

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: COMPUTER AIDED COLOUR SCIENCE IN TEXTILE WET
PROCESSING
(COURSE CODE: 3352801)

Diploma Program in which this course is offered	Semester in which offered
Textile Processing Technology	5 th Semester

1. RATIONALE

The diploma graduates are required to manage the wet processing of textiles in industry as per requirement of customers or computerized design. They need to identify the exact colour based on colour lightness, saturation and hue. This course has been included to provide the knowledge regarding basic colour science and computer application in Textile wet Processing. It also provides the clear concept of visual colour vision and computer colour matching system. This course also provides the information about newly invented techniques for colour matching for various shades of dyed and printed textiles with whiteness/yellowness index of textile materials. It is therefore very important course for textile processing engineers.

2. LIST OF 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 following competency:

- **Prepare various kinds of colours for different textile designs using colour science.**

3. COURSE OUTCOMES

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

- Develop desired colours using colour mixing laws
- Assess the colours visually
- Measure colour using instruments
- Match colour using optical theory
- Use computers for wet processing.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	ESE	PA	ESE	PA	
4	0	4	8	70	30	40	60	200

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 cognitive domain)	Topics and Sub-topics
Unit – I Fundamentals of Colour Science	1a. Describe colour and colour perception 1b. Explain colour mixing law and confusion in colour	1.1 Perception of Colour (Source of light, Object and Observer) 1.2 Colour Mixing: Additive and Subtractive colour mixing, Confusion in Colour (After image, Simultaneous contrast etc.) 1.3 Metamerism
Unit– II Theory of Visual Colour Assessment	2a. Describe colour vision theory 2b. Explain Visual assessment 2c. Describe various methods for visual assessment	2.1 Colour vision Theory (Mechanism of colour vision, Defects of colour vision, colour vision tests, Awareness about colour vision) 2.2 Visual Colour assessment: Variables in visual colour assessment, Standard conditions and methods for Visual assessment 2.3 Colour order System (Munsell, Colour Atlas system, CIE system)
Unit– III Basics of computer Aided Colour Science	3a. Explain working principle of colour measuring instruments 3b. Describe colour difference equation and chromaticity	3.1 Colour measuring instruments 3.2 Optical Sensor (Spectrophotometer, Colorimeters) 3.3 Signal Processor 3.4 Colour difference and chromaticity diagram, Colour difference equation (CIE), acceptability and perceptibility 3.5 Industrial colour tolerance limit
Unit– IV Optical Theory for Colour Matching	4a. Describe reflectance curves of dyed materials 4b. Explain Kubelka – Munk theory and its application 4c. Explain colour mixing law with the help of optical theory	4.1 Reflectance curves of dyed specimens Kubelka – Munk Theory 4.2 Application of K – M Theory to Textile 4.3 Optical Theory and colour mixing law 4.4 Invariant and conditional match
Unit – V Application of CCM in Wet Processing	5a. Explain CCM techniques for textiles 5b. Describe application of CAD/CAM in Textiles.	5.1 Implementation of CCM (computer colour matching) techniques for textile 5.2 Methods of Adopting CCM techniques 5.3 Limitation and drawbacks of CCM Techniques 5.4 Application of CAD/CAM in textile wet processing.

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
1.	Fundamentals of Colour Science	08	2	6	4	12
2.	Theory of Visual Colour Assessment	14	4	8	4	16
3.	Basics of Computer Aided Colour Science.	16	4	8	6	18
4.	Optical Theory for Colour Matching	08	2	6	4	12
5.	Application of CCM in Wet Processing	10	2	6	4	12
	Total	56	14	34	22	70

Legends: R = Remember; U= Understand; A= Apply and above levels (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 LIST OF PRACTICAL/EXERCISES

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 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/Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Prepare a colour circle (in terms of light theory)	02
2	I	Prepare a colour circle (in terms of pigment theory)	02
3	I	Prepare two, three and four colours shirting design	02
4	I	Prepare two, three and four colours dress material design	02
5	I	Prepare two, three and four colours bed – sheet design	02
6	I	Prepare two, three and four colours curtain design	02
7	I	Prepare Sari border, palav and bodi (all over) design	08
8	I	Prepare two, three and four colours military design	02
9	I	Create tie and dye effect on textile fabric	02
10	I	Create tone dyeing effect on suitable textile fabric	02

S. No.	Unit No.	Practical/Exercises (Outcomes in Psychomotor Domain)	Hours
11	I	Use colour vision under different colour background	02
12	I	Create grade scale and colour depth range for various dye	02
13	I	Create printing pattern (harmony and contrast colour combination)	04
14	I	Use colour mixing laws	02
15	I	Use the concept of colour perception	02
16	II	Prepare a flow chart for visual colour matching	02
17	II	Prepare a flow chart for computer colour matching	02
18	III	Identify colour using spectrophotometer	02
19	III	Identify colour using colourimeter	02
20	IV	Measure the transmission value of given dye solution	02
21	IV	Perform spot test of dyes	02
22	IV	Measure the reflectance value of dyed samples	02
23	V	Measure colour strength (K/S) of different dyed sample using the CCM system.	02
24	V	Measure the whiteness and yellowness indices of bleach samples	02
25	V	Measure colour difference (batch correction) between standard and reference samples	02
Total			60

8. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed students activities like:

- i. Literature survey on application of Computer in Textile.
- ii. Collection and Study of different Instruments used for colour measurement.
- iii. Group discussion on recent development in application of computer in textile.
- iv. Collection of data of various colour measuring instruments and Power point Presentation.
- v. Seminar/Quiz/Presentation on recent developments in the field of Computer for textile.

9. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

- i. Industrial Demonstration for assessment of colour as per Unit II and III
- ii. Visual demonstration of colour matching software
- iii. Self assignment
- iv. Guest lecturers from industry experts for contemporary practices of industries.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

S. No.	Author	Title of Books	Publication
1.	Gandhi, R.S. and H.A. Shah	Instrumental Colour Measurement and Computer Aided Colour Matching for Textiles	Mahajan Book Distributor, Latest publication
2	Gangakhedkar, N.S.	Understanding Computer Colour Matching	Rutu Prakashan, Mumbai, Latest publication

S. No.	Author	Title of Books	Publication
3	Shah, H.A.	Industrial Practice in Colour Measurement (with special reference to textile)	Mahajan Book Distributor, Latest publication
4.	Sule, A.D.	Computer Colour Analysis (Textile Application)	New Age Publication (P) Ltd, New Delhi

B. List of Major Equipment/ Instrument/software with Broad Specifications

- i. Lab. Winch dyeing machine
- ii. Lab. Jigger dyeing machine
- iii. Water heating bath
- iv. Laboratory Oven
- v. Padding Mangle
- vi. Spectrophotometer
- vii. Computer systems.

C. List of Software/Learning Websites

- i. [en.wikipedia.org/wiki/Textile dyeing](http://en.wikipedia.org/wiki/Textile_dyeing)
- ii. <http://textilefashionstudy.com>
- iii. <http://textilelearner.blogspot.in>
- iv. <http://www.niir.org>
- v. <http://www.textileschool.com/articles/204/dyeing-methods>
- vi. <http://www.teonline.com/knowledge-centre/dyeing-fiber-to-apparel.html>
- vii. <http://www.dyes-pigments.com/dyeing-process.html>
- viii. http://en.wikipedia.org/wiki/Munsell_color_system
- ix. <http://en.wikipedia.org/wiki/Reflectivity>

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. C R Madhu**, Adhoc Lecturer, Textile Processing Dept., R C Technical Institute, Ahmedabad.
- **Prof. J H Thakker**, Lecturer, Textile Processing Dept., R C Technical Institute, Ahmedabad.
- **Prof. R G Patel**, Lecturer, Textile Processing Dept., Dr. S and S S Ghandhy College of Engg. and Tech., Surat.
- **Prof. R M Pandya**, Lecturer, Textile Processing Dept., Dr. S and S S Ghandhy College of Engg. and Tech., Surat

Faculty Members from NITTTR, Bhopal

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