

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN TEXTILE PROCESSING TECHNOLOGY

TEACHING SCHEME (w. e. f. 10th Jan,' 11)

SEMESTER- VI (Re-Revised on 15-3-11)

Sr. No.	SUB. CODE	SUBJECT	TEACHING SCHEME (HOURS)			CREDITS
			THEORY	TUTORIAL	PRACTICAL	
1	362801	Polymer Science.	4	0	0	4
2	362802	Computer Application in Wet Processing Industries.	4	0	2	4
3	362803	Management of Textile Wet Processing Industries.	4	0	0	4
4	362804	Technology of Technical Textiles.	4	0	0	4
5	362805	Physical Chemistry of Dyeing.	4	0	2	4
6	362806	Seminar.	0	4	0	3
		TOTAL	20	4	4	23

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN TEXTTILE PROCESSING
TECHNOLOGY

SEMESTER- VI

Subject Code : 362801

Subject Name: POLYMER SCIENCE

Sr. No.	Subject Content	Hrs.
1	<p>1.0 BASIC CONCEPTS OF POLYMER SCIENCE :</p> <p>1.1 What is monomer and Polymer? 1.2 Different types of monomers and polymers. 1.3 Definition of repeat unit, degree of polymerisation, functionality of monomer. 1.4 Classification of polymers. 1.5 Molecular mass /weight of polymers. 1.6 Glass transition temperature (T_g) of Polymeric materials</p>	6
2	<p>2.0 CHEMISTRY OF POLYMERISATION :</p> <p>2.1 Classification of polymerisation methods. 2.2 Addition polymerization: 2.2.1 Free radical polymerisation. 2.2.2 Cationic polymerisation. 2.2.3 Anionic polymerisation. 2.2.4 Coordination polymerisation. 2.3 Condensation polymerization: 2.3.1 Polycondensation. 2.3.2 Polyaddition polymerisation. 2.3.3 Ring-opening polymerisation. 2.4 Co-polymerisation: 2.4.1 Classification of copolymers. 2.4.2 Copolycondensation.</p>	13
3	<p>3.0 TECHNIQUES OF POLYMERISATION:</p> <p>3.1 Bulk polymerisation. 3.2 Solution polymerisation. 3.3 Suspension polymerisation. 3.4 Emulsion polymerisation. 3.5 Precipitation polymerization. 3.6 Melt polycondensation polymerisation.</p>	12

	<p>3.7 Interfacial condensation polymerisation.</p> <p>3.8 Solid and Gas Phase polymerisation.</p> <p>3.9 Industrial polymerisation.</p>	
4	<p>4.0 SYNTHESIS AND APPLICATION OF DIFFERENT POLYMERS :</p> <p>4.1 Polypropylene.</p> <p>4.2 Polyacrylonitrile.</p> <p>4.3 Polyvinyl chloride</p> <p>4.4 Polytetrafluoroethylene (PTFE)</p> <p>4.5 Polyvinyl acetate.</p> <p>4.6 Polyesters. (Terylene and Dacron)</p> <p>4.7 Polyamides. (Nylon-6 and Nylon-66)</p> <p>4.8 Polyurethanes.</p> <p>4.9 Silicone Polymers.</p> <p>4.10 Rubbers (Elastomers)</p> <p> 4.10.1 Natural Rubber (Poly Isoprene)</p> <p> 4.10.2 Synthetic Rubber</p> <p> 4.10.2.1 Polybutylene and Polyisobutylene.</p> <p> 4.10.2.2 Polybutadiene</p> <p> 4.10.2.3 Polychloroprene (Neoprene)</p> <p> 4.10.2.4 Polysulphides (Thiokol)</p> <p> 4.10.2.5 Styrene Butadiene Rubber (SBR-Buna-S)</p> <p> 4.10.2.6 Nitrile Butadiene Rubber (NBR-Buna-N)</p>	16
5	<p>5.0 POLYMER ADDITIVES AND DEGRADATION OF POLYMERS:</p> <p>5.1 Fillers</p> <p>5.2 Plasticizers</p> <p>5.3 Antioxidants</p> <p>5.4 UV Stabilizers</p> <p>5.5 Flame Retardants</p> <p>5.6 Colorants</p> <p>5.7 Curing Agents</p> <p>5.8 Different types of polymer degradation such as :</p> <p> (i) Chain–end degradation (ii) Random degradation</p>	5
6	<p>6.0 BIOPOLYMERS :</p> <p>6.1 PHBV- Poly Hydroxy Butyrate Co -β- Hydroxyvelurate</p> <p>6.2 Polyglycolic acid (PGA)</p> <p>6.3 Polylactic acid (PLA)</p>	4
	TOTAL	56

Text Book :

1. Polymer Science

V. R. Gowariker
N. V. Viswanathan and
Jaydev Sreedhar

Reference Books:

1. Principles of Polymer Science
2. Synthetic organic Chemistry
3. Textbook of Polymer Science
4. Principles of Polymerisation

P. Bahadur & N. V. Sastry
O. P. Agarwal
Fred W. Billmeyer, Jr.
George Odian

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN TEXTTILE PROCESSING
TECHNOLOGY
SEMESTER- VI

Subject Code : 362802

Subject Name: COMPUTER APPLICATION IN WET PROCESSING INDUSTRIES

Sr. No.	Course Content	Hrs.
1	<p>1.0 Introduction to Application of Computerization in Textile Wet Processing Industry :</p> <p>1.1 Importance and necessity of Computerization in Textile Industry. 1.2 Use of computer system in various areas of Textile Industry. Limitation of computerization.</p>	4
2	<p>2.0 Fundamentals of Color Science :</p> <p>2.1 What is color? 2.2 Perception of Color. 2.3 Color Mixing Laws. 2.4 Confusion in Color Perception : 2.4.1 After image 2.4.2 Simultaneous contrast 2.4.3 Metamerism 2.5 Eye and Color Vision : 2.5.1 The eye 2.5.2 Color Vision theory in brief. 2.5.3 Defects of Color Vision. 2.5.4 Color Vision Tests. 2.5.5 Awareness of Color Vision.</p>	8
3	<p>3.0 Color Order system :</p> <p>3.1 Introduction to color order system. 3.2 Munsell system. 3.3 CIE system. 3.4 Whiteness assessment and Yellowness Index.</p>	5
4	<p>4.0 Colour Difference Measurement :</p> <p>4.1 Colour Difference and Chromaticity Diagram.. 4.2 Colour Difference equitation – CIE. 4.3 Concept of Acceptability versus Perceptibility. 4.4 Industrial Colour Tolerance Limit.</p>	7

	4.5 Colour Difference measurements in Colour Fastness Testing.	
5	5.0 Colour Assessment in Textiles : 5.1 Visual Assessment and Instrumental Colour Measurement. 5.2 Variables in Visual Colour Assessment. 5.3 Standard Conditions for visual evaluation. 5.4 Colorant formulation by visual assessment.	7
6	6.0 Optical Theory of Colour Matching : 6.1 Reflectance curves of dyed specimens. 6.2 Kubelka Munk Theory. 6.3 Application of K-M Theory to textiles.	5
7	7.0 Colour Measuring Instruments : 7.1 Principles of colour measuring instruments. 7.2 Role of optical sensor in spectrophotometer& colorimeter. 7.3 Role of signal processor connected with Optical sensor. 7.4 Selection of instrument and its utilization.	7
8	8.0 Computer matching system : 8.1 Introduction to CCM system. 8.2 Theory of pass/fail system, shade sorting, relative dye strength and Tone Analysis. 8.3 Recipe Formulation, its Correction and Recipe for Redyeing. 8.4 Implementation of CCM Technique for Textiles. 8.5 Methods of Adopting CCM Technique. 8.6 Advantages, Drawbacks and Limitations of CCM Technique.	8
9	9.0 Computerisation in Textile Printing : 9.1 Design generation using Printing Design Software. 9.2 Colour Separation by Scanner and its Software. 9.3 Design Transfer on Screens through Computer System.	5
	TOTAL	56

NOTE:-

Following are the minimum experiences required, but the college can do more experiences if possible.

Laboratory Experiences:

1. To measure the transmission value of a given solution of disperse dye.
2. To carry out a spot test for disperse dye.
3. To measure the reflectance value of given sample of disperse dye.
4. To study the method of colour perception.
5. To study the colour separation technique for printing design using scanner.
6. To study the additive colours and subtractive colours.
7. To prepare a block diagram of modern colour measuring instruments.
8. To study the technique of subtractive colour mixing.
9. To prepare a flowchart for visual colour matching.
10. To prepare a flowchart for computer colour matching.
11. To draw and study the Spectrophotometer.
12. To prepare a flow chart for the sequential process of colour matching in a dye house.
13. To draw and study the mechanism of COLORIMETER and CIE-LAB colour space.
14. To study the importance of Munsell Tree.
15. To find out the colour difference (dE) between standard sample and dyed sample and to get the decision of "PASS" or "FAIL" using CCM system.
16. To use the CCM system to observe the colour strength (K/S) of Disperse Dye on Polyester dyed by (i) Career method, (ii) H.T.H.P. method and (iii) Thermosol method.

17. To understand the meaning and importance of Calibration by carrying out the actual calibration of a given model of Spectrophotometer using White and Black tiles.
18. To find out the reflectance and K/S value of the dye present on the dyed fibre at an interval of 10 nm or 20 nm wave length with graphical representation using Spectrophotometer.
19. To check the result of washing fastness test by measuring the change in colour strength of tested dyed sample and stained sample before and after the test using Spectrophotometer.

20. To measure the Absorbance value or Transmittance value of a given unknown dye solution using Spectrophotometer.
21. To find out the %age strength difference between the standard dye and a sample of commercial dye by measuring their Absorbance value or Transmittance using Spectrophotometer and take the decision regarding the quality of a given sample of commercial dye.
- To understand the meaning of : (i) $+a^*$, (ii) $-a^*$, (iii) $+b^*$, (iv) $-b^*$, (v) L^* with the help of quantification of colour diagram obtained from spectrophotometer.

Text Book :

Sr. No.	Name of Book	Author
01	Instrumental Colour Measurement and Computer aided Colour Matching for Textiles	Dr. R. S. Gandhi & Dr. H. A. Shah

Reference Books:

Sr. No.	Name of Book	Author
01	Understanding Computer Colour Matching	N. S. Gangakhedkar
02	Industrial Practice in Colour Measurement (With special reference to Textile)	Dr. H. A. Shah
03	Computer Colour Analysis (Textile Application)	A. D. Sule

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN TEXTTILE PROCESSING
TECHNOLOGY

SEMESTER- VI

Subject Code : 362803

Subject Name: Management of Textile Wet Processing Industries

Sr. No.	Subject Content	Hrs.
1	<p>1.0 Management of Textile Industries :</p> <p>1.1 Concept of Management. 1.2 Objectives of Management. 1.3 Organization structure of Management. 1.4 Functions of textile Management. 1.5 An impact of scientific Management.</p>	4
2	<p>2.0 Plant Lay-out :</p> <p>2.1 Importance of Site selection. 2.2 Principle and objectives of plant lay-out. 2.3 Methods of plant lay-out. 2.4 Flexibility of plant lay-out. 2.5 Symptoms of bad layout. 2.6 Advantages of Scientific lay-out. 2.7 Plant lay-out of Textile Processing Industry.</p>	6
3	<p>3.0 Material Handling :</p> <p>3.1 Objects of Material Handling. 3.2 Functions and Advantages of Material Handling System. 3.3 Principles of Material Handling. 3.4 Material Handling devices and various flow patterns for Material Handling. 3.5 Relation between Plant Lay-out and Material Handling.</p>	6
4	<p>4.0 Production Management :</p> <p>4.1 Concept of Production Management. 4.2 Methods of Production. 4.3 Production Function and Plant Lay-out. 4.4 Product Development and its Methods. 4.5 Production planning and Control. 4.6 The Role of supervisor as a middle level management.</p>	6

5	<p>5.0 Cost and Cost Control :</p> <p>5.1 Definition of cost and total cost. 5.2 Elements and components of cost. 5.3 Functional classification of cost with special reference to textile industry. 5.4 Definition and theory of costing with calculation of costs. 5.5 Profit and profitability. 5.6 Depreciation and obsolescence. 5.7 Break even analysis.</p>	6
6	<p>6.0 Sales management and marketing :</p> <p>6.1 Organization of sales department. 6.2 Organization of marketing. 6.3 Marketing functions. 6.4 functions of sales department. 6.5 Importance, advantages and economic implication of advertising. 6.6 Advertising medias and sales promotion.</p>	6
7	<p>7.0 Store and Purchase Management :</p> <p>7.1 Types of stores. 7.2 Organization of store and purchase department. 7.3 Purpose of store keeping. 7.4 Duties of store keeper. 7.5 Importance of records and registers in store. 7.6 Advantages of good store recording system. 7.7 Importance of economic ordering quantity (EOQ) analysis. 7.8 Principles of skillful purchasing. 7.9 Duties of purchase officers. 7.10 Methods of purchasing. 7.11 The role of inventory control in stores management.</p>	16
8	<p>8.0 Indian factory acts :</p> <p>8.1 Objects and importance of Indian factory acts. 8.2 Labour welfare acts with social accountability (SA-8000). 8.3 Important boiler acts. 8.4 Important pollution control acts.</p>	6
	TOTAL	56

Text Book :

Sr.No.	Name of Book	Author
01	Industrial Organization and Engineering Economics	T.R.Banga and S.G.Sharma

Reference Books:

Sr.No.	Name of Book	Author
01	Management of Textile Industry	V.D. Dudeja
02	Organizational Behavior	B.A.Bhagawatwar

GUJARAT TECHNOLOGICAL UNIVERSITY
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TECHNOLOGY
SEMESTER- VI

Subject Code : 362804

Subject Name: TECHNOLOGY OF TECHNICAL TEXTILES

Sr. No.	Subject Content	Hrs.
1	<p>1.0 INTRODUCTION TO TECHNICAL TEXTILES :</p> <p>1.1 Definition and salient features of Technical Textiles. 1.2 Share of various fibres in Technical Textiles products. 1.3 Important market segments of Technical Textiles and their %age market share. 1.4 Clothtech as a Technical Textile and growth of its main products. 1.5 Definition of smart textiles, extra smart textiles, intelligent textiles and more intelligent textiles. 1.6 Scope of Technical Textiles.</p>	5
2	<p>2.0 MANUFACTURING METHODS OF TECHNICAL TEXTILES :</p> <p>2.1 Production flow chart of nonwoven Technical Textiles. 2.2 Materials used in the manufacturing of nonwoven Technical Textiles. 2.3 Various processes of bonding necessary for the manufacturing of nonwoven Technical Textiles. 2.4 Machineries used for the manufacturing of nonwoven Technical Textiles.</p>	7
3	<p>3.0 PROCESSING OF STITCH BONDED TECHNICAL TEXTILES :</p> <p>3.1 Various stitch bonded fabrics. 3.2 Processing of furnishing fabrics. 3.3 Processing of lining fabrics.</p>	7
4	<p>4.0 POLYPROPYLENE AS A TECHNICAL TEXTILE :</p> <p>4.1 General chemical properties of polypropylene. 4.2 Manufacturing of spun bonded (SMS) polypropylene. 4.3 Processing aspects of spun bonded (SMS) polypropylene.</p>	7

	4.4 End uses of spun bonded (SMS) polypropylene.	
5	<p>5.0 HIGH STRENGTH HIGH MODULUS (HSHM) FIBRES AS TECHNICAL TEXTILES :</p> <p>5.1 General properties of HSHM fibres such as (a) Carbon fibres, (b) Polyethylene, (c) Para-aramide fibres, (d) Ceramic fibres and (e) Silicon carbide fibres.</p> <p>5.2 Importance and utilities of above HSHM fibres as Technical Textiles.</p> <p>5.3 Processing aspects of the above HSHM fibres.</p>	7
6	<p>6.0 NEW ERA OF FUNCTIONAL OR INDUSTRIAL TEXTILES :</p> <p>6.1 Various industrial end-use textiles.</p> <p>6.2 Protective textiles.</p> <p>6.3 Composite with fibre reinforcement textiles.</p> <p>6.4 Medical and health care textiles.</p> <p>6.5 Geo textiles.</p> <p>6.6 Smart textiles.</p>	7
7	<p>7.0 COATED TEXTILES AND ITS NEW APPLICATIONS :</p> <p>7.1 Principle of coating of textiles.</p> <p>7.2 Polymers commonly used for coating and lamination.</p> <p>7.3 Various methods and processes of coating.</p> <p>7.4 New application areas of coated textiles.</p>	5
8	<p>8.0 SPECIALITY CHEMICALS USED IN TECHNICAL TEXTILE SECTOR :</p> <p>8.1 Introduction to speciality chemicals.</p> <p>8.2 Speciality chemicals to impart flame retardant finish to various type of Fibres.</p> <p>8.3 Speciality chemicals to impart light stability to synthetic fibres.</p> <p>8.4 Speciality chemicals to impart heat stability to synthetic fibres.</p>	5
9	<p>9.0 NON CONVENTIONAL FIBRES USED IN TECHNICAL TEXTILE SECTOR :</p> <p>9.1 Introduction to various nonconventional fibres like Jute, Choir, Metallic yarn, Banana yarn, Pineapple leaf fibre (PALF), Parachute fibres and Glass fibres.</p> <p>9.2 General properties of above nonconventional fibres.</p> <p>9.3 Possible processing techniques and Applications of above nonconventional</p>	6

	TOTAL	56
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Text Book :

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| 1. Handbook of Technical Textiles | A. R. Hrrocks & S. C. Annand (Textile Institute Pub., Edi.-2000) |
| 2. Man-Made fibres | R. W. Moncrieff |

Reference Books:

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| 1. Industrial Textiles | Sabit Adanur (Wellington Series,Edi.-1995) |
| 2. Textile Terms & Definitions | Textile Institute Pub., Edi.-1994 |
| 3. Manufactured Fiber Technology | V. B. Guptha & V. K. Kothari (Chapman Hall, London, Edi.-1997) |
| 4. Technical Literature : | |
| (a) World Textiles – (U.K.), | ----- |
| (b) Malimo – (Germany), | |
| (c) Technical Textiles & Polymer | |
| 5. Articles from “Colourage” – | ----- |
| Technical Textiles (Part 1 to 10) | |
| 6. Web Site : www.technicaltextiles.com | ----- |

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN TEXTTILE PROCESSING
TECHNOLOGY
SEMESTER- VI

Subject Code : 362805

Subject Name: PHYSICAL CHEMISTRY OF DYEING

Sr. No.	Subject Content	Hrs.
1	<p>1.0 INTRODUCTION TO DYEING:</p> <p>1.1 Importance of physical properties of fibres in relation to dyeing. 1.2 Properties of various dyes. 1.3 Effect of Denier,/count, Drawing, Heat setting& twist on dyeing rate. 1.4 Effect of pH on the result of dyeing. 1.5 What is Zeta Potential? 1.6 Effect of an Electrolyte in Dyeing. 1.7 Effect of Temperature on dyeing rate.</p>	7
2	<p>2.0 FUNDAMENTAL ASPECTS OF PHYSICAL CHEMISTRY OF DYEING:</p> <p>2.1 1st and 2nd law of Thermodynamics. 2.2 Entropy of Dyeing. 2.3 Equilibrium in dyeing. 2.4 Adsorption Isotherms such as (i) Langmuir adsorption Isotherm, (ii) Partition adsorption isotherm and (iii) Frundlich adsorption isotherm. 2.5 Heat of dyeing.</p>	18
3	<p>3.0 DYE FIBRE BONDS:</p> <p>3.1 Affinity of dyes for different fibres. 3.2 Stages of theory of dyeing. 3.3 Different dye fibre bonds such as (i) Hydrogen bond, (ii) Ionic bond, (iii) Covalent bond and (iv) Vander wall's forces.</p>	7
4	<p>4.0 PURIFICATION OF DYES:</p> <p>4.1 Impurities found in various dyes. 4.2 Estimation and purification of Dyes. 4.3 Measurement of rate of dyeing of various dyes like Direct dye, Reactive dye, Acid dye and Disperse dye (Partition ratio</p>	7

	method) on suitable fibre/fabric.	
5	5.0 DIFFUSION OF DYES: 5.1 Importance of diffusion in dyeing. 5.2 Diffusion of simple ions. 5.3 Diffusion coefficient of Disperse dyes on Polyester.	5
6	6.0 COMPETIBILITY OF VARIOUS DYES ON SUITABLE FIBRES/FABRICS: 6.1 Acid dyes on Nylon. 6.2 Direct dyes on Cotton. 6.3 Disperse dyes on Polyester. 6.4 Cationic dyes on Acrylic and CDPET.	7
7	7.0 USE OF SOLVENT IN DYEING: 7.1 Effect of solvent addition in dyeing. 7.2 Equilibrium isotherms with disperse dyes. 7.3 Effect of solvent in Nylon and Acrylic dyeing.	5
	TOTAL	56

NOTE:-

Following are the minimum experiences required, but the college can do more experiences if possible.

Laboratory Experiences:	Hrs
1. To study the effect of temperature on the rate of dyeing of Direct dye on cotton/viscose fiber/fabric.	4
2. To study the effect of temperature on the rate of dyeing of Reactive dye on cotton/viscose fiber/fabric.	4
3. To study the effect of denier on dyeing behavior of Disperse dye on polyester.	2
4. To study the effect of count on dyeing behavior of Reactive dye and Direct dye on cotton/viscose fiber/fabric.	4
5. To study the effect of denier on dyeing behavior of Acid dye on nylon.	2
6. To study the effect of alkali on dye-fiber bond between Reactive dye and cotton/viscose fiber/fabric.	4
7. To study the effect of organic acid and inorganic acid on the %age exhaustion of an acid dye on nylon.	4
8. To study the effect of carriers on dye uptake during the dyeing of polyester with Disperse dye.	2
9. To study the effect of Glauber's salt on the dyeing behavior of cationic	

dyes on CDPet (C ationic D yeable P olyester).	2
10. To study the effect of solvent on the dyeing behavior of acid dye on nylon.	2
11. To study the effect of solvent on the dyeing of Acrylic fibers with cationic/basic dyes.	2

Total	32

Text Book :

1. Textile Chemistry (Vol. III) R. H. Peters

Reference Books:

1. Theory of colouration of Textiles C. L. Bird & W. S. Boston
2. Physical Chemistry of Dyeing Thomas Vickerstaff
3. Instrumental colour Measurement Dr. R. S. Gandhi & Dr. H. S. Shah
and Computer aided colour matching
for Textiles

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN TEXTILE PROCESSING TECHNOLOGY

Semester : 6

Subject Code : 362806

Subject Name : Seminar

Sr. No.	Details
01	The Seminar Subject is an essential component of the curriculum of Diploma in Textile Processing Technology (DTPT) Programme. In current scenario, it is a prime requirement for a student to find out the new area/field/Topic/Subject of his own branch which has been recently and successfully researched or at the final stage of research or at the final stage of transferring to the bulk production scale from the success of Laboratory scale.
02	Total 04 hrs of Tutorials / week are to be allotted as a workload for his seminar. The Students will work in a group of atleast 04 students. The batch size of the students will be of $15+01(10\%) = 16$.
03	The students have to finalize a Topic for their group of 04 students. Out of 04 hrs Tutorial/week, they have to survey and study for the Topic / Subject from Library / Internet / Research Institute / Association / Textile Testing and Chemical Laboratory or Textile Processing Industries for 02 hrs/week and they have to discuss about the survey and study of their Topic / Subject with the predecided Internal Guide of that particular group or batch.
04	<p>This Subject will carry Total 100 marks as under:</p> <p>4.1 All the groups have to prepare a seminar report covering their survey, description, case study, Power point slide, figures, Sketches etc. and have to submit it at the end of the semester / Term to their guide. The weightage of this report submission will carry 20 marks as an Practical Internal Exam (Internal Component).</p> <p>4.2 The Student will be evaluated from their seminar work, report and Oral Examination by ONE External Examiner deputed by GTU and ONE Internal Examiner. The students have to present their seminar atleast for 15 minutes. In presence of both the examiners and all the faculty members. They can use Video Projector to display their Power point slides while presenting their Seminar, if they want. The assessment will carry 80 marks as an Practical/Oral University Exam (External Component).</p>