

**Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech in Apparel Production Management (APM)
(Applicable from the academic session 2018-2019)**

Semester-VII

Retail Management and Visual Merchandising (PE APM 701 A)

Name of the Course:		Retail Management and Visual Merchandising					
Course Code: PE APM 701 A		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10(=8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To impart the knowledge about the retail structure and different activities in the retail chain						
2	To impart the concept and significance of visual merchandising						
3	To introduce the different elements of visual merchandising and their applications						
Pre-Requisite:							
1	Basic knowledge of supply chain management and apparel merchandising (PC APM 604)						
2	Basic concept of marketing and fashion management (PC APM 604)						
3	Creativity and aesthetic concepts. (PC APM 303)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 6	10	10				
B	1 to 6			6	3	5	15
C	1 to 6			6	3	15	45

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- **Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.**
- **Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.**

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction Retailing Retailing, Role, Relevance of & Trends. Classification of Retail	4	10
2	Operations · Definition of Retail Management · Elements of Retail Management. 1. Retail location strategy 2. Product Mix and Merchandise management 3. Stores Management 4. Pricing 5. Advertising & sales promotion 6. Concept of Branding & Brand Management 7. Introduction to Consumer Analysis & Consumer Segmentation.	15	30
3	Legal & compliances 1. License 2. Legal Process 3. IR –Law 4. Shops & establishments 5. IPR (International patents & Trademarks)	4	10
4	Introduction to Visual Merchandising Definition of VM , Significance of VM , Types ofVM	4	10

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5	Elements of VM Different Elements of VM, Types of Store Planning & store Layout. Significances of Colour, Texture, Interiors, Fixtures, Props & Mannequins. Significance of Window Display & types of Window Display.	14	30
6	Visual Merchandising Planning Sequential steps of Visual Merchandising Planning	4	10
	Total	45	100

Text and reference books:

1. Cash R. P., Thomas, C., Wingate J. W. & Friedlander J. S., (2005) Management of Retail Buying; John Wiley & Sons.
2. Clodfelter, R. Retail Buying: From Staples to Fashions to Fads. 4th Edition. Delmar
3. Donnellan, J., Merchandise Buying and Management. 3rd Edition. NY: Fairchild Publications.
4. Tepper, B.K. & Godnick, N.E., Mathematics for Retail Buying. 5th Edition. NY: Fairchild Publications.
5. ANSUYA ANGADI Ansuya A textbook of Retail Management S.Chand (G/L) & Company Ltd (2009)
6. Morgan, T. (2008), Visual Merchandising: Windows and In-store Displays for Retail. Laurence King Publishing.
7. Bell, J. and Ternus, K. (2006), Silent Selling: Best Practices and Effective Strategies in Visual Merchandising. Fairchild Publications Inc, New York.
8. Bailey, S. and Baker, J. (2014), Visual Merchandising for Fashion. Fairchild Publications Inc, New York.
9. Websites www.wsgn.com

Course Outcome:

After successful completion of this course, the students should be able to

1. Identify the different necessary elements in a retail chain
2. Identify and plan different activities like sourcing, logistic or legal activities etc. in case of retail management.
3. Plan for visual merchandising elements like window display, props, theme, colours, interiors etc. for a retail outlet.

Special Remarks (If any): NIL.

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Yarn and Fabric Sourcing in Apparel (PE APM 701 B)

Name of the Course:		Yarn and Fabric Sourcing in Apparel					
Course Code: PE APM 701 B		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10(=8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points:3		End Semester Exam: 70 Marks					
Objective:							
1	To impart knowledge on sample preparation, types of samples and its quality requirements.						
2	To impart knowledge on raw material sourcing and sourcing concepts.						
Pre-Requisite:							
1	Knowledge of Garment industry & merchandising (PC APM 604)						
2	Knowledge of yarn and fabric structure (PC APM 301 , PC APM 402)						
3	Economics and costing (HM 301)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 9	10	10				
B	1 to 9			6	3	5	15
C	1 to 9			6	3	15	45
<ul style="list-style-type: none"> • Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							

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Unit	Content	Hrs/Unit	Marks/Unit
1	<p>Introduction</p> <p>The suppliers The buyers The China-first strategy The go-it-alone-strategy Strategic relationships Sampling: Types of samples – pro – photo type – fit – pre-production – top – shipment – gold sealed – sales man samples etc., need and importance of the samples – quality requirements -sampling and lead time – sampling and costing – approvals</p>	4	8
2	<p>Material sourcing</p> <p>Ordering/paying -Sourcing against buyers' requests Sourcing independently Introduction to Sourcing: Procurement and outsourcing in the fashion industry – benefits and risks of outsourcing – searching, evaluating, and maintaining sources of supply – make-buy decisions – single-multiple sourcing decisions -domestic-global sourcing decisions</p>	10	22
3	<p>Sourcing Concept</p> <p>Manufacturing resource planning – supply chain management – demand chain analysis – Just in Time Technology – quality specifications – inventory control – purchase orders – inspection – follow up</p>	2	6

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4	<p>The material sourcing process</p> <p>Stage I: the buyer's side, The material sourcing process Stage II: the factory side, The material sourcing process Stage III: salesperson samples , The material sourcing process Stage IV: ordering stock materials -The material sourcing process – Stage V: final stage</p>	5	10
5	<p>Textile testing</p> <p>Chemical restrictions worldwide United States market textile testing standards Flammability of wearing apparel – Test method ASTM D1230 or title 16 CFR, part 1610 Children's sleepwear flammability – Test method title 16 CFR, parts 1615 and 1616 Fibre content – AATCC Test method 20 and 20A Care labelling Other tests</p>	10	24
6	<p>All about trim ,Yarns, Paying for materials, Things go wrong ,The art of fabric sourcing-</p> <p>Changing the paradigm ,Developing skills and acquiring knowledge</p>	2	4
7	<p>The mechanics of fabric sourcing</p> <p>Material shows Colour–fabric–fashion services Shopping the stores Meeting the mills Supplier evaluation: determining which is the right mill Developing relationships with the mill</p>	4	8

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	Developing relationships with the buyer Some additional thoughts		
8	<p>The policies of trade</p> <p>Governments in garment exporting countries: the captive customer syndrome ,Governments in garment importing countries ,Summary EU country of origin rules ,Non-preference rules of origin ,Preference rules of origin , Basic preference rule for garments and accessories, Cumulation of origin Preference rule for fabric. United States country of origin rules , Non-preference rules of origin, Preference rules of origin ,Fabric and yarn restricted ,Third-party fabric, Trade preference levels, Short supply fabrics ,Special exceptions.</p>	4	8
9	<p>From theory to practice</p> <p>Planning ,Understand product requirements ,Understand your customer's requirements ,Calculate the logistics ,Analyse your local import and customer's import restrictions ,Create sourcing strategy ,Locate suitable mills. Locate new fabric ideas ,Working with the customer ,Present to customer ,Sampling process ,Negotiate the stock order ,Order the fabric</p>	4	10
	Total	45	100

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Text and reference books:

1. E.Glock Ruth and I. Kunz Grace, “Apparel Manufacturing – Sewn Product Analysis”, Blackwell Scientific Publications, 1996.
2. Jeannette Jamow, Kitty G.Dickerson, “Inside the Fashion Business”, Prentice-Hall of India, 1997.
3. Jacob Solinger, “Apparel Manufacturing”, Handbook, VanNostrand Reinhold Company,1980.
4. Tyler J David “Materials Management in Clothing Production”, 1991.
5. Herold Carr and Barbara Lathem,”The Technology of Clothing Manufacturing”, 2nd Edition, Blackwell Scientific Publications, London, 1988.

Course Outcome:

After successful completion of this course, the students should be able to

1. To understand the various sourcing techniques and methodologies
2. Identify the class of sample
3. Prepare the specification sheet as per required quality of the sample
4. Select raw material
5. Design new product
6. Plan the process layout for sourcing of raw material

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Modern Developments in Garment Manufacturing Process: Industry 4.0 (PE APM 701C)

Name of the Course:		Modern Developments in Garment Manufacturing Process: Industry 4.0					
Course Code: PE APM 701 C		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10(=8+2) Marks					
		Attendance: 5 Marks					
Practical: hr./week		End Semester Exam: 70 Marks					
Credit Points: 3							
Objective:							
1	To introduce modern process flow of garment manufacturing.						
2	To make students familiar with present developments in garment manufacturing process.						
3	To make students familiar with different domains of application of Artificial intelligence in Garment Industry						
4	To make students familiar with different types of software for the information flow and production planning and control in garment manufacturing.						
5	To make students aware about the latest developments in different machineries related to garment manufacturing and surface ornamentations.						
Pre-Requisite:							
1	Basic knowledge of software and basic algorithms (ES-CS201 , ES-CS291)						
2	Thorough knowledge about Garment manufacturing (PC APM 302 , PC APM 403 , PC APM 502)						
3	Thorough understanding of the technology of Sewing (PC APM 502)						
4	Thorough knowledge about production sequences and sub-functions in apparel manufacturing. (PC APM 302 , PC APM 403 , PC APM 502)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 6	10	10				
B	1 to 6			6	3	5	15
C	1 to 6			6	3	15	45
<ul style="list-style-type: none"> • Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction to modern garment manufacturing	12	25

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	techniques: Features of non-traditional garment manufacturing processes like QRM , UPS , Cellular or modular Production system , Digitised overhead hanger and conveyor belt system etc. , principles , applications , advantages and disadvantages of each techniques , comparative study .		
	Concept of JIT , Lean manufacturing , KANBAN , Real time production tracking system , RFID , modern PPC softwares , ERP , FCS , Web Ticketing system ,	6	15
	Introduction to industry 4.0 in garment manufacturing, Principles of machine learning , IOT and cloud computing . Present applications and future scopes of these in the domain of garment manufacturing.	6	15
4	Introduction to mobile applications in industrial environment. Concept of Smart garment factory. Diferent types of micro electromechanical devices and sensors for smart machineries in garment manufacturing.	6	15
5	Modern developments in garment machineries and surface ornamentations , Robotics and its applications, Computerised Spreading and Cutting machine, Sewbot , Computerized Embroidery and quilting machine, Template stitching /Profile stitching/ Automatic workstation , Digital Measuring Tape, Direct to Garment Printing (DTG) , Digital printing , principles and scope of 3D printing .	10	20
6	Principles of Big data analysis in Apparel marketing , Supply Chain management, Fashion Forecasting etc. Concepts of VR and AR in virtual fittings , simulations, customizations in garment retailing and E-commerce.	5	10
	Total	45	100

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Text and reference books:

1. Alexis leon and Mathews leon "Fundamentals of Information Technology" Leon press, 1999
2. Dennis P Curtin "Information Technology", Tata McGraw hill Pvt Ltd 1999
3. James A Senn "Information Technology in Business", Prentice Hall of India Pvt Ltd 1998.
- Windows office XP/MSOFFICE/MSACCESS/
4. Stephen Gray " CAD / CAM in clothing and Textiles ", Gower Publishing Limited, 1998, ISBN 0-566-07673X.
5. Compilation of papers presented at the Annual world conference Sep 26 -29, 1984 Hongkong, " Computers in the world of textiles ", The textile Institute ISBN: 0-0900739-69X.
6. W. Aldrich, " CAD in clothing and Textiles ", Blackwell Science 2nd edition, 1992, ISBN: 0-63 -3893

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7. Jacob Solinger, " Apparel Manufacturing Handbooks ", Van no strand and Reinhold Company, 1980,ISBN:0-442-21904-0.

8. .Computer technology for textile apparel Edited by Jinlian Hu, Woodhead Publishing Limited, 80 High Street, Sawston, Cambridge CB22 3HJ, UK.

Course Outcome:

After successful completion of this course, the students should be able to

1. Identify and understand the characteristics and process flow of modern techniques in garment manufacturing.
2. Select suitable process flow depending upon garment type and volume of production
3. Understand the principles of different domains of industry 4.0 and their applications in garment manufacturing , fashion marketing, and garment supply chain.

Special Remarks (If any): NIL.

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Clothing and Comfort Science (PE APM 702A)

Name of the Course:		Clothing and Comfort Science					
Course Code: PE APM 702A		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10(=8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To introduce the important functional , mechanical and physical properties of apparel fabrics , and their relationships with the performance of the garment.						
2	To impart the concept and different elements of clothing comfort.						
3	To impart the principles behind relationships between fabric properties with the fit, comfort and the hand-feel of garments.						
Pre-Requisite:							
1	Knowledge of fabric structure and properties of textile fabrics (PC APM 401 , PC APM 503)						
2	Knowledge about testing of different fabric properties (PC APM 503)						
3	Knowledge about the technology of garment manufacturing (PC PM 302 , PC APM 403 , PC APM 502, PC APM 604)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 10	10	10				

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B	1 to 10			6	3	5	15
C	1 to 10			6	3	15	45
<ul style="list-style-type: none"> • Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							

Unit	Content	Hrs/Unit	Marks/Unit
1	<p>Introduction</p> <p>Concept of selection of fabrics for clothing purpose. Factors involved in the study of clothing. General functional description of clothing. Types of fabric required for apparel use for different age group, occasions, purpose. Fabric properties and performance for apparel use.</p>	3	5
2	<p>Tailoring of fabrics</p> <p>Bending and shear properties, clothing fit and drape and formability.</p>	3	10
3	<p>Clothing Science</p> <p>Heat and moisture relations, breathability in clothing- thermal resistance, water vapor resistance, wicking and air permeability. Influence of environmental conditions of the protective performance of garments. Influence of environmental conditions of the protective performance of garments Influence of fiber yarn characteristics and fabric construction parameters on clothing comfort.</p>	8	12
4	<p>Serviceability of fabrics</p> <p>Abrasion resistance - flat abrasion, flex abrasion, edge abrasion, Pilling - mechanism of pilling formation, anti-pilling techniques, Snagging, Strength, Tearing strength - Tensile strength - Bursting strength , seam</p>	6	12

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	strength and seam slippage.		
5	<p>Functional properties</p> <p>Elasticity: elastic recovery, residual strain; Thermal insulation. Water repellence, water resistance and water proof; Wicking: vertical and horizontal transportation of liquid; Water absorbency Fabric friction, static electricity</p>	5	12
6	<p>Aesthetic properties</p> <p>Aesthetic aspects of clothing. Crease and wrinkle recovery - Lustre. Yarn unevenness: neps, thick place, thin place, periodic fault, Scroopiness, Colour- Colour fastness: to light, washing, perspiration, rubbing, dry cleaning.</p>	4	12
7	<p>Dimensional properties</p> <p>Hygral expansion, Relaxation shrinkage, Swelling shrinkage, Felting shrinkage. Mechanism of fabric shrinkage- Relationship between Hygral Expansion, Relaxation shrinkage and extensibility - Knitting Process Parameters and fabric stability. Methods of measuring dimensional stability to dry cleaning and dry heat.</p>	5	12
8	<p>Fabric Hand</p> <p>Smoothness, fullness and stiffness, subjective hand judgment, objective evaluation of fabric hand and its applications.</p>	3	6
9	<p>Clothing Comfort</p> <p>Definition of comfort - Human clothing system - Physical, Physiological and psychological aspects of comfort. Tactile and pressure sensation aspects. Physical properties of clothing and clothing materials in relation to comfort. Thermal transfer processes. Dry heat transfer and Rapid heat transfer.</p>	6	14

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	Function of Textiles in enhancing thermal comfort. Comparison of thermal comfort properties for different textile structures. Clothing comfort and sports garment		
10	New materials and finishes, new techniques, new concepts. Current trends and new developments in the study of clothing.	2	5
	Total	45	100

Text and reference books:

1. Kothari, V K, "Testing and Quality Management", CBS Book Publishers, New Delhi, 2000.
2. Li. Y, "The Science of Clothing Comfort", Textile Progress, Volume: 31, No. 1/2, Textile Institute.
3. Saville B P, "Physical Testing of Textiles", The Textile Institute, Woodhead publication limited, Cambridge.
4. Billie J Collier and Helen H Epps, "Textile Testing and Analysis", Prentice- Hall Inc., New Jersey.
5. Lyman Fourt & Norman R.S. Hollies, "Clothing: Comfort & Functions", Marcel Dekker, Inc, New York.
6. G.Song, "Improving Comfort in Clothing", Woodhead Publication.
7. A. Das, R. Alagirusamy, "Science in Clothing Comfort", Woodhead Publication.

Course Outcome:

After successful completion of this course, the students should be able to

1. Describe thermal and non-thermal components of clothing comfort.
2. Explain the role of body components in maintaining body temperatures
3. Recognize the principles of heat movement through human-clothing-environment system
4. Explain properties of clothing related to clothing comfort.
5. Summarize the influence of various factors for clothing comfort
6. Design a clothing product given comfort condition

Special Remarks (If any): NIL.

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Protective Clothing (PE APM 702B)

Name of the Course:		Protective Clothing					
Course Code: PE APM 702B		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10(=8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To impart knowledge various classes on protective fabrics/clothing/garment and future of personal protection						
2	To impart knowledge on various fibre, yarn and fabric structure used in protective clothing						
3	To impart knowledge on various chemical finishes applied protective fabrics/clothing/garment						
4	To impart knowledge on characterization of protective fabric/clothing/garment						
5	To impart knowledge on application of protective clothing						
Pre-Requisite:							
1	BS PH 101 , BS PH 201 , BS CH 101 , BS CH 201						
2	PC APM 301 , PC APM 402 , PC APM 492 , PC APM 503 , PC APM 592 , PC APM 402 , PC APM 501						
3	PC APM 302 , PC APM 403 , PC APM 502						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 7	10	10				

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B	1 to 7			6	3	5	15
C	1 to 7			6	3	15	45
<ul style="list-style-type: none"> • Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							

Unit	Content	Hrs/Unit	Marks/Unit
1	Overview of protective clothing Introduction, classification of hazard and its criteria requirement and Future of personal protection	3	6
2	Selection of fibres for protective clothing. Selection of fibres -suitability and properties of high performance fibres for various protective clothing. Brief introduction to fibre for protection,chemical composition and physical structure, characteristics - carbon, aramid and related fibre, High-modulus polyethylene, PBO and M5, inorganic fibre, resistant polymer fibre. Working of various fibres according to different end uses: Chemical and biological, ballistic, extreme cold, thermal(heat and fire),UV, electrostatic, radiation protective clothing etc.	8	20
3	Yarn & fabric properties and finishes for protective clothing. Yarn & fabric (knitted, woven & non-woven) parameters-their method of production. Effect of structure on their performance- use of composite materials in yarn and fabric formation used for protective end uses.	6	12
4	Different class of protective clothing Chemical and biological, ballistic, extreme cold, thermal (heat and	6	12

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	fire),UV, electrostatic, radiation protective clothing		
5	<p>Garment construction</p> <p>Method of construction of garments according to various protective end uses like protection against cold, ballistic protection, Use of different fabric types (knitted, woven, and nonwoven), coated/ laminated in different places. Use of interlining & composites. 3D structures. Hi-tech textiles -wearable electronics. Protective garments for industrial and apparel end uses.</p>	10	20
6	<p>Chemical finishes for protective fabrics/clothing/garment</p> <p>Use of coated fabrics - different type of finishes like fire retardant finishes, for different textile materials, water repellent finishes, anti microbial finishes. Chemical finishes against radiation and chemicals - Method of application of those finishes Protective finishes for health</p>	6	15
7	<p>Evaluation of protective fabrics/clothing/garment</p> <p>Desirable properties of protective textiles-method of testing for thermal protective performance, abrasion & wear resistance, Evaluation of resistance to mildew, ageing, sunlight, chemical, electrostatic and electrical resistivity, impact properties. ASTM standards for protective garments.</p>	6	15
	Total	45	100

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Text and reference books:

1. P.W.Harrison”The Design of Textiles for Industrial Application “ the Textile institute, Manchester 1998.
2. Bajaj P. and Sengupta A.K “Protective Clothing”The Textile Institute 1992.
3. Jhonson J.S. and Mansdork S.Z, “Performance of Protective Clothing”,ASTM 1996
4. Corbman B.P.,”Textiles :Fibre To Fabric”,McGrawhill Book Company,1985

Course Outcome:

After successful completion of this course, the students should be able to

1. Describe the scope and classification of protective clothing
2. Describe the hazard
3. Outline the fibres, yarns and fabric types to be used in protective clothing
4. Outline the functions and various requirements of protective clothing
5. Formulate standard of protective clothing/product for specific application

Special Remarks (If any): NIL.

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Nano Technology (OE APM 701A)

Name of the Course:		Nano Technology					
Course Code: OE APM 701A		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10 (8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To impart knowledge on nanotechnology						
2	To impart knowledge on production of nano particles, nano fibres and nano composites						
3	To impart knowledge on characterization of nano particles, nano composites and bio nano composites						
4	To impart knowledge on application of nanotechnology in diverse fields with special emphasis in textiles						
Pre-Requisite:							
1	General Physics and Chemistry						
2	Knowledge of PC TT 301: Textile fibre						
3	Knowledge of Biochemistry						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 6	10	10				

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B	1 to 6			6	3	5	15
C	1 to 6			6	3	15	45
<ul style="list-style-type: none"> • Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper. 							

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction History of nanotechnology, definition, bottom-up and top-down approach for synthesis of nanoparticles, application of nanotechnology	4	10
2	Nano fibre production Principle of electro-spinning, electro-spinning of nanofibres-conditions, structure formation, properties, effect of process parameters upon fibre formation, methods to produce continuous filaments, electro-spinning of polyamide and polyesters	8	25
3	Carbon nano tubes (CNT) Definition, synthesis, characterization and properties of CNT, application of CNT in polymer and textiles, effect of process conditions upon CNT structure and properties, nanotubes/nanofibre polymer composite, development of nanotubes/nanofibre polymer composites, analysis of rheological properties and microstructure of nanotubes/nanofibre polymer composites, introduction of multifunctional polymer nano composites.	8	20
4	Nanoparticles	9	20

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	Preparation, characterization and application of Ag, Fe, ZnO, TiO ₂ , MgO ₂ , SiO ₂ for coating and composites, clay nanoparticles, cellulose nano whiskers and nanoparticles, self assembled nano layer films, nano structuring of polymer with cyclodextrins.		
5	Characterization of nanoparticles Different nanomaterial characterization techniques, nano-finishing: self cleaning of fabrics, UV-protection, antibacterial, water repellent, antistatic and wrinkle resistant.	9	15
6	Ecological aspects Ecological considerations of nanoparticles and nanofibres, human health hazards, hazard to environment, aquatics and to useful microbes responsible for biodegradation, Global regulation concerning nanoparticles and products.	7	10
	Total	45	100

Text and reference books:

1. Brown P. J. and Stevens K. Nanofibres and Nanotechnology in textiles, Woodhead publishing Ltd., Cambridge, 2007.
2. Gogotsi Y. Nanotubes and Nanofibres, CRC Taylor & Francis, Boca Raton, 2006.
3. Cao G. Nanostructure and Nanomaterials, Imperial College press, USA, 2006.
4. Wilson M., Kannangara K., Smith G., Simons M. and Raguse B. Nanotechnology--- Basic Science and Engineering Technologies, Overseas Press, New Delhi, 2005.

Course Outcome:

After successful completion of this course, the students should be able to

1. Understand the objectives, tasks and basic principles behind nanotechnology
- 2 Understand the synthesis and characterization of nanoparticles, nanofibres and nanocomposites
- 3 Examine the effect of different nanoparticles on functional properties of different textile materials.
- 4 Apply the knowledge of nanotechnology in diverse fields as a whole and textiles in particular.

Special Remarks (If any): NIL.

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New Generation Fibre (OE APM 701B)

Name of the Course:		New Generation Fibre					
Course Code: OE APM 701 B		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10 (=8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To study the transition of new fibres						
2	To impart knowledge of the super fibre with new performance						
3	To impart knowledge about High-tech fibres with biomimetic chemistry						
4	To impart knowledge of fibres for the next generation						
5	To impart knowledge of bio-polymer frontiers						
Pre-Requisite:							
1	General Physics and Chemistry (BS PH 101 . BS PH 201)						
2	Knowledge of PC APM 301: Textile fibre						
3	Knowledge of Biochemistry (BS 301)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 12	10	10				
B	1 to 12			6	3	5	15
C	1 to 12			6	3	15	45

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- **Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.**
- **Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.**

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction to high performance and specialty fibres: Definitions and classification. Structural requirements of high performance fibres.	2	4
2	Aramids: Polymerization, polyamides. Spinning and properties of Aromatic fibre	4	9
3	Polymerization, spinning and properties of thermotropic liquid crystalline co-polyesters.	4	9
4	Polymerization, spinning and properties of other rigid rod polymers such as PBZT, PBO, PBI, PIPD	4	9
5	Precursors for carbon fibre manufacture, Preparation and properties of PAN precursor suitable for carbon fibre. Manufacturing of carbon fibres from PAN precursors, viscose and pitch fibres.	6	15
6	Gel spinning concept, Technical requirements for gel spinning process, Spinning process, structure and properties for UHMWPE fibre.	4	9
7	Glass and ceramic fibre: Glass for fibres and manufacturing process and applications. Chemistry of preparation, introduction to non oxide and oxide based ceramic fibres, basalt fibres and their applications.	4	9
8	Preparation and properties of thermally/chemically resistant polymers and fibres	3	5
9	Elastomeric fibres: Synthesis chemistry of segmented polyurethanes, spinning and properties of polyurethane fibres.	4	8
10	Conducting fibres: Polymer conductivity, processing of conducting polymers into fibres and fibre coatings. Spinning and properties of polyaniline (PANI) fibre and their applications.	5	12
11	Ultra fine fibres: definition, manufacturing ,characteristics and applications of	2	4

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	micro denier fibres		
12	Other specialty fibres: absorbent fibres, hollow fibres and profile fibres, bi-component fibres, optical fibres	3	7
	Total	45	100

Text and reference books:

1. Hongu T. and Phillips G. O. New fibres, 2nd Edition, Woodhead Publishing Ltd. 1997.
2. Hongu t., Takigami M. and Phillips G. O. New Millennium fibres, 1st edition, Woodhead Publishing Ltd. 2005.
3. Seymour R. B. Polymers for Engineering Applications, Us Department of Energy, Office of scientific and Technological Information, US, 1987.
4. Lewin M. and Preston S. Handbook of Fibre Science and technology, Vol. III, High Technology Fibres, Taylor & Francis, 1991.

Course Outcome:

After successful completion of this course, the students should be able to

1. Classify high performance and specialty fibres
2. Explain the fundamentals, manufacturing, properties and applications of rigid rod like fibre, carbon and glass fibres
3. Explain the structure and properties for UHMWPE fibre
4. Differentiate the structure, manufacturing methods, properties and applications of thermally/ chemically resistant fibre
5. Describe about elastomeric and conducting fibre
6. Summarize the properties and application of speciality fibre

Special Remarks (If any): NIL

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Robotics (OE APM 701 C)

Name of the Course:		Robotics					
Course Code: OE TT 701 C		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3hrs./week		Mid Semester Exam.: 15Marks					
Tutorial: Nil		Assignment & Quiz: 10 (=8+2)Marks					
Practical:		Attendance: 5Marks					
Credit Points:3		End Semester Exam.: 70 Marks					
Objective:							
1	To impart knowledge about the engineering aspects of Robots and their application.						
2	To make students acquaint with the principles of Robotics , theory and working principles of different types of sensors and mechanical systems used in the Textile Industry.						
Pre-Requisite:							
1	Basic Electrical Engineering and theory of machines (ES TT 301 , ES TT 391 , ES TT 401)						
2	Instrumentation & Control in Apparel Processing (ES TT 492)						
3	Concept of Programming Language and Assembly Language Programming (ES-CS201)						
4	Thorough knowledge of the production flow in Apparel Manufacturing Process (PC APM 302 , PC APM 403 , PC APM 502, PC APM 604)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 6	10	10				
B	1 to 6			6	3	5	15
C	1 to 6			6	3	15	45

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Unit	Content	Hrs/Unit	Marks/Unit
1.	<p>Basic concepts of Robotics</p> <p>Definition of Robot, History of robotics, Robotics market and the future prospects, Robot Anatomy, Robot configurations: Point to point control, continuous path contour. Robot motions, Joints, Work volume, Robot drive systems, Precision of movement – Spatial resolution, Accuracy, Repeatability,</p>	8	18
2.	<p>End Effectors</p> <p>End effectors- classification- mechanical, magnetic, vacuum and adhesive gripper- gripper force analysis and design. Robot control- Unit control system concept- servo and non-servo control of robot joints, adaptive and optimal control</p>	7	15
3.	<p>Robot actuation and feedback components</p> <p>Position sensors – Potentiometers, resolvers, encoders, velocity sensors. Actuators - Pneumatic and Hydraulic Actuators, Electric Motors, Stepper motors, Servomotors, Power Transmission systems.</p>	5	10
4.	<p>Robot Sensors and Machine vision system</p> <p>Sensors in Robotics - Sensor devices, Types of sensors- contact, Force and torque sensors- Proximity and range sensors- acoustic sensors- use of various sensors in Robotics.</p> <p>Machine Vision System: Introduction to Machine vision, the</p>	8	20

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	sensing and digitizing function in Machine vision, Image processing and analysis, Training and Vision systems.		
5.	<p>Robot programming and Automation</p> <p>Robot Programming: Robot language classification- programming methods- off and on line programming- Lead through method Teach pendent method- VAL systems and language, simple program.</p> <p>Automation: History of Automation, Reasons for automation, Disadvantages of automation, Automation systems, Types of automation – Fixed, Programmable and Flexible automation, Automation strategies</p>	10	22
6.	<p>Application in Apparel Industry</p> <p>Robotized Machines for cotton harvesting , PR robot for folding of cloth, PUMA robot for handling fabric ,Nomad 200 for cleaning, piecing ROBO in ring spinning machine ROBO lap in combing m/c , Robot pickup and place of cans , automatic splicer arm robot , dispenser in dyeing, Robotic Fiber Assembly and Control System (RFACS) in nonwoven, AI in textile industry.</p> <p>Application of Robotics in automatic Printing and Embroidery Process</p> <p>Applications of Robotics in material handling in the production floor.</p>	7	15
	Total	45	100

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Text and reference books:

1. S.R. Deb, Robotics technology and flexible automation, McGraw Hill publishing company limited, New Delhi, 1994.
2. M.P. Groover. Industrial Robotics Technology Programming and Applications, McGraw Hill Book Co, Singapore, 1987.
3. R.J. Schilling, Fundamentals of Robotics Analysis and Control, Prentice Hall of India, 1996.
4. J.J. Craig, Introduction to Robotics, Addison-Wesley, 2009.
5. T. Yoshikawa, Foundations of Robotics Analysis and Control, Prentice Hall of India, 2010.
6. K.S. Fu, R.C. Gonzales and C.S.G. Lee, Robotics: Control, Sensing, Vision and Intelligence, McGraw Hill, 1997.
7. Kevin M. Lynch and Frank C. Park: Modern Robotics: Mechanics, Planning, and Control, Kindle Edition
8. S.K. Saha, Introduction to Robotics, McGraw-Hill Publication, 2014.
9. Y. Koren, Robotics for Engineers, McGraw Hill, New York, 1985.
10. P.G. Ranky and C.Y. Ho, Robots Modelling Control and Applications with Software, Springer Verlag, 1985.
11. W. Stadler, Analytical Robotics and Mechatronics, McGraw Hill Book Co., 1995.
12. Khushdeep Goyal- Industrial Automation & Robotics

Course Outcome:

After successful completion of this course, the students should be able to

1. Understand basic knowledge of robotic.
2. Identify and understand transducers, sensors, actuators and controllers employed commonly in robotics.
3. Understand the Principles of Design and construction of robotics system.
4. Understand automation strategies.
5. Identify the different areas of application of Robotics in Apparel Industry

Special Remarks (If any): NIL

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Supply Chain Management (OE APM 702 A)

Name of the Course:		Supply Chain Management					
Course Code: OE APM 702 A		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10(=8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	Understand the basic concepts and key elements of Supply Chain Management.						
2	Gain the knowledge of Supply Chain Management performance.						
3	Design models in order to achieve efficiency.						
Pre-Requisite:							
1	Knowledge of economics, statistics , Merchandising (HM 301 , PC APM 604 , PC APM , PE APM 502 A/B)						
2	Manufacturing process (PC APM 302 , PC APM 403 , PC APM 502)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 9	10	10				
B	1 to 9			6	3	5	15
C	1 to 9			6	3	15	45

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- **Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.**

Unit	Content	Hrs/Unit	Marks/Unit
1	<p>Understanding the Supply Chain</p> <p>Definition of Supply Chain. Historical perspective; Objective of Supply Chain; The Importance of supply Chain Decisions; Decisions Phases in a Supply Chain; Process Views of a Supply Chain; Examples of Supply Chains. Supply Chain Performance: Achieving Strategic Fit and Scope: Competitive and supply Chain Strategies; Achieving Strategic Fit; Expanding Strategic Scope; Obstacles to</p> <p>Achieving Strategic Fit. Supply Chain Drivers and Metrics: Impellers of Supply Chain; Drivers of Supply chain performance; A framework for structuring Drivers; Facilities; Inventory; Transportation; Information; Sourcing; Pricing; Obstacles to Achieving Strategic Fit.</p>	7	14
2	<p>Designing</p> <p>Distribution Networks and Applications to e-Business: The role of Distribution in Supply Chain; Factors influencing Distribution Network Design; Design Options for a Distribution Network; Indian Distribution Channels; Distribution Networks in Practice.</p>	2	4
3	<p>Network Design in the Supply Chain</p> <p>The Role of Network Design in the Supply Chain; Factors Influencing Network design decisions; A framework for Network design decisions; Models for Facility Location and Capacity Allocation; The role of information Technology in Network Design; Tradition with Modernity; Making Network Design Decisions in Practice; The impact of Uncertainty on Network Design.</p>	6	12

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4	<p>Designing Global Supply Chain Networks</p> <p>The impact of Globalization on Supply Chain Networks; The Off shoring Decision: Total Cost; Risk Management in Global Supply Chains; the Basic Aspects of Evaluating Global Supply Chain Design; Evaluating Network Design Decisions Using Decision Trees; Making Global Supply Chain Design Decisions Under uncertainty in Practice; Uncertainty in Global Supply Chain operations –An Indian Experience. Demand</p>	5	10
5	<p>Forecasting in a Supply Chain</p> <p>The Role of Demand Forecasting in the Supply Chain; Characteristics of forecasts; Components of Forecast and forecasting methods; Basic approach to demand forecasting; Time-series Forecasting Methods; Measures of Forecast Error; The Role of information Technology in Forecasting; Risk Management in Forecasting; Forecasting in Practice.</p>	5	12
6	<p>Managing Economies of Scale in a Supply Chain: Cycle Inventory</p> <p>The role of Cycle Inventory in a Supply Chain; Estimating Cycle inventory-Related Costs in Practice; Economies of scale to exploit fixed costs; Economies of scale to exploit Quantity Discounts; Short-Term Discounting: Trade Promotions; Inventory; Cycle Inventory Optimization in Indian Distribution Channels.</p>	5	12
7	<p>Transportation in a Supply Chain</p> <p>The role of transportation in a supply chain; Modes of transportation and their Performance Characteristics; Design options for a Transportation Network; Trade-offs in Transportation Design; Tailored Transportation; The Role of information Technology in Transportation; Risk Management in Transportation; Making Transportation Decisions in Practice;</p>	5	12

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8	<p>Information Technology in Supply Chain</p> <p>The role of information Technology in a supply chain; The Supply Chain IT Framework; Customer Relationship Management; Internal Supply Chain Management; Supplier Relationship Management; The Transaction Management Foundation; The Future of IT in the Supply Chain; Risk Management in It; Supply Chain IT in Practice; IT System Selection Processes-Indian Approach and Experiences.</p>	5	12
9	<p>Coordination in a Supply Chain</p> <p>Lack of supply chain coordination and the bullwhip effect; Effect of lack of coordination on performance; Obstacles to coordination in a supply chain; Managerial Levers to achieve coordination; Building strategic partnerships and trust within a supply chain; Continuous Replenishment and Vendor-Managed Inventories; Collaborative Planning, Forecasting, and Replenishment (CPFR); The Role of IT in Coordination; Achieving Coordination in Practice; coordination in Supply Chains-Multiechelon Models.</p>	5	12
	Total	45	100

Text and reference books:

1. Supply Chain Management: Chopra & Meindl: 4th Edition 2010: Pearson Education – Addison Wesley Longman, ISBN-13: 978-0738206677
2. Designing and Managing the Supply Chain Concepts, Strategies and Case Studies -: David Simchi Levi, Philip Kaminsky & Edith Simchi Levi : 3rd Edition, 2008: Tata McGraw Hill, ISBN-13: 978-1935182399
3. Supply Chain Management Theories and Practices , R P Mohanty, S G Deshmukh, Bizmantra: 2005. ISBN-0957597118
4. Logistics and Supply Chain Management , M Martin Christopher : 4th Edition 2011 , Pearson Education, ISBN-13: 978-1493909827

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Course Outcome:

After successful completion of this course, the students should be able to

1. Identify the key elements and processes in a supply chain and their interaction
2. Understand and analyze the designing, planning and operational decisions of SCM.
3. Identify the techniques used in management of critical components of supply chain
4. Analyze, design and identify suitable supply chain networks for manufacturing organizations
5. Design and optimize inventories across the supply chain

Special Remarks (If any): NIL.

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Entrepreneurship Development (OE APM 702B)

Name of the Course:		Entrepreneurship Development					
Course Code: OE APM 702B		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10 (8 + 2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To create an awareness about benefits and draw backs of entrepreneurship.						
2	To impart basic knowledge about desired entrepreneurial skills and characteristics						
3	To impart knowledge about stages of effective entrepreneurial development						
Pre-Requisite:							
1	Basic knowledge about business (PC APM 604 , HM 301)						
2	Definition of profit, loss, Fixed cost, variable cost (PC APM 604 , HM 301)						
3	Creativity and motivation						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 4	10	10				
B	1 to 4			6	3	5	15
C	1 to 4			6	3	15	45
<ul style="list-style-type: none"> Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. 							

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- **Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.**

Unit	Content	Hrs/Unit	Marks/Unit
1	Entrepreneurship Entrepreneur – Definition of entrepreneurship, Entrepreneurship development, Concept of Entrepreneurship, Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Benefits of Entrepreneurship, Drawbacks of Entrepreneurship, Functions of Entrepreneurship, The myths of entrepreneurship.	10	25
2	Entrepreneurial SKILL and Characteristics Types of entrepreneur, Characteristics of an entrepreneur, Entrepreneurial skill, Personal qualities of successful entrepreneurs, Entrepreneurial competencies, Case study	8	25
3	Motivation Definition of Motivations, Importance of Motivation, Types of Motivation, Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	10	20
4	Business Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Stages of Effective Entrepreneurial development – Launching and Organizing an Enterprise – Enterprise selection – SWOT analysis , Market Survey and Research, Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and	17	34

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	Agencies. Case Study		
	Total	45	100

Text and reference books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India
4. Khanka. S.S., "Entrepreneurial Development" S. Chand & Co. Ltd.
5. Donlad F Kuratko,. "Entrepreneurship – Theory, Process and Practice".

Course Outcome:

After successful completion of this course, the students should be able to

1. Understand the different aspects of a new business
2. Understand the benefits of setting a new venture
3. Understand the essential characteristics and skill sets of a successful entrepreneur
4. Gain knowledge and skill needed to run a business successfully
5. Formulate a new project

Special Remarks (If any): NIL

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ERP (OE APM 703A)

Name of the Course:		ERP					
Course Code: OE APM 703A		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3hrs./week		Mid Semester Exam.: 15Marks					
Tutorial: Nil		Assignment & Quiz: 10 (=8+2)Marks					
Practical:		Attendance: 5Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To understand the importance of ERP and its relationship with the support systems.						
2	To understand the comprehensiveness of ERP Implementation as a strategic initiative of business.						
Pre-Requisite:							
1	Basic understanding on the business functions and processes. (PC APM 604 , HM 301)						
2	Basic knowledge on the domains of industry verticals will be an added advantage. (PC APM 604 , PC APM 302 , PC APM 303 , PC APM 403 , PC APM 502)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 6	10	10				
B	1 to 6			6	3	5	15
C	1 to 6			6	3	15	45
<ul style="list-style-type: none"> • Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part. • Specific instruction to the students to maintain the order in answering objective questions 							

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should be given on top of the question paper.

Unit	Content	Hrs/Unit	Marks/Unit
1	<p>The evolution of ERP systems</p> <p>A historical perspective - Evolution through Payroll system, Inventory Control system - Materials Requirement Planning (MRP I) system - Manufacturing Resource Planning (MRP II) system - Their advantages and Disadvantages - Definition and Concept of ERP - Business reasons for rise and popularity of ERP system - Benefits of an ERP System.</p>	5	10
2	<p>Business processes supported by ERP systems</p> <p>Various business functions in an Organization – Purchasing, Materials Management-Manufacturing, Sales & distribution - Plant Maintenance - Quality Management - Finance & Accounting including Costing- Human Resources etc.</p> <p>ERP market place – SAP, Oracle-PeopleSoft-JD Edwards-Baan-Microsoft’s suit of products etc. Business modules in these ERP packages – a brief comparative description of business function modules and sub modules - Overview of key end to end business processes supported in two major ERP systems (preferably SAP and Oracle) – Order to Cash - Procure to Pay- Plan to Produce and Dispatch.</p>	6	14
3	<p>The evolution of Information Technology (IT)</p> <p>A historical perspective Evolution of computer generations (hardware and software) – Operating systems, File systems to Database Management systems - Communication Networks - Enabling of ERP systems by IT evolution.</p>	5	12

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4	<p>Related technology concepts</p> <p>ERP and Supply Chain Management (SCM), and Customer Relationship Management (CRM), ERP and Business Intelligence (some of the popular tools like Congas, Business Objects should be mentioned), ERP and Data warehousing (Data Mart, Data Mining and On-line Analytical Processing - OLAP), ERP and E-business.</p>	6	14
5	<p>Implementation of ERP system</p> <p>1. ERP implementation approach Single vendor versus Best-of Breed ERP implementation, Big Bang versus Phased (by module/site) implementation, Using ERP of Application Service Provider (ASP).</p> <p>2. ERP implementation life cycle Planning different aspects (Economic viability, Senior Management commitment, Resource requirements, Change management etc.), Understanding requirements and Process preparation – Gap analysis and Business Process Engineering, User Acceptance criteria, Design, Configuration, Customization (difference between Configuration and Customization, advantages and disadvantages), Extensions, Data migration, End-user training, User Acceptance, Going live, Roll-out. Differences between ERP implementation life cycle and Custom Software development phases. Drawbacks of ERP system.</p> <p>3. Organizing implementation Interaction with Vendors, Consultants, and Users. Contracts with Vendors, Consultants, and Employees. Project Management and Monitoring. ERP Project Organization – Formation of Steering Committee and different User Groups. Top Management Commitment and Steering Committee meetings. Change Management, Risks and Challenges in ERP</p>	14	30

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	<p>implementation.</p> <p>4. Post-implementation Support, Review, Maintenance and Security of ERP systems A typical Support Cycle (Planning, Stabilization, Ongoing and Upgrade phases). Post implementation Review of ERP systems – measures of review (Efficiency, Effectiveness, and Competitive Advantage), and approaches for review (User attitude survey, Cost/benefit analysis, Compliance audit, Budget performance review, Service level Monitoring, Technical review, Product review, Integration review etc.). System maintenance and ERP system maintenance. Software upgrades (patch, release and version). Security and Access control of ERP systems.</p>		
6	<p>Emerging Trends and Future of ERP systems</p> <p>Service-oriented Architecture (SOA): Enterprise SOA layers – Business processes, Business services, Components and Integration services, Advantages and Drawbacks of SOA, When to use SOA, Difference between multi-layered Client-server architecture and SOA, basic awareness of Net Weaver from SAP, Web sphere from Oracle and .Net from Microsoft. Enterprise Application Integration (EAI): Basic understanding of the concept, Types of EAI (levels) – User Interface, Method (logic), Application Interface, Data. EAI architecture – Typical framework (Business Processes, Components & Services, Messaging service, and Transport service. Mention of some of the leading EAI vendors – IBM, Microsoft, Oracle, SAP, and TIBCO. Radio Frequency Identification (RFID) and ERP: awareness of RFID technology, Benefits of RFID integrated with ERPs. M-Commerce: basic concept and applications, difference with E-Commerce, benefits of integration with ERPs.</p>	9	20
	Total	45	100

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Text and reference books:

1. Enterprise Resource Planning – A Managerial Perspective by D P Goyal, Tata McGraw Hill Education, 2011
2. Enterprise Resource Planning by Ashim Raj Singla, Cengage Learning, 2008

Course Outcome:

After successful completion of this course, the students should be able to

1. Adapt & demonstrate the significance of ERP in today's business context.
2. Understand and appreciate the percolation of ERP into core business processes and as an enabler for extending its scope to back and forth the supply chain for organizations.
3. Relate the relationship between technological motivations with business justification when ERP implementation is done which has strategic implications for the business.

Special Remarks (If any): NIL

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RDBMS (OE APM 703 B)

Name of the Course:		RDBMS					
Course Code: OE APM 703 B		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: 10(=8+2) Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	To study and understand the basic concepts of RDBMS.						
2	To learn SQL in detail.						
3	To learn how to work with any database.						
Pre-Requisite:							
1	Basic knowledge of mathematics and statistics (BS TT 401 , PE APM 502 A/B)						
2	Fundamentals of computer knowledge (ES-CS 201)						
3							
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 7	10	10				
B	1 to 7			6	3	5	15
C	1 to 7			6	3	15	45
<ul style="list-style-type: none"> Only multiple choice type questions (MCQ) with one correct answer are to be set in the 							

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objective part.

- **Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.**

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.	7	14
2	Entity-Relationship Model Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.	4	8
3	Relational Model Structure of relational Databases, Relational Algebra, Relational Calculus	4	8
4	SQL and Integrity Constraints Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries	6	14
5	Relational Database Design Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF	8	20

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6	Internals of RDBMS Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction rocessing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.	8	18
7	File Organization & Index Structures File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .	8	18
	Total	45	100

Text and reference books:

1. HenryF.KorthandSilberschatzAbraham,“DatabaseSystemConcepts”,Mc.GrawHill.
2. ElmasriRamezandNovatheShamkant,“FundamentalsofDatabaseSystems”,BenjaminCummings Publishing.Company.
3. Ramakrishnan: Database Management System ,McGraw-Hill
4. GrayJimandReuterAddress,“TransactionProcessing:ConceptsandTechniques”,MoraganKauffman Publishers.
5. Jain: Advanced Database Management SystemCyberTech
6. DateC.J.,“IntroductiontoDatabaseManagement”,Vol.I,II,III,AddisonWesley.
7. Ullman JD., “Principles of Database Systems”, GalgottiaPublication.
8. JamesMartin,“PrinciplesofDatabaseManagementSystems”,1985,PrenticeHallof India,NewDelhi
9. “FundamentalsofDatabaseSystems”,RamezElmasri,ShamkantB.Navathe,AddisonWesleyPublishingEdition
10. “DatabaseManagementSystems”,ArunK.Majumdar,PritimayBhattacharya,TataMcGrawHill

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Course Outcome:

After successful completion of this course, the students should be able to

1. Understand the concept of Database system and Client Server Architecture
2. Understand and develop the concepts of Data Modeling, Security and Integrity.
3. Understand and execute different SQL queries .
4. Normalize the database using normal forms.
5. Understand the concept of query processing and transaction processing.

Special Remarks (If any): NIL.

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Soft Computing & Image Processing (OE APM 703 C)

Name of the Course:		Soft Computing & Image Processing					
Course Code: OE APM 703 C		Semester: VII					
Duration: 6 months		Maximum Marks: 100					
Teaching Scheme		Examination Scheme					
Theory: 3 hrs./week		Mid Semester Exam.: 15 Marks					
Tutorial: Nil		Assignment & Quiz: =10(=8+2)Marks					
Practical: hr./week		Attendance: 5 Marks					
Credit Points: 3		End Semester Exam.: 70 Marks					
Objective:							
1	Introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.						
2	Introduce students to fuzzy systems, fuzzy logic and its applications.						
3	Explain the students about Artificial Neural Networks and various categories of ANN						
4	To treat the 2D systems as an extension of 1D system design and discuss techniques specific to 2D systems						
Pre-Requisite:							
1	Mathematics, probability and statistics (BS TT 401 , ES TT 491 , PE APM 502 A/B)						
2	Digital Electronics ,Knowledge of algorithms (ES TT 401 , ES TT 492 , ES-CS 201)						
3	Progammng, problem solving skills (ES CS 201)						
End Semester Examinations Scheme. Maximum Marks – 70. Time allotted – 3 hrs.							
Groups	Units	Objective Questions (MCQ only with one correct answer)		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer`	Marks per question	Total marks
A	1 to 14	10	10				
B	1 to 14			6	3	5	15
C	1 to 14			6	3	15	45

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- **Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.**
- **Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.**

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction to soft computing Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Applications	3	5
2	Fundamentals of neural network Model of artificial neuron, architectures, learning models, single layer NNs, multi layer NNs, back propagation networks	2	7
3	Associative memory Auto-associative memory, bi-directional hetero-associative memory	2	6
4	Fuzzy set theory Fuzzy sets, membership, operations, properties, fuzzy relation	2	6
5	Fuzzy systems Fuzzy logic, fuzzification, fuzzy inference, fuzzy rule based system	2	6
6	Fundamental of genetic algorithms Encoding, operations of GA	3	7
7	Nature inspired optimization techniques Ant Colony, particle swarm optimization	3	6
8	Hybrid system Integrating Neural networks, fuzzy logic, and genetic algorithms, GA based	3	8

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	back propagation networks, fuzzy back propagation networks		
9	Fundamentals of neural network Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	5	10
10	Elements of Visual perception. Image sensing and Acquisition . Imaging in different bands. Digital Image Representation. Relationship between pixels. Image transformations: 2D-DFT, DCT, DST, Hadamard, Walsh, Hotelling transformation, 2D-Wavelet transformation, Wavelet packets.	5	10
11	Image Enhancements in spatial domain and Frequency domain. Image Restoration techniques. Color Image processing.	3	5
12	Error free compression Variable length coding, LZW, Bit-plane coding, Lossless predictive coding Lossy compression: Lossy predictive coding, transform coding, wavelet coding. Image compression standards, CCITT, JPEG, JPEG 2000, Video compression standards.	5	10
13	Summary of morphological operations in Binary and Gray Images. Image segmentation: Point, Line and Edge segmentation. Edge linking and Boundary detection. Segmentation using thresholding, Region based segmentation. Segmentation by morphological watersheds. Use of motion in segmentation.	5	9
14	Feature Extraction from the Image: Boundary descriptors, Regional descriptors, Relational descriptors.	2	5
	Total	45	100

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Text and reference books:

1. Introduction to Fuzzy Logic using MATLAB by S. N. Sivanandam, S. Sumathi and S. N. Deepa, Springer
2. Fuzzy Logic: Intelligence, Control, and Information by John Yen and Reza Langari
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications, Third Edition", Wiley 2010
4. S. Rajsekaran & G. A. Vijaya lakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm : Synthesis and Applications" Prentice Hall of India.
5. N.P. Padhy," Artificial Intelligence and Intelligent Systems" Oxford University Press.
6. Siman Haykin,"Neural Netowrks"Prentice Hall of India
7. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
8. Kumar Satish, "Neural Networks" Tata McGrawHill
9. R. C. Gonzalez, R.E. Woods," Digital Image processing", Pearson edition, Inc3/e,2008.
10. 2. A.K.Jain," Fundamentals of Digital Image Processing", PHI,1995
11. J.C. Russ," The Image Processing Handbook", (5/e), CRC, 2006
12. R.C. Gonzalez& R.E. Woods; "Digital Image Processing with MATLAB", Prentice Hall, 2003

Course Outcome:

After successful completion of this course, the students should be able to

1. Understand soft computing techniques and their role in problem solving.
2. Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
3. Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.
4. Understand the need for image transforms different types of image transforms and their properties.
5. Learn different techniques employed for the enhancement of images.
6. Learn different causes for image degradation and overview of image restoration techniques.
7. Learn different feature extraction techniques for image analysis and recognition

Special Remarks (If any): NIL.

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Product Design Lab and Portfolio Presentation (PC APM 791)

Name of the Course:		Product Design Lab and Portfolio Presentation
Course Code: PC APM 791		Semester: VII
Duration: 6 months		Maximum Marks: 100
Teaching Scheme		Examination Scheme
Theory: hrs./week	Continuous Internal Assessment: 40	
Tutorial: Nil	External Assessment: 60	
Practical: 4 hr./week	Distribution of marks:	
Credit Points: 2		
Course Outcomes: After successful completion of this course, the students should be able to		
1	Apply their concept into apparel designing in a form of Illustration	
2	Understand upcoming trend and colour forecast on apparel designing	
3	Able to acquire knowledge about customised apparel as well as other apparel	
4	Able to acquire knowledge about manufacturing and cost of customised and other apparel	
5	Design new product	
Pre-Requisite:		
1	Student must have good and keen knowledge about fabric properties, garment construction (PC APM 401 , PC APM 491 , PC APM 503 , PC APM 593 , PC APM 302 , PC APM 303 , PC APM 392 , PC APM 393 , PC APM 402 , PC APM 492 , PC APM 502 , PC APM 592)	
2	Student must have clear knowledge about colour and texturing process (PC APM 303 , PC APM 393)	
3	Creativity and imaginary power	
Practical:		
		1) Intellectual skills- Innovativeness, Consumer psychology, Colour psychology, Conceptual,

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	Trendsetter, Forecaster.(75%)
	2) Motor skill- Actualisation of Design Concept, Display Skills . (25%)

Laboratory Experiment:	
1	Product line design according to Historical Theme and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
2	Product line design according to Nature Theme and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
3	Product line design according to Season Theme and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
4	Product line design according to Abstract Theme and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
5	Product line design according to student's own choiceable Theme and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
6	Product line design according to Upcoming Trend and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
7	Product line design according to Forecasted colour scheme and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
8	Product line design according to Protective garment and make a portfolio on this theme with minimum 6 Illustrated designs for Men/Women/Kid
9	Prepare Specification sheet and cost sheet of mass production garments
10	Prepare Specification sheet and cost sheet of customised garments
11	Prepare Specification sheet and cost sheet of protective garments
12	Prepare One complete Garment sample with Pattern and specification sheet from your own created design of any one theme and make a cost sheet of it - Presentation - Bio data
The above list is not exhaustive. Additional laboratory work or experiments can be planned to consolidate the theoretical work and to emphasise the activities for doing rather than the knowing.	

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Text and reference books:

1. Naoki Watanabe, Contemporary Fashion Illustration Techniques
2. Anna Kiper, Fashion Illustration: Inspiration and Technique
3. Kathryn Hagen, Fashion Illustration for Designers
4. DK Fashion: The Definitive History of Costume and Style.

Special Remarks (If any):

1. Uniform Format of Portfolio : It is important to keep all the sheets of the same size to maintain visual continually. Sheets should be grouped separately and systematically either horizontally or vertically. This ensures uniformity of presentation. The presentation of the portfolio depends on the contents and also on your layouts. (Too much of fragmentation of a single sheet can be distracting)

2. The Portfolio must include :- Page of contents - Each separate project should include inspiration sheet/storyboard and colour chart with appropriate swatches - Client profile and indication of the market /country - Give a name/theme to each projects - Flat working drawings, detailed magnification and specification sheets showing your technical strength are vitally important . Line planning, fabric indications, fabric consumption, detailed measurement charts etc are all essential . These are to be used in conjunction with croquis -Design development sheets/design journal to show the creative process and /or commercial feasibility

Industrial Internship (PW APM 781)

Project I (PW APM 782)

8hrs/week