DEPARTMENT OF LEATHER TECHNOLOGY
ANNA UNIVERSITY, CHENNAI

VISION:

To become a premier Centre of Learning and Research in Leather and Allied Technologies.

MISSION:

MD1 To provide quality education in the area of Leather Technology with high professional values

MD2 To share and disseminate expertise to provide solutions for the problems faced by the Leather industry.

MD3 To build an expertise based capsule of delivering technology to leather and allied sectors.

MD4 To provide a learning ambience for innovators, researchers and technologists.

ANNA UNIVERSITY: : CHENNAI

UNIVERSITY DEPARTMENTS

B.TECH. LEATHER TECHNOLOGY REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM (CBCS)

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

PEO1 To demonstrate core competency in basic mathematics, scientific and engineering fundamental to design , formulate, analyse and solve the problems of leather and allied sectors.

PEO2 To pursue lifelong multidisciplinary learning as professional engineers, researchers and scientists and effectively communicate technical information

PEO3 To practice values and exhibit leadership qualities and team spirit to promote entrepreneurship and indigenization

2. PROGRAMME OUTCOMES (POs):

	Graduate Attribute	Programme Outcome
PO1	Engineering knowledge	Apply knowledge of mathematics, basic science and engineering science.
PO2	Problem analysis	Identify, formulate and solve engineering problems.
PO3	Design/development of solutions	Design a system or process to improve its performance, satisfying its constraints.
PO4	Conduct investigations of complex problems	Conduct experiments and collect, analyze and interpret the data.
PO5	Modern tool usage	Apply various tools and techniques to improve the efficiency of the system.
PO6	The Engineer and society	Conduct themselves to uphold the professional and social obligations.
PO7	Environment and sustainability	Design the system with environment consciousness and sustainable development.
PO8	Ethics	Interacting industry, business and society in a professional and ethical manner.
PO9	Individual and team work	Function in a multidisciplinary team.
PO10	Communication	Proficiency in oral and written Communication.
PO11	Project management and finance	Implement cost effective and improved system.
PO12	Life-long learning	Continue professional development and learning as a life-long activity.

3. PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1 Understand and apply the foundational knowledge to make a successful career in leather and leather products sector.

PSO2 Ability to identify the problems of the leather sector and provide solutions.

PSO3 Ability in manning and managing leather sector towards its sustainable development

4. MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVE WITH PROGRAMME OUTCOMES

Programme Educational Objectives	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
I	3	3	2	2	2	1	-	1	2	1	1	1
II	2	2	3	3	3	2	3	2	1	3	1	3
III	-	-	1	-	1	3	3	3	3	1	3	1

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5.MAPPING OF COURSE OUTCOMES AND PROGRAMME OUTCOMES

		Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Year I	Semester I	Technical English															
		Engineering Mathematics I															
		Engineering Physics															
		Engineering Chemistry															
		Engineering Graphics															
		Basic Sciences Laboratory															
		Workshop Practices Laboratory															
	Semester II	Professional Communication															
		Engineering Mathematics II															
		Problem Solving and Python Programming															
		Basics of Electrical and Electronics Engineering															
		Engineering Mechanics															
		Materials Science															
		Problem Solving and Python Programming Laboratory															
		Electrical and Electronics Engineering Laboratory															
Year II	Semester III	Probability and Statistics	2	2	1	2.8	1	-	-	-	-	-	1.4	1.4	1	-	-
		Applied Chemistry	3	3	2.2	1.4	1.4	1	1.4	1	1	1.8	1.4	1.8	3	2.4	1.4
		Introduction to Leather Manufacture	2	2	2.6	2	1.4	2.4	2.8	1.4	1		1.6	1	2.8	1.6	1.6
		Theory of Skin Proteins and Pre-Tanning Processes	3	2	1	1.67	1	1.67	2.5	1.67	1.67	1		2	1.67	3	2
		Principles of Unit Processes and Operations	3	1.25	1	1	1	1.25	1	2	1	1	1	2	1.67	1.67	1.67
		Elective – Humanities I															
		Introductory Practice in Leather Manufacture	1	3	1.5	1	1	1.5	2	1	2	1	1.5	2	1	1	1

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	Semester IV	Elective – Humanities II															
		Environmental Sciences	2	2.5	1.25	1	2.25	2	3	2	1.25	1	2	2	1	1	1
		Audit Course – I															
		Leather Manufacturing from Hides	2.6	2	1	1	1.6	1	1.6	1	1	1	1	1.6	1	1	1
		Instrumental Methods of Analysis	3	2.6	2	2	3	1	1.2	1		1	1	2	2.8	2.8	2.8
		Principles of Testing for Leather	3	2	1	1	2	1	1	1.25	1	1		1	1	1	1
		Theory of Tannages	3	2	1.67		1	1.67	2	1	1.67	1		1	1	1	1
		Practice on Leather from Hides	3	3	1.33	3	2.33	1	2	1	1.67	1	1	1	1.5	1.5	1.5
		Chemical Testing and Analysis Lab	2	3	1	3	2	1	1	1	2	1		1	1.5	1.5	1.5
Year III	Semester V	Elective – Humanities I															
		Audit Course – II															
		Leather Manufacture from Skins	3	3	1	1	2.25	1.25	2	2	1.25	1	1.25	1	1	1	1
		Theory of Post Tanning Process	3	3	1.8		1.8	2	2	1	2	1	2	1	1.67	1.67	1.67
		Professional Elective I															
		Professional Elective II															
		Physical Testing and Analysis Lab	2	3	1	3	2	1	1	1	2	1	1	1	1.5	1.5	1.5
		Practice on Leather from Skins	3	2	1	3	2	1	2	1	2	1	1	2	1.5	1.5	1.5
		Industrial Internship - I	2	2	2		2	2	2	2	3	2.33	1	3	1.5	1.5	1.5
	Semester VI	Leather Goods and Garments Technology	3	2.4	1.8	1.5	1.75	1.25	1.2	1	2	1.4	1.8	2	3	3	3
		Science and Technology of Leather Auxiliaries	3	1	1		2	1.25	2	1	1	1	1.25	1	1.67	3	2
		Theory of Leather Finishing	3	2	1.67		2.5	1.67	1.67	1	1	1		2	1.25	3	2
		Professional Elective III															
		Professional Elective IV															
		Open Elective I															
		Finishing Practice Laboratory	3	3	1	2	2	1	1	1	2	1	1	2	1.5	3	2
		Leather Goods and Garments–Design and Fabrication Laboratory	2	2.75	2.25	2	2.25	1.67	1.33	1	1.75	1.25	1.33	1.75	1.25	2.5	2.25

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Year IV	Semester VII	Footwear Technology	2.8	1.6	1.6	2	1	1	2.25	1.67	1.67	1.6	1	2	1.4	3	2.2
		Leather and Leather Products Machineries	2	2	1		2	1	1	1	1	1.25	1	1	1.25	3	2
		Professional Elective V															
		Professional Elective VI															
		Professional Elective VII															
		Open Elective II															
		Leather Footwear – Design and Fabrication Laboratory	2	1	1	1.67	1.5	1	2	1	1.5	2	1	3	1	1.25	2
		Internship / Training - II	3	2	2.5	2	2	2.5	2	2	3	1	1	3	2	2	3
		Project I	3	3	2	3	2	1.67	1.67	2	2	2	1.67	3	2	2	3
	Semester VIII	Project II	3	3	3	3	2	2.2	1.67	2	3	3	3	3	2	2	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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ANNA UNIVERSITY: : CHENNAI

UNIVERSITY DEPARTMENTS

B.TECH. LEATHER TECHNOLOGY

REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM

CURRICULUMAND SYLLABI FOR I TO VIII SEMESTERS

SEMESTER I

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS5151	Technical English	HSMC	4	4	0	0	4
2.	MA5158	Engineering Mathematics I	BSC	4	3	1	0	4
3.	PH5151	Engineering Physics	BSC	3	3	0	0	3
4.	CY5151	Engineering Chemistry	BSC	3	3	0	0	3
5.	GE5151	Engineering Graphics	ESC	5	1	0	4	3
PRACTICALS								
6.	BS5161	Basic Sciences Laboratory	BSC	4	0	0	4	2
7.	GE5162	Workshop Practices Laboratory	ESC	4	0	0	4	2
			TOTAL	**27**	**14**	**1**	**12**	**21**

SEMESTER II

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS5251	Professional Communication	HSMC	4	4	0	0	4
2.	MA5252	Engineering Mathematics II	BSC	4	3	1	0	4
3.	GE5153	Problem Solving and Python Programming	ESC	3	3	0	0	3
4.	EE5251	Basics of Electrical and Electronics Engineering	ESC	3	3	0	0	3
5.	GE5152	Engineering Mechanics	ESC	4	3	1	0	4
6.	PH5251	Materials Science	BSC	3	3	0	0	3
PRACTICALS								
7.	GE5161	Problem Solving and Python Programming Laboratory	ESC	4	0	0	4	2
8.	EE5261	Electrical and Electronics Engineering Laboratory	ESC	4	0	0	4	2
			TOTAL	**29**	**19**	**2**	**8**	**25**

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SEMESTER III

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA5354	Probability and Statistics	PCC	4	3	1	0	4
2.	LT5301	Applied Chemistry	PCC	3	3	0	0	3
3.	LT5302	Introduction to Leather Manufacture	PCC	3	3	0	0	3
4.	LT5303	Theory of Skin Proteins and Pre-Tanning Processes	PCC	3	3	0	0	3
5.	LT5304	Principles of Unit Processes and Operations	PCC	3	3	0	0	3
6.		Elective – Humanities I	HSMC	3	3	0	0	3
PRACTICALS								
7.	LT5311	Introductory Practice in Leather Manufacture	PCC	4	0	0	4	2
			TOTAL	**21**	**17**	**0**	**4**	**21**

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Elective – Humanities II	HSMC	3	3	0	0	3
2.	GE5251	Environmental Sciences	BSC	3	3	0	0	3
3.		Audit Course - I*	AC	3	3	0	0	0
4.	LT5401	Leather Manufacture from Hides	PCC	3	3	0	0	3
5.	LT5402	Instrumental Methods of Analysis	PCC	3	2	1	0	3
6.	LT5403	Principles of Testing for Leather	PCC	3	3	0	0	3
7.	LT5404	Theory of Tannages	PCC	3	3	0	0	3
PRACTICALS								
8.	LT5411	Practice on Leather from Hides	PCC	6	0	0	6	3
9.	LT5412	Chemical Testing and Analysis Lab	PCC	4	0	0	4	2
10.	LT5513	Internship/Training - I**	EEC	-	-	-	-	-
			TOTAL	**28**	**17**	**1**	**10**	**23**

*** Audit Course is optional.**

******Students have to undergo Internship/Training for a minimum period of 4 weeks during summer and assessments will be done during V semester.

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SEMESTER V

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Elective –Humanities I	HSMC	3	3	0	0	3
2.		Audit Course - II*	AC	3	3	0	0	0
3.	LT5501	Leather Manufacture from Skins	PCC	3	3	0	0	3
4.	LT5502	Theory of Post Tanning Process	PCC	3	3	0	0	3
5.		Professional Elective – I	PEC	3	3	0	0	3
6.		Professional Elective – II	PEC	3	3	0	0	3
PRACTICALS								
7.	LT5511	Physical Testing and Analysis Lab	PCC	4	0	0	4	2
8.	LT5512	Practice on Leather from Skins	PCC	6	0	0	6	3
9.	LT5513	Internship/Training - I	EEC	4	0	0	4	2
			TOTAL	**32**	**18**	**0**	**14**	**22**

*** Audit Course is optional.**

SEMESTER VI

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	LT5601	Leather Goods and Garments Technology	PCC	3	3	0	0	3
2.	LT5602	Science and Technology of Leather Auxiliaries	PCC	3	3	0	0	3
3.	LT5603	Theory of Leather Finishing	PCC	3	3	0	0	3
4.		Professional Elective III	PEC	3	3	0	0	3
5.		Professional Elective IV	PEC	3	3	0	0	3
6.		Open Elective I	OEC	3	3	0	0	3
PRACTICALS								
7.	LT5611	Finishing Practice Laboratory	PCC	4	0	0	4	2
8.	LT5612	Leather Goods and Garments – Design and Fabrication Laboratory	PCC	4	0	0	4	2
9.	LT5712	Internship/Training - II*****	EEC	-	-	-	-	-
			TOTAL	**26**	**18**	**0**	**8**	**22**

***** Students have to undergo Internship/Training for a period of 4 weeks during summer and assessments will be done during VII semester.

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SEMESTER VII

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	LT5701	Footwear Technology	PCC	3	3	0	0	3
2.	LT5702	Leather and Leather Products Machineries	PCC	3	3	0	0	3
3.		Professional Elective V	PEC	3	3	0	0	3
4.		Professional Elective VI	PEC	3	3	0	0	3
5.		Professional Elective VII	PEC	3	3	0	0	3
6.		Open Elective II	OEC	3	3	0	0	3
PRACTICALS								
7.	LT5711	Leather Footwear – Design and Fabrication Laboratory	PCC	6	0	0	6	3
8.	LT5712	Internship/Training - II	EEC	4	0	0	4	2
9.	LT5713	Project I	EEC	6	0	0	6	3
			TOTAL	**32**	**18**	**0**	**16**	**26**

SEMESTER VIII

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1.	LT5811	Project II	EEC	16	0	0	16	8
			TOTAL	**16**	**0**	**0**	**16**	**8**

TOTAL NO. OF CREDITS: 168

HUMANITIES AND SOCIAL SCIENCES (HSMC) – MANAGEMENT AND OTHERS						
Sl. NO.	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
1.	HS5151	Technical English	4	0	0	4
2.	HS5251	Professional Communication	4	0	0	4
					Total Credits	**8**

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HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			Lecture	Tutorial	Practical	
1.	HU5171	Language and Communication	3	0	0	3
2.	HU5172	Values and Ethics	3	0	0	3
3.	HU5173	Human Relations at Work	3	0	0	3
4.	HU5174	Psychological Process	3	0	0	3
5.	HU5175	Education, Technology and Society	3	0	0	3
6.	HU5176	Philosophy	3	0	0	3
7.	HU5177	Applications of Psychology in Everyday Life	3	0	0	3

HSMC– ELECTIVES – HUMANITIES II (EVEN SEMESTER)

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			Lecture	Tutorial	Practical	
1.	HU5271	Gender Culture and Development	3	0	0	3
2.	HU5272	Ethics and Holistic Life	3	0	0	3
3.	HU5273	Law and Engineering	3	0	0	3
4.	HU5274	Film Appreciation	3	0	0	3
5.	HU5275	Fundamentals of Language and Linguistics	3	0	0	3
6.	HU5276	Understanding Society and Culture through Literature	3	0	0	3

BASIC SCIENCE COURSE(BSC)						
SI. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	MA5158	Engineering Mathematics I	3	1	0	4
2.	PH5151	Engineering Physics	3	0	0	3
3.	CY5151	Engineering Chemistry	3	0	0	3
4.	BS5161	Basic Science Laboratory	0	0	4	2
5.	MA5252	Engineering Mathematics II	3	1	0	4
6.	PH5251	Materials Science	3	0	0	3
7.	GE5251	Environmental Sciences	3	0	0	3
					Total Credits	22

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ENGINEERING SCIENCE COURSE(ESC)						
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
1.	GE5151	Engineering Graphics	1	0	4	3
2.	GE5162	Workshop Practices Laboratory	0	0	4	2
3.	GE5153	Problem Solving and Python Programming	3	0	0	3
4.	EE5251	Basics of Electrical and Electronics Engineering	3	0	0	3
5.	GE5152	Engineering Mechanics	3	1	0	4
6.	EE5261	Electrical and Electronics Engineering Laboratory	0	0	4	2
7.	GE5161	Problem Solving and Python Programming Laboratory	0	0	4	2
					Total Credits	**19**

PROFESSIONAL CORE COURSES (PCC)						
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
1.	MA5354	Probability and Statistics	3	1	0	4
2.	LT5301	AppliedChemistry	3	0	0	3
3.	LT5302	Introduction to Leather Manufacture	3	0	0	3
4.	LT5303	Theory of Skin Proteins and Pre-Tanning Processes	3	0	0	3
5.	LT5304	Principles of Unit Processes and Operations	3	0	0	3
6.	LT5311	Introductory Practice in Leather Manufacture	0	0	4	2
7.	LT5401	Leather Manufacture from Hides	3	0	0	3
8.	LT5402	Instrumental Methods of Analysis	2	1	0	3
9.	LT5403	Principles of Testing for Leather	3	0	0	3
10.	LT5404	Theory of Tannages	3	0	0	3
11.	LT5411	Practice on Leather from Hides	0	0	6	3
12.	LT5412	Chemical Testing and Analysis Lab	0	0	4	2
13.	LT5501	Leather Manufacture from Skins	3	0	0	3
14.	LT5502	Theory of Post Tanning Process	3	0	0	3
15.	LT5511	Physical Testing and Analysis Lab	0	0	4	2
16.	LT5512	Practice on Leather from Skins	0	0	6	3
17.	LT5601	Leather Goods and Garments Technology	3	0	0	3
18.	LT5602	Science and Technology of Leather Auxiliaries	3	0	0	3
19.	LT5603	Theory of Leather Finishing	3	0	0	3
20.	LT5611	Finishing Practice Laboratory	0	0	4	2
21.	LT5612	Leather Goods and Garments – Design and Fabrication Laboratory	0	0	4	2
22.	LT5701	Footwear Technology	3	0	0	3
23.	LT5702	Leather and Leather Products Machineries	3	0	0	3
24.	LT5711	Leather Footwear – Design and Fabrication Laboratory	0	0	6	3
					Total Credits	**68**

PROFESSIONAL ELECTIVES COURSES (PEC)							
SI. NO.	**COURSE CODE**	**COURSE TITLE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	LT5001	Advanced Physics and Chemistry of Skin I	3	3	0	0	3
2.	LT5002	Advanced Physics and Chemistry of Skin II (Prerequisite for this course is LT5001)	3	3	0	0	3
3.	LT5003	Consumer Behaviour and Business Orientation	3	3	0	0	3
4.	LT5004	Eco-benign Options for Leather Processing	3	3	0	0	3
5.	LT5005	Engineering Economics and Finance Management	3	3	0	0	3
6.	LT5006	Enterprise Resource Planning for Leather Sector	3	3	0	0	3
7.	LT5071	Entrepreneurship Development	3	3	0	0	3
8.	LT5007	Fashion Forecasting for Leather and Leather Products	3	3	0	0	3
9.	LT5008	Human Resource Development	3	3	0	0	3
10.	LT5009	International Marketing and Foreign Trade	3	3	0	0	3
11.	LT5010	Leather and Leather Products Costing	3	3	0	0	3
12.	LT5011	Product Merchandising	3	3	0	0	3
13.	LT5012	Organisation and Management of Leather Manufacture	3	3	0	0	3
14.	LT5013	Safety in Leather Industries	3	3	0	0	3
15.	LT5014	Science and Technology of Leather Supplements and Synthetics	3	3	0	0	3
16.	LT5015	Technology of Animal and Tannery by Products Utilisation	3	3	0	0	3
17.	LT5016	Value Engineering in Leather Sector	3	3	0	0	3
18.	LT5017	Computer Applications for Leather and Leather Products	3	3	0	0	3
19.	LT5018	CAD/CAM for Leather Products Design and Manufacture	3	2	1	0	3
20.	LT5019	Polymer Science and Its Application in Leather	3	3	0	0	3
21.	LT5020	Tannery Waste Management	3	3	0	0	3
22.	GE5451	Total Quality Management	3	3	0	0	3
23.	LT5021	Biotechnology and Its Application in Leather	3	3	0	0	3

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)						
Sl. NO.	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**CREDITS**
1.	LT5513	Internship/Training - I	0	0	4	2
2.	LT5712	Internship/Training - II	0	0	4	2
3.	LT5713	Project I	0	0	6	3
4.	LT5811	Project II	0	0	16	8
					Total Credits	**15**

AUDIT COURSES (AC)
Registration for any of these courses is optional to students

Sl. No.	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	AD5091	Constitution of India	3	0	0	0	**4/5**
2.	AD5092	Value Education	3	0	0	0	
3.	AD5093	Pedagogy Studies	3	0	0	0	
4.	AD5094	Stress Management by Yoga	3	0	0	0	
5.	AD5095	Personality Development Through Life Enlightenment Skills	3	0	0	0	
6.	AD5096	Unnat Bharat Abhiyan	3	0	0	0	
7.	AD5097	Essence of Indian Knowledge Tradition	3	0	0	0	
8.	AD5098	Sanga Tamil Literature Appreciation	3	0	0	0	

SUMMARY

B. Tech. Leather Technology										
Sl. No.	**Subject Area**	**Credits per Semester**								**Total Credits**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
1.	HSMC	4	4	3	3	3				**17**
2.	BSC	12	7		3					**22**
3.	ESC	5	14							**19**
4.	PCC			18	17	11	13	9		**68**
5.	PEC					6	6	9		**21**
6.	OEC						3	3		**6**
7.	EEC					2		5	8	**15**
	AC(Non Credit)				✓	✓				**0**
Credits per Semester		**21**	**25**	**21**	**23**	**22**	**22**	**26**	**8**	**168**

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SYLLABI

HS5151 TECHNICAL ENGLISH L T P C
4 0 0 4

OBJECTIVES:

The first semester English course entitled 'Technical English' aims to,

- Familiarise first year students of engineering and technology with the fundamental aspects of technical English.
- Develop all the four language skills by giving sufficient practice in the use of the skills in real life contexts.
- Enhance the linguistic and communicative competence of first year engineering and technology students.

UNIT I INTRODUCING ONESELF 12

Listening: Listening and filling a form, listening to speeches by specialists from various branches of engineering and completing activities such as answering questions, identifying the main ideas of the listening text, style of the speaker (tone and tenor) – Speaking: Introducing oneself – introducing friend/ family - Reading: Descriptive passages (from newspapers / magazines)- Writing: Writing a paragraph (native place, school life)- Grammar: Simple present, present continuous – Vocabulary Development: One word substitution

UNIT II DIALOGUE WRITING 12

Listening: Listening to conversations (asking for and giving directions) –Speaking: making conversation using (asking for directions, making an enquiry), Role plays-dialogues- Reading: Reading a print interview and answering comprehension questions-Writing: Writing a checklist, Dialogue writing- Grammar: Simple past – question formation (Wh-questions, Yes or No questions, Tag questions)- Vocabulary Development: Stress shift, lexical items related to the theme of the given unit.

UNIT III FORMAL LETTER WRITING 12

Listening: Listening to speeches by famous people and identifying the central message of the speech – answering multiple-choice questions)-Speaking: Giving short talks on a given topic- Reading: Reading motivational essays on famous engineers and technologists (answering open- ended and closed questions)- Writing: Writing formal letters/ emails (Complaint letters)-Grammar: Future Tense forms of verbs, subject and verb agreement- Vocabulary Development: Collocations
– Fixed expressions

UNIT IV WRITING COMPLAINT LETTERS 12

Listening: Listening to short talks (5 minutes duration and fill a table, gap-filling exercise) note taking/note making- Speaking: Small group discussion, giving recommendations- Reading: Reading problem – solution articles/essays drawn from various sources- Writing: Making recommendations – Writing a letter/ sending an email to the Editor- note making- Grammar: Modals – Phrasal verbs – cause and effect sentences- Vocabulary Development: Connectives, use of cohesive devices in writing, technical vocabulary.

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UNIT V WRITING DEFINITIONS AND PRODUCT DESCRIPTION 12

Listening: Listening to a product description (labeling and gap filling) exercises- Speaking: Describing a product and comparing and contrasting it with other products- Reading: Reading graphical material for comparison (advertisements)-Writing: Writing Definitions (short and long) – compare and contrast paragraphs- Grammar: Adjectives – Degrees of comparison - compound nouns- Vocabulary Development: Use of discourse markers – suffixes (adjectival endings).

TOTAL: 60 PERIODS

Learning Outcomes

At the end of the course the students will have gained,

CO1 Exposure to basic aspects of technical English.
CO2 The confidence to communicate effectively in various academic situations.
CO3 Learnt the use of basic features of Technical English.
CO4 Writing features of Technical English
CO5 Writing complaint letters

Textbook:

1. Revised Edition of 'English for Engineers and Technologists' Volume 1 published by Orient Black Swan Limited 2019.

Assessment Pattern

- Assessments will assess all the four skills through both pen and paper and computer-based tests.
- Assessments can be pen and paper based, quizzes.

MA5158	ENGINEERING MATHEMATICS – I (Common to all branches of B.E. / B.Tech. Programmes in I Semester)	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers forpractical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvaluesand eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

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UNIT II DIFFERENTIAL CALCULUS

Limit of function — One sided limit — Limit Laws — Continuity — left and right continuity — types of discontinuities – Intermediate Value Theorem – Derivatives of a function - Differentiation rules – Chain rule – Implicit differentiation – logarithmic differentiation – Maxima and minima – Mean value theorem – (Optional: Polar coordinate system – Differentiation in polar coordinates).

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiationof implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction,Integration of irrational functions - Improper integrals.

UNIT V MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Areaenclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and
triple integrals.

TOTAL : 60 PERIODS

OUTCOMES:

At the end of the course the students will be able to

CO1 Use the matrix algebra methods for solving practical problems.
CO2 Apply differential calculus tools in solving various application problems.
CO3 Able to use differential calculus ideas on several variable functions.
CO4 Apply different methods of integration in solving practical problems.
CO5 Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
2. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, 6thEdition, New Delhi,2013.
3. Joel Hass, Christopher Heil and Maurice D. Weir, "Thomas' Calculus", Pearson, 14th Edition, New Delhi, 2018.
4. Narayanan S. and Manicavachagom Pillai T.K.,"Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (Animprint of Lakshmi Publications Pvt., Ltd.,), 7th Edition, New Delhi, 2009.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2015.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5th Edition, New Delhi, 2017.

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5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi , 2012.
6. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

PH5151 **ENGINEERING PHYSICS** **L T P C**

(Common to all branches of B.E / B.Tech programmes) **3 0 0 3**

OBJECTIVE

- To make the students in understanding the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.
- To enable the students in understanding the importance of quantum physics.
- To elucidate the application of quantum mechanics towards the formation of energy bands in crystallinematerials.

UNIT I MECHANICS 9

Moment of inertia (M.I) - Radius of gyration - Theorems of M .I - M.I of circular disc, solid cylinder , hollow cylinder , solid sphere and hollow sphere - K.E of a rotating body — M.I of a diatomic molecule — Rotational energy state of a rigid diatomic molecule - centre of mass — conservation of linear momentum — Relation between Torque and angular momentum - Torsional pendulum.

UNIT II ELECTROMAGNETIC WAVES 9

Gauss's law — Faraday's law - Ampere's law - The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect - reflection and refraction of light waves - total internal reflection - interference - interferometers - air wedge experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser - applications.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

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OUTCOME

After completion of this course, the students should able to

CO1 Understanding the importance of mechanics.

CO2 Express the knowledge of electromagnetic waves.

CO3 Know the basics of oscillations, optics and lasers.

CO4 Understanding the importance of quantum physics.

CO5 Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS

1.D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education, 2017.

2.D.Halliday, R.Resnick and J.Walker. Principles of Physics. John Wiley & Sons, 2015.

3.N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.

REFERENCES

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson, 2016.
2. D.J.Griffiths. Introduction to Electrodynamics. Pearson Education, 2015
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications. Springer, 2012.

CY5151	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

- To introduce the basic concepts of polymers, their properties and some of the important applications.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of the laws of photochemistry, photo processes and instrumentation & applications of spectroscopic techniques.
- To familiarize the operating principles and applications of energy conversion, its processes and storagedevices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

UNIT I POLYMER CHEMISTRY 9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Structure, Properties and uses of: PE, PVC, PC, PTFE, PP, Nylon 6, Nylon 66, Bakelite, Epoxy; Conducting polymers — polyaniline and polypyrrole.

UNIT II NANOCHEMISTRY 9

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties. Types — nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Properties (optical, electrical, mechanical and magnetic) and Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law (derivation and problems). Photo physical processes — Jablonski diagram. Chemiluminescence, photo- sensitization and photoquenching — mechanism and examples. Spectroscopy: Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational transitions. Width and intensities of spectral lines.Atomic absorption spectroscopy, UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

UNIT IV ENERGY CONVERSIONS AND STORAGE 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant — fast breeder reactor.Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). Fuel cells — H_2-O_2 and microbial fuel cell. Explosives — classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V WATER TECHNOLOGY 9

Water — sources and impurities — water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD and BOD. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - zeolite (permutit) and ion exchange demineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).

TOTAL: 45 PERIODS

OUTCOMES:

CO1: To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.

CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designingthe synthesis of nanomaterials for engineering and technology applications.

CO3: To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.

CO4: To recognize different forms of energyresources and apply them for suitable applications in energy sectors.

CO5: To demonstrate the knowledge of water and their quality in using at different industries.

TEXT BOOKS:

1. Jain P. C. & Monica Jain., “Engineering Chemistry”, 16th Edition, Dhanpat Rai Publishing Company (P) Ltd,New Delhi, 2015.
2. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. S.S.Dara, “A text book of Engineering Chemistry”, Chand Publications, 2014.

REFERENCE BOOKS:

1. Sachdeva M V, “Basics of Nano Chemistry”, Anmol Publications Pvt Ltd
2. B.Sivasankar, “Instrumental Methods of Analysis”, Oxford University Press. 2012.
3. Friedrich Emich, “Engineering Chemistry”, Scientific International Ltd.
4. V R Gowariker, N V Viswanathan and Jayadev Sreedhar, “Polymer Science” New AGE InternationalPublishers, 2009.

GE5151 **ENGINEERING GRAPHICS** **L T P C**

1 0 4 3

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) **1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING **14**

Basic Geometrical constructions, Curves used in engineering practices-Conics — Construction of ellipse, parabola and hyperbola by different methods – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES **15**

Orthographic projection- principles-Principle planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes-Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS **15**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **15**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **12**

Principles of isometric projection — isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) **3**

Introduction to drafting packages and demonstration of their use

TOTAL (L: 15 + P: 60) =75 PERIODS

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COURSE OUTCOMES: Upon completion of this course, the students will be able to:

CO1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
CO2. Draw orthographic projections of lines and planes
CO3. Draw orthographic projections of solids
CO4. Draw development of the surfaces of objects
CO5. Draw isometric and perspective views of simple solids.

TEXT BOOKS:

1. Bhatt, N. D, Panchal V M and Pramod R. Ingle, "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.
2. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES:

1. Agrawal, B. and Agrawal C.M., "Engineering Drawing", Tata McGraw, N.Delhi, 2008.
2. Gopalakrishna, K. R., "Engineering Drawing", Subhas Stores, Bangalore, 2007.
3. Natarajan, K. V., "A text book of Engineering Graphics", 28th Ed., Dhanalakshmi Publishers, Chennai,2015.
4. Shah, M. B., and Rana, B. C., "Engineering Drawing", Pearson, 2nd Ed., 2009.
5. Venugopal, K. and Prabhu Raja, V., "Engineering Graphics", New Age,2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

BS5161	**BASIC SCIENCES LABORATORY**	**L T P C**
	(Common to all branches of B.E. / B.Tech. Programmes)	**0 0 4 2**

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE

- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

LIST OF EXPERIMENTS:

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of Young's modulus
3. Uniform bending – Determination of Young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor

5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.
13. Photoelectric effect
14. Michelson Interferometer.
15. Estimation of laser parameters.
16. Melde's string experiment

TOTAL: 30 PERIODS

OUTCOME

Upon completion of the course, the students will be able

- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY: (Minimum of 8 experiments to be conducted)

OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and polymers by spectroscopy and viscometry methods.

LIST OF EXPERIMENTS:

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler"s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer(1,10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Phase change in a solid.

Attested

TOTAL: 30 PERIODS

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OUTCOMES:

- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To determine the molecular weight of polymers by viscometric method.
- To quantitatively analyse the impurities in solution by electroanalytical techniques
- To design and analyse the kinetics of reactions and corrosion of metals

TEXTBOOKS:

1. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).
2. Vogel"s Textbook of Quantitative Chemical Analysis (8th edition, 2014).

GE5162 WORKSHOP PRACTICES LABORATORY LT P C
(Common to all Branches of B.E. / B.Tech. Programmes) 0 0 4 2

COURSE OBJECTIVES: The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,
b) Planning and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint. Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

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PART II ELECTRICAL ENGINEERING PRACTICES 15

WIRING WORK:

a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
b) Wiring Stair case light.
c) Wiring tube – light.
d) Preparing wiring diagrams for a given situation.

Wiring Study:

a) Studying an Iron-Box wiring.
b) Studying a Fan Regulator wiring.
c) Studying an Emergency Lamp wiring.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Studying a FM radio.
b) Studying an electronic telephone.

TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipment; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

SEMESTER II

HS5251 PROFESSIONAL COMMUNICATION L T P C
4 0 0 4

COURSE OBJECTIVES

The course entitles 'professional communication' aims to,

- Improve the relevant language skills necessary for professional communication.
- Develop linguistic and strategic competence in workplace context.
- Enhance language proficiency and thereby the employability of budding engineers and technologists.

UNIT I TECHNICAL COMMUNICATION 12

Listening: Listening to telephone conversations (intent of the speaker and note taking exercises)- Speaking: Role play exercises based on workplace contexts, introducing oneself- Reading: Reading the interview of an achiever and completing exercises (skimming, scanning and predicting)- Writing: Writing a short biography of an achiever based on given hints- Grammar: Asking and answering questions, punctuation in writing, prepositional phrases- Vocabulary Development: use of adjectives.

UNIT II SUMMARY WRITING 12

Listening: Listening to talks/lectures both general and technical and summarizing the main points- Speaking: Participating in debates- Reading: Reading technical essays/ articles and answering comprehension questions-Writing: Summary writing-Grammar: Participle forms, relative clauses- Vocabulary Development: Use of compound words, abbreviations and acronyms.

UNIT III PROCESS DESCRIPTION 12

Listening: Listening to a process description and drawing a flowchart-Speaking: Participating in Group Discussions, giving instructions- Reading: Reading instruction manuals- Writing: Writing process descriptions- Writing instructions- Grammar: Use of imperatives, active and passive voice, sequence words- Vocabulary Development: Technical jargon

UNIT IV REPORT WRITING 12

Listening: Listening to a presentation and completing gap-filling exercises- Speaking: Making formal presentations- Reading: Reading and interpreting charts/tables and diagrams- Writing: Interpreting charts/tables and diagrams, writing a report- Grammar: Direct into indirect speech, use of phrases- Vocabulary Development: reporting words

UNIT V WRITING JOB APPLICATIONS 12

Listening: Listening to a job interview and completing gap=filling exercises- Speaking: Mock interview, telephone interviews- Reading: Reading a job interview, SOP, company profile and completing comprehension exercises- Writing: job applications and resumes and SOPs-Grammar: Present perfect and continuous tenses- Vocabulary Development: Technical vocabulary.

TOTAL : 60 PERIODS

LEARNING OUTCOMES

At the end of the second semester the learners should be able to,

CO1. Read technical texts effortlessly.
CO2. Comprehend technical texts effortlessly.
CO3. Write reports of a technical kind.
CO4. Speak with confidence in interviews and
CO5. Thereby gain employability

Textbook

1. Revised Edition of 'English for Engineers and Technologists' Volume 1 published by Orient Black Swan Limited 2019.

Assessment Pattern

- Assessments will assess all the four skills through both pen and paper and computer based tests.
- Assessments can be pen and paper based, quizzes.

MA5252 ENGINEERING MATHEMATICS – II L T P C

(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVES:

- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in Engineering problems.
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem, Stoke's theorem and Gauss divergence theorem – Verification and application in evaluating line, surface and volume integrals.

UNIT II ANALYTIC FUNCTION 12

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation .

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UNIT III COMPLEX INTEGRATION 12

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT IV DIFFERENTIAL EQUATIONS 12

Method of variation of parameters – Method of undetermined coefficients – Homogenous equations of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students will be able to:

CO1. Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
CO2. Construct analytic functions and use their conformal mapping property in application problems.
CO3. Evaluate real and complex integrals using the Cauchy's integral formula and residuetheorem.
CO4. Apply various methods of solving differential equation which arise in many applicationproblems.
CO5. Apply Laplace transform methods for solving linear differential equations.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2015. 1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), 7th Edition, New Delhi, 2009.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th Edition, New Delhi, 2011.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, New Delhi, 2017.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt.,Ltd, 7th Edition, New Delhi, 2012.
5. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

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GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To know the basics of algorithmic problem solving.
- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING 9

Fundamentals of Computing – Computing Devices – Identification of Computational Problems – Pseudocodes and Flowcharts – Instructions – Algorithms – Building Blocks of Algorithms – Introduction to Python Programming – Python Interpreter and Interactive Mode – Variables and Identifiers – Arithmetic Operators– Values and Types – Statements.

Suggested Activities:

- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic operations.
- Installing Python.
- Simple programs on print statements, arithmetic operations.

Suggested Evaluation Methods:

- Assignments on pseudocodes and flowcharts.
- Tutorials on Python programs.

UNIT II CONDITIONALS AND FUNCTIONS 9

Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions.

Suggested Activities:

- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.
- Implementation of a simple calculator.
- Developing simple applications like calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.
- External learning - Recursion vs. Iteration.

Suggested Evaluation Methods:

- Tutorials on the above activities.
- Group Discussion on external learning.

UNIT III SIMPLE DATA STRUCTURES IN PYTHON 10

Introduction to Data Structures – List – Adding Items to a List – Finding and Updating an Item – Nested Lists – Cloning Lists – Looping Through a List – Sorting a List – List Concatenation – List Slices – List Methods – List Loop – Mutability – Aliasing – Tuples: Creation, Accessing, Updating, Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value, Nested Tuples, Basic Tuple Operations – Sets.

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Suggested Activities:

- Implementing python program using lists, tuples, sets for the following scenario: Simple sorting techniques
  Student Examination Report Billing Scheme during shopping.
- External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

Suggested Evaluation Methods:

- Tutorials on the above activities.
- Group Discussion on external learning component.

UNIT IV STRINGS, DICTIONARIES, MODULES 10

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicing, Comparing, Iterating – Basic Built-In String Functions – Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, Sorting, Looping, Nested Dictionaries Built-in Dictionary Function – Finding Key and Value in a Dictionary – Modules – Module Loading and Execution – Packages – Python Standard Libraries.

Suggested Activities:

- Implementing Python program by importing Time module, Math package etc.
- Creation of any package (student's choice) and importing into the application.

Suggested Evaluation Methods:

- Tutorials on the above activities.

UNIT V FILE HANDLING AND EXCEPTION HANDLING 7

Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

Suggested Activities:

- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks -for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

Suggested Evaluation Methods:

- Tutorials on the above activities.
- Case Studies.

TOTAL: 45 PERIODS

OUTCOMES

On completion of the course, students will be able to:

CO1. Develop algorithmic solutions to simple computational problems.
CO2. Develop and execute simple Python programs.
CO3. Write simple Python programs for solving problems and decompose a Python program into functions.
CO4. Represent compound data using Python lists, tuples, dictionaries etc.
CO5. Read and write data from/to files in Python programs.

TEXT BOOK:

1. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers, 2016. (http://greenteapress.com/wp/thinkpython/).

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REFERENCES:

1. Guido van Rossum, Fred L. Drake Jr., “An Introduction to Python – Revised and Updated for Python 3.2”, Network Theory Ltd., 2011.
2. John V Guttag, “Introduction to Computation and Programming Using Python”, Revised and Expanded Edition, MIT Press , 2013
3. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley India Edition, 2016.
4. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, Cengage Learning, 2012

EE5251 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts of electric circuits, magnetic circuits and wiring.
- To understand the operation of AC and DC machines.
- To understand the working principle of electronic devices and circuits.

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING 9

Electrical circuit elements (R, L and C)-Dependent and independent sources – Ohm’s Law-Kirchhoff’s laws - mesh current and node voltage methods (Analysis with only independent source) - Phasors – RMS-Average values-sinusoidal steady state response of simple RLC circuits. Types of wiring- Domestic wiring - Specification of Wires-Earthing-Methods-Protective devices.

UNIT II THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS 9

Three phase supply – Star connection – Delta connection –Balanced and Unbalanced Loads-Power in three-phase systems – Comparison of star and delta connections – Advantages-Magnetic circuits-Definitions-MMF, Flux, Reluctance, Magnetic field intensity, Flux density, Fringing, self and mutual inductances-simple problems.

UNITIII ELECTRICAL MACHINES 9

Working principle of DC generator, motor-EMF and Torque equation-Types –Shunt, Series and Compound-Applications. Working principle of transformer-EMF equation-Operating principles of three phase and single phase induction motor-Applications. Working principles of alternator-EMF equation-Operating principles of Synchronous motor, stepper motor-Applications.

UNIT IV BASICS OF ELECTRONICS 9

Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-Rectifier circuits-Wave shaping.

UNIT V CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES 9

Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS

OUTCOMES:

CO1 To be able to understand the concepts related with electrical circuits and wiring.
CO2 To be able to study the different three phase connections and the concepts of magnetic circuits.
CO3 Capable of understanding the operating principle of AC and DC machines.
CO4 To be able to understand the working principle of electronic devices such as diode and zener diode.
CO5 To be able to understand the characteristics and working of current controlled and voltage controlled devices.

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill Education, 2014
2. Del Toro, "Electrical Engineering Fundamentals", Second edition, Pearson Education, New Delhi, 1989.
3. John Bird, "Electrical Circuit theory and technology", Routledge; 5th edition, 2013

REFERENCES:

1. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017
3. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", McGraw Hill, 2010.
4. Muhammad H.Rashid, "Spice for Circuits and electronics", 4th ed.,Cengage India,2019.

GE5152 ENGINEERING MECHANICS L T P C
3 1 0 4

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and non-coplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I STATICS OF PARTICLES (9+3)

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNITII EQUILIBRIUM OF RIGID BODIES (9+3)

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNITIII DISTRIBUTED FORCES (9+3)

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by

Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration

UNIT IV FRICTION (9+3)

The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction. Rolling Resistance, Ladder friction.

UNITV DYNAMICS OF PARTICLES (9+3)

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact, Method of Virtual Work - Work of a Force, Potential Energy, Potential Energy and Equilibrium.

TOTAL (L: 45 + T: 15) =60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.

CO2. Apply the concept of reaction forces (non-concurrent coplanar and non-coplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.

CO3. Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass momentof inertia of solids.

CO4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.

CO5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11thEdition, 2017.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES:

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013

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PH5251 MATERIALS SCIENCE L T P C

(Common to Mechanical, Manufacturing, Industrial, Mining, 3 0 0 3
Aeronautical, Automobile and Production Engineering& Rubber and Plastics Technology)

OBJECTIVES:

- To make the students to understand the basics of crystallography and crystal imperfections.
- To introduce various strengthening methods of materials, and also various mechanical properties and their measurement.
- To impart knowledge on the basics of phase diagrams and their applications.
- To learn about iron-carbon system, and about various ferrous and non-ferrous alloys.
- To introduce the preparation, properties and applications of ceramics, composites and nanomaterials.

UNIT I CRYSTALLOGRAPHY 9

Crystallographic directions and planes – metallic crystal structures: BCC, FCC and HCP – linear and planar densities – crystal imperfections- edge and screw dislocations, Burgers vector and elastic strain energy- surface imperfections – grain and twin boundaries – Polymorphism – phase changes – nucleation and growth – homogeneous and heterogeneous nucleation.

UNIT II MECHANICAL PROPERTIES 9

Tensile test - plastic deformation by slip – slip systems – mechanisms of strengthening in metals: strain hardening, grain size reduction, solid solution strengthening, precipitation hardening – Creep: creep curves, stress and temperature effects, mechanisms of creep, creep-resistant materials – Fracture: ductile and brittle fractures - the Griffith criterion –fracture toughness - Fatigue failure:the S-N curve – factors that affect fatigue life – Hardness: Rockwell and Brinell hardness tests, Knoop and Vickers microhardness tests.

UNIT III PHASE DIAGRAMS 9

Basic concepts - Gibbs phase rule –Unary phase diagram (iron) - Binary phase diagrams: isomorphous systems (Cu-Ni) –determination of phase composition and phase amounts – tieline and lever rule - binary eutectic diagram with no solid solution and limited solid solution (Pb-Sn) – eutectoid and peritectic reactions - other invariant reactions – microstructural development during the slow cooling: eutectic, hypereutectic and hypoeutectic compositions.

UNIT IV FERROUS AND NONFERROUS ALLOYS 9

The Fe-Fe3C phase diagram: phases, invariant reactions, development of microstructure in eutectoid, hypoeutectoid and hypereutectoid alloys–influence of other alloying elements in the Fe-C system - phase transformations –isothermal transformation diagram for eutectoid iron-carbon alloy – microstructures: pearlite, bainite, spheroidite and martensite – steels, stainless steels and cast irons – copper alloys – aluminum alloys – titanium alloys.

UNIT V CERAMICS, COMPOSITES AND NANO MATERIALS 9

Ceramics – types and applications-refractories, abrasives and cements – Composites: classification, role of matrix and reinforcement -Fiber reinforced composites – carbon-carbon composites –Nanomaterials:types, physical, chemical and mechanical properties - carbon nanotubes: properties and applications - synthesis of nanomaterials: sonochemical, molecular epitaxy, physical vapor deposition (PVD) and chemical vapor deposition (CVD). Characterization: Transmission electron microscopy - scanning electron microscopy - Atomic force microscopy - X-ray powder diffraction - Nanoparticle size calculation.

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TOTAL: 45 PERIODS

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OUTCOMES:

Upon completion of this course, the students will

- understand the basics of crystallography and its importance in materials properties
- understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
- gain knowledge on binary phase diagrams, and also will be able to determine the phase composition and phase amount.
- understand about the Fe-C system and various microstructures in it, and also about various ferrous and non-ferrous alloys.
- get adequate understanding on the preparation, properties and applications of ceramics, composites and nanomaterials.

REFERENCES:

1. W.D.Callitser and D.G.Rethwish. Materials Science and Engineering. John Wiley & Sons, 2014.
2. V.Raghavan. Materials Science and Engineering: A First Course. PHI Learning, 2015.
3. M.F.Ashby, P.J.Ferreira and D.L.Schodek. Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers, 2011.
4. J.F.Shackelford. Introduction to Materials Science for Engineers. Pearson, 2015.
5. D.R. Askeland and W.J.Wright. Essentials of Materials Science and Engineering,Cengage Learning, 2013.
6. W.F.Smith, J.Hashemi and R.Prakash. Materials Science and Engineering. McGraw Hill Education, 2017.

GE5161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY **L T P C**
0 0 4 2

OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To articulate where computing strategies support in providing Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
8. Implementing programs using written modules and Python Standard Libraries.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

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OUTCOMES:

On completion of the course, students will be able to:

- Develop algorithmic solutions to simple computational problems
- Develop and execute simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python data structures.
- Apply Python features in developing software applications.

EE5261 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY L T P C
0 0 4 2

OBJECTIVES

1. To impart hands on experience in verification of circuit laws and measurement of circuit parameters
2. To train the students in performing various tests on electrical motors.
3. It also gives practical exposure to the usage of CRO, power sources & function generators

List of Experiments

1. Verification of Kirchhoff's Law.
2. Steady state response of AC and DC circuits (Mesh, Node Analysis)
3. Frequency response of RLC circuits.
4. Measurement power in three phase circuits by two-watt meter method.
5. Regulation of single phase transformer.
6. Performance characteristics of DC shunt generator.
7. Performance characteristics of single phase induction motor.
8. Characteristics of PN diode and Zener diode
9. Characteristics of Zener diode
10. Half wave and full wave Rectifiers 11.Application of Zener diode as shunt regulator.
11. Characteristics of BJT and JFET

TOTAL: 60 PERIODS

OUTCOMES:

1. To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
2. Ability to perform speed characteristic of different electrical machines
3. Ability to use logic gates and Flip flops

SEMESTER III

MA5354 PROBABILITY AND STATISTICS L T P C
3 1 0 4

OBJECTIVES

- To understand the basics of random variables with emphasis on the standard discrete and continuous distributions.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the Central Limit theorem.
- To apply the small/ large sample tests through Tests of hypothesis.
- To understand the concept of analysis of variance and use it to investigate factorial dependence.
- To monitor a process and detect a situation when the process is out of control.

UNIT I RANDOM VARIABLES 12

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions – Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTS OF SIGNIFICANCE 12

Type I and Type II errors – Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-square test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank – Sum test (Wilcoxon test).

UNIT IV DESIGN OF EXPERIMENTS 12

Completely Randomized Design – Randomized Block Design – Latin Square Design – factorial design – Taguchi's robust parameter design.

UNIT V STATISTICAL QUALITY CONTROL 12

Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c and np charts) Tolerance limits – Acceptance sampling.

TOTAL: 60 PERIODS

OUTCOMES

- To analyze the performance in terms of probabilities and distributions achieved by the determined solutions
- To be familiar with some of the commonly encountered two dimensional random variables and be equipped for a possible extension to multivariate analysis
- To apply the basic principles underlying statistical inference (estimation and hypothesis testing)
- To demonstrate the knowledge of applicable large sample theory of estimators and tests
- To obtain a better understanding of the importance of the methods in modern industrial processes.

TEXT BOOKS:

1. Devore, J.L. “Probability and Statistics for Engineering and the Sciences”, Cengage Learning, 9th Edition, Boston, 2017.
2. Johnson, R.A. and Gupta, C.B. “Miller and Freund’s Probability and Statistics for Engineers”, Pearson India Education, Asia, 9th Edition, New Delhi, 2017.
3. Walpole, R.E., Myers R.H., Myres S.L., and Ye, K. “Probability and Statistics for Engineers and Scientists”, Pearson Education, Asia, 9th Edition, New Delhi, 2011.

REFERENCES:

1. Krishnaiah, K. and Shahabudeen, P. “Applied Design of Experiments and Taguchi Methods”, Prentice Hall of India, New Delhi, 2012.
2. Milton, J.S. and Arnold, J.C. “Introduction to Probability and Statistics”, Tata McGraw Hill, 4th Edition, 3rd Reprint, New Delhi, 2008.
3. Ross, S.M. “Introduction to Probability and Statistics for Engineers and Scientists”, Elsevier, 5th Edition, New Delhi, 2014.
4. Spiegel, M.R., Schiller, J., Srinivasan, R.A. and Goswami, D., “Schaum’s Outline of Theory and Problems for Probability and Statistics”, McGraw Hill Education, 3rd Edition, Reprint, New Delhi, 2017.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	To analyze the performance in terms of probabilities and distributions achieved by the determined solutions	2	2	1	2	1	–	–	–	–	–	1	1	1	-	-
CO2	To be familiar with some of the commonly encountered two dimensional random variables and be equipped for a possible extension to multivariate analysis	2	2	1	3	1	–	–	–	–	–	1	1	1	-	-
CO3	To apply the basic principles underlying statistical inference(estimation and hypothesis testing)	2	2	1	3	1	–	–	–	–	–	2	2	1	-	-
CO4	To demonstrate the knowledge of applicable large sample theory of estimators and tests	2	2	1	3	1	–	–	–	–	–	1	1	1	-	-
CO5	To obtain a better understanding of the importance of the methods in modern industrial processes.	2	2	1	3	1	–	–	–	–	–	2	2	1	-	-

Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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LT5301 **APPLIED CHEMISTRY** **L T P C**
3 0 0 3

OBJECTIVE

- This course aims at introducing fundamental inorganic and organic chemistry required for leather manufacture**.**

UNIT I INTRODUCTION TO INORGANIC COMPOUNDS 9

A brief survey of the 's' block - binary compounds, complexes, alkalides and electrides. Features of the 'p' block and its elements - expansion of the octet, Lewis structures; 'd' and 'f' orbitals and transition metals; Coordination compounds –nomenclature, Theories - Coordination theory, Werner's theory; Ligand field theory; MO energy level diagrams **for homo nuclear di-**atomics. Introduction to inorganic tanning materials.

UNIT II MOLECULAR BONDING 9

Valence bond approach and atomic orbital hybridizations. LCAO-MO theory, Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, Hyper conjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Aromaticity: Hückel's rule, Electrophilic and nucleophilic aromatic substitution reactions, Redox reactions.

UNIT III ORGANIC TANNING AGENTS AND COMPOUNDS 9

Chemistry of condensed and hydrolysable tannins proanthocyanidins, dimers, trimers and other oligomers. Chemistry of sulphonyl chloride, quinone, oxazolidine, phosphonium and other organic tanning agents. Methods of preparation of vegetable tannin extracts, spray dried vegetable tannins, generation stability of organic reactive intermediates: carbocations, carboanions, free radicals, carbenes, benzynes and nitrenes.

UNIT IV COLLOIDS AND SURFACTANTS 10

Introduction to colloids – properties of colloids – coagulation of solutions –Origin of charge on colloidal particles –Determination of size of colloidal particles- Donnan Membrane equilibrium – Emulsions – Gels – Applications of colloids

Chemical and Physico-chemical types, properties; Rheology: Viscosity. Non-Newtonian flow and Viscoelasticity, Birefringence: electrical and streaming; Various Diffusional aspects and applications.

UNIT V APPLICATION TO LEATHER TECHNOLOGY 8

Use of inorganic and organic materials in leather manufacture; Wetting theory, Cohesion and Adhesion**.**

TOTAL: 45 PERIODS

OUTCOMES:

On the completion of the course students are expected to

CO1. Have the basic knowledge on inorganic compounds.
CO2. Understand the concept of various molecular bonding.
CO3. Interpret the characteristic of organic compounds and its relevance in tanning.
CO4. Perceive the concepts of colloids and surfactants.
CO5. Application of colloidal science to leather technology.

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TEXT BOOKS and REFERENCES:

1. J W Huheey, E A Keiter and R L Keiter, 'Inorganic Chemistry' 4th edn, Harper Collins,
2. M J Winter, 'Chemical Bonding' Oxford Primer Series, Oxford University Press, 1994
3. N C Norman, 'Periodicity and the p-block Elements' Oxford Primer Series, Oxford University Press, 1994
4. R.T. Morrison and R.N.Boyd “Organic Chemistry” VI Ediition Prentice Hall Inc (1996) USA
5. K.S.Tiwari, N.K.Vishnoi and S.N.Malhotra “A text book of Organic Chemistry” Second Edition, Vikas Publishing House Pvt. Ltd. (1998) New Delhi.
6. Puri B.H. Sharma L.R and M.S.Prathama, Principles of Physical Chemistry, S. Chand and Company, Delhi (2001).
7. Gordon M. Barrow, Physical Chemistry, Sixth edition, Tata McGraw Hill (1998).
8. Introduction to Colloid and Surface Chemistry, Duncan J. Shaw, Butternorth, Hewemann, (1992)

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Revised Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have the basic knowledge on inorganic compounds	3	3	2	1	1	1	1	1	1	2	1	2	3	2	1
CO2	Understand the concept of various molecular bonding	3	3	2	1	1	1	1	1	1	2	1	2	3	2	1
CO3	Interpret the characteristic of organic compounds and its relevance in tanning.	3	3	2	1	1	1	1	1	1	2	1	2	3	2	1
CO4	Perceive the concepts of colloids and surfactants.	3	3	2	2	2	1	2	1	1	2	2	2	3	3	2
CO5	Application of colloidal science to leather technology.	3	3	3	2	2	1	2	1	1	1	2	1	3	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5302 INTRODUCTION TO LEATHER MANUFACTURE L T P C
3 0 0 3

OBJECTIVE

- This course aims at introducing the fundamentals of chemistry and technology of leather manufacture in response to current market scenario, application avenues and future requirements.

UNIT I APPLICATIONS AND ALTERNATIVES TO LEATHER 8

Current and emerging applications of leather; Properties required for key application avenues; Alterative materials to leather and their application avenues; Uniqueness of leather compared to currently available alternative materials.

UNIT II HIDES/SKINS AND PRESERVATION 10

Functions and properties of skins and hides; Histological characteristics of hides and skins - Cow, Ox, Buff, Cow Calf, Buff calf, Goat and Sheep; Chemical constituents of hides and skins; Various fibrous and non-fibrous proteins; Standard flaying techniques; Hide/skin putrefaction and factors involved; Various preservation techniques and their principles; Defects in hides and skins; Raw material grading – Size, weight and surface defects as criteria.

UNIT III PRE-TANNING AND TANNING PROCESSES 10

Principles and objectives of pre-tanning processes viz., soaking, liming, deliming, bating, pickling, depickling, degreasing and repickling. Various types of tanning materials; Organic and mineral tanning agents; Principles involved in vegetable and chrome tanning and their mechanism in brief; Combination tannages.

UNIT IV POST TANNING AND FINISHING PROCESSES 8

Principles and objectives of post tanning processes viz., rechroming, neutralisation, retanning, dyeing and fatliquoring; Various mechanical operations involved; Methods of drying. Principles and objectives of leather finishing; Classification of leather finishing; Types of auxiliaries and finishes used; General machinery employed in leather finishing.

UNIT V PROCESS RATIONALE FOR MAKING SPECIFICTYPE OF LEATHER 9

General principles in selection of materials and design of processes for making specific type of leathers - shoe upper, upholstery, garment, glove; Properties required for end use application; Modifying the pre-tanning, tanning, post-tanning and finishing processes to suit the end use requirements; Trouble shooting during leather making – case studies.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students are expected to

CO1. Understand the application and alternatives to leather in current global scenario.
CO2. Aware of various preservation techniques of the skins / hides.
CO3. Have knowledge on pre-tanning and tanning processes.
CO4. Have knowledge on post-tanning and finishing processes.
CO5. Comprehend the process rational for making specific leather.

TEXT BOOKS and REFERENCES:

1. Sarkar, K.T., Theory and Practice of Leather Manufacture, Ajoy Sorcor, Madras, 4th Rev.Ed 1995.
2. Dutta, S.S., An Introduction to the Principles of Leather Manufacture, 4th Edition, Indian Leather Technologists Association, Calcutta, 4th Edition 1999.
3. Sharphouse, J.H.,"Leather Technicians Handbook", Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.
4. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.I & II, Type of tannages, Rober E. Krieger Publishing Co., New York, 1978.
5. Thorstensen, T.C., Practical Leather Technology, Krieger Publications, 1993.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	Understand the application and alternatives to leather in current global scenario.	-	1	1	1	1	2	3	3	1	-	2	1	2	1	1
CO2	Aware of various preservation techniques of the skins / hides	2	2	3	2	1	3	3	1	1	-	1	1	3	2	2
CO3	Have knowledge on pre-tanning and tanning processes	2	3	3	3	1	2	2	1	1	-	2	1	3	2	2
CO4	Have knowledge on post-tanning and finishing processes	2	2	3	2	2	2	3	1	1	-	1	1	3	2	2
CO5	Comprehend the process rational for making specific leather.	2	2	3	2	2	3	3	1	1	-	2	1	3	1	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5303 THEORY OF SKIN PROTEINS AND PRE- TANNING PROCESSES L T P C
3 0 0 3

OBJECTIVE

To understand the basic structure and function of skin and its components and to understand the various pre-tanning processes/operations

UNIT I COMPONENTS, FUNCTIONS AND COMPOSITION OF SKIN 9

Organization of skin components in different animals; Structure and function of epidermis, dermis, cutaneous and subcutaneous tissues; hair; fat tissue; nerve; erectorpilli muscle; sweat glands; Various constituents of hides and skins; Fibrous and non-fibrous proteins in skin; Structure and properties of complex carbohydrates and proteoglycons; Structure and properties of fatty acids; Structure, function and properties of amino acids.

UNIT II COLLAGEN: STRUCTURE, FUNCTION, THERMAL TRANSITION AND DEGRADATION 10

Structure of collagen; Types of collagen; Tropocollagen molecules; Sub-units of collagen; Kinetics of fibril formation; Electron microscopy of the collagen fibre; Biosynthesis; Denaturation temperature; Mechanism of denaturation process; Thermal shrinkage; Factors influencing melting transition; Degradation of collagen – collagenase and its physico - chemical properties and mechanism of action.

UNIT III PRESERVATION AND PRE-TANNING PROCESSES 9

Principles of preservation of hides and skins **-** Defects due to parasitic diseases of livestock that affect leather quality.

Chemistry and principles of different pre-tanning processes - Soaking, liming, deliming, bating, pickling, depickling and degreasing.

UNIT IV CLEANER PROCESSING IN BEAMHOUSE PRACTICES 9

Salt-free curing options, sulphide free unhairing systems, ammonia-free deliming, salt free pickling systems, solvent and eco-friendly degreasing systems. Strategies to bring down BOD, COD and TDS standards of tannery effluents.

UNIT V PRACTICE AND QUALITY CONTROL 8

Different methods of pre-tanning processes as applied to light, heavy and industrial leathers. Process control in pre-tanning operations.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the students are expected to

CO1. Know about various structural components and functions of skin/hide
CO2. Understand the molecular structure of collagen and its supramolecular assemblies and their characteristics
CO3. Gain fundamental knowledge on preservation and pre-tanning
CO4. Aware of various cleaner pre-tanning processes
CO5. Determine the quality control requirements of pre-tanning process.

TEXT BOOKS:

1. Lehninger A.L., Nelson D.L., Cox M.M., “Principles of Biochemistry", CBS Publications,1993.
2. Gustavson, K.H., `The Chemistry and Reactivity of Collagen', Academic Press, New York, 1958.
3. Flaherty, O., William Roddy, T. Robert, M. Lollar, `The Chemistry and Technology of Leather', Vol.1 Preparation for Tannage, E Robert Krieger Publishing Company, New York, 1978.
4. Bienkiewicz, K., "Physical Chemistry of Leather Manufacture", Krieger, Florida, 1982.

REFERENCES:

1. Voet D., Voet G., “Biochemistry ", Second Edition, John Wiley and Sons, 1994.
2. Stryer L., “Biochemistry ", Fourth Edition, 1994.
3. Darnell J., Lodish H., Baltimore D., “Molecular Cell Biology ", Freeman W.H., 1990.
4. “Microbes and Enzymes - -Basics and Applied”, R. Puvanakrishnan, Former Sc.G. and Head, Dept. of Biotechnology, CLRI

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Know about various structural components and functions of skin/hide	3	2	1	-	1	-	1	-	-	1	-	2	-	3	1
CO2	Understand the molecular structure of collagen and its supramolecular assemblies and their characteristics	3	2	1	-	-	-	-	-	-	1	-	2	-	3	1
CO3	Gain fundamental knowledge on preservation and pre-tanning	3	2	1	1	1	1	3	1	1	1	-	2	1	3	2
CO4	Aware of various cleaner pre-tanning processes	3	2	1	2	1	3	3	2	2	1	-	2	2	3	3
CO5	Determine the quality control requirements of pre-tanning process.	3	2	1	2	1	1	3	2	2	1	-	2	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5304 PRINCIPLES OF UNIT PROCESSES AND OPERATIONS L T P C
3 0 0 3

OBJECTIVE

To impart basic knowledge on unit process and operation involving in the leather and leather chemicals.

UNIT I CONCEPTS AND METERING OF FLUIDS 9

Concepts of Unit operations and Processes, Fundamentals: Unit and Dimensions, Material and Energy Balances. Fluid statics and dynamics, Compressible and incompressible fluids, Newtonian and Non-Newtonian fluids, Measurement of pressure drop and fluid velocity. Pumps, Compressor, Blowers.

UNIT II HEAT TRANSFER AND MASS TRANSFER 10

Fundamentals of Heat Transfer, Heat transfer equipment, Heat exchangers, Evaporators and Condensers and Simple Design Calculations.

Diffusion: Binary diffusion, concept of mass transfer coefficients and interface mass transfer and stage wise contact.

Distillation: Principle of distillation, Application of distillation in leather chemicals and auxiliaries processing.

Extraction: Extraction principles, Leaching and Extraction equipment and their application in manufacture of leather chemicals

Drying: Drying characteristics, Theory and mechanism of drying, estimation of drying rate, design and performance of industrial dryers for leather.

Humidification: Humidity charts, methods of humidification and dehumidification; Equipments and their design aspects; Humidity control in leather processing.

UNIT III MECHANICAL SEPARATIONS 8

Size reduction: Theory and equipment ; application in leather chemical processing **Clarification :** Principles of clarification, Liquid-Liquid, Liquid-solid and Liquid-gas separations, Application in leather processing and effluent treatment Mixing : Basic theory and application in leather and leather chemical processing.

UNIT IV PRINCIPLES OF UNIT PROCESSES 10

General principles of unit operations and unit processes in leather and leather chemicals processing: General concepts of unit operations and unit processes in leather and leather chemicals processing. Development of process flow sheets with reference to leather and leather chemical industries design, control safety pollution abatement. Principles of halogenation, esterification, hydrolysis, oxidation, hydrogenation. Polymerization, sulphation and sulphonation, diazotization and coupling.

Tanning agents: Vegetable tannins and Vegetable tannin extracts, Basic Chromium Sulphate, Aluminium, and Zirconium, salts for leather processing.

Oils, fats and detergents: Oils and fats; their nature and products derived from oils and fats, Fatty Acids and Alcohols, waxes and fatliquors.

Synthetic binders: Binders based on acrylics, polyamides, polyesters, polyurethanes, polypropylene

Dyes and intermediates and surface coating agents: Raw materials; important unit processes; Types of dye intermediates and dyes; pigments, lacquers

Recent developments in chemicals for leather manufacture: Recent developments like REACH and its implications on leather chemicals; Alternate eco-benign leather chemicals and auxiliaries for leather manufacture.

UNIT V WATER AND INORGANIC CHEMICALS 8

Treatment of water for domestic and industrial purposes, manufacture of sodium chloride, sodium sulphide, sodium sulphite and bisulphite, soda ash, caustic soda, lime, sulphuric and hydrochloric acids.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student would understand

CO1. The basic concepts of unit operations, material and energy balances.
CO2. The fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification.
CO3. The size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather and leather chemicals.
CO4. Principle of various unit processes in leather chemical processing.
CO5. About the use of water and manufacture of inorganic chemicals used in leather manufacture.

TEXT BOOKS and REFERENCES:

1. McCabe .W.L and Smith, J.C., Unit Operations in Chemical Engineering, McGraw Hill, Fourth Ed., 1993.
2. Treybal, R.E., Mass Transfer Operations, McGraw Hill Book Company, Third Ed. 1981.
3. Coulson, J.M., and Richardson, J.F., Chemical Engineering, Vol.I and II Third Ed. Pergamon press, 1978.
4. Welty, J.R., Wilson, R.E., and Wicks, C.E. Fundamentals of momentum, Heat and Mass Transfer, Third Ed., John Wiley, 1984.
5. Perry, J.H., Chemical Engineers Handbook, McGraw Hill, New York, Sixth Ed., 1984.
6. Shreve, R.N., Austin, G.T., Shreve's Chemical Process Industries, McGraw-Hill Book company, 1984.
7. Groggins, P.H., Unit Processes in Organic synthesis, McGraw-Hill Book company, 5th Edition, 2004.
8. Dutta, S.S., An introduction to the principles of leather manufacture, ILTA.
9. Thorstensen, T.C., Practical Leather Technology, Krieger Publications, 1993.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	The basic concepts of unit operations, material and energy balances.	3	1	1	1	1	1	1	2	1	1	1	2	1	3	1
CO2	The fluid dynamics mass and heat transfer in various unit operations such as distillation, extraction, drying and humidification	3	2	1	1	1	2	1	2	1	1	1	2	2	3	1
CO3	The size reduction and separation and mixing techniques technology of organic and inorganic chemicals involved in the processing of leather and leather chemicals	3	-	1	1	1	1	1	2	1	1	1	2	2	3	2
CO4	Principle of various unit processes in leather chemical processing	3	1	1	1	1	-	1	2	1	1	1	2	-	3	3
CO5	About the use of water and manufacture of inorganic chemicals used in leather manufacture	3	1	1	1	1	1	1	2	1	1	1	2	-	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5311 INTRODUCTORY PRACTICE IN LEATHER MANUFACTURE L T P C
0 0 4 2

OBJECTIVE

To provide basic practical knowledge about leather manufacture.

LIST OF EXPERIMENTS

1. Assortment of hides and skins, wet blue/EI, crust and finished leather
2. Pre tanning and tanning practice*
3. Post tanning and finishing practice*
4. Introduction to various mechanical operations/processing equipment/devices (demonstration)

*Making Upper and Garment leather using any of the following raw materials cow, buffalo, goat and sheep.

TOTAL: 60 PERIODS

OUTCOMES:
On the completion of the course students are expected to

CO1. Aware of assortment of hides/skins, wet blue/EI, crust and finished leather.
CO2. Know the practice of pretanning, tanning and post tanning.
CO3. Have knowledge on various mechanical operation involved in leather processing.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Aware of assortment of hides/skins, wet blue/EI, crust and finished leather	1	3	1	1	1	2	2	1	2	1	2	2	1	3	2
CO2	Know the practice of pretanning, tanning and post tanning.	1	3	2	1	1	-	2	1	2	1	1	2	1	3	1
CO3	Have knowledge on various mechanical operation involved in leather processing.	1	3	-	1	1	1	2	1	2	1	-	2	1	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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GE5251 ENVIRONMENTAL SCIENCES L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them. • To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and environmental issues.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio geographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land 47 degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

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UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOME

CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2: To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.

CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.

CO4: To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.

CO5: To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers (2018).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2016).
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).

REFERENCE BOOKS:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005).
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. (2013)

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation. .	-	1	1	-	-	2	3	3	2	-	-	-	2	-	-
CO2	To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society..	2	1	1	-	-	2	3	3	-	-	-	-	2	-	-
CO3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	1	1	1	-	-	2	3	3	-	-	-	-	2	-	-
CO4	To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.	1	1	1	-	-	3	3	3	-	-	-	-	2	-	-
CO5	To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.	-	-	-	-	-	3	2	2	1	-	-	-	2	-	-

Attested

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5401 LEATHER MANUFACTURE FROM HIDES L T P C
3 0 0 3

OBJECTIVE

This course aims at imparting knowledge in the technology of making different types of heavy leathers from hides.

UNIT I PRODUCT BRIEF OF LEATHERS FROM HIDES 9

Product brief of various light and heavy leather manufacture from hides.

UNIT II HEAVY LEATHER MANUFACTURE FROM HIDES 9

Property requirement of sole, harness, saddle and other industrial leathers from hides; Process design considerations; Choice of raw material; Traditional and modern methods; International standards required for the heavy leathers.

UNIT III LIGHT LEATHER MANUFACTURE FROM HIDES 9

Property requirement of upper, garment and other light leathers from hides; Process design considerations; Choice of raw material; International standards requirements for the light leathers from hides.

UNIT IV PROCESS TECHNOLOGY FOR LEATHERS FROM HIDES 9

Process details to achieve the specifications for the following leathers: Full chrome/Semi chrome/Chrome retan - uppers, suedes, nubuck, lining, nappa, shrunken grain, upholstery, burnishable, printed leathers; Upgradation technologies; Rectification of defects in hides.

UNIT V SPORTS GOODS LEATHERS 9

Different types of raw materials used, physical and chemical properties required and process details to achieve the specifications for the following sports goods leathers: Leathers for football, volley ball, hockey ball and cricket ball. Glove leathers for wicket keepers and boxing.

TOTAL: 45 PERIODS

OUTCOMES:

CO1.To understand the basic product brief of light and heavy leather manufacture from hides.
CO2.To gain knowledge in property requirement and process design of heavy leather
CO3.To gain knowledge in property requirement and process design of light leather
CO4.Articulate in depth knowledge in process technology for leather from hides
CO5.Understand the physical and chemical properties of raw materials used in sports goods leathers

TEXT BOOKS and REFERENCES:

1. Choichi Ogiwara, `A practical guide to heavy leather processing', Fuel and Leather Research Centre, Karachi, 1980.
2. Tuck, D.H. `The manufacture of upper leathers', Tropical Products Institute, London, 1981.
3. Jyotirmay Dey, `Practical aspects of the manufacture of upper leather, Indian Leather Technologists Association, Calcutta, 1989.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	P O6	PO 7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	To understand the basic product brief of light and heavy leather manufacture from hides.	1	-	-	1	2	1	2	1	1	1	1	2	1	3	2
CO2	To gain knowledge in property requirement and process design of heavy leather	3	2	1	1	2	-	2	1	-	1	1	2	-	3	2
CO3	To gain knowledge in property requirement and process design of light leather	3	2	1	1	1	1	2	1	1	-	1	2	1	2	1
CO4	Articulate in depth knowledge in process technology for leather from hides	3	-	1	-	1	1	1	1	1	1	1	1	1	3	2
CO5	Understand the physical and chemical properties of raw materials used in sports goods leathers	3	2	-	-	2	-	1	1	-	1	-	1	1	-	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5402 INSTRUMENTAL METHODS OF ANALYSIS L T P C
2 1 0 3

OBJECTIVE
To introduce various methods of chemical analysis through sophisticated instruments for accuracy.

UNIT I INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS 10
Electromagnetic radiation; Various ranges, Dual properties, Various energy levels, Interaction of photons with matter, absorbance, and transmittance and their relationship, Permitted energy levels for the electrons of an atom and simple molecules, classification of instrumental methods based on physical properties.

UNIT II MOLECULAR SPECTROSCOPY 10
Various transitions in organic and inorganic compounds effected by UV, visible and infrared radiations, various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Effects of auxochromes and effects of conjugation on the absorption maxima, Applications of UV-Visible and IR spectroscopy.
Quantitative spectroscopy: Beer-Lambert's Law, Limitations, Deviations (Real, Chemical, Instrumental) Nesslerimetry. Estimation of dyes, Cr and Fe using Beer- Lambert's Law.

UNIT III ATOMIC SPECTROSCOPY 8
Atomic Absorption Spectrophotometry; Principle, Instrumentation and Application, Various interferences observed in AAS (Chemical, radiation and excitation); Flame photometry; Principle, Instrumentation and applications.

UNIT IV POLARIMETRY, REFRACTOMETRY AND THERMAL ANALYSIS 9
Polarimetry and refractometry Principle, instrumentation and Applications. Thermogravimetry: Instrumentation, applications, thermograms of some important
compounds; Differential thermal analysis: principle, Instrumentation and applications, Principles and applications of DSC, DTA in leather and leather chemicals.

UNIT V CHROMATOGRAPHIC METHODS 8
Classification of chromatographic methods, column, Thin layer, paper, Gas, GPC, High performance liquid chromatographical methods (principles, mode of separation, instrumentation and technique) for the analysis of leather auxiliaries.

TOTAL: 45 PERIODS

OUTCOMES:
CO1.To gain fundamental knowledge about the electromagnetic spectrum and its limitations.
CO2. To understand the underpinning science behind molecular spectroscopy
CO3. To have knowledge in principles of atomic spectroscopy and its application.
CO4. To understand the concept of various physico-chemical analytical methods.
CO5. To articulate various chromatographic techniques for leather chemical analysis.

TEXT BOOKS:
1. Willard, H.H., Merritt, L.L., Dean J.A., and Settle, F.A., Instrumental methods of analysis, Sixth edition, CBS publishers, 1986.

REFERENCES:
1. Parikh V.M. Absorption spectroscopy of organic molecules Addisen –Wesley Publishing company, 1994.
2. Skoog D.A. and West D.MM., Fundamentals of Analytical Chemistry, Saunders – college Publishing, 1982.
3. Banwell, G.C., Fundamentals of molecular spectroscopy TMH, 1992.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	To gain fundamental knowledge about the electromagnetic spectrum and its limitations.	3	3	2	2	3	1	1	-	-	1	1	2	3	2	2
CO2	To understand the underpinning science behind molecular spectroscopy	3	3	2	2	3	1	1	-	-	1	1	2	3	2	2
CO3	To have knowledge in principles of atomic spectroscopy and its application	3	2	2	2	3	1	1	-	-	1	1	2	3	2	2
CO4	To understand the concept of various physico-chemical analytical methods.	3	2	2	2	3	1	1	-	-	1	1	2	3	3	3
CO5	To articulate various chromatographic techniques for leather chemical analysis	3	3	2	2	3	1	1	-	-	1	1	2	2	2	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5403 PRINCIPLES OF TESTING FOR LEATHER L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on analytical methods for the analysis of leather, leather chemicals and process liquors generated during processing of leathers

UNIT I ANALYSIS OF LEATHER CHEMICALS 10

Principles of analytical methods employed in analysis of pretanning chemicals – Lime, unhairing, deliming and bating agents; Vegetable tanning materials and extracts; Aldehydes; Chrome extracts and liquors; Principles of analytical and instrumental methods employed in analysis of syntans, dyes, oils and fats, fatliquor, finishing auxiliaries. Specifications recommended by standards organizations.

UNIT II ANALYSIS OF PROCESS LIQUORS AND EMISSIONS 8

Principles of analytical and instrumental methods employed in analysis of exhaustion liquors of pretanning, tanning and post tanning processes. Analysis of emissions - air pollutants from leather processing; Specifications recommended by standards organizations.

UNIT III ANALYSIS OF LEATHERS 9

Principles of analytical and instrumental methods employed in analysis of various chrome leathers, vegetable tanned leathers; Specifications recommended by standards organizations. Principles of analytical and instrumental methods employed in analysis of eco-sensitive substances- Pentachlorophenol (PCP), Formaldehyde, Hexavalent chromium [Cr(VI)], azodyes etc., present in finished leathers.

UNIT IV MICROBIOLOGY FOR LEATHER 8

Testing of bacterial action on raw hides and skins and in the different stages of Leather Manufacture. Effect of mould growth during processing of skins/hides, finished leathers, leather goods and during transportation. Testing and prevention of mould growth during processing, storage of finished goods and transportation.

UNIT V PHYSICAL TESTING OF LEATHERS 10

Orientation of fibre structure of skins/hides and leathers using various microscopes; Sampling position for physical testing of leathers. Different physical testing methods - principles involved. Static and Dynamic methods, Non-destructive testing of leathers.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student would understand

CO1.The analytical chemistry behind the testing of leather chemicals and leathers.
CO2.Various techniques for analyzing leather chemicals, spent process liquors, and pelts/ leathers.
CO3.Quality Standards of various leather chemicals and leather end products.
CO4.Gain experience on microbiology testing techniques of leathers.
CO5.Have knowledge on various physical testing methods of leathers.

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TEXT BOOKS and REFERENCES:

1. Sarkar, P.K., `Analytical Chemistry of Leather Manufacture', Indian Leather Technologists Association, Calcutta, 1982.
2. `Official methods of Analysis', Society of Leather Technologists and Chemists, U.K., 1981.
3. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.IV, Evaluation of leather, Rober E. Krieger Publishing Co., New York, 1978.
4. Dutta, S.S. "An introduction to the principles of physical testing of leather", Indian Leather Technologist's Association, Calcutta, 1991.
5. `Methods of chemical testing of leathers', IS: 582 - 1970, Bureau of Indian Standards, New Delhi, 1977.
6. "Methods of Physical testing of leathers, IS: 5914-1970, Bureau of Indian Standards, New Delhi, 1971.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	The analytical chemistry behind the testing of leather chemicals and leathers	3	3	1	1	2	1	1	2	1	1	-	1	1	3	2
CO2	Various techniques for analyzing leather chemicals, spent process liquors, and pelts/ leathers.	3	1	1	1	2	1	1	-	1	1	-	1	1	2	1
CO3	Quality Standards of various leather chemicals and leather end products	3	2	1	1	2	1	1	1	1	1	-	1	1	2	1
CO4	Gain experience on microbiology testing techniques of leathers	3	2	1	1	2	1	1	1	1	1	-	1	1	3	2
CO5	Have knowledge on various physical testing methods of leathers	3	2	1	1	2	1	1	1	1	1	-	1	1	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5404 **THEORY OF TANNAGES** **L T P C**
3 0 0 3

OBJECTIVE

To impart knowledge on the chemistry of various inorganic and organic tanning materials and systems.

UNIT I CHROMIUM CHEMISTRY 10

Definition of ligands, nucleophilicity of ligands and electronegativity of donor atoms, chelation and masking, and introduction of factors controlling molecular stability of transition metal complexes. Historical overview of mineral tanning.

Electronic configuration and its implications, common oxidation states of chromium, redox stabilities of chromium (VI) and chromium (III) salts, redox potentials and their interconversion, protolysis, kinetic inertness of chromium (III), basicity, oxolation and polymerisation, Stiasny's series, McClandish precipitation point.

UNIT II FACTORS CONTROLLING CHROME TANNING 8

Preparation of basic chromium sulphate (BCS) salt, reaction parameters influencing composition of BCS, kinetics of chrome tanning, diffusion and complexation, effects of float volume, pH, basicity, masking, temperature, drum speed, ageing chrome tanned substrates.

UNIT III MECHANISM OF INORGANIC TANNAGES 10

Theories of chrome tanning; absorption, coating, electrostatic and hydrogen bond interactions and coordinative forces involved in chrome tanning, indirect evidence for chrome binding sites in protein, hydrothermal stability of chrome- collagen compound.

Aqueous chemistry of aluminium (III), zirconium (IV), titanium (IV) and iron(III) and its relevance to mineral tanning, chemistry of silicates and phosphates and their tanning mechanisms, mechanism of inorganic tannages and their relevance to combination tanning.

UNIT IV VEGETABLE TANNIN CHEMISTRY 9

Vegetable tannins - definition and classification, Occurrence; Chemistry of hydrolysable tannins - gallotannins, ellagi tannins - their structural aspects including tannin dimers, trimers.

Tannins as well as non-tannins, polyphenolic constituents present in popular vegetable tanning materials and their physico-chemical properties and their effect on the physical properties of leathers.

UNIT V MECHANISM OF VEGETABLE AND OTHER ORGANIC TANNAGES 8

Mechanism of reaction of vegetable tannins with collagen. Electrolytic equilibria, diffusion equilibria, fixation and absorption equilibria. Principles in pit, drum and E.I. tanning.

Mechanism of tanning with aldehydes and other organic tanning agents; Synthetic tannins - Classification - properties, uses in leather industry.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will be in the position to

CO1.Understand the chemistry of chromium and factors controlling chrome tanning.
CO2.Understand the mechanism of inorganic Tannages.
CO3.Comprehend the chemistry of vegetable tannins and mechanism of vegetable and organic tanning
CO4.Have knowledge on mechanism of oil and aldehyde tanning
CO5.Understand the parameters influence on tanning

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TEXT BOOKS and REFERENCES:

1. Fred O Flaherty, Roddy, T.W. andLollar, R.M. `The Chemistry and Technology of Leather', Vol.III, Type of tannages, RoberE.Krieger Publishing Co.,New York, 1978.
2. Gustavson K.H. `Chemistry of Tanning Processes' Academic Press, New York, 1958.
3. Bienkiewicz, K., Physical Chemistry of Leather Manufacture', Krieger, Florida 1982.
4. Covington A D, 'Tanning Chemistry' RSC Publishing, Cambridge, UK, 2009.
5. Howes, F.N. "Vegetable tanning materials", Butterworth. London, 1953.
6. Haslam, E. "The biochemistry of Plants", Vol.7. Academic Press, 1981, Chapter 18, "Vegetable tannins". "A survey of modern vegetable tannages". Tanning extracts Producers Federation, Switzerland, 1975.
7. Humphreyes, G.H.W. and Jones, C.R. "The manufacture of sole and other heavy leathers". Pergamon Press, 1966. Chapter 5, "Vegetable tannin materials and syntans".
8. Vegetable and Synthetic Tanning agents, Sundara Rao, V.S., et al – The Leather Industry, (ed. by Sadulla, S) Kothari Desk book series, H.C. Kothari Group (Publications Division), Madras, p.71, 1995.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understand the chemistry of chromium and factors controlling chrome tanning.	3	1	-	-	1	-	1	1	-	1	-	1	1	3	1
CO2	Understand the mechanism of inorganic tannages.	3	3	1	-	1	1	3	1	2	1	-	1	1	2	2
CO3	Comprehend the chemistry of vegetable tannins and mechanism of vegetable and organic tanning	3	2	1	-	1	2	2	1	1	1	-	1	1	3	2
CO4	Have knowledge on mechanism of oil and aldehyde tanning	3	1	-	-	1	-	2	1	-	1	-	1	1	3	2
CO5	Understand the parameters influence on tanning	3	3	3	-	1	2	2	1	2	1	-	1	1	2	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5411	PRACTICE ON LEATHER FROM HIDES	L T P C 0 0 6 3

OBJECTIVE

To carry out the practical leather processing of heavy and finished leathers from raw hides.

- Heavy leathers like sole, saddle, belting etc., from hides
- Finished leathers from different bovine hides and calf skins
- Manufacture of vegetable tanned and chrome sole leathers;
- Processing of belting leathers, harness and saddle leathers; (minimum one)
- Manufacture of following leathers (minimum four) from different raw materials and tannages:
- Upholstery leathers
- Upper leathers
- Nappa leathers
- Patent leathers
- Shrunken grain leathers
- Nubuck /Suede upper leathers
- Burnishable upper leathers
- Oil-pull up leathers

OUTCOMES:

At the end of the course, the students will be able to

CO1. Develop different types of leathers from hides

CO2. Comprehend the processing aspects for making leathers from hides.

CO3. Understand the process – property correlation for making various types of leathers from hides.

TOTAL: 90 PERIODS

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Develop different types of leathers from hides	3	3	1	3	2	1	2	1	2	1	1	1	2	3	1
CO2	Comprehend the processing aspects for making leathers from hides.	3	3	1	3	3	1	2	1	1	1	1	1	1	3	3
CO3	Understand the process – property correlation for making various types of leathers from hides.	3	3	2	3	2	1	2	1	2	1	1	1	-	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5412	CHEMICAL TESTING AND ANALYSIS LAB	L T P C
		0 0 4 2

OBJECTIVE

To provide practical knowledge and the skill on chemical analyses of various leather chemicals, process liquors, effluent and pelts/leathers at various stages of processing and eco-sensitive chemicals present in leather.

Analysis of Lime

a. Purity of lime
b.Total bases

Analysis of Deliming Agents

a. Analysis of ammonium salts
b.Analysis of boric acid

Analysis of Bate Agent

Enzyme Assay

Analysis of Vegetable Tanning Materials

a Qualitative analysis
b Quantitative analysis
c Acids and salts in vegetable tannin extracts by different methods

Analysis of Chrome tanning agents

a Moisture
b Cr_2O_3 content
c Acid combined with chromium
d Basicity: Proctor and Lehigh basicities
e Degree of olation

Analysis of Syntans

Quantification of phenolic contentand free formaldehyde

Analysis of Oils and fatliquors

a Moisture
b Acid value
c Saponification value
d Iodine value
e Free fatty acids
f Un-saponifiables
g Total alkalinity

Chemical Analysis of pelts and leathers

OUTCOMES:

At the end of the course, the students will be able to

CO1. Have practical experience and understanding on the analysis of various leather chemicals
CO2. Have practical knowledge on pelts/leathers analysis
CO3. Understand the challenges of eco-sensitive substances and their qualitative and quantitative analytical methods

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TOTAL: 60 PERIODS

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have practical experience and understanding the analysis of various leather chemicals	2	3	1	3	2	1	1	1	2	1	-	1	2	3	3
CO2	Have practical knowledge of pelt/leather analysis	2	3	1	3	2	1	1	1	2	1	-	1	-	3	1
CO3	Understand the challenges of eco-sensitive substances and their qualitative and quantitative analytical methods.	2	3	1	3	2	1	1	1	2	1	-	1	1	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5501 LEATHER MANUFACTURE FROM SKINS L T P C

3 0 0 3

OBJECTIVE

This course aims at imparting knowledge in the technology of making different types of light leathers from skins.

UNIT I PROPERTIES OF LEATHER 9

Classification of leathers, Definition of various leather properties, Understanding and measurement of properties, Relevance and significance of various leather properties in manufacture and usage for different end application.

UNIT II UPPER AND LINING LEATHERS 9

Shoe upper, lining leathers: Choice of raw materials, relationship between each leather property and process parameter; Rational of preparation of the same.

UNIT III GARMENT AND GLOVE LEATHERS 9

Garment nappa, fine glove leathers: Choice of raw materials, relationship between each leather property and process parameter; Rational of preparation of the same.

UNIT IV OTHER SPECIALITY LEATHERS 9

Chamois, suede garment, glazed kid leathers etc: Choice of raw materials, relationship between each leather property and process parameter; Rational of preparation of the same.

UNIT V LIGHT LEATHER MANUFACTURE 9

Process of manufacture of leathers such as glazed kid, nappa garment, fine glove, suede garment and lining; Quality control aspects with special reference to light leather manufacture.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will be in a position to

CO1. Understand the property variations of different leathers
CO2. Design suitable processing variations that are required to manufacture leather from skin.
CO3. Develop specialty leathers from skin
CO4. Correlate and understand the leather property and process parameter.
CO5. Comprehend the quality control aspects of light Leather

TEXT BOOKS and REFERENCES:

1. Briggs, P.S. `Gloving, clothing and special leathers', Tropical Products Institute, London, 1981.
2. Kartheiz, Fuchs, H.P. `The Chemistry and technology of Novelty Leathers' FAO, United Nations, Rome.
3. CLRI Process Bulletins.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understand the property variations of different leathers	3	3	1	1	-	-	-	2	-	1	-	1	0	3	2
CO2	Design suitable processing variations that are required to manufacture leather from skin	3	3	1	1	2	1	2	2	1	1	1	1	0	3	3
CO3	Develop specialty leathers from skin	3	3	1	1	2	1	2	2	1	1	1	1	2	3	1
CO4	Correlate and understand the leather property and process parameter.	3	3	1	1	2	1	2	2	1	1	1	1	2	3	3
CO5	Comprehend the quality control aspects of light leather	3	3	1	1	3	2	2	2	2	1	2	1	1	3	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5502 THEORY OF POST TANNING PROCESS L T P C

3 0 0 3

OBJECTIVE

To impart knowledge on chemicals and processes involved in post tanning operations of leather manufacture.

UNIT I DYES AND DYEING OF LEATHER 9

Theory of colours, chromophoric groups and their optical absorption; Classification of dyes based on their chemical nature, application and colour index, properties; blending of dyes, theory and practice of colour matching, theory and mechanism of dyeing, chemistry and application of dyeing auxiliaries such as leveling agents, dispersing agents and dye fixatives.

UNIT II FATLIQUORS AND FATLIQUORING OF LEATHER 9

Natural and synthetics oils and fats, emulsifier, types of emulsion, emulsion particle size and stability. Fatliquor – classification, types and properties. Preparation of fatliquors from natural and synthetic oils. Fatliquoring of leather, Principles and mechanism of fatliquoring process.

UNIT III SYNTANS AND RETANNING OF LEATHER 10

Classification of syntans, auxiliary, intermediate, replacement syntans and resin tanning agents Sulphonation of naphthalene, napthols, phenol-formaldehyde condensation reactions, characterisation and photo oxidation mechanisms of phenolic syntans. Bleaching agents and mordants. Light fast, amino resin, melamine, formaldehyde-free, acrylic and PU syntans. Chemistry and mechanism of retanning.

UNIT IV PRACTICE OF POST TANNING PROCESSES AND OPERATIONS 9

Practice of post tanning processes viz., re-chroming / semi-chroming, neutralization, retanning, dyeing, fatliquoring, fixing and Post tanning process technologies for products from different types of leathers.

UNIT V POST TANNING MECHANICAL OPERATIONS 8

Sammying, splitting and shaving, drying, staking, toggling, buffing etc operations – understanding and judicious application of these operations to meet the end product parameters;

TOTAL: 45 PERIODS

OUTCOMES:

On the completion of the course students are expected to

CO1. Have knowledge on different dyes and its principles and its color theory for leather applications

CO2. Have knowledge on different fatliquors used in leather manufacture

CO3. Have knowledge on different types of syntans used in leather manufacture

CO4. Articulate on use of dyes syntans and fat liquors for different leather end products

CO5. Understand the application of different post tanning machineries towards manufacture of different leathers

TEXT BOOKS and REFERENCES:

1. Venkataraman, K. `Chemistry of Synthetic Dyes', Academic Press, New York and Lond, 1971.
2. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.III, Rober E. Krieger Publishing Co., New York, 1978.
3. Billmeyer and Saltzman's, `Principles of Color Technology', Wiley–Inter Sciences Publication.
4. Dutta, S.S., Introduction to the Principles of Leather Manufacture, Indian Leather Technologists Association, Calcutta, 1980.
5. Gustavson, K.H., "Chemistry of Tanning Processes" Academic Press, New York, 1958.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have knowledge on different dyes and its principles and its color theory for leather applications	3	3	1	-	1	-	2	1	-	1	-	1	-	3	-
CO2	Have knowledge on different fatliquors used in leather manufacture	3	3	1	-	1	-	2	1	-	1	-	1	-	3	1
CO3	Have knowledge on different types of syntans used in leather manufacture	3	3	1	-	1	2	2	1	2	1	-	1	2	3	3
CO4	Articulate on use of dyes syntans and fatliquors for different leather end products	3	3	3	-	3	2	2	1	2	1	2	1	2	3	3
CO5	Understand the application of different post tanning machineries towards manufacture of different leathers	3	3	3	-	3	2	2	1	2	1	2	1	1	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5511	PHYSICAL TESTING AND ANALYSIS LAB	L	T	P	C
		0	0	4	2

OBJECTIVE

To provide practical knowledge on microscopical and microbiological testing of leathers and physical testing of leathers.

MICROSCOPY LAB

a. Setting up of a compound microscope
b. Preparation of microscopical slides by paraffin embedding method and by freezing method
c. Identification of hides and skins from their morphological and histological pattern of Buffalo, Cow, Sheep, Goat, Pig and other species.
d. Microscopical assessment of fibre structure during the process - Soaking, liming, pickling and tanning and different finished leathers.

MICROBIOLOGY LAB

a. Preparation of various culture media
b. Staining of bacteria
c. Enumeration of bacteria in hides and skins and in tan liquors
d. Isolation and identification of fungi/mold/yeast in raw hides/skins, leathers and tan liquors
e. Mildew resistance test for leathers
f. Identification of insect and parasitic damages in skins/hides/leathers (Entomology demo only)

PHYSICAL TESTING LAB

Strength Properties

a. Tensile Strength and Elongation at break
b. Tongue tear strength
c. Stitch tear and slit tear strengths

Fastness Properties

a. Rub fastness
b. Light fastness

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the students would have practical experience and understanding in
CO1. Microscopical analysis/identification of leathers.
CO2. Microbiological testing of raw skins/hides, pelts and leathers and various process liquors.
CO3. Performing various physical testing methods for assessing leathers

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Microscopical analysis/identification of leathers	2	3	1	3	2	1	1	1	2	1	1	1	2	3	1
CO2	Microbiological testing of raw skins/hides, pelts and leathers and various process liquors	2	3	1	3	2	1	1	1	2	1	1	1	1	3	3
CO3	Performing various physical testing methods for assessing leathers.	2	3	1	3	2	1	1	1	2	1	1	1	-	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

LT5512 **PRACTICE ON LEATHER FROM SKINS** **L T P C**
0 0 6 3

OBJECTIVE

To carry out the practical for manufacture of light leathers from raw goat, sheep and calf skins.
Practical training (minimum 6 leathers) on the manufacture of

- White Leather from wet white tanning (compulsory)
- Resin and protein upper leathers
- Nappa leathers
- Glazed kid leathers
- Nubuck leathers
- Dress glove
- Utility glove leathers
- Crushed kid leathers
- Suede upper leathers
- Suede garment leathers
- Mesh leathers
- Hair-on/Fur-on leathers
- Chamois leathers

TOTAL: 90 PERIODS

OUTCOMES:

At the end of the course students will gain
CO1. Processing different types of leathers from skin
CO2. Practice in making specialty leathers from different skins
CO3. Knowledge on process recipe for making different leather.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Processing different types of leathers from skin	3	2	1	3	2	1	2	1	2	1	1	2	2	3	1
CO2	Practice in making specialty leathers from different skins	3	2	1	3	2	1	2	1	2	1	1	2	1	3	3
CO3	Knowledge on process recipe for making different leather	3	2	1	3	2	1	2	1	2	1	1	2	-	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5513 **INTERNSHIP/TRAINING - I** **L T P C**
0 0 4 2

Each student is expected to undertake 1-month practical training on aspects associated with leather manufacture in Tanneries and or Leather Chemical supplier units as a part of Industrial Internship – I during the summer vacation after fourth semester. The evaluation for this course will be carried out in fifth semester. During fifth semester the student should submit (to assigned faculty) an industrial training report on practical internship undertaken. The report should be based on the practical experience gained at the industry, which should be duly certified by the production in- charge of the industry. The objective of the training is to enhance the practical knowledge of the students on various aspects associated with leather manufacture. Faculty will assess the students to judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

TOTAL DURATION: 4 WEEKS

OUTCOME

At the end of this course, the students are expected to
CO1. Provide opportunity to explore students' interest
CO2. Recognize the real working environment
CO3. Build balance between classroom knowledge with practical application

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO-1	Provide opportunity to explore students' interest	2	2	2	-	2	2	2	2	3	2	1	3	2	3	3
CO-2	Recognize the real working environment	2	2	2	-	2	2	2	2	3	2	1	3	-	3	3
CO-3	Build balance between classroom knowledge with practical application	2	2	2	-	2	2	2	2	3	3	1	3	1	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5601 LEATHER GOODS AND GARMENTS TECHNOLOGY L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on making leather goods and garments

UNIT I OVERVIEW 9

Classification of Leather Goods and Garments; Selection of Materials, grading and assorting of leathers for leather goods and garments; Property requirements for leather and other materials; Accessories for Leather goods and garments - Various types of fasteners, fittings and other accessories. Alternative materials and their adaptability for goods and garments. Operational sequences in leather goods and garments production.

UNIT II OPERATIONS 10

i) Production planning - Nomenclature used for component identification in various leather garments skirts, jackets, trousers etc and various leather goods – Wallet, hand bags, Executive bags etc. Process scheduling and line balancing.

ii) Cutting and clicking - Hand and machine cutting, Knives and tools – Preparation and handling. Pattern interlocking/nesting for material optimization. Factors influencing cutting value. Dieless cutting.

iii) Assembling- Pre assembly and assembly operations – skiving, splitting, folding, sewing etc. Various types of assembly techniques for leather goods and garments.

iv) Quality - Quality control measures in leather products manufacture.

UNIT III MACHINERY 9

Machinery needs for leather goods and garments manufacture. Various types of sewing machines – flat bed, cylinder bed, post bed and other special sewing machines
– different feed mechanisms. Clicking, splitting, skiving, folding, embossing, creasing machines – their working principles operation and maintenance.

UNIT IV DESIGN AND DEVELOPMENT 9

Pattern design and development – measurement/ sizing for various types of garments, pattern design of leather goods and garments, pattern grading for leather garments. CAD applications for leather goods and garments. Fashion and material trends.

UNIT V ORGANISATION AND MANAGEMENT 8

Project Feasibility reports, plant lay out, costing and pricing for leather goods and garments. Analysis of International market trends for goods and garments – EU, USA and other markets. Social auditing of leather goods and garment units - occupational Health and Safety, ISO 9000 and 14000.

TOTAL: 45 PERIODS

OUTCOMES:

On the completion of the course students are expected to

CO1.To know various materials and components for the manufacture of leather goods and garments.
CO2.To understand various operations involved in making of leather good and garments.
CO3.To understand the working principle, operation and maintenance of different machineries used for making leather goods and garments
CO4.To gain fundamental knowledge on design and development of leather goods and garments
CO5.To understand Organisation and management of leather goods and garments manufacturing unit.

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TEXT BOOKS and REFERENCES:

1. Pattern Making Manual - Womens Garments, ESMOD, Paris, 1991.
2. Fashion Drawing Method, ESMOD, Paris, 1992.
3. Metric Pattern cutting for Menswear, Winifred Aldrich, BSP Professional Books, London, 1990.
4. Grading Manual, ESMOD, Paris, 1994.
5. Skiving Manual, First Edition, 1994 CLRI, Madras.
6. A course manual on leather garment pattern designing.
7. Leather garments making, NIMI publication, 2012.
8. Leather and sports goods – Pattern and Template marker, NIMI Publications, 2011

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	To know various materials and components for the manufacture of leather goods and garments.	3	2	1	-	-	-	1	1	-	1	2	2	3	-	-
CO2	To understand various operations involved in making of leather good and garments.	3	3	2	2	2	1	1	1	2	2	2	2	3	-	--
CO3	To understand the working principle, operation and maintenance of different machineries used for making leather goods and garments	3	2	2	1	2	1	1	1	-	1	1	2	3	-	-
CO4	To gain fundamental knowledge on design and development of leather goods and garments	3	2	2	2	2	1	1	1	-	2	1	2	3	-	-
CO5	To understand Organisation and management of leather goods and garments manufacturing unit.	3	3	2	1	1	2	2	1	2	1	3	2	3	-	-

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5602 SCIENCE AND TECHNOLOGY OF LEATHER AUXILIARIES L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on the chemistry and properties of various auxiliaries used in leather processing

UNIT I INTRODUCTION 8

Leather Auxiliaries – Roles and Functions, Classification of Auxiliaries based on applications and chemistry

UNIT II SYNTANS 10

Syntans – Introduction to raw materials and background to relevant chemistries of production such as sulfonation, condensation, polymerisation etc. Technology for preparation of aromatic sulfonic acid – formaldehyde /urea-formaldehyde and sulfone based syntans. Role of syntan product chemistries in obtaining desired feel in leather. General manufacturing principles of acrylic, PU and other polymeric syntans

UNIT III FATLIQUORS 9

Physical chemistry of colloids. Chemistry of emulsifying agents. Stability and Efficiency of emulsions. Chemistry of oils and fats – Differences, chemical structure of fatty acids, classification of oils, differences between animal, vegetable and mineral oils. Chemical modification of oils for applications in leather. Differences between natural and synthetic fatliquors. General manufacturing principles of fatliquors

UNIT IV DYES AND PIGMENTS 10

Theory of colour. Fundamentals of colour matching. Particle size. Relevance of particle size of colour. Chemical constituents of dyes. Classification of dye and introduction to chromophores. Structural features of dyes. General manufacturing principles of dyes

Pigments – classification, relevance of particle size to colour. Introduction to various types of pigments and their chemistries. General manufacturing principles of pigments

Differences between dyes and pigments

UNIT V CHEMISTRY OF FINISHING CHEMICALS 8

Classification of finishes. Chemistry of film formation and theory of adhesion.

Binders – chemical classification, General understanding of polymeric, protein and other types of binders.

General understanding of the chemistries of plasticizers, feel modifiers, waxes, slip agents.

TOTAL: 45 PERIODS

OUTCOMES:

On the completion of the course students are expected to

CO1.To gain knowledge on different leather auxiliaries used in leather manufacturing

CO2.Have knowledge in the preparation of different types of tanning agents

CO3.Understand the chemistry of oil and oil modification for the leather lubrication

CO4.Understand chemistry and application of different dyes and pigments used in leather manufacturing

CO5.Have knowledge on the chemistry of finishing chemicals

TEXT BOOKS AND REFERENCES:

1. Fred O Flaherty, Roddy, T.W. and Lollar, R.M. `The Chemistry and Technology of Leather', Vol.II, Type of tannages, Rober E. Krieger Publishing Co., New York, 1978.
2. Gustavson, K.H. `Chemistry of Tanning Processes' Academic Press, New York, 1958.
3. Venkataraman , K. `Chemistry of Synthetic Dyes', Academic Press, New York and Lond, 1971.
4. Myers, R.R., and Lond, J.S. `Treatise on Coatings', Marcel Dekker, New York, 1975.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
CO1	To gain knowledge on different leather auxiliaries used in leather manufacturing	3	1	1	-	2	1	3	1	1	1	1	1	-	3	2
CO2	Have knowledge in the preparation of different types of tanning agents	3	1	1	-	3	-	2	1	1	1	2	1	-	3	2
CO3	Understand the chemistry of oil and oil modification for the leather lubrication	3	1	1	-	1	2	1	1	1	1	-	1	2	3	2
CO4	Understand chemistry and application of different dyes and pigments used in leather manufacturing	3	1	1	-	2	1	2	1	1	1	1	1	2	3	2
CO5	Have knowledge on the chemistry of finishing chemicals	3	1	1	-	2	1	2	1	1	1	1	1	1	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5603 THEORY OF LEATHER FINISHING L T P C
3 0 0 3

OBJECTIVE
To impart knowledge on materials and processes/operations involved in leather finishing.

UNIT I SURFACE COATING 9
Theory of surface coating; Characteristics of various components of coating system; Parameters of the process of coating and its influence on coating characteristics; Testing of coatings.

UNIT II PIGMENTS 9
Classification of pigments; Inorganic, organic, nacreous (pearlescent) and interference pigments - their representation code in the colour index. Different forms of pigments - powders and pastes. Evaluation and control of their brilliance, opacity, particle size, resistance to solvent, heat and light and colour matching.

UNIT III POLYMERIC MATERIALS AND THEIR DISPERSION FORMS 9
General introduction to addition and condensation polymerization; various methods of polymerisations, resins binders - acrylics, vinyls and urethanes, protein binders, cellulose nitrate, cellulose acetate butyrate, - protein binders - lacquers - emulsion and emulsifiers - evaluation and control - solvents and thinners.

UNIT IV PRINCIPLES OF FINISHING, FINISH FORMULATIONS ANDTHEIR APPLICATION 9
Impregnation: Terminology, types of impregnating binders, characteristics, selection of systems for corrected and full grain impregnation, formulations, application methods and precautions
Finishing: Definition, aims, film formation mechanisms, properties of films such as glass transition temperature / minimum film forming temperature, transparency, gloss and resistance to heat, light and solvent. Binder to pigment ratio, plasticizer, wetting agents, role in dispersion and stability - requirements in multiple coat technique – such as clearing coat, sealer coat, base coat, top and feel coat. Single coat composition methods like spraying, curtain coating, roller coating etc. Cationic finishes and their relative merits. Foam finish; Eco- friendly finishing - Volatile Organic Compounds (VOC) reductions. Finish formulation for various types of leathers.

UNIT V VARIOUS FINISHING METHODS AND TECHNIQUES 9
Role of equipment like HVLP spray, Roller coats, Continuous embossing machines, Finiflex, etc. Methods such as oil pull-up, waxy, burnishable, antique, grain suede, screen printing, roller printing, tie and dye finishing. Pearl finishing, easy-care and patent finishing, cationic finishing, foam finishing, transfer foil, lamination, transfer coating, texture modification/creation using perforation, scaling, engraving and foil transfer.

TOTAL: 45 PERIODS

OUTCOMES:
On the completion of the course students are expected to
CO1. Appreciate the role of various finishing agents and auxiliaries used in leather finishing
CO2.Formulate strategies for finishing different types of leathers
CO3.Upgradation technologies for enhancing value to low grade substrates
CO4.Knowledge on different machineries used in leather finishing
CO5.Understand the principles of finishing mechanisms

TEXT BOOKS and REFERENCES:

1. Pattern. T.E., Pigment Hand Book, vol.3 ed. W.J., New York, 1973.
2. Patterson, P., Pigments - An Introduction to Theory of Physical Chemistry, Elsevier Publishing Co. Ltd., Amsterdam, 1967.
3. Treatise on coating, Misers and Long Ed., Marcel Dekker, New York (5 Vol.)
4. Sharphouse, J.H., “Leather Technicians Handbook”, Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Appreciate the role of various finishing agents and auxiliaries used in leather finishing	3	1	-	-	2	1	-	1	1	1	-	2	2	3	2
CO2	Formulate strategies for finishing different types of leathers	3	1	-	-	-	-	-	1	1	1	-	2	1	3	2
CO3	Upgradation technologies for enhancing value to low grade substrates	3	2	1	-	2	-	1	1	1	1	-	2	-	3	2
CO4	Knowledge on different machineries used in leather finishing	3	3	2	-	3	2	2	1	1	1	-	2	1	3	1
CO5	Understand the principles of finishing mechanisms	3	3	2	-	3	2	2	1	1	1	-	2	1	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5611	FINISHING PRACTICE LABORATORY	L T P C
		0 0 4 2

OBJECTIVES:

To provide practical training in various methods of finishing of leathers.

Practical training/demonstration to students in the following areas:

- Modern methods of finishing
- Use of cross linkers, Feel modifiers
- Water repellent finish formulations.
- Finishing using Roller coaters, Transfer coating m/c
- Cationic and foam finishing technologies.
- Patent finishing using Roller Coaters
- Trouble shooting in finishing.
- Finishing of various types of leathers – chrome-free, exotic, upholstery and water- repellent leathers

TOTAL: 60 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1.Have practical experience in finishing of various types of leathers.
CO2. Understand recent technology involved in leather finishing.
CO3. Aware of various machinery operation involving in leather finishing

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have practical experience in finishing of various types of leathers	3	3	1	2	2	1	1	1	2	1	1	2	2	3	3
CO2	Understand recent technology involved in leather finishing	3	3	1	2	2	1	1	1	2	1	1	2	1	3	1
CO3	Aware of various machinery operation involving in leather finishing	3	3	1	2	2	1	1	1	2	1	1	2	-	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5612 LEATHER GOODS AND GARMENTS – DESIGN AND FABRICATION LABORATORY

L T P C
0 0 4 2

OBJECTIVE

To provide practical training in fabrication of various leather goods and garments.

Practical training to students in the following areas:

- Free hand object drawing practice
- Leather goods and garments working sketch practice
- Fashion illustration and color application
- Good's and garment's leather assortment
- Physical observation of goods and garments accessories and reinforcement materials
- Practice in various kinds of tools and machineries operation and its function
- Goods and garments pattern preparation and pattern laying on leather
- Goods and garments leather and reinforcement material cutting and lining material cutting
- Pre-assembly and stitching operations
- Pattern design for leather goods and garments
- Practice in goods and garments making
- Goods and garments quality control checking
- Pattern grading and practice in CAD/CAM

TOTAL: 60 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1.Have practical experience in designing of leather goods and garments.
CO2.Have practical knowledge in fabrication of leather goods and garments.
CO3.Aware of computer applications involved in developing leather goods and garments

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have practical experience in designing leather goods and garments.	2	3	2	3	2	1	1	1	2	1	1	2	1	3	1
CO2	Have practical knowledge in fabrication of leather goods and garments.	2	3	2	2	2	2	2	1	2	1	2	2	1	3	3
CO3	Aware of computer applications involved in developing leather goods and garments.	2	3	2	1	2	-	-	1	2	1	-	2	1	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5701 **FOOTWEAR TECHNOLOGY** **L T P C**

3 0 0 3

OBJECTIVE

To impart knowledge on the manufacture, evaluation and application of materials and components used in footwear manufacture

UNIT I DESIGN AND PATTERN DEVELOPMENT 9

History of shoe; Purposes and styles; Fashion and designs; Preparation of standards and section for men, ladies and children; Classic and other types of shoes and boots.

UNIT II FOOTWEAR MATERIALS AND COMPONENTS 9

Types of upper and lining leathers based on finish and animal origin; Different types of Natural and Synthetic soling materials – Adhesives used in upper and full shoe manufacturing process; threads, shank, insole boards, reinforcement materials, types of fasteners and grinderies.

UNIT III CUTTING, PRE-CLOSING AND CLOSING 9

Introduction of cutting – Types of Clicking: Manual and Mechanical, Clicking room design and management, Pre-Closing operations: Skiving – Reinforcement attaching – Components attaching – types of edge treatments - types of seams – Basic construction of needle and types needle points – types of sewing machines – quality parameters for closed upper.

UNIT IV PRELASTING AND LASTING 9

Principles and methods of Pre-lasting operations: Counter moulding, insole attaching and toe mulling – Lasting operations: Machine lasting (Toe, side & seat lasting) Sole preparation, sole cementing, Heat activation, Sole attaching process - Health and Safety control measures follows in shoe manufacturing line – Various Shoe dressing techniques – Quality checking parameters for finished shoe

UNIT V DIFFERENT METHODS OF SHOE CONSTRUCTION 9

Methods, Sequence of Operations, advantages and disadvantages: Cemented construction, Machine Sewn or Mckay construction, Slip Lasted construction, Stitch down construction (veldtschoen), Welted/ Goodyear welted construction - Direct moulded footwear constructions: DVP & DIP

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1. To acquire the knowledge of various materials and components used in footwear fabrication process

CO2. To understand the basic footwear design and the process of pattern development

CO3. To impart the knowledge on cutting process of various footwear materials and to understand the sequence followed in Pre closing and closing operations of basic footwear models

CO4. To acquire the knowledge on pre lasting operations, also to understand the machines and equipment used in lasting operations in footwear manufacturing

CO5. To disseminate the knowledge of operations involved in various footwear constructions

TEXT BOOKS and REFERENCES:

1. Cott, N.F., “American Shoe Making”, Shoe Trades Publishing Co., Cambridge.1993.
2. “Shoes and Leather News”, Published by bureau of foreign and domestic commerce, Dept of commerce, US, 1940.
3. B. Venkatappaiah, (1997),”Introduction to modern footwear technology” Chennai. - GOTETI GRAPHICS.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	To acquire the knowledge of various materials and components used in footwear fabrication process	3	1	1	-	-	-	2	-	-	1	-	2	1	3	2
CO2	To understand the basic footwear design and the process of pattern development	3	2	2	-	1	-	-	-	-	2	-	2	1	3	1
CO3	To impart the knowledge on cutting process of various footwear materials and to understand the sequence followed in Pre closing and closing operations of basic footwear models	2	1	2	-	1	1	1	1	1	2	1	2	1	3	2
CO4	To acquire the knowledge on pre lasting operations, also to understand the machines and equipment used in lasting operations in footwear manufacturing	3	2	2	2	1	1	3	2	2	2	-	2	2	3	3
CO5	To disseminate the knowledge of operations involved in various footwear constructions	3	2	1	2	1	1	3	2	2	1	-	2	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5702 LEATHER AND LEATHER PRODUCTS MACHINERIES L T P C
3 0 0 3

OBJECTIVE

To provide orientation on the machineries used for leather and leather products manufacture

UNIT I MECHANICAL POWER TRANSMISSION AND FLUID POWER SYSTEMS 9

Mechanical power transmission system components- Belts, chains, Gears and Cams. Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids - Properties of fluids.

UNIT II PRINCIPLES AND OPERATION OF LEATHER PROCESSING MACHINERIES 9

Salient features and purpose of the various machinery used in beam house, tanning and finishing yards - unhairing, fleshing, scudding, sammying, setting, shaving, staking, buffing, dedusting, glazing machines, finiflex, hydraulic press, curtain coating, roller coating, transfer coating, autospray, driers, measuring machine.

UNIT III PRINCIPLES AND OPERATION OF LEATHER PRODUCT MACHINERIES 9

Salient features and purpose of the various machinery used in leather product manufacturing – Clicking, Splitting, Skiving, Sewing machines – Flat bed, Post bed, Cylinder bed machines, strap cutting machine, Lasting machines – Forepart lasting, Heel seat lasting, Side lasting, Post lasting machines, Heat setting, Ponding, Roughing, Heat activator, Sole pressing, Shoe polishing machine

UNIT IV TRANSPORT SYSTEMS AND AUTOMATION IN LEATHER PRODUCT MANUFATURING 9

Different types of material handling system in leather products industry. Manual, semi- automatic and automatic conveyor. Application of computer/microprocessor based machines for leather products making, Die Less Cutting Systems.

UNIT V LAYOUT AND MAINTENANCE 9

Lay out for a small/medium tannery and leather product unit. Arrangements of machines as per the sequence of operation for standard leather processing/ product making. Preventive maintenance and safety in the use of leather and leather product machineries.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students are expected to.

CO1.Have knowledge of mechanical power transmission and fluid power systems
CO2.Understand the working principles of leather processing machineries
CO3.Understand the working principles of leather product machineries
CO4.Have knowledge on transport systems and automation in leather product manufacture
CO5.Aware of layout and maintenance of tannery and leather product unit

TEXT BOOKS and REFERENCES:

1. Walter Landmann, The Machines in the Tannery – A Review of Leather Producing Machinery and Equipment in current use, World Trades Publishing, UK, 2003
2. T.C.Thorstensen, Practical Leather Technology- Robert E.krieger Publishing Company, Huntington, New york, 1976.
3. Thornton, J.H, “Text book for footwear manufacture”, National Trade press, London, 1970
4. Blakeman, J., “An introduction to applied science for boot and shoe manufacture”, The Anglo American Technical Co. Ltd., London, 1924

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have knowledge of mechanical power transmission and fluid power systems	2	2	1	-	2	1	1	1	1	2	1	1	2	3	2
CO2	Understand the working principles of leather processing machineries	3	2	1	-	1	1	1	1	1	1	1	1	-	3	2
CO3	Understand the working principles of leather product machineries	2	2	1	-	2	1	1	1	1	1	1	1	1	3	1
CO4	Have knowledge on transport systems and automation in leather product Manufacture	1	2	1	-	2	1	1	1	1	-	1	1	1	3	3
CO5	Aware of layout and maintenance of tannery and leather product unit	2	2	1	-	3	1	1	1	1	1	1	1	1	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5711 LEATHER FOOTWEAR – DESIGN AND FABRICATION LABORATORY

L T P C
0 0 6 3

OBJECTIVE

To provide practical training in fabrication of leather footwear.

DESIGNING AND PATTERN MAKING

An introduction to fashion, style and design. Basic Shoe Styles and its geometry. Product Range Building System. Shoe Craftsmanship. Basic Styles in Footwear: Ladies Court Shoe, Oxford, Derby, Slip on, Moccasin, Boots. Open type footwear. Last Parameters: Length of Last, Fitting Girth, Instep Girth, Heel Girth, Ankle Girth. Pattern Making: Style line sketching, Taping of last, Preparation of Upper Standard, Extraction of component patterns of upper, Preparation of Lining Standard, Extraction of component patterns of lining, Details of Allowances.

CUTTING AND CLICKING

Hand and Machine cutting, Basic Pattern cutting practice, Fabric and other materials, Leather cutting practice, Pattern nesting practice, Cutting practice of Footwear components, Pattern area Assessment practice, Knowledge on Clicking machine and Cutting Dies, Quality of Footwear components.

PRE-CLOSING AND CLOSING

Pre-Assemble Operation: Splitting, Skiving, Folding, Reinforcement attachments. Upper Preparation: Sewing practice on Paper and Leather, Assembling cut components, Sewing components, Fabrication of uppers with quality control.

LASTING AND FINISHING

Bottom Stock Preparation: Insole cutting and preparation, Toe and Counter Stiffener cutting and preparation, Rubber and Leather bottom Sole cutting and preparation.

Hand Lasting practice and Machine Lasting practice for Cemented construction, Sole attaching and Finishing, Quality control of full shoe.

TOTAL: 90 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1.To impart practical knowledge on Designing and pattern Making of Basic Footwear models.

CO2.To acquire hands on skills on cutting and clicking operations of various footwear materials

CO3.To disseminate dexterity on on pre closing, closing lasting and finishing operations of footwear manufacturing

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	To impart practical knowledge on Designing and pattern Making of Basic Footwear models.	2	1	1	2	2	-	1	-	-	2	-	3	1	1	2
CO2	To acquire hands on skills on cutting and clicking operations of various footwear materials	2	1	1	-	2	-	-	-	-	2	1	3	1	1	2
CO3	To disseminate dexterity on on pre closing ,closing lasting and finishing operations of footwear manufacturing	2	1	1	1	1	1	2	-	1	2	-	3	1	1	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5712 **INTERNSHIP/TRAINING - II** **L T P C**
0 0 4 2

Each student is expected to undertake 1 month practical training on aspects associated with leather or leather products manufacture as a part of Industrial Internship – II during the summer vacation after sixth semester. The evaluation of this programme will be carried out in seventh semester. During seventh semester the student should submit (to assigned faculty) an industrial training report on practical internship undertaken. The report should be based on the practical experience gained at the industry, which should be duly certified by the production in-charge of the industry. The objective of the training is to enhance the practical knowledge of the students on various aspects associated with leather manufacture. Faculty will assess the students to judge the level of proficiency, originality and capacity for application of the practical knowledge attained by the student during the training period.

TOTAL DURATION: 4 WEEKS

OUTCOME

At the end of this course, the students are expected to
CO1.Provides real work experience
CO2.Opportunity to explore students' interest
CO3.Students will be able to integrate classroom knowledge and theory with practical application
CO4.Provides a nice learning curve for students with little experience
CO5.Develops professional skills and competencies

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Provides real work experience	3	2	2	2	2	2	2	2	3	1	1	3	1	2	3
CO2	Opportunity to explore students' interest	3	2	2	2	2	3	2	2	3	1	1	3	1	1	3
CO3	Students will be able to integrate classroom knowledge and theory with practical application	3	1	3	2	2	-	2	2	3	1	1	3	2	2	3
CO4	Provides a nice learning curve for students with little experience	3	3	3	2	2	2	2	2	3	1	1	3	3	2	3
CO5	Develops professional skills and competencies	3	2	-	2	2	3	2	2	3	1	1	3	3	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5713	PROJECT I	L	T	P	C
		0	0	6	3

The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme. Each student is required to submit a report on the project undertaken by and assigned to him by the Department. The report should be based on the information available in the literature, plan of work, experimental details, data determined in the laboratory/industry, results, discussion of the data presented, conclusion and future work. Proper bibliographic details are necessary in the report.

VIVA VOCE

The object of the viva-voce examination is to determine whether the objectives of the Project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the Project Work.

TOTAL : 90 PERIODS

OUTCOME

At the end of this course, the students are expected to

CO1.Apply the fundamental concept learnt during the theory courses
CO2.Identification of industrial problems
CO3.Review of literature
CO4.Identify the Knowledge gap
CO5.Ability to plan and design process for the current problem

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO-1	Apply the fundamental concept learnt during the theory courses	3	3	2	3	2	3	3	2	2	2	3	3	1	1	3
CO-2	Identification of industrial problems	3	3	2	3	2	1	1	2	2	2	-	3	3	1	3
CO-3	Review of literature	3	3	2	3	2	1	1	2	2	2	1	3	2	2	3
CO-4	Identify the Knowledge gap	3	3	2	3	2	-	-	2	2	2	1	3	2	3	3
CO-5	Ability to plan and design process for the current problem	3	3	2	3	2	-	-	2	2	2	-	3	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5811	PROJECT II	L	T	P	C
		0	0	16	8

The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme. Each student is required to submit a report on the project undertaken by and assigned to him by the Department. The report should be based on the information available in the literature, plan of work, experimental details, data determined in the laboratory/industry, results, discussion of the data presented, conclusion and future work. Proper bibliographic details are necessary in the report.

VIVA VOCE

The object of the viva-voce examination is to determine whether the objectives of the Project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the Project Work.

TOTAL: 240 PERIODS

OUTCOME

At the end of this course, the students are expected to

CO1.Ability to identify a problem and define project objectives
CO2.Ability to plan and execute work
CO3.Ability to collect data and compile results
CO4.Ability to analyse the results
CO5.Ability to present and communicate the findings effectively

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Ability to identify a problem and define project objectives	3	3	3	3	2	3	3	2	3	3	3	3	1	2	3
CO2	Ability to plan and execute work	3	3	3	3	2	2	1	2	3	3	3	3	1	1	3
CO3	Ability to collect data and compile results	3	3	3	3	2	2	1	2	3	3	3	3	2	2	3
CO4	Ability to analyse the results	3	3	3	3	2	2	-	2	3	3	3	3	3	2	3
CO5	Ability to present and communicate the findings effectively	3	3	3	3	2	2	-	2	3	3	3	3	3	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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ELECTIVES

LT5001 ADVANCED PHYSICS AND CHEMISTRY OF SKIN – I **L T P C**
3 0 0 3

OBJECTIVE

To impart knowledge on the advanced physical and chemical concepts of native collagen and collagen processed into leather.

UNIT I HISTOLOGY OF SKIN **9**

Histology and fibre packing in Skins. Techniques for study of macro-ultra and microstructural details of skins. Primary, secondary, tertiary and quaternary structure of collagen.

UNIT II MOLECULAR ARCHITECTURE OF COLLAGEN **10**

Molecular architecture of collagen. Inter and intra-change forces in the stabilisation and aggregation of collagen molecules. Three dimensional network of collagen fibres in skins and leather matrix.

UNIT III PHYSICO-CHEMICAL PROPERTIES OF COLLAGEN **8**

Hydration, fibre swelling and phase transitions in collagen fibres and their role in dimensional stability of skin and leather matrix.

UNIT IV THERMO-MECHANICAL PROPERTIES OF COLLAGEN **9**

Molecular mechanisms in relaxation and folding with special reference to native collagen and tanned collagen. Helix to coil transition and effects of thermo-mechanical stress on connective tissue fibres.

UNIT V CROSSLINKING MECHANISM **9**

Shrinkage and cross linking phenomena in native, chrome tanned and vegetable tanned collagen. Influence of electromagnetic and high energy radiation on native collagen.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1.Have comprehensive knowledge on the chemistry and physics of skin.
CO2.Understand the molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation and shrinkage.
CO3.Have knowledge on cross-linking phenomena of collagen/processed collagen/leather.
CO4.Ability to analyse the various thermo-mechanical properties of collagen.
CO5.Comprehend the electromagnetic and high energy radiation on collagen.

TEXT BOOKS AND REFERENCES:

1. Flaherty, O. Roddy, T.W., Lollar, R.M., `The Chemistry and Technology of Leather', Vol.1, E. Robert Krieger Publishing Co., New York 1978.
2. Gustavson, K.H., `The Chemistry and Reactivity of Collagen', Academic Press, New York, 1958.
3. Ramachandran, G.N., `Treatise on the Biology of Collagen, Academic Press, New York, 1967.
4. Krishnan, V, Ed. 'Trends in Collagen', Proceedings of the Indian Academy of Sciences (Chemical Sciences), Vol. 111, No. 1, Indian Academy of Sciences, Bangalore, 1999.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have comprehensive knowledge on the chemistry and physics of skin.	3	3	1	1	1	1	2	3	1	1	1	2	3	1	1
CO2	Understand the molecular architecture, hydration, swelling, phase transitions, dimensional stability, relaxation and shrinkage.	3	3	2	1	1	-	2	2	1	1	1	2	3	1	1
CO3	Have knowledge on cross-linking phenomena of collagen/processed collagen/leather.	3	3	1	1	1	1	2	2	1	1	1	2	3	2	1
CO4	Ability to analyse the various thermo-mechanical properties of collagen.	3	3	1	1	1	2	2	1	1	1	1	2	3	3	1
CO5	Comprehend the electromagnetic and high energy radiation on collagen.	3	3	-	1	1	1	2	2	1	1	1	2	3	3	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5002 ADVANCED PHYSICS AND CHEMISTRY OF SKIN – II

(Prerequisite for this course is LT5001) **L T P C**

3 0 0 3

OBJECTIVES

- To understand hydration of skin protein and its functional sites
- To understand diffusion and transport phenomena in collagenous matrices
- To understand molecular level changes and dimensional changes during various unit processes in leather making
- To relate surface science to leather making.

UNIT I REACTIVITY OF COLLAGEN 8

Macro and microporosity of skin and influence of hydration and water structure on the pore size pattern in skin. Functional sites in protein for interactions with vegetable and pre-tanning materials, Electrophilic and nucleophilic reactions at protein sites.

UNIT II DIFFUSION AND TRANSPORT PHENOMENA 9

Types of transport of fluids into solid matrices. Diffusion and transport phenomena in collagenous matrices. Kinetics and diffusion of tannery materials, dyes; forced diffusion into collagenous matrices.

UNIT III MOLECULAR BEHAVIOUR OF COLLAGEN 10

Molecular level changes in collagen at various process conditions (*viz.,* soaking, liming/dehairing, deliming/bating, pickling, tanning, dyeing and fatliquoring).

UNIT IV MACRO AND MICRO STRUCTURAL BEHAVIOUR OF COLLAGEN 9

Dimensional changes and ultra and micro structural variations of skins during soaking, liming, deliming/bating, pickling, tanning, retanning, fatliquoring and drying as well as finishing with resin and casein.

UNIT V SURFACE SCIENCE FOR LEATHER 9

Surface science application to leather. Surface charge and energy of full chrome and chrome retanned leather. Emulsions in leather processing and the surface charge and potential of leather finish films, adhesion, mechanisms, influence of opacity, refractive index and scattering coefficient of pigments and pigment formulations and factors controlling the stability of leather finish films.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1.Have an appreciation and understanding on the underpinning scientific concept on skin and leather.

CO2.Understand the diffusion and transport phenomena.

CO3.Have knowledge on molecular behaviour of collagen.

CO4.Acquire knowledge on molecular level changes and dimensional changes in leather making.

CO5. Obtaining coherent knowledge on surface science applications with leather making.

TEXT BOOKS AND REFERENCES:

1. Fred O, Flaherty, Roddy, T.W Roddy and Robert M. Lollar Ed., `The Chemistry of Technology of Leather', Robert E. Krieger Publishing Co., New York 1978.
2. Bienkiewicz, `Physical Chemistry of Leather Manufacture' Krieger, Floridaa, 1982.
3. Gustavson, K.H., `Chemistry of Tanning Processes', Academic Press, New York, 1958.
4. Krishnan, V, Ed. 'Trends in Collagen', Proceedings of the Indian Academy of Sciences (Chemical Sciences), Vol. 111, No. 1, Indian Academy of Sciences, Bangalore, 1999.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have an appreciation and understanding on the underpinning scientific concept on skin and leather.	3	3	1	1	1	1	2	3	1	1	1	2	3	1	1
CO2	Understand the diffusion and transport phenomena.	3	3	2	1	1	-	2	2	1	1	1	2	3	1	1
CO3	Have knowledge on molecular behaviour of collagen.	3	3	1	1	1	1	2	2	1	1	1	2	3	2	1
CO4	Acquire knowledge on molecular level changes and dimensional changes in leather making.	3	3	1	1	1	2	2	1	1	1	1	2	3	3	1
CO5	Obtaining coherent knowledge on surface science applications with leather making.	3	3	-	1	1	1	2	2	1	1	1	2	3	3	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5003 CONSUMER BEHAVIOUR AND BUSINESS ORIENTATION L T P C
3 0 0 3

OBJECTIVE

To enable the students to understand the science behind various marketing activities.

UNIT I INTRODUCTION TO CONSUMER BEHAVIOUR 8

Consumer, Shopper and Buyer. Consumer decision making process – problem recognition, information search, alternative evaluation, choice, transaction and consumption, post purchase behavior, cognitive dissonance.

UNIT II PSYCOLOGICAL IMPACT ON CONSUMER 9

Psychological influence - symbolic consumption, self-image, personality, personal values, life style, psychographics, groups. Memory and learning, perception and cognition, motivation, emotion, mood, self-image, belief, attitude, intention, gender, age.

UNIT III SOCIAL IMPACT ON CONSUMER 9

Sociological influence – cultural, sub cultural, cross cultural, social class, ethnic, religion, club, group, family.

UNIT IV CONSUMER DATA COLLECTION AND ANALYSIS 9

Consumer Research - Identifying research opportunity, developing the research questionnaire, selecting the research design – quantitative, qualitative, sample size and type. Data collection, data analysis, reporting.

UNIT V MARKETING STRATEGY 10

Advertising Promotion – Consumer impact on marketing, marketing impact on consumer, impact of communication on changing consumer attitude. Shopping environment – social, physical and environ. Fashion – behavioural perspective, cycles of fashion adoption, Segmentation, Target and Positioning (STP). Consumer behaviour and Marketing Mix – 4 P. Creating and sustaining brand personality. Subliminal messaging and persuasion of consumers. Creating “Buzz” to influence consumer behaviour.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course students are expected to

CO1. Acquire knowledge on consumer behaviour.
CO2. Understand social impact on consumer.
CO3. Acquire knowledge on marketing strategy.
CO4. Understand psychological impact on consumer.
CO5. Interpret data analysis and research opportunity.

TEXT BOOKS and REFERENCES:

1. Consumer Behavior 9th Edition Leon and Schiffman and Leslie Lazar Knuk, Pearson Education Blackwell: Consumer Behaviour, 10e, Thomson 2007
2. Consumer Behaviour- Suja Nair - Himalaya Publishers. Assael: Consumer Behaviour, 6e Thomson 2006
3. Research for Marketing decisions- Paul, Donald, Herald- Prentice Hall (India) Zikmund: Exploring Marketing Research, 8e, Thomson 2006
4. Naresh K.Malhotra, Marketing Research, An applied Orientation, Pearson Education Asia. Panda, Shiba Charan, Entrepreneurship Development, New Delhi, Anmol Publications.
5. Patel, V.G., The Seven Business Crises and How to Beat Them, Tata-Mcgraw,New Delhi, 1995.
6. Verma, J.C..,and Gurpal Singh, Small Business and Industry-A Handbook for Entrepreneurs, Sage, New Delhi, 2002

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	Acquire knowledge on consumer behaviour.	-	-	-	-	2	-	2	3	3	3	-	-	3	-	3
CO2	Understand social impact on consumer.	-	-	-	-	2	-	2	3	3	3	-	-	3	-	3
CO3	Acquire knowledge on marketing strategy.	-	-	-	-	2	-	2	3	3	3	-	-	3	-	3
CO4	Understand psychological impact on consumer.	-	-	-	-	2	-	2	3	3	3	-	-	3	-	3
CO5	Interpret data analysis and research opportunity.	-	-	-	-	2	-	2	3	3	3	-	-	3	-	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5004 ECO-BENIGN OPTIONS FOR LEATHER PROCESSING L T P C
3 0 0 3

OBJECTIVE
To impart knowledge on ecofriendly options for leather processing.

UNIT I CLEANER PROCESSING - BEAMHOUSE 10
Eco-friendly process technologies: Salt free curing options, sulphide free unhairing systems, ammonia - free deliming, salt free pickling systems, solvent free degreasing systems. Paradigm shift from chemical processing of hides and skins to bio based beam house processing.

UNIT II CLEANER PROCESSING - TANNING 8
Less chrome and chrome-free tanning systems. Latest concepts and trends in leather processing.

UNIT III CLEANER PROCESSING – POST TANNING 8
Formaldehyde, Phenol, AOX free post tanning systems; Latest concepts and trends in leather processing.

UNIT IV INTEGRATED CLEANER PROCESSING 10
Cleaner processing based on Eco-labelling. Integrated strategies to achieve permissible BOD, COD and TDS standards of tannery effluents.

UNIT V ECO-FRIENDLY FINISHING TECHNIQUES 9
Role of finishing equipments such as HVLP spray, foam finishing, etc in cleaner perspective. Aqueous finishing concepts and formulation; Other novel finishing techniques to reduce VOC.
Cleaner finishing of splits for shoe suede, garment suede, grain finished effect and specialty finishes - processing technologies and finishing techniques specially suited for the purpose. Upgradation of lower ends for better utilisation.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students are expected to

CO1. Have knowledge on the cleaner process technology in the leather processing.
CO2. Understand the cleaner tanning, post tanning and finishing systems.
CO3. Have knowledge on the fundamentals of bio beam house processing.
CO4. Acquire knowledge on latest trends in leather processing.
CO5. To understand the finishing techniques for better utilisation.

TEXT BOOKS and REFERENCES:

1. P.S.Briggs, "Gloving, Clothing and special leathers" products Institute, London, 1981.
2. J.H.Sharphouse, "Leather Technicians Hand Book", Leather Producers Association, Northampton NN3 1JD, Reprinted 1995.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have knowledge on the cleaner process technology in the leather processing.	1	2	2	1	3	1	3	2	1	1	1	1	1	3	-
CO2	Understand the cleaner tanning, post tanning and finishing systems.	1	2	2	1	3	1	3	2	1	1	1	1	1	3	-
CO3	Have knowledge on the fundamentals of bio beam house processing.	1	2	2	1	3	1	3	2	1	1	1	1	0	3	2
CO4	Acquire knowledge on latest trends in leather processing.	2	2	3	1	3	1	3	2	1	1	1	1	0	3	3
CO5	To understand the finishing techniques for better utilisation.	1	2	2	1	3	1	3	2	1	1	1	1	3	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5005 ENGINEERING ECONOMICS AND FINANCE MANAGEMENT L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on financial management concepts and principles of engineering economics

UNIT I FINANCIAL ACCOUNTING 10

Accounting principles – basic records depreciation – depreciation methods – preparation and interpretation of profit and loss statement – balance sheet – fixed assets – current assets.

UNIT II PROFIT VALUE ANALYSIS 10

Cost volume profit relationship – relevant costs in decision making profit management analysis – break even analysis – margin of safety Angle of incident and multi product break even analysis – Effect of changes in volume selling price fixed cost and variable cost on profit.

UNIT III WORKING CAPITAL MANAGEMENT 8

Current assets and liability decisions – estimation of working capital requirements – Management of accounts receivable – Inventory – cash – inventory valuation methods.

UNIT IV CAPITAL BUDGETING 9

Significance of capital budgeting – payback period – present value method – Accounting rate of return method.

UNIT V ENGINEERING ECONOMICS 8

Economics – Engineering economics – Demand analysis Laws of demand – Production and cost – Pricing methods

TOTAL: 45 PERIODS

OUTCOME:

At the end of this course, the students are expected to

CO1.Understand the financial management and economics.
CO2. Understand the profit value analysis.
CO3. Have knowledge in capital management and engineering economics.
CO4. Ability to identify the accounting rate of return method.
CO5. To analyse demand laws.

TEXT BOOKS

1. R. Kesavan, C.Elanchezhian and T.Sundar Selwyn – Engineering Economics and Financial Accounting, Laxmi Publications 2005

REFERENCES:

1.C.James, Vanhorn, Fundamentals of Financial management PHI 1996
2.Charles T.Homgren, Cost Accounting, PHI 1985
3.S.N.Maheswaran, Management Accounting and Financial Control, Sultan Chand, 1992.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understand the financial management and economics.	-	-	2	3	3	3	-	3	-	-	-	3	3	3	3
CO2	Understand the profit value analysis.	-	-	2	3	3	3	-	3	-	-	-	3	3	3	3
CO3	Have knowledge in capital management and engineering economics.	-	-	2	3	3	3	-	3	-	-	-	3	3	3	3
CO4	Ability to identify the accounting rate of return. method.	-	-	2	3	3	3	-	3	-	-	-	3	3	1	3
CO5	To analyse demand laws.	-	-	2	3	3	3	-	3	-	-	-	3	3	2	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5006 ENTERPRISE RESOURCE PLANNING FOR LEATHER SECTOR L T P C
3 0 0 3

OBJECTIVE

The objective of this course is to teach the principles of ERP technologies involved in enterprise resource and various case studies in the pre and post implementation of ERP's that will enable the students to perform as an efficient entrepreneur.

UNIT I INTRODUCTION 8

1. What is ERP?
2. Need of ERP
3. Advantages of ERP
4. Growth of ERP

UNIT II ERP AND RELATED TECHNOLOGIES 9

1. Business process Reengineering (BPR)
2. Management Information System (MIS)
3. Decision Support Systems (DSS)
4. Executive Support Systems (ESS)
5. Data Warehousing, Data Mining
6. Online Analytical Processing (OLTP)
7. Supply Chain Management (SCM)
8. Customer Relationship Management (CRM)

UNIT III ERP MODULES AND VENDORS 10

1. Finance
2. Production planning, control and maintenance
3. Sales and Distribution
4. Human Resource Management (HRM)
5. Inventory Control System
6. Quality Management
7. ERP Market

UNIT IV ERP IMPLENENTATION LIFE CYCLES 10

1. Evaluation and selection of ERP package
2. Project planning
3. Implementation team training and testing
4. End user training and Going Live
5. Post Evaluation and Maintenance

UNIT V ERP CASE STUDIES 8

Post implementation review of ERP Packages in Manufacturing, Services, and other Organizations

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students are expected

CO1. To understand and know about basics of ERP.

CO2. To understand various technologies associated to ERP.

CO3. To gain knowledge about various ERP modules.

CO4. To understand and aware of lifecycles associated with ERP.

CO5. To know inferences of POST implementation ERP.

TEXT BOOKS and REFERENCES:

1. Leon, A. Enterprise Resource Planning, Tata Mcgraw-hill, 1999.
2. Garg, V.K. and Venkitakrishnan, N.K. ERP Ware: ERP Implementation Framework, Prentice Hall, 1999
3. Garg, V.K. and Venkitakrishnan, N.K. Enterprise Resource Planning Concepts and Practice, PHI Learning Pvt. Ltd., 2004

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Course Articulation Matrix:

Courses Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	To understand and know about basics of ERP.	3	1	1	-	1	-	-	-	-	-	-	-	1	-	-
CO2	To understand various technologies associated to ERP.	3	2	1	1	1	-	-	1	-	-	1	-	1	2	1
CO3	To gain knowledge about various ERP modules.	3	2	1	-	-	-	-	-	1	-	-	1	1	2	2
CO4	To understand and aware of lifecycles associated with ERP.	3	1	1	1	-	-	-	1	1	--	2	-	1	2	3
CO5	To know inferences of POST implementation ERP.	3	1	1	2	-	-	-	1	-	-	-	-	1	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5071	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVE

This course aims to provide necessary knowledge and attitude to understand and appreciate the process of starting and developing a new venture.

UNIT I QUALITY OF ENTREPRENEURS 8

Entrepreneurs – Mindset, character, motivation. Competencies - creativity, innovation, risk taking, leadership, communication. Negotiation and networking skill. Myths about entrepreneurs; benefits and drawbacks of entrepreneurship. Reasons for a venture failure. Successful first generation entrepreneurs in leather sectors – case study.

UNIT II PLANNING AND DEVELOPMENT 8

Business Plan - Generating idea; converting an idea into business venture. Conducting feasibility analysis – Financial, Commercial, Technical, Environmental and Legal. Developing a business plan for leather and leathers products. Presenting a business plan to investors to pitch for funds.

UNIT III FINANCIAL MANAGEMENT 10

Business Finance – Forms of ownership, Financial projections and pro- forma of profit and loss account, cash flow statements; production and marketing budgets. Capital budgeting and investment analysis, breakeven point and sensitivity analysis to decide on a tannery proposal. Source of funds – own funds, banks, long term development financial institutions, Angel investors, Venture Capitalist, Public issue (IPO). Taxes - VAT, Service Taxes, Excise and Customs duties, CST, GST (proposed), tax exemptions for exports and SEZ. Controlling business - working capital control and cost control; inventory, procurement and receivables control. Quality control. Sales and marketing expenses control. SCM for leather sector.

UNIT IV ORGANIZATIONAL MANAGEMENT 9

Building Team – creating growth oriented organizational culture. Employee motivation, retention strategies. Organizational structure with clear roles, responsibilities, authorities and accountabilities. Attracting talent with ESOP and other incentives and benefits. Training development to enhance the quality of operators, supervisors and managers of the tannery.

UNIT V BUSINESS DEVELOPMENT STRATEGIES 10

Building Business – Market plan, market research, competitive analysis, formulating competitive marketing strategy – Segmenting, Targeting and Positioning of the brand. Formulating marketing mix – 4 P. Personal selling, managing a sales team. Distribution and CRM Strategy. New Product development. E-commerce fundamentals; strategy for expansion. Franchising - benefits and drawbacks of franchising. Global marketing – overseas marketing strategies; export documentation. Mergers and Acquisitions – synergy and valuation. Intellectual Property - patterns, trademarks, copy rights and trade secrets to grow the business in leather sector.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students are expected to

CO1. Have knowledge on entrepreneurial tasks such as, generating idea and planning business.
CO2. Have knowledge on financial management.
CO3. Understand the organizational management and business development strategies.
CO4. Acquire knowledge to enhance the productivity.
CO5. Have knowledge on Intellectual property.

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TEXT BOOKS and REFERENCES:

1. Entrepreneurship - D.F. Kuratko and T.V.Rao – Cengage Learning -2012 ; ISBN – 978-81315-1716-1
2. Entrepreneurial Development – Dr. S.S. Khanna - S. Chand -2012 ISBN – 81- 219- 1801-4
3. Handbook for New Entrepreneurs – P.C. Jain – Entrepreneurship Development Institute of India – 2010; ISBN:13 : 978-0-19-565224-6
4. Essentials of Entrepreneurship and Small Business Management – Thomas W. Zimmerer, Norman M. Scarborough – PHI Learning Ltd New Delhi. ISBN : 978 – 81- 203-3911-8
5. http://smallb.in/entrepreneurship - A SIDBI initiative
6. http://business.gov.in/ - Business Knowledge Resources for SMEs
7. http://www.dcmsme.gov.in/ - Development Commissionaire (MSME) Ministry of Small Micro Medium Industries

Attested

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have knowledge on entrepreneurial tasks such as, generating idea and planning business.	2	1	2	2	2	2	1	2	3	1	1	2	-	-	3
CO2	Have knowledge on financial management.	-	1	2	1	-	2	1	2	3	1	1	3	-	2	3
CO3	Understand the organizational management and business development strategies.	1	1	2	1	3	2	1	2	3	1	1	1	1	2	3
CO4	Acquire knowledge to enhance the productivity.	1	1	2	1	2	2	1	2	3	1	1	2	2	3	3
CO5	Have knowledge on Intellectual property.	1	1	2	1	2	2	1	2	3	1	1	2	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

Attested

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LT5007 FASHION FORCASTING FOR LEATHER AND LEATHER PRODUCTS L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on fashion forecasting for leather and leather products.

UNIT I HISTORICAL EVALUATION AND INTERNATIONALTRENDS 10

Historical evaluation of leather and leather products styling. Seasonal influences on fashion, cultural and geographical instances on leather and products fashion. Market research and track record

UNIT II FASHION CONSIDERATIONS 9

Design Criteria through effect of shape, colour, pattern, texture and decorative materials. Life cycle of fashion

UNIT III PRODUCT DEVELOPMENT 9

Market Strategy - Prototype Development - Field test and evaluation - Standard preparation - Second prototype - Final run. Costing

UNIT IV PRESENTATION TECHNIQUES 9

Organisation of shows and preparation of art portfolios; advertising; effect of foreign languages in the presentation and promotional activities.

UNIT V FASHION FORECAST 8

Direction of fashion trends in leather and leather products production and marketing.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course students are expected to

CO1. To impart the knowledge on international trends and fashion consideration on leather and leather products.

CO2. Understand and apply the knowledge on designs and various styles and also the importance of the colour influences on the leather products.

CO3. To disseminate the knowledge on prototype process techniques and marketing strategies on leather products.

CO4. To impart the knowledge on commercialization and promotional processes on leather products.

CO5. To apply the knowledge on forecast on fashion demand on seasonal influences.

TEXT BOOKS and REFERENCES:

1. Cott, N.F., “American Shoe Making”, Shoe Trades Publishing Co., Cambridge.1993.
2. “Apparel International” Published by P.F collier and sons, U.K, 1961.
3. “Shoes and Leather News”, Published by bureau of foreign and domestic commerce, Dept of commerce, US, 1940.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	To impart the knowledge on international trends and fashion consideration on leather and leather products.	3	2	2	-	-	1	1	1	2	3	1	2	1	3	2
CO2	Understand and apply the knowledge on designs and various styles and also the importance of the colour influences on the leather products.	3	3	3	-	-	-	-	-	1	3	1	2	1	3	2
CO3	To disseminate the knowledge on prototype process techniques and marketing strategies on leather products.	3	2	3	-	1	1	3	1	1	3	1	2	1	3	2
CO4	To impart the knowledge on commercialization and promotional processes on leather products.	3	2	1	1	1	-	3	2	1	3	1	2	2	3	3
CO5	To apply the knowledge on forecast on fashion demand on seasonal influences.	3	2	2	1	1	1	3	2	1	3	1	2	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5008	HUMAN RESOURCE DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVE

To impart human resource management skills to the students.

UNIT I MANAGEMENT AND GENERAL EMPLOYMENT PRACTICES 9

Human resource planning, Organizational design, HR budgeting, Motivation, Leadership, Employee involvement vs engagement, Job design: Job Analysis - Job description and job specification, Performance management; Performance and potential appraisals, Human resource audit, Workplace ethics and behaviour, International HRM

UNIT II STAFFING 8

Equal employment opportunity, recruitment, selection, successive planning, organizational exit

UNIT III HUMAN RESOURCE DEVELOPMENT 9

HRD role clusters: Analysis/Assessment roles- Evaluator, Needs analyst, Researcher Development roles - Evaluator, HRD materials developer, Program designer

Strategic roles – HRD manager, Marketer, Organization – Change agent, Individual – Career development advisor, Instructor/Facilitator, Administrator

Competency development: Technical competence, Managerial competence, Process competence, Helping Competence and Coping Competencies; Training and Development; Organizational Development, Career Planning and Development

Contemporary issues: Strategic talent management, Knowledge management and learning organizations, BPR, TQM and Intellectual capital management. HR Outsourcing

UNIT IV COMPENSATION BENEFITS 9

Job evaluation, Pay structures, Skill based, Competency based and Performance based pay system, Benefit programs, Pay delivery administration

UNIT V HEALTH, SAFETY, SECURITY AND LABOUR RELATIONS 10

Introduction to occupational safety-Employee assistance programs, safety management and approaches, theft, fraud, investigations, corrections; Labour laws in India, unfair labour practices, collective bargaining

TOTAL: 45 PERIODS

OUTCOMES:

On the completion of course students are expected to

CO1 . Understand the role of human resource management and employment practices.

CO2. To gain in-depth knowledge in staffing.

CO3. To gain knowledge in understanding the HRD role clusters, competency development and contemporary issues.

CO4. To gain knowledge on job evaluation and compensation benefits.

CO5. To gain knowledge on occupational health, safety, security and labour laws.

TEXT BOOKS AND REFERENCES:

1. Mathis, R. L. and Jackson, J. H. (2003). Human Resource Management, (10th ed.), Mason, Ohio: Thomson-Southwestern.
2. Rao, T.V., (1996) “Human Resources Development: Experiences. Interventions. Strategies”, Sage Publications, New Delhi.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understand the role of human resource management and employment practices.	2	1	2	2	2	2	1	2	3	1	1	2	-	-	3
CO2	To gain in-depth knowledge in staffing.	-	1	2	1	-	2	1	2	3	1	1	3	-	2	3
CO3	To gain knowledge in understanding the HRD role clusters, competency development and contemporary issues.	1	1	2	1	3	2	1	2	3	1	1	1	1	2	3
CO4	To gain knowledge on job evaluation and compensation benefits.	1	1	2	1	2	2	1	2	3	1	1	2	2	3	3
CO5	To gain knowledge on occupational health, safety, security and labour laws.	1	1	2	1	2	2	1	2	3	1	1	2	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5009 INTERNATIONAL MARKETING AND FOREIGN TRADE L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on international marketing and foreign trade aspects of leather industry

UNIT I INTRODUCTION 9

Basics of International trade - India's trade policy, International trade and Monetary Systems- Marketing Services in International trade Pricing and trade cycles- Precautionary measures to prevent fraud in International trade - International trade Multimodal Transport Operations- Consumer Behavior and Role of international Marketing- Indian market Analysis

UNIT II MANAGEMENT OF IMPORT AND EXPORT 9

Introduction-Import to India-An over view, Import and the Customs in India-Importation of Goods, Customs Duty and Exemptions-Valuation of Goods under Customs, Clearance of Imported Goods and Goods in Transit-Warehousing of Goods, Import into India.
India's new foreign trade Policy -Legal frame work of foreign trade Policy-Special focus
- General provision on Import and Export-Promotional Measures- Duty exemption/ Duty remission scheme EPCG Scheme -EOU/ EHTP/ STP/ BTP- SEZs.

UNIT III DOMESTIC AND IMPORT TRADE MANAGEMENT 10

Marketing concepts and Import-Forms of organization in Import and domestic Trade- Products, Sales forecasting and sales Management-pricing, Promotion, Branding and Advertising.
Retail Management - Introduction to Logistics - Parameters of Supply Chain Management - Management of logistics and Supply Chain - Consumer Supply Chain Relationship

UNIT IV IMPORT POLICY 8

The Customs Tariff Act-Exemptions in Import-by UN and its agencies and their officials-Import by UN or international organizations for execution of projects in India- Imports by Government Diplomats, Trade representatives etc.-Customs Tariff

UNIT V MARKETING STRATEGY 9

Marketing Management in the Indian context Introduction-concept-process functions- Role of Marketing in modern Organization- Marketing environment-Socio economic forces- Marketing Planning-Understanding Buyerand Organizational behavior- - Product Management -Pricing decisions-Promotion Decisions

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students are expected to

CO1. Understand the basics of international trade, government policies in export
CO2. Have knowledge on aspects of world trade related to leather sector and custom tariff
CO3. Understand the international marketing.
CO4. Thorough knowledge on India's new foreign trade Policy
CO5. Perceive marketing management and promotion decisions.

TEXT BOOKS AND REFERENCES:

1. Wagdre, H. International Marketing Management, Adhyayan Publisher, 2007
2. Datey, V. S. Foreign Trade Policy, Taxmann Publishers, 2008.
3. Bhat, M. K. international marketing management with special reference to India, king publishers, 2001

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understand the basics of international trade, government policies in export.	-	-	2	3	3	3	-	3	-	-	-	3	3	2	3
CO2	Have knowledge on aspects of world trade related to leather sector and custom tariff.	-	-	2	3	3	3	-	3	-	-	-	3	3	2	3
CO3	Understand the international marketing.	-	-	2	3	3	3	-	3	-	-	-	3	3	2	3
CO4	Thorough knowledge on India's new foreign trade policy.	-	-	2	3	3	3	-	3	-	-	-	3	3	2	3
CO5	Perceive marketing management and promotion decisions.	-	-	2	3	3	3	-	3	-	-	-	3	3	2	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5010 LEATHER AND LEATHER PRODUCTS COSTING L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on leather and leather products costing

UNIT I COSTING METHODS 10

Cost accounting, elements of cost, classification of cost elements – examples from leather industry, methods of costing

UNIT II COST ANALYSIS 8

Cost profit volume analysis, breakeven analysis; standard costing, analysis of variance

UNIT III LEATHER AND LEATHER PRODUCT COSTING 9

Costing of leather and leather products – material, labour, power and overhead expenses

UNIT IV RISK ANALYSIS OF FOREIGN EXCHANGE 10

Foreign exchange mechanisms, exchange rates; foreign exchange exposure management – risks, strategies to reduce risk

UNIT V BUDGET MANAGEMENT 8

Budget, types of budgets, budgeting and control in tanneries and leather products industry

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students are expected to

CO1. Manage the costing of leather and leather products.
CO2. Have knowledge on budget management.
CO3. Understand the risk analysis of foreign exchange.
CO4. Able to analyse costing.
CO5. Perceive cost accounting and various methods of costing.

TEXT BOOKS and REFERENCES:

1. "Costing in leather processing industry", ICWAI, 2001
2. Bulijan, J., "Costs of tannery waste treatment", UNIDO, 2005
3. "World statistical compendium for raw hides and skins, leather and leather footwear", Food and Agriculture Organization of the United Nation, 2016
4. James C., Van Home., "Financial Management and Policy", Prentice Hall of India Pvt. Ltd, New Delhi, 1980
5. Thukaram Rao M.E., "Cost and Management Accounting" New Age International, Bangalore, 2004

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Manage the costing of leather and leather products.	2	1	-	-	1	2	2	1	1	1	-	2	1	3	-
CO2	Have knowledge on budget management.	2	2	3	-	3	-	1	1	1	1	2	2	1	3	-
CO3	Understand the risk analysis of foreign exchange.	3	2	-	-	3	1	-	1	1	1	-	2	-	3	2
CO4	Able to analyse costing.	2	3	2	-	2	1	1	1	1	1	3	2	-	3	3
CO5	Perceive cost accounting and various methods of costing.	3	2	1	-	1	1	1	1	1	1	-	2	3	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5011 **PRODUCT MERCHANDISING** **L T P C**
3 0 0 3

OBJECTIVE

To impart knowledge on leather products merchandising that relates to the domestic and global leather and leather product merchandising.

UNIT I PRINCIPLES OF MARKETING MANAGEMENT 9

Introduction, Definition, Importance and Scope of Marketing, Philosophies of Marketing Management, Elements of Marketing - Needs, Wants, Demands, Customer, Consumer, Markets and Marketers; Marketing Vs Selling, Consumer Markets and Industrial Markets. Concept of Marketing Management, Marketing – Mix, Functions of Marketing Management, Marketing Organisations, Qualities of Marketing Manager.

Marketing Environment, Factors Affecting Marketing Environment, Marketing Information System and Marketing Research, Strategic Marketing Planning.

UNIT II PURCHASING PRINCIPLES AND MANAGEMENT 9

Purchasing scope and development - Strategic aspects of purchasing - Key purchasing -variables consideration - Purchasing negotiations and competitive – Bidding - Outsourcing -purchasing operation - Buying capital goods and services - Purchasing for resale - Purchasing systems and technology - Evaluation of purchasing performance - Purchasing ethics and legal issues

UNIT III PRINCIPLES AND PRACTICE OF MERCHANDISING 9

Merchandising concepts, technology, systems, planning - Merchandise pricing and budgeting, sample handling - Managing merchandise assortments - Developing and - presenting product lines - Introduction to shipping operation

UNIT IV RETAIL SECTOR OF LEATHER 9

Overview of retailing; Changing retail environment - Typology of retail buying - Understanding the consumer - Competitive strategies in the retail industry - Retail location strategy; Store layout and Design - Product planning and selection; Inventory management - Retail pricing; Retail communication - Customer Service

UNIT V GLOBAL SOURCING STRATEGY 9

Globalization and its influences - The role and importance of global sourcing - Global sourcing process and strategy - Investigation and tendering - Supplier selection and development - Operationalization of global sourcing strategy - Performance Measurement - The benefits and challenges of global sourcing - Coping with custom clearance uncertainties - Sourcing on the Internet - Supplier relationship development - Merchandising language for sourcing

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students will be in the position to understand

CO1. Understand the basic principles of marketing management.
CO2. Understand the purchasing principles and management.
CO3. Fundamentals of procurement and merchandising.
CO4. Basic knowledge of retail sector.
CO5. Knowledge of global marketing and global sourcing.

Attested

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TEXT BOOKS AND REFERENCES:

1. Apparel Product Design and Merchandising Strategies by Cynthia L. Regan. Publisher: Prentice Hall
2. Integrated Retail Management by James R. Ogden & Denise T. Ogden, 2007, Biztantra Retail Management – Levy & Weitz-TMH 5th Edition 2002
3. Charles W L Hill. And Arun Kumar Jain. International Business: competing in the global market place, Mc Graw-Hill, 2007.
4. John D. Daniels Lee H Radebaugh, International Business: Environments and Operations Addison Wesley, 2007.
5. Justin Paul – International Business – Prentice Hall of India, 2007 Oded Shenkar Yadong Luo : International Business – John Wiley & Co., 2006

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understand the basic principles of marketing management.	3	1	-	-	1	1	2	1	1	1	-	2	2	3	2
CO2	Understand the purchasing principles and management.	2	2	3	-	3	1	1	1	1	1	2	2	2	3	2
CO3	Fundamentals of procurement and merchandising.	2	2	-	-	3	1	-	1	1	1	-	2	2	3	2
CO4	Basic knowledge of Retail sector.	2	3	2	-	2	1	1	1	1	1	3	2	3	3	3
CO5	Knowledge of global marketing and global sourcing.	3	2	1	-	1	1	1	1	1	1	-	2	3	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5012 ORGANISATION AND MANAGEMENT OF LEATHER MANUFACTURE L T P C
3 0 0 3

OBJECTIVE
To provide skills and knowledge on organization and management for leather sector.

UNIT I RAW MATERIAL RESOURCE MANAGEMENT 10
Basic Resource – Livestock: Management systems - Population distribution and trends in India and World – Relative importance - Supply of meat animals – Projections for future
Raw materials – Hides and skins: Meat consumption pattern – Slaughter and mortality rates – Availability of hides and skins in India and world – Storage and grading systems – Pricing and other marketing factors - Major markets and sources of supply from India and world – Scenarios for future

UNIT II INDUSTRY MANAGEMENT 10
Social relevance and historical growth of leather sector. Processing Industry – Tanning: Structure of the Industry in India and the World – Capacity, Production, Environmental management - Exclusive complexes and CETPs – Sustainability challenges
Fabrication Industries – Products: Structure and Distribution of Product industries in India and World - Pattern of Leather utilization – Capacity, Production, Employment pattern - Components of design and fashion

UNIT III DOMESTIC TRADE MANAGEMENT 8
Domestic Trade – India: Production and Consumption pattern of Footwear in India – Market demand for Leather and Synthetic (non- leather) footwear - Market for Leather goods , garments , gloves and other leather articles in India – Import of Footwear and Products into India – Emerging market scenario in India
Export Trade – India: Export and Import policy - Export trends of leather and products
– major markets for India - Importance of Brands , Fashion , Certification issues – Priorities for Future

UNIT IV INTERNATIONAL TRADE MANAGEMENT 7
International Trade – Global: Major exporting and importing countries in the world – Significance of African region in the world market - Changes in the pattern of demand at global level - Role of Market network, Brands and Fashion– Impact of E- Commerce
– Ecological and Social labelling /certification systems - Traceability, Ethical, Resource conservation issues – Role of WTO - Future challenges for leather trade

UNIT V DEVELOPMENT STRATEGY 10
Planning and Trade Promotion strategies – India: Planning of Material, Manpower, Financial resources – Potential for non- conventional raw-material resources and product categories – Role of various Organisations – Trade promotion measures – Market surveys and building market intelligence – Measures for India's sustainability in world trade.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the students are expected to

CO1. Have knowledge in raw material resource management.
CO2. Have knowledge about leather industry in India and world.
CO3. Understand the domestic trade management in leather.
CO4. Understand the international trade management in leather.
CO5. Have knowledge on industry, trade management and development strategy in leather.

Attested

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REFERENCES

1. Report of All India Survey on Raw Hides and Skins, CLRI, 1987 and 2004
2. Report on Capacity Utilisation and Scope for modernization of Indian tanning industry , CLRI, 1990
3. Report of the Committee on The Development of Leather and Leather Manufactures for Exports (Seetharamaiah Committee Report) ,Govt of India 1972
4. Report of the Nation wide Survey on Leather Product Units in India, CLRI, 1997.
5. Thyagarajan, G, Srinivasan, A.V. and Amudeswari, A., "Indian Leather 2010, A technology, Industry and Trade Forecast', CLRI, Madras 1994.
6. Bulletins of India's Foreign Trade in Leather and Leather Products , CLRI
7. Sadulla, S. The Leather Industry Kothari's Desk book Series, H.C. Kothari Group (Publications Division), Madras 1995.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have knowledge in raw material resource management.	2	1	1	1	1	3	1	1	2	1	1	1	-	3	3
CO2	Have knowledge about leather industry in India and world.	1	1	1	-	1	3	1	1	1	1	3	1	-	3	3
CO3	Understand the domestic trade management in leather.	1	1	1	2	1	3	1	1	3	1	2	1	1	3	3
CO4	Understand the international trade management in leather.	1	1	1	1	1	3	1	1	2	1	2	1	2	3	3
CO5	Have knowledge on industry, trade management and development strategy in leather.	-	1	1	1	1	3	1	1	2	1	2	1	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

Attested

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LT5013	SAFETY IN LEATHER INDUSTRIES	L	T	P	C
		3	0	0	3

OBJECTIVE

To impart knowledge on Occupational Safety and Hazard aspects in leather manufacture

UNIT I SAFETY PHILOSOPHY, HAZARD IDENTIFICATION AND ASSESSMENT 9

Legal framework of safety and health in India International conventions and trends; Responsibilities and enforcement mechanism. Need for safety and health (cost/benefit rational; safety, environment and productivity triangle); Role of industrial hygiene, Hazard classification (hazard categories and groups), Hazard identification and assessment (tools and methods).

UNIT II SAFETY IN USE OF HAZARDOUS SUBSTANCES AT WORK 10

Chemical and biological hazards in the work place in the leather industry; Health effects of chemical and biological exposure Hazard information systems on hazardous substances (material safety data sheets, labelling), workplace exposure monitoring and evaluation, hazard prevention and control measures (storage, handling and disposal) in the leather industry.

UNIT III PRODUCTIVE MACHINE SAFETY IN THE LEATHER INDUSTRY, WORK ECOLOGY AND ERGONOMICS 10

Safety hazards of machinery, machine tools and electrical installations ; Hazard prevention and safeguarding of machinery (guards, machine controls, ergonomics) ; Role of preventive maintenance; Safe workstation design and layout, Manual handling of material; Lighting (standards, use of natural and artificial illumination); Climate control (standards, temperature/humidity, improving general ventilation); Noise management (standards, prevention and protection); Safety of factory premises and installations (railings, flooring, safe structures); Welfare measures; Personal protection and hygiene (selection, use, maintenance);

UNIT IV EMERGENCY PREVENTION AND PREPAREDNESS 8

Planning for emergencies; Control of fire and explosion; Dealing with medical emergencies

UNIT V SAFETY AND HEALTH MANAGEMENT AND PROMOTION 8

Promoting safety and health practices at the workplace (training, safety and warning signs); Role and responsibilities of managers, supervisors and workers.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will be in the position to understand the

CO1. Acquire knowledge on legal framework of safety and health in India and international conventions.

CO2. To understand hazard identification and assessment methods.

CO3. Have knowledge on machinery safety in the leather industry.

CO4. Comprehensive knowledge on work ecology and ergonomics.

CO5. Acquire familiarity on emergency prevention and preparedness safety and health management.

Attested

DIRECTOR
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TEXT BOOKS and REFERENCES:

1. Jeannie Mager Stellmann, Encyclopaedia of Occupational Safety and Health, 4th edition, International Labour Office, Geneva 1999.
2. J. Buljan, A Sahasranaman, J Hannak, Occupational Safety and Health Aspects of Leather Manufacture, 1st edition, United Nations Industrial Development Organization, Chennai, 1998.
3. CLRI, Safety Manual on Leather Processing, 1st edition, Central Leather Research Institute, Chennai, 1999.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Acquire knowledge on legal framework of safety and health in India and international conventions.	1	3	-	-	2	1	2	2	1	1	-	2	-	3	-
CO2	To understand hazard identification and assessment methods.	1	3	1	1	2	1	2	2	1	1	-	2	-	3	-
CO3	Have knowledge on machinery safety in the leather industry.	1	3	2	2	2	1	2	2	1	1	-	2	1	3	2
CO4	Comprehensive knowledge on work ecology and ergonomics.	1	3	2	2	2	1	2	2	1	1	-	2	2	3	3
CO5	Acquire familiarity on emergency prevention and preparedness safety and health management.	1	3	-	-	2	1	2	2	1	1	-	2	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5014 SCIENCE AND TECHNOLOGY OF LEATHER SUPPLEMENTS AND SYNTHETICS **L T P C 3 0 0 3**

OBJECTIVE

To impart knowledge on the use of leather supplements used as substitutes for leather in the manufacture of leather products

UNIT I INTRODUCTION **8**

Technology of the most common polymeric materials used in leather industry as supplements. Polymer and Rubber industries in India.

UNIT II SUPPLEMENT SYNTHESIS **10**

Manufacture of industrially important polymers for plastics, fibres and lastomer - Polyethylene, polypylene, polyvinyl chloride, polyvinyl alcohol, polyacrylonitrile, polystyrene, polyurethane, fluoro-carbon polymers, epoxy resins, polyamides, polyesters, alkyd resins, silicone polymers, cellulosics.

UNIT III POLYMER FABRICATION **9**

Fabrication of polymeric materials, compounding and mixing, casting, extrusion, fibre spinning, molding, coating, foam fabrication.

UNIT IV TESTING OF POLYMERS **8**

Testing of polymers. Mechanical and Thermal testing.

UNIT V POLYMER MODIFICATION **10**

Manufacture of rubber and elastomers. Natural rubber, processing, vulcanizing synthetic elastomers, butadiene copolymer, neutral rubber, polyisoprene polybutadiene. Polymer and rubber industries in India.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1. Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.
CO2. Understand the fundamentals of polymerization of various polymers used.
CO3. Able to manufacture industrially important polymers.
CO4. Gain knowledge on analytical skills on testing of polymers.
CO5. Knowledge on polymer modification.

TEXT BOOKS and REFERENCES:

1. Williams, D.J., `Polymer Science andEngineering', Prentice Hall, New York, 1971.
2. Austin, G.T., Shrere's `Chemical Process Industries', 5th ed., McGraw Hill International Book Co., Singapore, 1984.
3. Elrich. F.R., `Science and Technology of Rubber', Academic Press, New York, 1978.
4. Lubin, `Handbook of composites', Van Nostrand Reinhold Co., New York

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Have knowledge on the chemistry of most common polymeric materials used in leather industry as supplements.	3	3	-	-	-	-	3	-	-	-	-	3	-	3	1
CO2	Understand the fundamentals of polymerization of various polymers used.	3	3	-	-	-	-	3	-	-	-	-	3	-	3	1
CO3	Able to manufacture industrially important polymers.	3	3	-	-	-	-	3	-	-	-	-	3	1	3	2
CO4	Gain knowledge on analytical skills on testing of polymers.	3	3	-	-	-	-	3	-	-	-	-	3	2	3	3
CO5	Knowledge on polymer modification.	3	3	-	-	-	-	3	-	-	-	-	3	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5015 TECHNOLOGY OF ANIMAL AND TANNERY BY PRODUCTS UTILISATION L T P C
3 0 0 3

OBJECTIVE

To impart knowledge on the preparation and use of tannery by-products that are generated at abattoirs and tanneries.

UNIT I INTRODUCTION 9

Types of animal byproducts - from abattoirs, meat processing plants, poultry, fishingand other sources including fallen animals. Present methods of collection, processing and utilisation in developing countries vis - a - vis developed countries
: conservation techniques and concept of two tier technology. Protein meals from animal by-products including fallen animals and their significance in livestock feeds.

UNIT II ANIMAL RENDERING AND BLOOD UTILIZATION 9

Bone products and their utilisation. Keratinous proteins - various sources keratinous based products and their uses. Alimentary tract and its processing into various products. Present status of the industry in the country. Pet foods methods of preparation in brief.

UNIT III UTILIZATION OF ORGANS AND GLANDS FROM SLAUGHTERED ANIMALS 9

Anaerobic digestion, its significance for the preparation of animal feed, fuel gas, fertilizer, etc. Quality control including microbiological aspects of products processed from animal by products.

UNIT IV TANNERY BYPRODUCTS CHARACTERISTICS 9

Details of solid wastes from tannery; composition and characteristics – raw trimmings, fleshings, hair wastes, shavings, wetblue/crust/finished leather trimmings, buffing waste.

UNIT V TANNERY BYPRODUCTS UTILIZATION 9

Technologies for utilization of raw trimmings – Glue, Gelatin; fleshing waste – glue, energy recovery; hair waste – composite, keratin hydrolysate; chrome and veg shavings – board, protein fillers; utilization of crust/finished leather trimmings.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will be in the position to
CO1. To gain knowledge on various animal by-products and their significance.
CO2. To gain knowledge on various options available for utilization of slaughter house by-products.
CO3. To understand valuable opportunities available for utilization of various parts of slaughtered/fallen animals.
CO4. To understand the nature and quantum of various solid wastes generated from tanneries.
CO5. To gain knowledge on various options available for the utilization of tannery.

TEXT BOOKS and REFERENCES:

1. Burnham, F. `Rendering - the invisible industry'', Aero Publishers, inc., Fallbrook, CA 92028, 1978.
2. Mann, I. `Processing and Utilisation of animal by-products', Food and Agriculture organisation, Rome, 1962.
3. Scaria, K.J., Mahendrakumar and Divakaran, S. `Animal by-Products - processing and utilisation', Central Leather Research Institute, Madras, 1981.
4. Taiganides, E.P. `Animal Wastes', Applied Science, Publishers Ltd., Essex, 1977.

5. Mahendrakumar, `Hand Book of rural technology for the processing of animal by- products'. FAO Agricultural Services Bulletin 79, Food and Agriculture Organisation.
6. Divakaran, S. Animal Blood - Processing and utilisation, Food and Agriculture Organisation, Rome, 1978.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	To gain knowledge on various animal by-products and their significance.	-	-	-	-	-	1	2	-	-	-	-	1	1	-	1
CO2	To gain knowledge on various options available for utilization of slaughter house by-products.	-	1	2	-	1	1	2	1	-	-	1	1	1	-	1
CO3	To understand valuable opportunities available for utilization of various parts of slaughtered/fallen animals.	-	1	2	-	1	1	2	1	-	-	1	1	1	-	1
CO4	To understand the nature and quantum of various solid wastes generated from tanneries.	-	-	2	-	-	2	3	-	-	-	-	1	2	3	1
CO5	To gain knowledge on various options available for the utilization of tannery solid wastes.	-	1	2	-	2	2	3	1	-	-	1	1	2	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5016 VALUE ENGINEERING IN LEATHER SECTOR L T P C
3 0 0 3

OBJECTIVE

To impart knowledge of value engineering and reengineering and relating them to leather industry.

UNIT I FUNDAMENTALS OF VALUE ENGINEERING AS APPLIED TO LEATHER MANUFACTURE 8

Value- Types –How to add value-Job plan – techniques employed- Who will do value engineering- Organizing the value engineering study-Benefits in leather and allied industries

UNIT II STEP BY STEP APPLICATION OF JOB PLAN IN LEATHER RELATED INDUSTRIES 10

Selection of project and team members – general phase – information phase – function phase – creative phase – evaluation phase – Investigation phase – implementation phase – Audit-in leather and allied industries

UNIT III WORK SHEETS AND GUIDE LINES FOR LEATHER AND ALLIED INDUSTRIES 9

Preparation of worksheets – general and information phase – Function Classification, relationship and summary- Meaningful costs- Cost analysis- Idea listing and Comparison – Feasibility ranking – Investigator phase, study summary – guidelines for writing value engineering proposal – Financial aspects – Life cycle cost analysis – Oral presentation – Audit – Case studies and Discussion.

UNIT IV REENGINEERING PRINCIPLES IN LEATHER PROCESSING IN LEATHER AND PRODUCT SECTOR 10

The 6 R's of organizational transformation and reengineering – process reengineering- preparing the workforce – Methodology – PMI leadership expectation – Production and service improvement model – Process improvement in leather and allied industries.

UNIT V IMPLEMENTATION OF REENGINEERING IN LEATHER SECTOR 8

Process analysis techniques – Work flow analysis – Value analysis approach – Nominal group technique – Fish bone diagram – Pareto analysis – team building – Force fields analysis – Implementation in leather and allied industries.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students will be in the position to

CO1. Understand the concept of value engineering
CO2. Application of Job plan in Leather industries
CO3. Knowledge of worksheets and guidelines for leather and allied industries
CO4.Have knowledge in reengineering in leather sector
CO5. Apply the learned concepts in a case study/project.

TEXT BOOKS AND REFERENCES:

1.S.S. Iyer, "Value Engineering", New Age Information, 1996.
2.Del L. Younker, "Value Engineering" Marcel Dekker, Inc. 2003
3.M.S. Jayaraman and Ganesh Natarajan, "Business Process Reengineering", Tata McGraw Hill, 1994.
4.Dr. Johnson, A.Edosomwan,"Organizational Transformation and Process reengineering", British Library Cataloguing in publication data, 1996.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	Understand the concept of value engineering	-	-	3	3	3	3	-	-	-	-	-	-	-	3	-
CO2	Application of Job plan in Leather industries	-	-	3	3	3	3	-	-	-	-	-	-	-	3	-
CO3	Knowledge of worksheets and guidelines for leather and allied industries	-	-	3	3	3	3	-	-	-	-	-	-	1	3	2
CO4	Have knowledge in reengineering in leather sector	-	-	3	3	3	3	-	-	-	-	-	-	2	3	3
CO5	Apply the learned concepts in a case study/project.	-	-	3	3	3	3	-	-	-	-	-	-	2	3	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5017 COMPUTER APPLICATIONS FOR LEATHER AND LEATHER PRODUCTS

L T P C
3 0 0 3

OBJECTIVE

To make students capable of using Computer and related technologies for an effective management of leather and leather products industry

UNIT I INTRODUCTION AND IT INFRASTRUCTURE 9

Concept of Data Communication, Modes of Transmission - Digital Vs Analog, Types of Communication - Simplex, Half Duplex, Full Duplex; Communication Protocols - FTP, HTTP, TCP/IP, WAP; Network topologies; Network Types (LAN, WAN and MAN); Need of IT Infrastructure; Form factor; Data Center and Disaster Recovery; Security and Threads;

UNIT II ROLE OF INFORMATION TECHNOLOGY IN LEATHER SECTOR 8

Introduction to System Development; System development life cycle- System Study; System Analysis; System Design (Input, output, files, procedure); Deployment (Implementation) and maintenance.

UNIT III DATABASE MANAGEMENT SYSTEMS AND ITS APPLICATIONS IN LEATHER SECTOR 8

Fundamental Concepts of Database Technology and Data Organization; Database Model Concepts; Data Security; Data Integration; Retrieving, Manipulating, Updating tables; Databases relevant to Leather Sector.

UNIT IV CONCEPTS FOR WEB BASED APPLICATIONS 10

Tools for Web Designing, Management Information System, ERP System for Leather Processing – Material Management and Inventory Control, Production Planning.

UNIT V E-COMMERCE AND CAD SYSTEMS 10

E-Commerce-Definition; Traditional Commerce V/s E-Commerce; Benefits of e- commerce; Various e-commerce models-B2B, B2C; Introduction to special input/output systems required for CAD. CAD Systems for Leather and Leather Products: Computerized techniques for pattern creation, grading, pattern nesting, consumption calculation costing. Pattern conversion techniques for leather products, standard DXF, AMMA DXF; Computerised color matching systems – its principle and application.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1. To gain fundamental knowledge about information, communication and technology.
CO2. To understand about system development connected to leather sector.
CO3. To know and understand on concepts of database.
CO4. To understand and aware of web-based applications associated with leather sector.
CO5. To understand and gain fundamental knowledge in E-commerce and CAD system.

TEXT BOOKS AND REFERENCES:

1. Alex Leon and Mathews Leon, “Fundamentals of Information Technology”, Leon Tech world, 1999.
2. Efraim Turban, R. Kelly Rainer and Richard E. Potter, “Introduction to Information Technology”, John Wiley and Sons; 3rd Edition (24 May 2004)

3. Dorian Cougias, E. L. Heiberger, Karsten Koop, The Backup Book: Disaster Recovery from Desktop to Data Center.
4. Date C. J., “An Introduction to Database Systems”, 7th Ed., Narosa Publishing, 2004
5. Kendall and Kendall, Systems Analysis and Design (Prentice Hall India)
6. Achyut S. Gobbole, Data Communication and Networks (Tata McGraw Hill Publishing Company)
7. Understanding SQL (BPB Publications)
8. Hands-on HTML(BPB Publications)
9. Ann Navarro, Effective Web Designing (BPB Publications)
10. E-commerce Developer’s Guide to Building Community and using Promotional Tools (BPB Publications)
11. Reference Manuals for CAD systems for Footwear and Garments.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	To gain fundamental knowledge about information, communication and technology.	3	1	1	1	-	-	-	1	-	-	-	-	-	1	-
CO2	To understand about system development connected to leather sector.	3	2	1	-	1	-	-	1	-	-	3	1	1	3	1
CO3	To know and understand on concepts of database.	3	2	1	3	1	1	-	-	-	-	-	-	-	1	2
CO4	To understand and aware of web-based applications associated with leather sector.	3	1	1	-	1	-	-	-	-	1	-	-	-	1	-
CO5	To understand and gain fundamental knowledge in E-commerce and CAD system.	3	1	1	-	-	-	1	2	-	-	-	-	1	-	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5018	CAD/CAM FOR LEATHER PRODUCTS DESIGN AND MANUFACTURE	L T P C 2 1 0 3

OBJECTIVE

To impart knowledge on CAD/CAM for leather products design and manufacture.

UNIT I COMPUTER APPLICATIONS IN LEATHER AND PRODUCT SECTOR **10**

Introduction to computer: Concepts of CAD/CAM. Capabilities and operation of graphical workstations, graphic terminals, input/output devices, interface and storage devices, net-working concepts of LAN and WAN, principles of digital and analog conversion.

UNIT II HARDWARE IN CAD **10**

Introduction to special input/output systems required for CAD. Digitization: 2D and 3D systems, input devices: Digitizer, pattern scanner
Output devices: Printer, Plotter, Spreader and cutters. Different types, working principles and applications.
Introduction to CAD software: Garment, Leather goods footwear.

UNIT III PATTERN ENGINEERING **8**

Computerized techniques for pattern creation, grading, pattern nesting, consumption calculations and costing, pattern conversion techniques for Leather products, standard DXF, AMMA DXF.

UNIT IV LAST AND SOLE MODELLING FOR FOOTWEAR **9**

Digitization with Microscribe; manipulation and optimization of digitized last; use of macros; last comparison; grading wizard; flattening; 3D visualization of last and styles; concept of e-last; introduction to sole and sole mould design.

UNIT V ADVANCED COMPUTATIONAL TECHNIQUES IN CAD, RAPID PROTOTYPING **8**

Principles and practice; simulation – concepts and applications.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course students are expected to
CO1. Understanding the concepts of computer applications in leather products sector.
CO2. Have knowledge in various hardware used in CAD.
CO3. To have comprehensive knowledge in pattern engineering techniques for leather and leather products.
CO4. Ability to designing last and sole modelling for footwear using CAD.
CO5. Have knowledge in advanced computational techniques in CAD, rapid prototyping.

TEXT BOOKS and REFERENCES:

1. MP Groover and EW Zinimers, “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India, 1984.
2. Newman and S P Sul.,” Introduction to Computer Graphics”, Published by Morgan Kaufmann,1995
3. S.Harrington, “Computer Graphics: A programming approach”, Edition 2, Published by Elsevier, 1997.

4. Zandi, “Computer Aided Design and drafting”, Published by Delmer,1985.
5. William Pratt., “Digital Image Processing”, 1978.
6. Desai and Abel, “Introduction to FEM”. “Step by Step guide to CAD for footwear”: CAD Centre, SDDC, CLRI.
7. Rapid prototyping ; AU – FRG publications, 1984.
8. Jorg Buchner, Simulation: “QUEST” manual: EDS Technologies, Published by Springer, 2003.

Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understanding the concepts of computer applications in leather products sector.	3	-	3	-	3	-	-	-	-	-	-	-	3	-	3
CO2	Have knowledge in various hardware used in CAD.	3	-	3	-	3	-	-	-	-	-	-	-	3	-	3
CO3	To have comprehensive knowledge in pattern engineering techniques for leather and leather products.	3	-	3	-	3	-	-	-	-	-	-	-	3	-	3
CO4	Ability to designing last and sole modelling for footwear using CAD.	3	-	3	-	3	-	-	-	-	-	-	-	3	-	3
CO5	Have knowledge in advanced computational techniques in CAD, rapid prototyping.	3	-	3	-	3	-	-	-	-	-	-	-	3	-	3

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

Attested

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LT5019 POLYMER SCIENCE AND ITS APLLICATIONS IN LEATHER L T P C
3 0 0 3

OBJECTIVE
To impart basics and fundamental knowledge on polymer science for leather applications.

UNIT I INTRODUCTION 9
Introduction to natural and synthetic polymers; Terms and fundamental concepts; Step-growth polymerization, Carother's equation, Functionality, Crosslinking; PET manufacturing; Chain growth polymerization, Free radical polymerization, Kinetics of free-radical initiation, termination, chain transfer, Mayo's equation, cage effect, autoacceleration, inhibition and retardation;

UNIT II SYNTHESIS OF POLYMERS USED IN LEATHER 9
Polypropylene manufacturing; Acrylic manufacturing; Atom transfer radical polymerization, ionic polymerization, ring opening polymerization; Nylon-6 manufacturing; Co-polymerization and its importance. Copolymer equation, reactivity ratio, tailor making of copolymer properties; Techniques of chain polymerization; Bulk, solution, emulsion, microemulsion and suspension polymerization; chemical modification of fibres; Polymer solution, Flory's theory; Interaction parameter.

UNIT III CHARACTERIZATION METHODS 9
Molecular weight and its distribution by: End group analysis, osmometry, light scattering, ultra-centrifugation, gel permeation chromatography, intrinsic viscosity; Spectroscopic methods of polymer characterization such as, FTIR. UV, NMR and others.

UNIT IV PROCESSING TECHNIQUES FOR POLYMERS USED IN LEATHER 9
Compounding of polymers - fillers, plasticizers, antioxidants, UV stabilizers, colouring agents and flame retardants. Polymer processing - compression, moulding, injection, extrusion, calendering and film casting; Preparation and properties of polyesters, polyamides, epoxy and silicone polymers; Conductive polymers, super absorbent polymers.

UNIT V POLYMER RECYCLING 9
Recycling, remoulding, depolymerisation, incineration, biodegradable polymers for leather applications.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students are expected to

CO1. Knowledge of natural polymers and synthetic polymers.
CO2. Have knowledge on polymer synthesis.
CO3. Understanding characterization methods for polymers.
CO4. Understand the application of polymers in leather.
CO5. Have knowledge in polymer recycling.

TEXT BOOKS and REFERENCES:

1. Joel R Fried, "Polymer Science and Technology", Journal of Chemical Association, ACS Publications, 2004
2. Fred W Billmeyer, "Textbook of Polymer Science", John Wiley & Sons, 1984-03
3. Hearle, J.W.S, "Polymers and their Properties", E. Horwood, New York, 1982
4. Lenz RW , "Organic Chemistry of Synthetic High Polymers", Interscience Publishers, New York, 1967
5. Anil Kumar; Rakesh K Gupta, "Fundamentals of Polymers", McGraw-Hill, New York, 1998

6. Stephen Z. D. Cheng and Bernhard Wunderlich, “Polymer Science”, Polymer Physics Ed., 1986 7. Mishra G. S., “Introductory Polymer Chemistry”, John Wiley & Sons, Dhanpat Rai & Co. Pvt. Ltd., 2003
7. Gowariker V.R., Viswanathan N. V., and Jayadev Sreedhar, “Polymer Science”, New Age International (P) Limited publishers, Bangalore, 2001
8. William D. Callister, Jr, “Materials Science and Engineering – An Introduction”, Sixth Edition, John Wiley & Sons, Inc., 2004.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Knowledge of natural polymers and synthetic polymers.	3	1	1	-	-	1	1	-	-	1	-	1	3	1	1
CO2	Have knowledge on polymer synthesis.	3	-	-	-	1	1	-	1	-	1	-	1	3	1	1
CO3	Understanding characterization methods for polymers.	3	-	-	1	1	1	-	-	1	1	-	1	3	2	1
CO4	Understand the application of polymers in leather.	3	2	2	2	2	1	2	2	2	1	-	1	3	3	1
CO5	Have knowledge in polymer recycling.	3	2	2	2	1	1	2	2	2	1	-	1	3	3	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5020 **TANNERY WASTE MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVE

This subject is to impart knowledge on waste management primarily associated with leather industries.

UNIT I INTRODUCTION TO TANNERY WASTE 9

Definition of pollution- different types of environmental pollution- classification of pollutants in water and wastewater – characterization of pollutants in water and wastewater - types of sampling, and significance of sampling, precautions to be taken while sampling and preservation of samples and discharge standards
Tannery wastewater: TDS, BOD, COD, floating solids, grit particles, suspended solids, dissolved solids, organic and inorganic matters. Tannery solid waste: trimmings, flesh, hair and chrome shavings.

UNIT II PRIMARY WASTEWATER TREATMENT 8

Screening – Flow Equalisation – Theory on Coagulation and Flocculation – Sedimentation – Filtration – Detail study and design aspects with reference to tannery wastewater.

UNIT III SECONDORY WASTEWATER TREATMENT 8

Introduction to microbial metabolism – Bacterial growth – Kinetics of Biological Growth. Aerobic suspended growth system - Aerobic attached growth system - Anaerobic suspended growth system - Anaerobic attached growth system – Advanced Biological System – UASB – EGSB

UNIT IV TERTIARY WASTEWATER TREATMENT 10

Theories on Advanced Oxidation Process viz., Photocatalytic treatment, Membrane Separation, Homogenous catalysis system using hydrogen peroxide, ozone etc - Heterocatalytic systems using metal oxides, activated carbon – Removal of Inorganic Compounds through electro dialysis, reverse osmosis, multiple effect evaporator, ion- exchange.

UNIT V SOLID WASTE DISPOSAL 10

Secured land fill: leachability studies and management of leachates – Biomethanisation of Solid waste: with reference to energy recovery – Thermal incineration – Bacterical compositing – Vermi composting – Bioremediation-RO reject management.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students are expected to

CO1. To understand various parameter and standards associated with wastewater treatment and discharge.
CO2. To understand the basic concepts on primary wastewater treatment.
CO3. To gain understanding on the secondary biological treatment of wastewater.
CO4. To attain knowledge on the concepts of tertiary wastewater treatment.
CO5. To acquire knowledge on various solid waste from tanneries and their management principles.

Attested

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TEXT BOOKS and REFERENCES:

1. Arceivala S.J. "Waste water treatment and disposal" Marcel Dekkar Inc., New York, 1981.
2. Metcalf and Eddy,H `Tchobanoglous, G. and Burton, F.L. (Ed), Waste water Engineering,treatment, disposal and reuse, 3rd edn. Tata-McGraw Hill Publishing, New Delhi 1991.
3. Besselievie, B.E. and Schwartz, M. "The Treatment of Industrial wastes", 2nd edn., McGraw Hill.
4. McCarty, P., Parkin, G.F. and Sawyer, C.N., "Chemistry for Environmental Engineering4th Edition", McGraw Hill, 1994.

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	To understand various parameter and standards associated with wastewater treatment and discharge.	3	1	1	-	-	1	1	-	-	1	-	1	3	1	1
CO2	To understand the basic concepts on primary wastewater treatment.	3	2	2	2	2	1	2	2	2	1	-	1	3	3	1
CO3	To gain understanding on the secondary biological treatment of wastewater.	3	2	2	2	2	1	2	2	2	1	-	1	3	3	1
CO4	To attain knowledge on the concepts of tertiary wastewater treatment.	3	2	2	2	2	1	2	2	2	1	-	1	3	3	1
CO5	To acquire knowledge on various solid waste from tanneries and their management principles.	3	2	2	2	2	1	2	2	2	1	-	1	3	3	1

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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GE5451 **TOTAL QUALITY MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniques like QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization.

UNIT I INTRODUCTION **9**

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM –-Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES **9**

Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planningCustomer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal-- Continuous process improvement – Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I **9**

The seven traditional tools of quality - New management tools - Six-sigma Process CapabilityBench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II **9**

Quality circles – Quality Function Deployment (QFD) - Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures- Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM **9**

Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation Internal Audits-Registration-ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Ability to apply TQM concepts in a selected enterprise.
CO2: Ability to apply TQM principles in a selected enterprise.
CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
CO4: Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.
CO5: Ability to apply QMS and EMS in any organization.

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Bester field,MaryB.Sacre,HemantUrdhwareshe and RashmiUrdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.

REFERENCES:

1. Joel.E. Ross, “Total Quality Management – Text and Cases”,Routledge.,2017.
2. Kiran.D.R, “Total Quality Management: Key concepts and case studies, Butterworth – Heinemann Ltd, 2016.
3. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition, 2003.
4. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Ability to apply TQM concepts in a selected enterprise.	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	Ability to apply TQM principles in a selected enterprise.	3	2	-	-	-	-	-	-	-	-	-	-	3	2	2
CO3	Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.	2	-	-	-	3	-	-	-	-	-	-	-	2	1	2
CO4	Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.	3	-	2	-	-	-	-	-	-	-	-	-	2	1	1
CO5	Ability to apply QMS and EMS in any organization	3	-	3		-	-	-	-	-	-	-	-	2	-	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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LT5021 BIOTECHNOLOGY AND ITS APPLICATION IN LEATHER L T P C
3 0 0 3

OBJECTIVES

To impart knowledge on biotechnological applications in processing of skins into leather.

UNIT I PROTEINS AND NUCLEIC ACID AND ENZYMOLOGY 9

Chemistry of DNA and RNA: Structure, Conformation and function. Proteins - Chemistry, structure and Function, Separation Principles in proteins. Classification, assay, characterization, mechanism of action, enzyme kinetics, immobilized enzymes.

UNIT II GENETIC ENGINEERING (RECOMBINANT DNA TECHNOLOGY) 10

Principles and methods: Essentials of biotechnology – products of biotechnology, Restriction enzymes, vectors, DNA cloning strategies.

UNIT III ENZYMES FOR LEATHER PROCESSING 10

Cleaner Leather Processing: Use of enzyme options in beam house operations - Soaking,unhairing, bating, degreasing, offal treatment: Types of enzymes -proteases, lipases - properties, assay systems and production. Types of fermentation, Preparation of media, preparation of inoculum, separation and purification of products.

UNIT IV WASTE MANAGEMENT FOR LEATHER 8

General features of the organic and inorganic pollutants of tannery. Stabilization and disposal of organic and chemical wastes and their biological treatment. Possible energy generation from wastes.

UNIT V UTILISATION OF COLLAGENOUS TISSUES FOR BIOMEDICAL AND OTHER APPLICATIONS 8

Collagen and its application in food, cosmetic and medical fields.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students are expected to

CO1. Understand basic biotechnology concepts and its relevance for application in leather processing.
CO2. Principles of genetic engineering.
CO3. Have knowledge in enzyme for leather processing.
CO4. Manage the waste generated from leather industries.
CO5. Application of collagen in other fields.

TEXT BOOKS and REFERENCES:

1. Rohm, H.J. and Reed, G. "A Comprehensive treatise on Biotechnology", Verlag Chemie, lecinheim,1983.
2. Pelczar, J.,Reid, R.D.and Chan, F.C.S.,"Microbiology", Tata McGraw Hill, 1977.
3. Old, R.W., and Primrose, S.B., "Principles of Genemanipulation" 3/e Cambridge, 1985. Stryer, L."Biochemistry" 3/e W.H. Freeman and Co. 1989.
4. Lehninger, A.L., Nelson, D.L., Gx M.M"Principles of Biochemistry", CBS Publications, 1993
5. Puvanakrishnan, R and Dhar, S.C."Enzyme Technology in Beamhouse practices"' CLRI Publication.
6. Wrinter, N.A., "Biological treatment of waste water", 1982.
7. Schroeder, E.D., "Waste and Waste water treatment", McGraw - Hill Inc. 1983

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Course Articulation Matrix:

Course Outcomes	Statement	Program Outcome														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	Understand basic biotechnology concepts and its relevance for application in leather processing.	3	1	1	1	3	1	3	3	1	1	-	1	2	3	1
CO2	Principles of genetic engineering.	3	-	1	1	1	1	3	1	1	1	-	1	-	3	3
CO3	Have knowledge in enzyme for leather processing.	3	2	1	1	2	1	3	2	1	1	-	1	1	3	2
CO4	Manage the waste generated from leather industries.	3	1	1	1	2	1	3	2	1	1	-	1	1	3	2
CO5	Application of collagen in other fields.	3	1	1	1	2	1	3	2	1	1	-	1	1	3	2

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively

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AUDIT COURSES (AC)

AD5091 CONSTITUTION OF INDIA L T P C
3 0 0 0

OBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I INTRODUCTION 9

History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) -Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES 9

Fundamental Rights-Right to Equality-Right to Freedom-Right against Exploitation Right to Freedom of Religion-Cultural and Educational Rights-Right to Constitutional Remedies Directive Principles of State Policy-Fundamental Duties

UNIT III ORGANS OF GOVERNANCE 9

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV EMERGENCY PROVISIONS 9

Emergency Provisions - National Emergency, President Rule, Financial Emergency

UNIT V LOCAL ADMINISTRATION 9

District's Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila Pachayat-Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level-Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									✓			✓
CO2									✓			✓
CO3									✓			✓
CO4									✓			✓
CO5									✓			✓

TEXTBOOKS:

1. Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.
3. Jain M P, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. The Constitution of India (Bare Act), Government Publication,1950

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AD5092 **VALUE EDUCATION** **L T P C**
3 0 0 0

OBJECTIVES:

- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self destructive habits with value education
- Interpret social empowerment with value education

UNIT I INTRODUCTION TO VALUE EDUCATION 9

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgements

UNIT II IMPORTANCE OF VALUES 9

Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III INFLUENCE OF VALUE EDUCATION 9

Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendshipHappiness Vs suffering, love for truth.

UNIT IV REINCARNATION THROUGH VALUE EDUCATION 9

Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation

UNIT V VALUE EDUCATION IN SOCIAL EMPOWERMENT 9

Equality, Non violence, Humility, Role of Women, All religions and same message,Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45 PERIODS

OUTCOMES:

CO1 – Gain knowledge of self-development
CO2 – Learn the importance of Human values
CO3 – Develop the overall personality through value education
CO4 – Overcome the self destructive habits with value education
CO5 – Interpret social empowerment with value education

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							✓	✓				✓
CO2							✓	✓	✓			✓
CO3							✓	✓	✓			✓
CO4							✓	✓				✓
CO5							✓	✓				✓

REFERENCES:

1. Chakroborty , S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press ,New Delhi

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AD5093 **PEDAGOGY STUDIES** **L T P C**
3 0 0 0

OBJECTIVES:

- Understand the methodology of pedagogy.
- Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Illustrate the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

UNIT I INTRODUCTION AND METHODOLOGY: 9

Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions **-** Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW 9

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES 9

Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT 9

Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS 9

Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 45 PERIODS

OUTCOMES:

- Understand the methodology of pedagogy.
- Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Know the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												✓
CO2												✓
CO3												✓
CO4												✓
CO5												✓

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

AD5094 STRESS MANAGEMENT BY YOGA L T P C
3 0 0 0

OBJECTIVES:

- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do's and Don't's in life through Yam
- Categorize Do's and Don't's in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

UNIT I INTRODUCTION TO YOGA 9

Definitions of Eight parts of yog.(Ashtanga)

UNIT II YAM 9

Do`s and Don't's in life.
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III NIYAM 9

Do`s and Don't's in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT IV ASAN 9

Various yog poses and their benefits for mind & body

UNIT V PRANAYAM 9

Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45 PERIODS

OUTCOMES:

CO1 – Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2 – Learn Do's and Don't's in life through Yam
CO3 – Learn Do's and Don't's in life through Niyam
CO4 – Develop a healthy mind and body through Yog Asans
CO5 – Learn breathing techniques through Pranayam

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							✓	✓				✓
CO2							✓	✓				✓
CO3							✓	✓				✓
CO4							✓	✓				✓
CO5							✓	✓				✓

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REFERENCES:

1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur

AD5095 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS L T P C
3 0 0 0

OBJECTIVES:

- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I 9

Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue)

UNIT II NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II 9

Verses- 52,53,59 (dont’s) - Verses- 71,73,75,78 (do’s)

UNIT III APPROACH TO DAY TO DAY WORK AND DUTIES 9

Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48

UNIT IV STATEMENTS OF BASIC KNOWLEDGE – I 9

Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18

UNIT V PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA 9

Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 45 PERIODS

OUTCOMES:

CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									✓			✓
CO2									✓			✓
CO3									✓			✓
CO4									✓			✓
CO5									✓			✓

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REFERENCES:

1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari's ThreeSatakam , Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata,2016

AD5097 ESSENCE OF INDIAN KNOWLEDGE TRADITION L T P C
3 0 0 0

COURSE OBJECTIVES

The course will introduce the students to

- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

UNITI INTRODUCTION TO CULTURE 9

Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II INDIAN LANGUAGES AND LITERATURE 9

Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature

UNIT III RELIGION AND PHILOSOPHY 9

Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)

UNIT IV FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING) 9

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V EDUCATION SYSTEM IN INDIA 9

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TOTAL: 45 PERIODS

COURSE OUTCOMES

After successful completion of the course the students will be able to

- Understand philosophy of Indian culture.
- Distinguish the Indian languages and literature.
- Learn the philosophy of ancient, medieval and modern India.
- Acquire the information about the fine arts in India.
- Know the contribution of scientists of different eras.
- Understand education systems in India

REFERENCES:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition",ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200

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4. Narain, “Examinations in ancient India”, Arya Book Depot, 1993
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
6. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, ISBN 13: 978-8120810990, 2014

AD5098 SANGA TAMIL LITERATURE APPRECIATION L T P C
3 0 0 0

Course Objectives: The main learning objective of this course is to make the students an appreciation for:
1. Introduction to Sanga Tamil Literature.
2.‘Agathinai’ and‘Purathinai’ in SangaTamil Literature.
3.‘Attruppadai’in SangaTamil Literature.
4.‘Puranaanuru’in SangaTamil Literature.
5.‘Pathitrupaththu’in SangaTamil Literature.

UNIT I SANGA TAMIL LITERATUREANINTRODUCTION 9
Introduction to Tamil Sangam–History of Tamil Three Sangams–Introduction to Tamil Sangam Literature–Special Branches in Tamil Sangam Literature- Tamil Sangam Literature’s Grammar-Tamil Sangam Literature’s parables.

UNIT II ‘AGATHINAI’AND‘PURATHINAI’ 9
Tholkappiyar’s Meaningful Verses–Three literature materials–Agathinai’s message- History of Culturefrom Agathinai– Purathinai–Classification–Mesaage to Society from Purathinai.

UNIT III ‘ATTRUPPADAI’. 9
Attruppadai Literature–Attruppadaiin‘Puranaanuru’-Attruppadaiin‘Pathitrupaththu’-Attruppadai in ‘Paththupaattu’.

UNIT IV ‘PURANAANURU’ 9
Puranaanuru onGood Administration,Rulerand Subjects–Emotion&itsEffectin Puranaanuru.

UNIT V ‘PATHITRUPATHTHU’ 9
Pathitrupaththuin‘Ettuthogai’–Pathitrupaththu’sParables–Tamildynasty:Valor,Administration, Charity in Pathitrupaththu- Mesaage to Society from Pathitrupaththu.

Total (L:45) = 45 PERIODS

COURSE OUTCOMES:
Upon completionofthiscourse, the studentswillbeable to:
1. Appreciate and apply the messages in Sanga Tamil Literature in their life.
2. Differentiate‘Agathinai’ and‘Purathinai’in their personal andsocietallife.
3. Appreciate and apply the messages in‘ Attruppadai’in their personal and societalife.
4. Appreciate and apply the messages in‘ Puranaanuru’in their personal and societallife.
5. Appreciate and apply the messages in‘ Pathitrupaththu’in their personal and societallife.

REFERENCES:
1. Sivaraja Pillai, The Chronology oftheEarlyTamils,SagwanPress,2018.
2. HankHeifetz andGeorgeL. Hart, The Purananuru,Penguin Books,2002.
3. Kamil Zvelebil,TheSmile of Murugan: OnTamil Literature of South India, Brill Academic Pub,1997.
4. GeorgeL. Hart, Poetsof theTamil Anthologies: AncientPoemsofLove andWar, Princeton University Press,2015.
5. XavierS.Thani Nayagam, Landscape and poetry:astudy of nature in classical Tamil poetry,Asia Pub.House, 1967.

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CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1									0.9						0.6
2									0.9						0.6
3									0.9						0.6
4									0.9						0.6
5									0.9						0.6

HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

HU5171 LANGUAGE AND COMMUNICATION LT P C
3 0 0 3

COURSE DESCRIPTION

This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as non verbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

Objectives

- ✓ To familiarize students with the concept of communication using linguistic and non linguistic resources.
- ✓ To help students ask critical questions regarding facts and opinions.
- ✓ To provide students with the material to discuss issues such as language and power structures.
- ✓ To help students think critically about false propaganda and fake news.

Learning Outcomes

- ➢ Students will be able to use linguistic and non linguistic resources of language in an integrated manner for communication.
- ➢ Students will be able to analyse communication in terms of facts and opinions.
- ➢ Students will be able to discuss, analyse and argue about issues related to language and power.

UNIT I LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION: 9

a) Writing and Speech
b) Distinction between language structure and language use, form and function, acceptability and grammaticality
c) Gestures and Body language, pictures and symbols, cultural appropriacy
d) Communicative Competency, context and situation, combination of linguistic and non-linguistic elements of communication

UNIT II STRUCTURE OF WRITING/CONVERSATION: 9

a) Language skills and the communication cycle; speaking and listening, writing and reading
b) Initiating and closing conversations, intervention, turn taking
c) Writing for target reader, rhetorical devices and strategies
d) Coherence and Cohesion in speech and writing

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UNIT III POWER STRUCTURE AND LANGUAGE USE: 9

a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

UNIT IV MEDIA COMMUNICATION: 9

a) Print media, electronic media, social media
b) Power of media
c) Manufacturing of opinion, fake news and hidden agendas

UNIT V PERSUASIVE COMMUNICATION AND MISCOMMUNICATION: 9

a) Fundamentals of persuasive communication
b) Persuasive strategies
c) Communication barriers

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Austin, 1962, J.L. How to do things with words. Oxford: Clarendon Press. Grice, P.1989. Studies in the way of words. Cambridge, M.A: Harvard University Press.
2. Chomsky, N.1966. Aspects of the theory of syntax, The MIT press, Cambridge. Chomsky, N.2006. Language and Mind, Cambridge University Press.
3. Hymes. D.N. 1972, On communication competence in J.B. Pride and J.Holmes (ed), Sociolinguistics, pp 269-293, London Penguin.
4. Gilbert, H.Harman, 1976. Psychological aspect of the theory of syntax in Journal of Philosophy, page 75-87.
5. Stephen. C. Levenson, 1983, Pragmatics, Cambridge University press.
6. Stangley, J. 2007. Language in Context. Clarendon press, Oxford. 7. Shannon, 1942. A Mathematical Theory of Communication. 8. Searle, J.R. 1969. Speech acts: An essay in the philosophy of language. Cambridge: Cambridge University Press.

HU5172 VALUES AND ETHICS L T P C
3 0 0 3

OBJECTIVES:

- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT I DEFINITION AND CLASSIFICATION OF VALUES 9

Extrinsic values- Universal and Situational values- Physical- Environmental-Sensuous- Economic-Social-Aesthetic-Moral and Religious values

UNIT II CONCEPTS RELATED TO VALUES 9

Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III IDEOLOGY OF SARVODAYA 9

Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

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UNIT IV SUSTENANCE OF LIFE **9**

The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V VIEWS ON HIERARCHY OF VALUES **9**

The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to understand definition and classification of values.
CO2: Able to understand purusartha.
CO3: Able to understand sarvodaya idea.
CO4: Able to understand sustenance of life.
CO5: Able to understand views of hierarchy of values.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								✓	✓			✓
CO2								✓	✓			✓
CO3								✓	✓			✓
CO4								✓	✓			✓
CO5								✓	✓			✓

TEXTBOOKS:

1. AwadeshPradhan :MahamanakeVichara. (B.H.U., Vanarasi-2007)
2. Little, William, : An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)
3. William, K Frankena : Ethics (Prentice Hall of India, 1988)

HU5173 HUMAN RELATIONS AT WORK **L T P C**
3 0 0 3

OBJECTIVES:

- Illustrate human relations at work its relationship with self.
- Explain the importance of interacting with people at work to develop teamwork.
- Infer the importance of physical health in maintaining human relations at work.
- Describe the importance of staying psychologically healthy.
- Identify the essential qualities for progressing in career.

UNIT I UNDERSTANDING AND MANAGING YOURSELF **9**

Human Relations and You: Self-Esteem and Self-Confidence: Self-Motivation and Goal Setting; Emotional Intelligence, Attitudes, and Happiness; Values and Ethics and Problem Solving and Creativity.

UNIT II DEALING EFFECTIVELY WITH PEOPLE **9**

Communication in the Workplace; Specialized Tactics for Getting Along with Others in the Workplace; Managing Conflict; Becoming an Effective Leader; Motivating Others and Developing Teamwork; Diversity and Cross-Cultural Competence.

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UNIT III STAYING PHYSICALLY HEALTHY 9

Yoga, Pranayam and Exercise: Aerobic and anaerobic.

UNIT IV STAYING PSYCHOLOGICALLY HEALTHY 9

Managing Stress and Personal Problems, Meditation.

UNIT V DEVELOPING CAREER THRUST 9

Getting Ahead in Your Career, Learning Strategies, Perception, Life Span Changes, and Developing Good Work Habits.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						✓		✓	✓			✓
CO2									✓	✓		✓
CO3						✓		✓	✓			✓
CO4								✓				✓
CO5								✓	✓	✓		✓

TEXT BOOK:

1. Dubrien, A. J. (2017). Human Relations for Career and Personal Success: Concepts, Applications, and Skills, 11th Ed. Upper Saddle River, NJ: Pearson.

REFERENCES:

1. Greenberg, J. S. (2017). Comprehensive stress management (14th edition), New York: McGraw Hill.
2. Udai, Y. (2015). Yogasanaurpranayam. New Delhi: N.S. Publications.

HU5174 PSYCHOLOGICAL PROCESSES L T P C
3 0 0 3

COURSE DESCRIPTION

Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people's psyche and behaviour around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

OBJECTIVES

The major objectives of this course is

- To develop students' awareness – on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
- To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

UNIT 1: INTRODUCTION

What is psychology? - Why study psychology? - Psychology as science – Behavior and its role in human communication – socio-cultural bases of behaviour – Biological bases of behavior - Brain and its functions – Principles of Heredity – Cognition and its functions Fields of psychology – Cognitve and Perceptual – Industrial and Organizational.

UNIT 2: SENSORY & PERCEPTUAL PROCESSES

Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation – movement – organization – illusion; Internal-external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

UNIT 3: COGNITION & AFFECT

Learning and memory – philosophy of mind – concepts - words – images – semantic features – Association of words – Repetition – Retrieval – Chunking - Schemata - Emotion and motivation – nature and types of motivation – Biological & Psychosocial motivation – nature and types of emotions – physiological & cognitive bases of emotions – expressions of emotions – managing negative emotions - enhancing positive emotions.

UNIT 4: THINKING, PROBLEM-SOLVING & DECISION MAKING

Thinking skills – Types of thinking skills – Concrete & Abstract thinking – Convergent & Divergent - Analytical & Creative thinking – Problem & Possibility thinking – Vertical & Lateral thinking – Problem solving skills – stages of problem solving skills – Decision making - intuition and reasoning skills - Thinking and language - The thinking process- concepts, problem solving, decision-making, creative thinking; language communication.

UNIT 5: PERSONALITY & INTELLIGENCE

Psychological phenomena & Attributes of humans - cognition, motivation, and behavior - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behavior change.

TOTAL: 45 PERIODS

REFERENCES

1. Morgan, C.T.and King, R.A (1994) Introduction to Psychology, Tata McGraw Hill Co Ltd, New Delhi.
2. Robert A. Baron (2002), Psychology, 5th Edition, Prentice Hall, India.
3. Michael W.Passer, Ronald E.smith (2007), Psychology: The science of mind and Behavior,3rd Edition Tata McGraw-Hill Edition.
4. Robert S.Feldman (2004) Understanding Psychology 6th Edition Tata McGraw – Hill.
5. Endler, N. S., & Summerfeldt, L. J. (1995). Intelligence.personality. psychopathology. and adjustment. In D. H. Saklofske & M. Zeidner (Eds.). International handbook of personality and intelligence (pp. 249-284). New York: Plenum Press.
6. Ford, M. E. (1994). A living systems approach to the integration of personality and intelligence.In R. J. Sternberg.& P. Ruzgis (Eds.). Personality and intelligence (pp. 188-21 7). New York: Cambridge University Press.
7. De Bono, E (1990) Lateral Thinking, Harper Perennial, New York.

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HU5175 EDUCATION, TECHNOLOGY AND SOCIETY L T P C
3 0 0 3

COURSE DESCRIPTION

This course introduces students to multidisciplinary studies in Education, Technology and Society. Students will get an understanding of the relationship between education, technology and society. They will also learn about the long lasting impact of good education in a technologically advanced society.

COURSE OBJECTIVES:

The course aims

- To help learners understand the basics of different types of technology utilised in the field of education
- To make them realize the impact of education in society
- To make them evolve as responsible citizen in a technologically advanced society

LEARNING OUTCOMES

By the end of the course, learners will be able to

- Understand the various apps of technology apps and use them to access, generate and present information effectively.
- Apply technology based resources and other media formats equitably, ethically and legally.
- Integrate their technical education for betterment of society as well as their personal life.

UNIT I INDIAN EDUCATION SYSTEM

Gurukul to ICT education – Teacher as facilitator – Macaulay's Minutes – English medium vs Regional medium – Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES

Learning Theories – Behaviorism – Cognitivism – Social Constuctivism – Humanism Learning Styles – Multiple Intelligences – Emotional Intelligence – Blooms Taxonomy

UNIT III TECHNOLOGICAL ADVANCEMENTS

Web tools – Social media in education – elearning – MOOCs – Mobile assisted learning – Learning Apps – Blended learning - Self-directed learning

UNIT IV EDUCATIONAL TECHNOLOGY

Technological implications on Education – Teaching, Learning & Testing with Technology - Advantages and drawbacks – Critical analysis on the use of technology

UNIT V ETHICAL IMPLICATIONS

Plagiarism – Online Copyright issues – Ethical and value implications of education and technology on individual and society.

TOTAL:45 PERIODS

TEACHING METHODS

Teaching modes include guest lectures, discussion groups, presentations, visual media, and a practicum style of learning.

EVALUATION

As this is course is not a content based course, it focuses more on the ethical use of technology in education and society, and so, evaluation can be based on assignments and discussions. So there is no need for an end semester examination. Internals marks can be taken for the total marks.

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INTERNAL (100 % WEIGHTAGE)

(a) Written Test (40 marks)
(b) Assignment: Write a real time report of the technology use in any school / college (15 marks)
(c) Presentation: Students choose any one of the technological tools and present its relevance to education and society (15 marks)
(d) Group discussion: Students discuss in groups on case studies relating to various challenges in education and technology use in society (20 marks)
(e) Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others' posts. (10 marks)

REFERENCES

1) Education and Social order by Bertrand Russel
2) Theories of learning by Bower and Hilgard
3) Technology and Society by Jan L Harrington

HU5176 PHILOSOPHY L T P C
3 0 0 3

OBJECTIVES

- To create a new understanding by teaching philosophy through a comparison of Indian and Western traditions.
- To Fosters critical thinking and imagination by dealing with inter-related concepts in literature and science.
- To bridge the gap between the sciences and humanities through introspective analyses.
- To nurture an understanding of the self and elucidates ways to progress towards a higher understanding of one's self and others.

UNIT I KNOWLEDGE 9

Knowledge (Vidya) Versus Ignorance (Avidya)- Brihadaranyaka Upanishad. Unity and Multiplicity – Isha Upanishad. What is True Knowledge? Ways to True Knowledge. Introduction to Philosophy of Yoga, Socratic Debate, Plato's Views.Asking and Answering Questions to Stimulate Critical Thinking and to Draw Ideas.Argumentative Dialogues.Dialectical Methods to Arrive at Conclusions.

UNIT II ORIGIN 9

Origin of Universe And Creation – 'Nasidiya Sukta' in Relation With Big Bang Theory. Greek Concept of Chaos.The Concept of Space – Space as the Final Goal – Udgitha. Relationship Between Teacher And Student – The Knowledge Of Combinations, Body And Speech – Siksha Valli – Taittriya Upanishad.

UNIT III WORD 9

Aum- Speech and Breath as Pair – Chandogya Upanishad and Brihadaryanaka Upanishad.Significance of Chants, Structure of Language and Cosmic Correspondences.The Non-Dual Word – Bhartrihari's Vakyapadiyam. Sphota-Ultimate Reality Expressed Through Language. Intention.Thought 'Sabdanaor' and Speaking.

UNIT IV KNOWLEDGE AS POWER/OPPRESSION 9

Power- as Self-Realization in Gita.Krishna's Advice to Arjuna on How to Conquer Mind. Francis Bacon – Four Idols – What Prevents One From Gaining Knowledge? Michel Foucault- Knowledge as Oppression.Panopticon.Rtam (Truth) and Satyam (Eternal Truth).

UNIT V SELF KNOWLEDGE/BRAHMAN **9**

Knowledge about Self, Transcendental Self.The Different Chakras and the Stages of Sublimation.Philosophy of Yoga and Siva for Union of Mind and Body.Concept of Yin/Yang.Aspects of the Feminine / Masculine.

TOTAL : 45 PERIODS

OUTCOMES:

On completion of the course, the students will be able to:

1. Think sceptically, ask questions and to arrive at deductions.
2. Connect and relate different branches of thought.
3. Comprehends the relation between language, thought and action.
4. Arrive at a better understanding of self and others and forms a new outlook.

REFERENCES:

1. Swami Nikhilananda: The Upanishads, Swami Nikhilananda, Advaita Ashrama, Kolkata.
2. Swamy Tapasyananda: Srimad Bhagavad Gita, The Scripture of Mankind, Sri Ramakrishna Math, Chennai.
3. Subrahmanyam, Korada: Vakyapadiyam of Bhartrhari Brahmakanda, Sri Garib Dass series.
4. Swami Lokeswarananda: Chandogya Upanishad, Swami Lokeswarananda, Ramakrishna Mission Institute of Culture, Kolkata.
5. Brahma, Apuruseya: The Four Vedas: Translated in English.
6. Haich, Elizabeth: Sexual Energy and Yoga.
7. Bacon, Francis: Power as Knowledge
8. Vlastos, Gregory: Socrates Ironist and Moral Philosopher.
9. Plato: The Republic, Penguin.
10. Gutting, Garry: Foucault A Very Short Introduction, Oxford.

HU5177 APPLICATIONS OF PSYCHOLOGY IN EVERYDAY LIFE **L T P C**

3 0 0 3

UNITI INTRODUCTION **7**

Nature and fields.

UNITII PSYCHOLOGYININDUSTRIESAND ORGANIZATIONS **9**

Job analysis; fatigue and accidents; consumer behavior.

UNITIII PSYCHOLOGY AND MENTALHEALTH **11**

Abnormality, symptoms and causes psychological disorders

UNITIV PSYCHOLOGY AND COUNSELING **7**

Need of Counseling, Counselor and the Counselee, Counseling Process ,Areas of Counseling.

UNITV PSYCHOLOGY AND SOCIALBEHAVIOUR **11**

Group, group dynamics, team building, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL:45 PERIODS

TEXTBOOKS

1. Schultz,D.&Schultz,S.E.(2009). Psychology and Work Today(10thed.). New Jersey:Pearson /Prentice Hall.
2. Butcher,J.N., Mineka,S.,& Hooley,J. M.(2010). Abnormal psychology(14th ed.).New York: Pearson
3. Gladding,S.T. (2014).Counselling:A comprehensive profession. New Delhi: Pearson Education
4. Aronson, E.,Wilson, T. D.,& Akert, R. M.(2010).Social Psychology(7th Ed.). Upper Saddle River,NJ: Prentice Hall

HSMC– ELECTIVES – HUMANITIES II (EVEN SEMESTER)

HU5271 GENDER, CULTURE AND DEVELOPMENT L T P C
3 0 0 3

COURSE DESCRIPTION

This course offers an introduction to Gender Studies that asks critical questions about the meanings of sex and gender in Indian society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary drawing from Indian literature and media studies, to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with class, caste and other social identities. This course also seeks to build an understanding of the concepts of gender, gender-based violence, sexuality, and rights and their impact on development through a number of discussions, exercises and reflective activities.

Objectives

- ✓ To familiarize students with the concepts of sex and gender through literary and media texts.
- ✓ To help students ask critical questions regarding gender roles in society.
- ✓ To provide students with the material to discuss gender issues such as gender based discrimination, violence and development.
- ✓ To help students think critically about gender based problems and solutions.

Learning Outcomes

- ➢ Students will be able to critically read literary and media texts and understand the underlying gender perspectives in them.
- ➢ Students will be able to analyse current social events in the light of gender perspectives.
- ➢ Students will be able to discuss, analyse and argue about issues related to gender and their impact on society, culture and development.

UNIT I: Introduction to Gender

- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender
- Social Construction of Gender

Texts:

1. Sukhu and Dukhu (Amar Chitra Katha)
2. The Cat who Became a Queen (Folk tale, J. Hinton Knowles, Folk-Tales of Kashmir. London: Kegan Paul, Trench, Trübner, and Company, 1893, pp. 8-10.)

UNIT II: Gender Roles and Relations

- Types of Gender Roles
- Gender Roles and Relationships Matrix
- Gender-based Division and Valuation of Labour

Texts:

1. Muniyakka (Short Story, Lakshmi Kannan, Nandanvan and Other Stories, Hyderabad: Orient Blackswan, 2011)
2. Video: Witness: Freeing Women From Cleaning Human Waste (2014, HRW, Manual Scavenging, India)

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UNIT III: Gender Development Issues

- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

Texts:

1. The Many Faces of Gender Inequality (Essay, Amartya Sen, Frontline, Volume 18 - Issue 22, Oct. 27 - Nov. 09, 2001)
2. Tell Us Marx (Poem, Mallika Sengupta, Translated by Sanjukta Dasgupta)

UNIT IV: Gender-based Violence

- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

Texts:

1. Lights Out (Play, Manjula Padmanabhan)
2. Lights Out (Video of play enacted)

UNIT V: Gender and Culture

- Gender and Film
- Gender, Media and Advertisement

Texts:

1. Mahanagar (Movie: Satyajit Ray)
2. Beti Bachao Beti Padhao Advertisements

READINGS: Relevant additional texts for readings will be announced in the class. Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

ASSESSMENT AND GRADING:

Discussion & Classroom Participation: 20%
Project/Assignment: 30%
End Term Exam: 50%

HU5272	ETHICS AND HOLISTIC LIFE	L T P C
		3 0 0 3

OBJECTIVES:

- To emphasize the meaning and nature of ethics, human values and holistic life for leading a good, successful and happy life through continuous examination of thoughts and conduct in day to day life.
- To understand the status and responsible role of individual in abatement of value crisis in contemporary world in order to develop a civilized and human society. Understanding the process of ethical decision making through critical assessment of incidents/cases of ethical dilemmas in personal, professional and social life.
- To view the place of Ethics and Human Values in the development of individual and society through identification and cross examination of life values and world view of his/her role models in society.

UNIT I HUMAN LIFE, ITS AIM AND SIGNIFICANCE

The concept of a successful life, happy life and a meaningful life, Ethical and decision making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.

UNIT II CREATIVE AND LEADERSHIP ABILITY AND THEIR DEVELOPMENT

Intellectual, Emotional, Creative, Ethico - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude.

UNIT III HARMONY IN PERSONAL AND SOCIAL LIFE:

Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all, Creating a value based work culture in hostel, classroom and other places in the campus and society.

UNIT IV CHARACTER, RIGHTEOUSNESS AND VIRTUES FOR A MEANINGFUL LIFE

Egolessness, Humility, Righteousness, Purity, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance.

UNIT V DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND HUMAN WELFARE

Science, Technology, Consumerism, Relation with Nature and Environment, New dimension of Global Harmony: Democracy, Equality, Social Justice

TOTAL:45 PERIODS

OUTCOMES:

On completion of the course, the students will be able to:

1. Enable students to understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world view.
2. Develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.
3. Enable students to cross examine their earlier decisions taken in life and understand the meaning of ethical dilemma to overcome the ethical dilemmas and engage in critical reflection.
4. Develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.
5. Enable students to develop a method for making ethically sound decisions for themselves, within hostels, classrooms, university campus and society.

HU5273 LAW AND ENGINEERING L T P C
3 0 0 3

UNIT I THE LEGAL SYSTEM: SOURCES OF LAW AND THE COURT STRUCTURE 9

Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

UNIT II LAWS **9**

Basic principles of contract law, sale of goods law, laws relating to industrial pollution, accident, environmental protection, health and safety at work, patent law, constitutional law: the supreme law of the land, Information technology law and cyber crimes.

UNIT III BUSINESS ORGANISATIONS **9**

Sole traders (Business has no separate identity from you, all business property belongs to you).

Partnerships: Types of Partnerships - Limited Liability Partnership, General Partnership, Limited Partnerships. Companies: The nature of companies, Classification of companies, Formation of companies, Features of a public company, Carrying on business, Directors– Their Powers and Responsibilities/Liabilities.

UNIT IV LAW AND SOCIETY **9**

Interdisciplinary nature of law, legal ideologies/philosophy/ schools of jurisprudence**.**

UNIT V CASE STUDIES **9**

Important legal disputes and judicial litigations

TOTAL: 45 PERIODS

HU5274 FILM APPRECIATION **L T P C**
3 0 0 3

COURSE DESCRIPTION

This is an intensive course designed to promote comprehensive understanding and insights into the nature of cinema and other related forms and practices. Movies, though at times are used more as escapism, they are also a true art form and expressive tool used by writers, directors and actors. This course will explore the aesthetics of cinema, the concepts behind storytelling and various other elements of a film. It will also explore the impact of movies in our society and in our lives. It also encourages students to use films as a medium to analyse visual texts and read underlying messages.

OBJECTIVES:

- To help learners understand the various movie genres and its types.
- To understand various elements that contributes to film making.
- To make them realize the impact of film in society.
- To analyse the visual media and interpret the underlying messages.

UNIT I THE COMPONENTS OF FILMS **9**

Story, Screenplay & Script – Actors – Director – Crew Members – Mis En Scene – Structure of A Film – Narrative Elements – Linear & Non-Linear – Types of Movie Genres: Mysteries, Romantic Comedies, Horror Etc.

UNIT II EVOLUTION OF FILM **9**

History of Films – Early Cinema – Silent Movies – Talkies – Film Language, Form, Movement – Film Theories – Realist, Auteurists, Feminist, Psychonalyic, Idealogical Theories.

UNIT III FILMS ACROSS THE WORLD **9**

European Films – Russian Films – Japanese Films – Korean Films – Hollywood Film – Studio Culture – All Time Great Movies.

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UNIT IV INDIAN FILMS **9**

The Early Era – History Of Indian Cinema – Movies for Social Change – Hindi Movies that Created Impact – Regional Movies – Documentaries – Cultural Identity.

UNIT V INTERPRETING FILMS **9**

Film Criticism & Appreciation – Censorship in Movies – Cultural Representation in Movies – Television – New Media & Online Media – Films Beyond Entertainment.

TOTAL: 45 PERIODS

OUTCOMES

On completion of the course, the students will be able to:

- Recognize types of films, their impact on society and their roles in our lives.
- Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
- Interpret the underlying messages in the movies.

Teaching Methods

- Each unit consists of reading materials, learning activities videos, websites. Students are expected to watch movies sometimes in class and at times at home and discuss in class.

Evaluation

- As this is course is critical appreciation course on films, there is no written end semester examination. The course is more on learning how to critically analyse a movie and appreciate its finer elements. Therefore evaluation can be based on assignments and discussions. Internals marks can be taken for the total marks.

Internal (100 % weightage)

- Assignment 1: Write a movie review with critical analysis (20 marks).
- Assignment2 : Write a script for a scene taken from a short story / novella (20 marks).
- Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
- Group discussion : Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
- Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others' posts. (10 marks)

REFERENCES

1. A Biographical Dictionary of Film by David Thomson, Secker & Warburg, 1975
2. Signs and Meaning in the Cinema by Peter Wollen, Secker & Warburg, 1969
3. The World Viewed by Stanley Cavell 1971
4. Film Style and Technology: History and Analysis by Barry Salt, Starword, 1983
5. The Encyclopedia of Indian Cinema Edited by Ashish Rajadhyaksha and Paul Willemen, BFI, 1994.

HU5275 FUNDAMENTALS OF LANGUAGE AND LINGUISTICS **L T P C**
3 0 0 3

OBJECTIVES

- To broadly introduce students to the formal and theoretical aspects of linguistics.
- To enable learners to understand the various practical applications of language and recent findings in the field of applied linguistics.

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CONTENTS : -

UNIT I LANGUAGE AND LINGUISTICS: AN OVERVIEW 9

Language and Linguistics-Linguistic Knowledge-Knowledge of Sound Systems & Words – Creativity of Language – Relationship of form and meaning. Grammar – descriptive, prescriptive, universal-Human Language – Animal Language – Sign Language- Computers and Language.

UNIT II MORPHOLOGY - WORDS OF LANGUAGE 9

Content and function words – morphemes -free & bound –prefixes – suffixes – roots and stems – inflectional and derivational morphology-compound words and their formation – malapropisms – slips of the tongue.

UNIT III SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE 9

Syntax : Rules of Syntax- Sentence Structure-Structural Ambiguity-Syntactic Categories. Semantics: Lexical Semantics – Anomaly-Metaphors- Idioms- Synonyms – Antonyms – Homonyms -Pragmatics– Speech Acts

UNIT IV PHONETICS – THE SOUNDS OF LANGUAGE 9

Speech sounds- Introduction to branches of Phonetics- The Phonetic Alphabet – IPA – Consonants - Vowels – Diphthongs- Tone and Intonation.

UNIT V APPLIED LINGUISTICS - THE PRACTICAL APPLICATIONS OF LANGUAGE 9

Language learning and teaching (ELT)- lexicography-translation studies-computational linguistics-neurolinguistics (speech pathology and language disorders)- forensic linguistics – sociolinguistics.

TOTAL : 45 PERIODS

Teaching Methods :

Lectures, discussion.

Evaluation Internal and External :

Internal: 2 written tests + assignments, seminars, project (50+15+15+20).

External: A 3 hour written exam (50 marks)

REFERENCES :

1.Victoria Fromkin, Robert Rodman, Nina Hyams.2019.An Introduction to Language. USA. CENGAGE.11th edition

2. Cook. G,2003. Applied linguistics.UK: Oxford University Press.

HU5276 UNDERSTANDING SOCIETY AND CULTURE THROUGH LITERATURE L T P C
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OBJECTIVES

- To internalize the importance of language by understanding its role in the transformation of man.
- To look at language, literature and culture as locus of identity and change.
- To extract meaning from existing literatures and cultures.
- To identify meanings in modern life by reconnecting with lost cultures.

Attested

DIRECTOR
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Anna University, Chennai-600 025

Unit 1 Introduction

Why study literature? Tracing the origin – pictures. Tokens as precursors of writing. Movement from three dimensions to two dimensions- Pictography. From visual to oral -Logography. Reading out literature to young children- Edmund J Farrell.

Unit 2. Reading Culture

Reading culture through language, signs and consumables- Roland Barthes. Culture through poems- Nissim Ezekiel's ' The night of the Scorpion' . 'Nothing's Changed'- Tatamkhulu Afrika- Apartheid. Ruskin Bond- 'Night train at Deoli'- How real life is different from movies.

Unit 3. Identifying Meaning

Searching and locating meaning through literature. Looking for order in a chaotic world. The Myth of Sisyphus (Albert Camus) and Adi Shankar's 'Jagat Mithya'- the world as an illusion. The Indian version as 'meaninglesss meaning'.

Unit 4. Post Modernism

'If on a winter's night a traveler'- Italo Calvino. The book about the reader- the experience of reading as reading. Metafiction. Selfie Culture. Visual Culture as purpose of modern life.

Unit 5. Returning to Pictures

Literature of the present- Emphasis on the visual world. Twitterature. SMS. Whatsapp language. Consumer culture. Change in fixed gender notions. Interactive sessions. Introspection.

Reading list

1. Bond, Ruskin: 'Night train at Deoli'
2. Ezekiel, Nissim: ' The Night of the Scorpion'
3. Afrika,Tatamkhulu: 'Nothing's Changed'
4. Barthes, Roland: *Mythologies*
5. Shankaracharya: *Viveka Chudamani*
6. Camus, Albert- *The Myth of Sisyphus*
7. Calvino, Italo: *If on a winter's night a traveler*
8. Farrell, Edmund J: 'Listen, my children, and you shall read'

Outcome

- Can identify the connections among language, literature and culture.
- Is able to relate between seemingly different aspects of life.
- Understands the fractions in modern life and can assimilate meanings.