
IV	Non Woven Fabric	02	01	03	01	05
V	Web Formation Method	13	03	11	03	17
VI	Bonding Methods For Non Woven Web	09	03	09	03	15
	Total	42	17	38	15	**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/PRACTICALS

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
1	I	Draw the chart of classification of technical textile and its application	02
2	II	Collect samples of various geo textile and record its applications	02
3	II	Collect samples of various medical textile and record its applications	02
4	III	Observe production methods and the salient features of bullet proof fabric, and record.	02
5	III	Observe production methods and the salient features of Chemical poof and high visibility fabric, and record.	02
6	IV	Draw Flow chart of production cycle of non woven process	02
7	V	Draw sketch and Explain the Dry-laid web formation methods.	02
8	V	Draw and Explain the Wet-laid web formation methods	02
9	V	Draw sketch and explain the Ducon spun bond system	02
10	V	Draw sketch and explain the melt blown system spun bond system	02
11	VI	Draw sketch and explain the Needle punching system bonding methods	02
12	VI	Draw sketch and explain the Thermo Bonding system bonding methods	02
13	VI	Draw the Chemical Bonding system of various bonding methods	02
14	VI	Observe and draw dry and wet finishing process of non-woven fabric	02
		Total	**28**

8. SUGGESTED STUDENT ACTIVITIES

i. Literature survey of different segment of technical textiles.
ii. Collection of Sample of Technical Textiles.
iii. Visit to Technical Textile industry and preparing report with sketches.
iv. Prepare production chart of different Technical Textiles Applications.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. Show educational video and CDs
ii. Prepare Sample Charts
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	Moorthi, P. Madhava and Guruprasad Sunder Shetty	Non Woven	Mahajan Publisher pvt ltd, Ahmedabad ISBN 81-85401-25-X
2	Giovanni, Tanchis	The Non Wovens	Fondazione ACIMIT
3	Horrocks and Anand	Handbook of Technical Textile	The Textile Institute, CRC Press and Woodhead Publishing Limited
4	Khatwani, P.A., Yardi, S.S.	NCUTE - Programme on Technical textiles	Nodal Centre for Upgradation of Textile Education- IIT-Delhi, February 2-3, 2002.
5	Bandopadhyay B.N. and Bhar N.M	BTRA, Collection of papers on Defense Textiles	BITRA, Bombay
6	Spire	Specifying Technical Textiles	The Textile Institute
7	Bajaj, P. and Sengupta, A.G.	Industrial applications of Textiles: Textile for filtration and coated fabrics	Textile progress; 4,1, Textile Inst., 1985
8	Floyd, G.L. and Taylor, H.M.	Industrial application of Textiles	Textile progress - 1970, Vol.VI, No.2, Textile Inst.
9	Horrocks, A.R.	Durability of Geo Textiles	
10	Textile Association	Geo textile in Civil Engineering works:-	The Textile Association 1985
11	Faculty of Engineering and Technology, M.S. University, Baroda	Book of papers:-National seminar on non woven and Geo textile	Institute of Engineers 1988, Baroda
12	Newton, A. and Ford, J.E.	Production and properties of non woven fabric	Textile Institute, ISBN-10: 0785572155
13	Gulrajani, M. L.	Non woven	The Textile Institute
14	Purdy, A. T.	Needle punching	The Textile Institute, Manchester, ISBN 0900739320
15	Mukhopadhyay, S. K. and Partridge, J. F.	Automotive Textiles	The Textile Institute, Textile Progress, Vol 29, No.1/2
16	Purdy, A. T.	Development in non woven fabrics	The Textile Institute, ISBN 0900739622
17	Richard, A. Scott	Textiles for Protection	The Textile Institute, CRC Press and Woodhead Publishing Limited

B) Major Equipment/ Instrument with Broad Specifications

i. Textile Laboratory – Semi commercial Non-woven manufacturing line.

C) Software/Learning Websites

i. www.inda.org
ii. http://technotex.gov.in/
iii. http://www.ittaindia.org/
iv. http://www.fibre2fashion.com/industry-article/technical-textile/
v. http://www.sgiventure.com/areasofpotential.html
vi. http://www.sgiventure.com/areasofpotential.html
vii. http://www.teonline.com/knowledge-centre/study-technical-textiles.html
viii. http://nptel.ac.in/courses/116102014/
ix. http://en.wikipedia.org/wiki/Nonwoven_fabric
x. http://www.ktechnonwoven.com/
xi. http://en.wikipedia.org/wiki/Geotextile
xii. http://www.geotextile.com/
xiii. http://www.terram.com/products/geotextiles/
xiv. http://www.nilex.com/products/geotextiles
xv. http://www.dilo.de/index.php?id=1andL=1
xvi. http://textilelearner.blogspot.in/2012/02/introduction-of-medical-textiles.html
xvii. http://textile.iitd.ac.in/highlights/fol8/
xviii. http://www.intexa.com/
xix. http://www.itlglobal.com/
xx. http://www.slideshare.net/hiteshhobbit/automotive-texile
xxi. http://www.sageautomotiveinteriors.com/
xxii. www.textiles.edu
xxiii. www.textilesinfo.com
xxiv. http://www.technicaltextile.net/articles/geo-textiles/

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. D.V. Bihola**, Lecturer in Textile Manufacturing, R.C T I, Ahmedabad
- **Prof. S.M. Zala,** Lecturer in Textile Manufacturing, B.P.T I, Bhavnagar

Coordinator 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