SCHEME OF STUDIES & EXAMINATION FOR

M. TECH.

FASHION & APPAREL ENGINEERING

M.D.UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF STUDIES & EXAMINATION FOR
MASTER OF TECHNOLOGY COURSE IN
FASHION & APPAREL ENGINEERING

SEMESTER-I

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule				Duration of Exam
			L	**P**	**Total**	**Class work**	**Theory**	**Practical**	**Total**	
1	MFA 501	Structure & Properties of Fibres, Fabrics and	4	0	4	50	100	0	150	3
2	MFA 503	Modern Technology of Fabric and Apparel Production	4	0	4	50	100	0	150	3
3	MFA 505	Advanced Textile and Garment designing concepts	4	0	4	50	100	0	150	3
4	MFA 507	Computer application in textile & fashion industry	4	0	4	50	100	0	150	3
5	MFA 509	Production Planning & Operation Management	4	0	4	50	100	0	150	3
		TOTAL	20	0	20	250	500		750	

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus and the same will be evaluated on marks.
2. The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of marks.
3. The choice of students for any elective shall not be binding on the Deptt. to offer it.

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SEMESTER-II

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule (Marks)				Duration of Exam
			L	**P**	**Total**	**Class work**	**Theory**	**Practica**	**Total**	
1	MFA 502	Operations Research & Statistics of	4	0	4	50	100	0	150	3
2	MFA 504	Technical Textiles & Smart Garments	4	0	4	50	100	0	150	3
3	MFA 506	Developments in Specialty Yarns & Texturing	4	0	4	50	100	0	150	3
4	MFA 508	Theory & Design of Garment Machinery	4	0	4	50	100	0	150	3
5	MFA 510	Environment Management & Eco-friendly	4	0	4	50	100	0	150	3
6	MFA 512	Modern methods of Apparel Merchandising & Management	4	0	4	50	100	0	150	3
		TOTAL	24	0	24	300	600	0	900	

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus and the same will be evaluated on marks.
2. The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of marks.
3. The choice of students for any elective shall not be binding on the Deptt. to offer it.

MFA 501 Structure and Properties of Fibres, Fabrics and Garments

L	T/P	C			
4	0	4	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Structure of fibres, morphology and order in fibre structure. Theories of fine structures of fibres.

Frictional properties – Theory of friction and lubrication and its application to fibres. Measurement of friction. Thermal and optical behaviour of fibres.

Unit II

The Mechanical properties of fibres. Theories of elasticity. Thermodynamics analysis of deformation. Rubber elasticity of long chain molecules and molecular network. Application to fibres. Theories of viscose-elasticity. Stress relaxation, creep, stress-strain relations, Temperature of visco-elasticity as applied to natural fibres. Swelling and theories of moisture sorption, .Di-electric properties. Effects of frequency and temperature on dielectric constant and static electricity.

Unit III

Fabric geometry- woven and other types of fabrics. Importance of fabric geometry and constructional parameters on the Bending, crease, Air permeability and handle and comfort properties.

Unit IV

Structure of garments- patterns, Draping and grading. Effect of fabric properties like GSM, Thickness on the Drape behaviour.

Reading List

Titles	***Name of the Authors***
1. Handbook of Textile Fibres	J Gordon Cook
2. Textile Fibres	HVS Murthy
3. Manufactured Fibre Technology	VB Gupta & VK Kothari
4. Physical properties of Textile Fibres	WE Morton & JWS Hearle
5. Physical Testing of Textiles	BP Saville
6. Physical methods of Investigating Textiles	R Meredith
7. Draping for Apparel Design	Helen J Armstrong
8. Grading Techniques for Fashion Design	J Price and Bernard Zamkoff

MFA 503 Modern Technology of Fabric and Apparel Production

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Introduction to nonwovens. Fibre preparation processes. Web formation processes. Web bonding processes. Finishing processes.

Unit II

Structure of nonwovens. Testing and properties of nonwovens. Structure-property relationship in nonwovens, Nonwoven products.

Unit III

Knitting : Manufacturing of single jersey, rib, purl and interlock weft knit fabrics. Properties of these fabrics. Manufacturing of Tricot and Rashal fabrics and properties of these fabrics.

Narrow woven fabrics: Manufacturing of Narrow woven fabrics, Braids, Ribbons, Tapes, Elastic webs, and other type of non-woven fabrics, Properties and application of narrow woven fabrics

Nets and Laces: Manufacturing techniques of Nets and Laces, their properties and end-uses

Unit IV

Modern Apparel production : Modern marker planning, Spreading, cutting, sewing, pressing and delivery techniques. Different types of Softwares used for modern apparel production techniques.

Reading List

Titles	***Name of the Authors***
1. Nonwoven Textiles	Radko Krecma
2. Manual of Nonwovens	Radko Krecma
3. Handbook of Nonwovens	S Russels
4. Knitting Technology	DJ Spencer
5. Knitting Technology	DB Ajgaonkar
6. The Technology of Clothing Manufacture	Harold Carr & B Latham

MFA 505 Advanced Textile and Garment Designing Concept

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I:

Introduction to pattern making techniques - Flat pattern making, Dart manipulation and Draping. Geometrical Principles of apparel Construction-Use of simple geometrical elements, Cut and Spread, wrapping and tying, flares and pleats for garment construction.

Unit II:

Process of textile design generation,fashion marketing concept, fashion seasons, Creation of garments illusions for variable consumer requirements. Technology of dyed and painted textiles design generation for tie and dye, batik, block printing and transfer printing

Unit III:

Techniques of design generation by weaving for brocades , Ikat and other traditional Indian Textiles. Latest Textile design techniques like Ink jet printing, fusion prints of batik with kantha embroidery , Stencil work etc.

Unit IV:

Introduction to Home fashion textiles, Quilt Designing- Types of fabrics, weddings, geometrical and resist dyed quilts patterns, Bed sheet designing-cut and spread techniques , pillow shapes and designs, Coverlids and mattresses.

Reading List:

Titles	***Name of the Authors***
1.The Technology of Clothing Manufacture	Harold Carr & B Latham
2.Geometry of patterns	Stanley Bezuszka
3.Fabric, form and flat pattern Cutting	Winifred Aldrich
4. Fashion : From Concept to Consumer	Fashion Fringes

MFA 507 Computer application in textile & fashion industry

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit 1

Introduction to applications of computers in textile industry, Requirements and advantages of computer assisted technologies in garment industry. Elements and principles of Textile Design, Use of basic design elements in motif, pattern, fabric and garment design generation. Types of pattern, Geometry of patterns, Placement of patterns by various combining techniques to create fabric design.

Unit 2

Introduction to CAD, Basic Design generation function, Introduction to basic principles of fashion illustration. Use of software like adobe photo shop, Corel- draw, Tuka Studio etc for fashion illustration and portfolio presentation via Transformations, Colour combinations, Patterns insertions and modifications, special effects brushes, color modifications etc.

Unit 3

Introduction to CAM and CIM based systems. Usage of Computer in Body Size-chart generation, Pattern making, Spreading, Cutting, Sewing & assembling,Finishing operations in garment industry via study of commercial machine models used in industry.

Unit 4

Introduction to management planning and information, Management Information System, ERP (Enterprise resource Planning), PLM (Product Life Management) software for fashion articles

E- Retailing,Usage of computers as Quick response strategies in fashion Industry .

Reading List

Title	Author
1.CAD in clothing and Textiles	Winifred Aldrich
2.Computers in fashion Industry	Patric Taylor
3. Adobe Photoshop for fashion Deign	Susan Lazear
4. Adobe Illustrator for fashion Design	Susan Lazear

MFA 509 Production Planning & Operation Management

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Basic concept of production & operation, Macro and micro level planning with special reference to apparel industry, Production scheduling & control, PERT/CPM.

Unit II

Application of Industrial Engineering in Apparel industry. Method of conducting Work study, Time study and method study with special reference to apparel industry. Ergonomics in garment industry.

Unit III

Management Information system. Concept of ERP and its application.

Unit IV

Social accountability and its impact. Implementation of SA-8000 in Industry.

Reading List

Title	Author
1. Production and Operation Management	NG Nair
2. Production and Operation Management	S N Charry
3 Production Management	KC Batra
4. Production and Operation Management, Concept, Model and Behaviour	E Adams
5. Industrial Engineering & Production Management	Martland Telsang

SECOND SEMESTER

MFA 502 Operations Research & Statistics of Engg

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit-I

Linear Optimization Models: Formulation of linear – programming problems. Graphical solution. Simplex algorithms: Prig M method, Two phase Method, Dual Simplex algorithm (Numericals based on these methods). Transportation problems (including time minimizing transportation problems). Assignment problems including traveling salesman and airline crew problems. Degeneracy in Transportation problems.

Unit-II

Introduction to Sequencing Models: Problems based on n jobs 2 machines, 4 jobs in machines. Gantt chart.

Introduction to Networking planning: CPM : Concept, difference from PERT. Critical path. Floats PERT. Concept, critical path finding, problems involving probability of project completion/

Unit-III

Concept of probability. Additive and multiplicative laws of probability. Random variables. Mathematical expectation. Discrete and continuous probability distributions (Definitions, and problems only). Binomial, Poisson and normal distributing (properties and applications).

Concept of sampling. Techniques of sampling. Sampling distribution. Test of hypothesis. Type I and Type II errors. Level of significance and P-value approach.

Unit-IV

Test of significance for large and small samples. χ^2 test for goodness of fit. t-test. F-test. Analysis of variance (one way and two way classifications).

Introduction to MATLAB and its applications.

Reading List

Title	Author
Operations Research Methods and Practices	CK Mustafi
Operations Research	Kantiswarup, PK Gupta,Manmohan
Operations Research	Gupta and SD Sharma
Business Statistics	Gupta and Gupta
Mathematical Statistics	Gupta and Kapur
Theory and problems of probability and Statistics	MP Spiegel

MFA 504 Technical Textiles and Smart garments

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Introduction: Definition, Textile materials in technical applications.

Fibres: Natural and Man-made fibres suitable for technical applications and their relevant properties.

Unit II

Geotextiles: Mechanics of reinforcement, filtration and drainage of soils by geotextiles. Typical applications. Determination of soil particle size and pore size distribution, relations between soil particle and size and pore size distribution for hydraulic applications.

Unit III

Medical textiles: Textiles in various medical applications. Absorbency of textile materials & methods of sterilization; application oriented design of typical medical textiles (e.g. porous graft or trashed tube). Materials used and design procedure for protecting wounds, cardiovascular application, Sutures etc.

Automotive Textiles: Fibres used for automotive applications-upholstery, carpeting, preformed parts, tyres, safety devices, filters and engine compartment items. Brief description for the manufacture and application of these devices or parts.

Unit IV

Rigid composites: Three dimensional fabrics and triaxially braided materials for composites.

Filtration: Principles and some mathematical models of wet and dry filtrations. Characteristics properties of fibres and fabrics in selective examples of filtration.

Ropes and Cordages: Methods of production. Application oriented structure and production of ropes, cordages and twines.

Intelligent & Smart garments, Sportswear, Leisurewear, swimwear, Spacesuits

Protective clothing: Thermal protection. Ballistic protection. Protection from electromagnetic radiation and static hazards. Protection against micro-organisms, chemicals.

Reading List

Title	Author
1. Coated and Laminated textiles	W Fung
2. Handbook of Technical textiles	Ar horrocks and S C Anand
3. Textiles in Automative engineering	W Fung and J M Hardcastle
4. Smart fibres, fabrics and clothing	X M Tao
5. Textiles for protection	R A Scott
6. Textiles in Sport	R Shishoo
7. Wearable electronics and photonics	X M Tao

MFA 506 Developments in Specialty Yarns and Texturing

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Types of Specialty yarns:- Novelty yarns, Grindle yarns, core-spun yarns, Chennile yarns, Corded yarns, Bulky yarns and other types of specialty yarns. Methods of production of novelty yarns, their properties and applications

Unit II

Sewing threads: Their manufacturing techniques, special finishes, properties and end-uses

Unit III

Different types of texturing – Twist texturing, Air-jet texturing, edge crimping stuffer box crimping, gear crimping, knit-de-knit etc.

Detailed discussion on False Twist. texturing process, machine,. Material, process and machine variables – their effect on properties of yarn. Recent developments.

Unit IV

Air-jet texturing – detailed discussion of process. Different types of variables and their effect on properties of yarn. Recent developments of airjet texturing machine, jets and process.

Methods of assessing and evaluation of textured yarns. Hi-bulk yarns – especially acrylic. Chemical texturing.

Reading List

Title	Author
1. Spun Yarn technology	A Venkatasubramani
2. Air-jet Texturing	Allan Fellingham
3. Yarn Texturing technology	J Hearle, L Hollick and D Wilson
4. Knitting with novelty yarn	ALaura J Bryant
5. Synthetic Filament Yarn:Texturing technology	Ali Demir

MFA 508 Theory and Design of Garment Machinery

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Theory, measurement and control of yarn tension in unwinding from sewing thread packages during Sewing. Study of stitch formation during sewing operation. Relationship between sewing speed and stitches per inch on stitch formation. Stitch types and stitch geometry.: Various types of stitch types produced on different types of sewing machines. Properties of stitches and their usefulness.

Unit II

Seam types and seam geometry: Various types of seams and their geometry. Application of different seams in producing different garments.

Feed mechanisms: Different types of sewing feed mechanisms and their uses Control of differential feed.

Unit III

Development in design and operation of modern sewing machines. Theory and design principles of latest automatic controls in stitch regulation in sewing. .

Kinematics of drop feed mechanism. Design problems of conventional sewing machines.

Unit IV

Principles underlying unorthodox sewing machinery system : Microprocessor and computer controls, Specialty sewing machines and their Kinematics.

Timings for sewing operations for needle and looper systems.

Reading List

Title	Author
1. Advances in Apparel Production	Catherine Fairhurst
2. The Technology of Clothing Manufacture	Harold Carr & B Latham
3. A stitch in Time	Abernathy et al
4. Singer Sewing Book	Gladys Cunningham
5. Complete Guide to Sewing	Readers Digest

MFA 510 Environment management & Eco-friendly textiles

L	T/P	C
4	0	4

Class work	:	50
Examination	:	100
Total	:	150
Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Concept of environment management and its importance in manufacturing industry. Sources of various kinds of pollution in textile & apparel industry. Assessment of environmental impact and designing of environmental management program. Environment audit.

Unit II

Air, water and noise pollution. Disposal of waste and effluents and related processes. Standard norms for effluent emissions in textile & apparel industry.

Unit III

Occupational, health and safety management.

Unit IV

Eco-friendly chemical processing, Natural dyes, Eco standards and their applications.

Eco-friendly textiles: Organic cotton & wool- their production and processes

Reading List

Title	Author
1. Recycling textile and plastic waste	AR Horrocks
2. Ecotextile ’98	AR Horrocks
3. Environmental Impact of textiles	K Slater
4. Recycling in textiles	Y Wang
5. Clothing biosensory engineering	Y Li and AS Wong
6. Biomedical engineering of textiles and clothing	Y Li
7. Biodegradable and sustainable fibres	R S Blackburn

MFA 512 Modern Methods of Merchandising & Management

L	T/P	C			
4	0	4	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Retailing Environment: Introduction to Retailing, Types of Retailing, Multi-channel Retailing, Retailing Strategy: Retail Audit, Retail Customer, Retail/Site Selection, Retail Organization and Human Resource Management, Customer Relationship Management, Pricing in Retailing, Retail Communication

Unit II

Merchandise Management: Developing and Implementing Merchandise Plans, Financial Management, Operations Management, Supply chain management

Unit III

Store Management: Store Layout, Design and Visual Merchandising, Customer Service

Unit IV

Fashion Communications: Fashion shows, Portfolio, Mood board, Story board, Flat sketches, colour chart, Forecasting: Colour forecasting, Fabric forecasting, Fashion advertising, Fashion photography

Reading List

Title	Author
1. Introduction to the World of Retailing	Levy and Weitz; Berman and Evans
2. Retail Institutions and Multi-channel	Levy and Weitz; Berman and Evans
3. Strategic Planning in Retailing	Berman and Evans
4. Retail Market Strategy	Levy and Weitz
5. Identifying and Understanding Consumers	Berman and Evans
6. Customer Buying Behavior	Levy and Weitz
7. Store Layout, Design and Visual Merchandising	Levy and Weitz
8. Retail Image and Promotional Strategy	Berman and Evans
9. Pricing	Levy and Weitz; Berman and Evans

SCHEME OF STUDIES & EXAMINATION FOR

M. TECH.

SECOND YEAR

(3^{rd} and 4^{th} Semster)

FASHION & APPAREL ENGINEERING

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SEMESTER-III

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule (Marks)				Duration of Exam
			L	**P**	**Total**	**Class work**	**Theory**	**Practical**	**Total**	
1	MFA 601	Research Methodology	4	0	4	50	100	0	150	3
2	MFA	Elective -I	4	0	4	50	100	0	150	3
3	MFA	Elective -II	4	0	4	50	100	0	150	3
4	MFA 611	Seminar on Advanced Topics	-	3	3	50	-	50	100	3
5	MFA 613	Minor Project	-	4	4	50	-	50	100	3
		TOTAL	20	0	19	250	300		650	

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus and the same will be evaluated on marks.
2. The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of marks.
3. The choice of students for any elective shall not be binding on the Deptt. to offer it.

Elective -I

MFA – 603: Automation of Apparel Production
MFA – 605: Apparel Production Cad/CAM systems

Elective – II

MFA – 607: Computer-aided Pattern Design
MFA – 609: Utility Properties of cloth, materials

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SEMESTER-IV

S.No	Course No.	Subject	Teaching Schedule			Examination Schedule (Marks)				Duration of Exam (Hours)
			L	**P**	**Total**	**Class work**	**Theory**	**Practical**	**Total**	
1	MFA 602	Dissertation	-	20	20	300	0	450	750	3

NOTE:

1. **The sessionals of Dissertation shall be evaluated on the basis of grades i.e., A+, A,B,C,D & E**
2. **The Dissertation shall be evaluated by an examination committee consisting of the Head of the Department, Dissertation supervisor and one external examiner. The evaluation shall be based on the above grades.**
3. **The grading system is defined at the end of the Scheme of the Studies and Examinations.**

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The performance of the student of M.Tech (Fashion and Apparel Engineering) course shall be graded on the basis of percentage of marks and corresponding grades as mentioned below:

A)

Marks		Grades		Marks
85	<	A+	<	100
75	<	A	<	85
60	<	B	<	75
50	<	C	<	60
40	<	D	<	50
00	<	E	<	40

Letter Grades	Performance	Division
A+	Excellent	First
A	Very good	First
B	Good	First
C	Fair	Second
D	Pass	Third
E	Repeat	Fail

Note: The Candidate who have passed all the semesters examination in the first attempt obtaining at least 75% marks in aggregate shall be declared to have passed in the first division wit Distinction mentioned in the degree.

B)

Actual percentage of Marks Obtained and corresponding grades should be mentioned on detailed marks certificate of student. To obtain `D' grades a student must have secure at least 40% marks in each subject of the semester Examination.

C)

Student who earned an `E' grade or less than 40% marks in any subject shall have reappear in that subject

MFA 601 Research Methodology

L	T/P	C			
4	0	4	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Research: Definition of research, Applications of research and types, Research process and steps in it, Deductive and inductive reasoning; **Validity**-conclusion, internal, construct and external.
Literature review- Need, Procedure- Search for existing literature, Review the literature selected, Develop a theoretical and conceptual framework, Writing up the review,

Unit II

Formulating a research problem: Sources, Considerations, Steps in formulation of a problem, formulation of objectives, **Definition of variables –** Concepts, indicators and variables, Types of variables, Types of measurement scales, **Constructing the Hypothesis**- Null(Research) and alternative, one-tailed and two-tailed, Hypothesis testing, errors in testing. Models-
Effects, means and regression

Unit III

Research Design: Design of Experiments: Objectives, strategies, Factorial experimental design, Designing engineering experiments, basic principles- replication, randomization, blocking, Guidelines for design of experiments, **Simple Comparative Experiments**-Basic statistical concepts, random variable, sample mean and variance, degrees of freedom, standard normal distribution, statistical hypothesis, Two sample *t*-test, *P*-value, Confidence Intervals, Paired comparisons, Analysis of Variance (ANOVA),**Taguchi Techniques for Experimental Design**

Unit IV

Research Proposal: Contents-Preamble, the problem, objectives, hypothesis to be tested, study design, setup, measurement procedures, analysis of data, organization of report; Displaying datatables, graphs and charts, **Writing a research report-** Developing an outline, Key elements-
Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference writing of books and research papers, Report Writing- Prewriting considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals

Reading List

Titles	***Name of the Authors***
1. Research Methodology	Kumar Ranjit
2. Research Methods	William, M.K.
3. Design & Analysis of Experiments	Montgomery, Douglas, C.
4. Research Methodology	Kothari, C.K.

MFA 603 Automation of Apparel Production

L	T/P	C			
4	0	4	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Concept of automation: Base subject information, basic terms and definitions from mechanization area and automation area. Energy transfer in kinematic system, drive requests, types of drives, comparison, characteristics, fluid drives, characteristics, comparing, pneumatic drives, air properties as a medium for energy transfer. Hydraulic drives, schematic diagram, powerpacks, Proportional hydraulic system, servo-operated valves, circuits with PAS (power assisted steering). Electric drives, general view, characteristics, powers (outputs).

Unit II

Automated elements in cutting of textile materials, cutting by water jet .

Automated elements in clothing production- sewing and ironing process.

Unit III

Overview of conceptions of "Work Robots" and "Manipulators". Kinematic of configurations, kinematic couples, application in textile and clothing industry, Effectors of "Work Robots" and "Manipulators",Vacuum grippers, control grippers, and special grippers of gripping of textile materials.

Unit IV

Types of driving mechanism of sewing machines, automated sewing machines.

Automation in area of handling and manipulation with textile material in clothing process. Conveyor systems.

Reading List

Titles	***Name of the Authors***
1. Automation and Robotics in the Textile and Apparel Industries	Berkstresser, G.A. & Buchanan, E.M.
2. The Technology of Clothing Manufacture	Carr, H. and Latham, B.
3. Introduction to Garment Manufacture	Cheng, C.Y and Yip, S.F
4. Garment Manufacture - Basic Sewing Technology	Lau, K.P. et al.
5. Fusing Technology	Cooklin G
6. Sewing for Fashion Design	Relis, N. & Strauss, G
7. Textile Objective Measurement and Automation in Garment Manufacture	Stylios G.
8. Apparel Manufacturing Handbook	Solinger, J
9. Methods of Joining Fabrics	Crum, R.J

MFA 605 Apparel Production CAD/CAM systems

L	T/P	C			
4	0	4	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Application of company information systems, ERP, PLM systems and a engineering methods (JIT, MRP, TOC, ?) in aid of control and company process planning.
ERP system Helios Orange by LSC International

Unit II

Control and company process planning by means of CIM, General principles of CA (computer aided) systems I. (CAD, CAE, CAP,..), Formats of video date storage, Data interchange among CA systems
General principles of CA systems II. (CAM, CAD/CAM, CQM,..)

Unit III

Application of CA technology in clothing production I. - point of software view
Application of CA technology in clothing production II. - point of hardware view (principles of digitizer, plotter, scanner, cutter, ..)

Unit IV

Systems for 2D and 3D clothes designing - data communication between 2D CAD AccuMark system and 3D V-Stitcher, evaluation of clothes fitting to body, creation of virtual presentation

Body scanners - MaNescan system, MIT_MaNescan program, procedure for measuring and evaluation by 3D CAD CATIA program, application of these programs for production of made to order clothes
Automatic contactless data capture in clothing production - application of RFID and bar codes

Reading List

Titles	***Name of the Authors***
1. Automation and Robotics in the Textile and Apparel Industries	Berkstresser, G.A. & Buchanan, E.M.
2. The Technology of Clothing Manufacture	Carr, H. and Latham, B.
3. Introduction to Garment Manufacture	Cheng, C.Y and Yip, S.F
4. Garment Manufacture - Basic Sewing Technology	Lau, K.P. et al.
5. Sewing for Fashion Design	Relis, N. & Strauss, G
6. Textile Objective Measurement and Automation in Garment Manufacture	Stylios G.
7. Apparel Manufacturing Handbook	Solinger, J
8. CAD / CAM in clothing and Textiles	Stephen Gray
9. CAD in clothing and Textiles	W.Aldrich

MFA 607 Computer Aided Pattern design

L	T/P	C			
4	0	4	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Advanced 3D pattern design systems. Application of the MTM method (Made To Measure) for the production of individual and personalized garments.

Unit II

Pattern modification for garment size and fit. A Good basic understanding of the variation in figure shapes and the appropriate pattern modification. Pattern alteration according to the wearer´s; bone structure, posture, body size and contour. Measurement pattern deformation. Choosing the material from a pre-defined library and defining your mechanical properties of fabrics for simulation.

Unit III

Theory of design procedures for the automated design of garments using the CAD system PDS Tailor XQ. Using CAD technology for customisation. Design Concept - software for developing templates from 3D shapes. Production of 2D templates from 3D designs for prototyping. The rational way to design clothes and the transition from 2D to 3D images of virtual body.

Unit IV

Computer Graphics - theory, input and output devices, applications, product development.
The principle of scanning the surface of the human body using a system MaNescan. Flattening the surface of 3D objects and their applications in the flattening human body surface in a 3D CAD program CATIA.

Reading List

Titles	***Name of the Authors***
1. Computer-Aided Pattern Design and Product Development	Alison Beazley and Terry Bond
2. Fashion Computing: Design Techniques And CAD	Sandra Burke
3. CAD / CAM in clothing and Textiles	Stephen Gray
4. CAD in clothing and Textiles	W.Aldrich
5. Computer Aided Design By Gerber Technology	Amazon.com
6. Modaris, Diamino and Justprint for Apparel Design	Amazon.com

MFA 609 Utility properties of cloth, materials

L	T/P	C			
4	0	4	Class work	:	50
			Examination	:	100
			Total	:	150
			Exam duration	:	3 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each unit and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each unit

Unit I

Characteristics of clothing materials, according to the function of a clothing product. Classification of clothing materials. Clothing materials demands for users and garments producers.

Unit II

CSN, ISO standards for evaluation of clothing materials and garments.
Processing properties of clothing materials. Processing and utility properties of sewing threads evaluating methods

Unit III

End-use properties- clothing materials durability, evaluative methods, Extent of care for garments
End-use properties- aesthetic properties of clothing materials, evaluative methods
End-use properties- Physiological properties of clothing materials, evaluative methods

Unit IV

Clothing comfort, apparent temperatures
Hand evaluation – subjective and objective methods of hand evaluation
End-use properties- Special properties of clothing materials for extreme conditions, evaluative methods
Multifunction and semi-permeable clothing materials, Special protective clothing.

Reading List

Titles	***Name of the Authors***
1. Nonwovens-Theory, Process, performance and Testing	Hassan M Behery
2. Testing and Quality Management	V.K. Kothari
3. An Introduction to Quality Control for Apparel Industry	P.V. Mehta,
4. Engineering apparel fabrics and garments	J Fan, and L Hunter
5. Physical testing of textiles	B P Saville
6. Fabric testing	Woodhead Publishers

MFA 611 Seminar on Advanced Topics

L	T/P	C			
			Class work	:	50
0	3	3	Examination	:	50
			Total	:	100

Purpose: To enable a student to be familiar with Communication skills.
Student is expected to learn
a. How to make a presentation
i. Verbal
ii. Non Verbal
iii. LCD based Power Point
b. How to write a report
i. Abstract
ii. Body
iii. Conclusions
iv. Executive Summary
c. Group Discussion
i. Share the work with a group
ii. Modularization of the work
iii. Shareware Development
d. Communication
i. Horizontal
ii. Vertical
 Students will be given a topic of importance and are expected
a. To present the topic verbally in 30 minutes
b. To present the topic as a report in 30 pages

MFA-613 Minor Project L-T/P- C 0 -4 - 4 Term work marks: 100

The term work under this, submitted by the student shall include –
1. Work diary maintained by the student and counter signed by his guide.
2. The contents of work diary shall reflect the efforts taken by candidate for
(a) Searching the suitable project work
(b) Visits to different factories or organizations
(c) Brief report of journals and various papers referred
(d) Brief report of web sites seen for project work
(e) The brief of feasibility studies carried to come to final conclusion
(f) Rough sketches
(g) Design calculation etc. etc. carried by the student.

The student has to make a presentation in front of panel of experts in addition to guide as decided by department head.

SECOND YEAR

FOURTH SEMESTER

MFA-602 **DISSERTATION**

L	T/P	C
	20	20

The student will submit a synopsis at the beginning of the semester for the approval from the project committee in a specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held with in two months time. Dissertation Report must be submitted in a specified format to the project committee for evaluation purpose at the end of semester.