



The Kavery Engineering College

Mecheri, Mettur Tk. Salem Dt – 636 453.

(An Autonomous Institution Approved by AICTE, New Delhi & Affiliated to Anna University)

An ISO 9001:2015 certified Institution and accredited by NAAC with A+ grade.



B. TECH AGRICULTURAL ENGINEERING CHOICE BASED CREDIT SYSTEM CURRICULUM FOR SEMESTER I TO VIII

(Applicable to the students admitted from the Academic year 2024-2025 onwards)

VISION

To cultivate creative, globally competent, employable and disciplined computing professionals with the spirit of benchmarking educational system that promotes academic excellence, scientific pursuits, entrepreneurship and professionalism.

MISSION

- || To develop the creators of tomorrow's technology to meet the social needs of our nation.
- || To promote and encourage the strength of research in Engineering, Science and Technology.
- || To channel the gap between Academia, Industry and Society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- PEO1 To comprehend, analyze, design and develop innovative products and provide solution for the real-life problems in agricultural field
- PEO2 To adopt modern techniques, advanced Agro meteorological methods, scientific and organic fundamentals required to solve industrial and societal problems.
- PEO3 To solve the most important realistic problems in the field of sustainable agriculture by applying gained competencies.
- PEO4 To enable and face the rural reality through learning experience and to get an exposure to a new rural area and the socio- economic condition of people.
- PEO5 Acquire knowledge of recent trends and Technology and solve problem in industry and farmers.

PROGRAMME OUTCOMES (POS)

- PO1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex problems in Agricultural Engineering.
- PO2 **Problem analysis:** Identify, formulate, review research literature, and analyze Agricultural Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

- PO3 **Design/development of solutions:** Design the system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
- PO4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Agricultural Engineering.
- PO5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Agricultural Engineering activities with an understanding of the limitations.
- PO6 **Society and Environment sustainability:** Apply engineering knowledge and contextual reasoning to evaluate societal, health, safety, legal, cultural, and environmental impacts of professional engineering solutions, and demonstrate responsibility toward sustainable development and environmental protection in engineering practice.
- PO7 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO8 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO9 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO10 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
- PO11 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1 Graduates are enabled to perform in planning judicious utilization of natural resources through existing soil, water conservation techniques and various irrigation and drainage methods.
- PSO2 Graduates are able to design the process, evaluate and come out with solutions for farm implements through adequate farm power for sustainable agriculture.
- PSO3 Graduates are able to apply the comprehensive knowledge of engineering practices in production of agricultural products and further development with effective value-added technologies and become strong in quality control.

**B. TECH AGRICULTURAL ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTER I TO VIII**

(Applicable to the students admitted from the Academic year 2024-2025 onwards)

SEMESTER – I									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
UENT24101	Professional English -I	3	0	0	3	40	60	100	HSMC
UMAT24102	Matrices and Calculus	3	1	0	4	40	60	100	BSC
UPHT24103	Engineering Physics	3	0	0	3	40	60	100	BSC
UCHT24104	Engineering Chemistry	3	0	0	3	40	60	100	BSC
UPST24105	Problem Solving and Python Programming	3	0	0	3	40	60	100	ESC
UTAT24106	Heritage of Tamils/தமிழர் மரபு	1	0	0	1	40	60	100	HSMC
Practical / Employability Enhancement									
UIPE24101	Induction Programme	-	-	-	-	-	-	-	MC
UPSL2413	Problem Solving and Python Programming Laboratory	0	0	4	2	60	40	100	ESC
UPCL2412	Physics and Chemistry Laboratory	0	0	4	2	60	40	100	BSC
UENL2411	English Laboratory\$	0	0	2	1	60	40	100	EEC
Total Credits to be earned					22				
SEMESTER – II									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
UENT24201	Professional English-II	2	0	0	2	40	60	100	HSMC
UMAT24201	Statistics and Numerical Methods	3	1	0	4	40	60	100	BSC
UAIT24201	Principles and Practices of Crop Production	2	0	2	3	50	50	100	PCC
UBET24201	Basic Electrical, Electronics and Instrumentation Engineering	3	0	0	3	40	60	100	ESC
UGET24201	Engineering Graphics	2	0	4	4	50	50	100	ESC
UTAT24201	Tamils and Technology/ தமிழரும் தொழில்நுட்பமும்	1	0	0	1	40	60	100	HSMC
UNCC24001	NSS/YRC/Clubs	2	0	0	0	0	0	0	-
Practical / Employability Enhancement									
UGEL24201	Engineering Practices Laboratory	0	0	4	2	60	40	100	ESC
UBEL24201	Basic Electrical, Electronics and Instrumentation Engineering Laboratory	0	0	4	2	60	40	100	ESC
UGEL24202	Communication Laboratory / Foreign Language\$	0	0	4	2	60	40	100	EEC
Total Credits to be earned					23				

SEMESTER – III									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
UMAT24304	Fourier Series and Linear Programming	3	1	0	4	40	60	100	BSC
UAIT24301	Principles of Soil Science and Engineering	3	0	0	3	40	60	100	PCC
UAIT24302	Fluid Mechanics and Machines	3	0	0	3	40	60	100	PCC
UAIT24303	Surveying and Levelling	3	0	0	3	40	60	100	PCC
Theory with Practical									
UAITL24301	Unit Operations in Agricultural Processing	2	0	2	3	50	50	100	PCC
UMETL24305	Mechanics of Machines	3	0	2	4	50	50	100	PCC
Practical / Employability Enhancement									
UAIL24301	Fluid Mechanics Laboratory	0	0	4	2	60	40	100	PCC
UAIL24302	Soil Science Laboratory	0	0	3	1.5	60	40	100	PCC
UAIL24303	Surveying and Levelling Laboratory	0	0	3	1.5	60	40	100	PCC
USD24301	Soft Skill 1	2	0	0	0	0	0	0	MC
Total Credits to be earned					25				

SEMESTER – IV									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
UAIT24401	Tractors and Engine Systems	3	0	0	3	40	60	100	PCC
UAIT24402	Soil and Water Conservation Engineering	3	0	0	3	40	60	100	PCC
UAIT24403	Strength of Materials	3	0	0	3	40	60	100	PCC
UAIT24404	Hydrology and Water Resources Engineering	3	0	0	3	40	60	100	PCC
UESST24401	Environmental Sciences and Sustainability	2	0	0	2	40	60	100	BSC
Theory with Practical									
UMETL24301	Engineering Thermodynamics	3	0	2	4	50	50	100	PCC
Practical / Employability Enhancement									
UAIL24401	Tractor and Farm Engines Laboratory	0	0	2	1	60	40	100	PCC
UAIL24402	Strength of Materials Laboratory	0	0	4	2	60	40	100	PCC
USD24401	Soft Skill 2	2	0	0	0	0	0	0	MC
Total Credits to be earned					21				

SEMESTER – V									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
UAIT24501	Farm Equipment and Machinery	3	0	0	3	40	60	100	PCC
	Professional Elective - I	3	0	0	3	40	60	100	PEC
	Professional Elective - II	3	0	0	3	40	60	100	PEC
	Professional Elective - III	3	0	0	3	40	60	100	PEC
	Professional Elective - IV	3	0	0	3	40	60	100	PEC
	Mandatory Course-I	2	0	0	0	0	0	0	MC
Practical / Employability Enhancement									
UAIL24501	Farm Machinery Laboratory	0	0	4	2	60	40	100	PCC
UAIL24502	ICT in Agricultural Engineering Laboratory	0	0	4	2	60	40	100	PCC
UIDL24001	IDEA Lab	0	0	2	1	100	0	100	EEC
USD24501	Soft Skill 3	2	0	0	0	0	0	0	MC
USI24501	Summer Internship - I *	0	0	0	1	0	0	100	EEC
Total Credits to be earned					21				

SEMESTER – VI									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
UAIT24601	Post-Harvest Technology	3	0	0	3	40	60	100	PCC
UAIT24602	Irrigation and Drainage Engineering	3	0	0	3	40	60	100	PCC
	Professional Elective - V	3	0	0	3	40	60	100	PEC
	Professional Elective - VI	3	0	0	3	40	60	100	PEC
	Open Elective – I	3	0	0	3	40	60	100	OEC
	Mandatory Course - II	2	0	0	0	0	0	0	MC
Practical / Employability Enhancement									
UAIL24601	Post– Harvest Technology Laboratory	0	0	2	1	60	40	100	PCC
UAIL24602	CAD for Agriculture Machinery Laboratory	0	0	4	2	60	40	100	PCC
UAIL24603	Mini Project	0	0	4	2	0	0	0	EEC
USD24601	Soft Skill 4	2	0	0	0	0	0	0	MC
Total Credits to be earned					20				

SEMESTER – VII

Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
UAIT24701	Remote Sensing and Geographical Information System	3	0	0	3	40	60	100	PCC
UGET24707	Human values and Ethics	2	0	0	2	40	60	100	HSMC
UGET24702	Total Quality Management	3	0	0	3	40	60	100	HSMC
	Open Elective – II	3	0	0	3	40	60	100	OEC
	Open Elective – III	3	0	0	3	40	60	100	OEC
Theory with Practical									
UAITL24701	Renewable Energy in Agricultural Engineering	3	0	2	4	50	50	100	PCC
Practical / Employability Enhancement									
UAIL24701	Remote Sensing and GIS Laboratory	0	0	4	2	60	40	100	PCC
UAIL24702	Irrigation Field Laboratory	0	0	2	1	60	40	100	PCC
USI24701	Summer Internship - II #	0	0	0	1	0	0	100	EEC
Total Credits to be earned					22				

SEMESTER – VIII

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Cate gory
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
	Professional Elective- VII	3	0	0	3	40	60	100	PEC
	Open Elective-IV	3	0	0	3	40	60	100	OEC
Practical / Employability Enhancement									
UAIL24801	Project Work /Internship	---	---	20	10	60	40	100	EEC
Total Credits to be earned					16				

TOTAL CREDITS: 170

MANDATORY COURSES

S.No	Course Code	Course Title	Hours / Week			Total Contact periods	Credits
			L	T	P		
1	UMC24001	Disaster Risk Reduction and Management	2	0	0	2	0
2	UMC24002	Elements of Literature	2	0	0	2	0
3	UMC24003	Film Appreciation	2	0	0	2	0
4	UMC24004	Introduction to Gender Studies	2	0	0	2	0
5	UMC24005	Industrial Safety	2	0	0	2	0
6	UMC24006	Interpersonal Skills	2	0	0	2	0
7	UMC24007	Personality and Character Development	2	0	0	2	0
8	UMC24008	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	2	0	0	2	0

PROFESSIONAL ELECTIVE -PEC

Course Code	Course	Category	Hours /Week			C	Maximum Marks		
			L	T	P		CA	ESE	Total
STREAM – I (FOOD PROCESSING)									
UAIPE2401	Refrigeration and Cold Storage	PEC	3	0	0	3	40	60	100
UAIPE2402	Food and Dairy Engineering	PEC	3	0	0	3	40	60	100
UAIPE2403	Process Engineering of Fruits and Vegetables	PEC	3	0	0	3	40	60	100
UAIPE2404	Storage and Packaging Technology	PEC	3	0	0	3	40	60	100

UAIPE2405	Food Process Equipment and Design	PEC	3	0	0	3	40	60	100
UAIPE2406	Food Plant Design and Management	PEC	3	0	0	3	40	60	100
UAIPE2407	Emerging Technologies in Food Processing	PEC	3	0	0	3	40	60	100
STREAM-2 (FARM MACHINERY AND ENERGY)									
UAIPE2408	Farm Power and Machinery Management	PEC	3	0	0	3	40	60	100
UAIPE2409	Testing and Evaluation of Farm Machinery and Equipment	PEC	3	0	0	3	40	60	100
UAIPE2410	Biochemical and Thermo chemical Conversion of Biomass	PEC	3	0	0	3	40	60	100
UAIPE2411	Waste and By Product Utilization	PEC	3	0	0	3	40	60	100
UAIPE2412	Human Engineering and Safety in Farm Machinery Operations	PEC	3	0	0	3	40	60	100
UAIPE2413	Precision Farming Equipment	PEC	3	0	0	3	40	60	100
UMEPE2414	Solar Energy System	PEC	3	0	0	3	40	60	100
STREAM- 3 (WATER MANAGEMENT AND PROTECTED CULTIVATION)									
UAIPE2415	Watershed Planning and Management	PEC	3	0	0	3	40	60	100
UAIPE2416	Groundwater and Well Engineering	PEC	3	0	0	3	40	60	100
UAIPE2417	Design of Micro-Irrigation System	PEC	3	0	0	3	40	60	100
UAIPE2418	Protected Cultivation	PEC	3	0	0	3	40	60	100
UAIPE2419	On-farm Water Management	PEC	3	0	0	3	40	60	100
UAIPE2420	Irrigation Water Quality and Waste Water Management	PEC	3	0	0	3	40	60	100
UAIPE2421	Climate Change and Adaptation	PEC	3	0	0	3	40	60	100
STREAM-4(IT AND AGRICULTURAL BUSINESS MANAGEMENT)									
UAIPE2422	Integrated Farming System	PEC	3	0	0	3	40	60	100
UAIPE2423	Agri Business Management	PEC	3	0	0	3	40	60	100
UAIPE2424	Sustainable Agricultural and Food Security	PEC	3	0	0	3	40	60	100
UAIPE2425	System Analysis in Agricultural Engineering	PEC	3	0	0	3	40	60	100
UAIPE2426	IT in Agricultural System	PEC	3	0	0	3	40	60	100
UAIPE2427	Automation in Agriculture	PEC	3	0	0	3	40	60	100
UAIPE2428	Landscape Architecture	PEC	3	0	0	3	40	60	100

**List of Open Elective courses offered by Other Engineering Courses for Agricultural Engineering
(OPEN ELECTIVES – I, II & III)**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Biomedical Engineering									
UBMOE2401	Basics of Microbial Technology	3	0	0	3	40	60	100	OEC
UBMOE2402	Radiological Equipment	3	0	0	3	40	60	100	OEC
UBMOE2403	Fundamentals of Cell and Molecular Biology	3	0	0	3	40	60	100	OEC
UBMOE2404	Human Physiology	3	0	0	3	40	60	100	OEC
UBMOE2405	Lifestyle Diseases	3	0	0	3	40	60	100	OEC
UBMOE2406	Pathology and Microbiology	3	0	0	3	40	60	100	OEC
UBMOE2407	Medical Electronics	3	0	0	3	40	60	100	OEC
UBMOE2408	Assist Devices	3	0	0	3	40	60	100	OEC
Chemical Engineering									
UCHOE2401	Nanomaterials and applications.	3	0	0	3	40	60	100	OEC
UCHOE2402	Polymer Technology	3	0	0	3	40	60	100	OEC
UCHOE2403	Enzyme engineering	3	0	0	3	40	60	100	OEC
UCHOE2404	Bio Energy Resources	3	0	0	3	40	60	100	OEC
UCHOE2405	Chemical Process Safety	3	0	0	3	40	60	100	OEC
Civil Engineering									
UCEOE2401	Architectural Heritage of India	3	0	0	3	40	60	100	OEC
UCEOE2402	Building Planning and Construction	3	0	0	3	40	60	100	OEC
UCEOE2403	Elementary Civil Engineering	3	0	0	3	40	60	100	OEC
UCEOE2404	Energy and Environment	3	0	0	3	40	60	100	OEC
UCEOE2405	Global Warming and Climate Change	3	0	0	3	40	60	100	OEC
UCEOE2406	Introduction to Disaster Management and Mitigation	3	0	0	3	40	60	100	OEC
Computer Science and Engineering									
UCSOE2401	Introduction to C Programming	2	0	2	3	50	50	100	OEC
UCSOE2402	Introduction to Data Structures	2	0	2	3	50	50	100	OEC
UCSOE2403	Data Science Fundamentals	2	0	2	3	50	50	100	OEC
UCSOE2404	Introduction to Data Analytics	2	0	2	3	50	50	100	OEC
UCSOE2405	Artificial Intelligence and Machine Learning Fundamentals	2	0	2	3	50	50	100	OEC
UCSOE2406	IoT Concepts and Applications	2	0	2	3	50	50	100	OEC
Electronics and Communication Engineering									
UECOE2401	Industrial Electronics	3	0	0	3	40	60	100	OEC
UECOE2402	Image Processing and Computer Vision	3	0	0	3	40	60	100	OEC
UECOE2403	4G/5GCommunicationNetworks	3	0	0	3	40	60	100	OEC
UECOE2404	Wireless Communication	3	0	0	3	40	60	100	OEC

UECOE2405	Embedded and Real Time Systems	3	0	0	3	40	60	100	OEC
UECOE2406	Robotics and its Industrial Application	3	0	0	3	40	60	100	OEC
UECOE2407	Industrial IoT	3	0	0	3	40	60	100	OEC
UECOE2408	Sensors and Transducers	3	0	0	3	40	60	100	OEC
UECOE2409	Space Science	3	0	0	3	40	60	100	OEC
Electrical and Electronic Engineering									
UEEOE2401	Electrical safety	3	0	0	3	40	60	100	OEC
UEEOE2402	Introduction to Electrical Machines	3	0	0	3	40	60	100	OEC
UEEOE2403	Electric Energy Generation, Utilization and Conservation	3	0	0	3	40	60	100	OEC
UEEOE2404	Power Electronics and Drives	3	0	0	3	40	60	100	OEC
UEEOE2405	Electrical Estimation and Costing	3	0	0	3	40	60	100	OEC
UEEOE2406	Basics of Electrical measurements	3	0	0	3	40	60	100	OEC
UEEOE2407	Introduction to Control Engineering	3	0	0	3	40	60	100	OEC
UEEOE2408	Fundamentals of Electrical Drives	3	0	0	3	40	60	100	OEC
UEEOE2409	Energy conservation and Management	3	0	0	3	40	60	100	OEC
UEEOE2410	Automotive Electrical and Electronics Engineering	3	0	0	3	40	60	100	OEC
UEEOE2411	Introduction to Embedded systems	3	0	0	3	40	60	100	OEC
Mechanical Engineering									
UMEOE2401	Reverse Engineering	2	0	2	3	50	50	100	OEC
UMEOE2402	Non - Destructive Testing	2	0	2	3	50	50	100	OEC
UMEOE2403	Additive Manufacturing Technology	2	0	2	3	50	50	100	OEC
UMEOE2404	Energy Technology	3	0	0	3	40	60	100	OEC
UMEOE2405	Renewable Energy Technologies	3	0	0	3	40	60	100	OEC
UMEOE2406	Introduction to Industrial Engineering	3	0	0	3	40	60	100	OEC
UMEOE2407	Fiber Reinforced Plastics	3	0	0	3	40	60	100	OEC
UMEOE2408	NANO Technology	3	0	0	3	40	60	100	OEC

OPEN ELECTIVE COURSES (OEC)									
Open Elective courses offered by Agricultural Engineering to other branches									
Course Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	ESE	Total
Theory Course(s)									
UAIOE2401	Introduction to Food processing	OEC	3	0	0	3	40	60	100
UAIOE2402	Traditional Indian Foods	OEC	3	0	0	3	40	60	100
UAIOE2403	Fundamentals of Food Engineering	OEC	3	0	0	3	40	60	100
UAIOE2404	Remote Sensing Concepts	OEC	3	0	0	3	40	60	100
UAIOE2405	Basics of Integrated Water Resources Management	OEC	3	0	0	3	40	60	100

CREDITS SUMMARY

S.NO	CATEG ORY	CREDITS SUMMARY								TOTAL CREDI TS	PERC ENTA GE
		I	II	III	IV	V	VI	VII	VIII		
1.	HSMC	4	3					5		12	7.05
2.	BSC	12	4	4	2					22	12.94
3.	ESC	5	11							12	7.05
4.	PCC		3	21	19	7	9	10		73	42.94
5.	PEC					12	6		3	21	12.35
6.	OEC						3	6	3	12	7.05
7.	EEC	1	2			2	2	1	10	18	10.58
8.	MC	√		√	√	√ √	√√				
TOTAL		22	23	25	21	21	20	22	16	170	100%

HSMC – Humanities, Social Sciences and Management Courses

BSC – Basic Sciences Courses

ESC – Engineering Sciences Course

PCC – Professional Core Courses

PEC – Professional Elective Courses

OEC – Open Elective Courses

EEC – Employment Enhancement Course

MC – Mandatory course



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Accredited by NAAC with A+ grade & Recognised by UGC under section 2f & 12B
Mecheri, Salem Dt-636453, Tamilnadu



Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UENT24101	PROFESSIONAL ENGLISH - I	L	T	P	C	100
		3	0	0	3	
Course Objectives	• To improve the communicative competence of learners • To learn to use basic grammatic structures in suitable contexts • To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text • To help learners use language effectively in professional contexts • To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.					

Unit-I	INTRODUCTION TO EFFECTIVE COMMUNICATION	(1)
What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?		
Unit-I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	(8)
Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Why/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).		
Unit-II	NARRATION AND SUMMATION	(9)
Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar -Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.		
Unit-III	DESCRIPTION OF A PROCESS / PRODUCT	(9)
Reading - Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).		


CHAIRMAN - BOARD OF STUDIES
 The Kavery Engineering College,
 (Autonomous)
 Mecheri, Salem - 636 453.



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Unit-IV	CLASSIFICATION AND RECOMMENDATIONS	(9)
Reading – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc.). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal (chart , graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions		
Unit-V	EXPRESSION	(9)
Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.		
Total No of Periods to be Taught		45 Periods

TEXT BOOK:

1	English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2	English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University.

REFERENCES:

1	Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2	A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3	English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4	Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5	Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

COURSE OUTCOMES:

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

CO1:	To use appropriate words in a professional context
CO2:	To gain understanding of basic grammatical structures and use them in right context.
CO3:	To read and infer the denotative and connotative meanings of technical texts
CO4:	To read and interpret information presented in tables, charts and other graphic forms
CO5:	To write definitions, descriptions, narrations and essays on various topics


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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	3	3	3	1	3	-	-	-	-
CO2	1	1	1	1	1	3	3	3	1	3	-	-	-	-
CO3	2	3	2	3	2	3	3	3	2	3	3	-	-	-
CO4	2	3	2	3	2	3	3	3	2	3	3	-	-	-
CO5	2	3	3	3	-	3	3	3	2	3	-	-	-	-
Avg.	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMAT24102	MATRICES AND CALCULUS	L	T	P	C	100
		3	1	0	4	
Course Objectives	- To develop the use of matrix algebra techniques that is needed by engineers for practical 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	(9+3)
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications : Stretching of an elastic membrane.		
Unit-II	DIFFERENTIAL CALCULUS	(9+3)
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications : Maxima and Minima of functions of one variable.		
Unit-III	FUNCTIONS OF SEVERAL VARIABLES	(9+3)
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.		
Unit-IV	INTEGRAL CALCULUS	(9+3)
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 - Applications : Hydrostatic force and pressure, moments and centres of mass.		
Unit-V	MULTIPLE INTEGRALS	(9+3)
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications : Moments and centres of mass, moment of inertia.		
Total No of Periods to be Taught		60


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TEXT BOOK:

1	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2	Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3	James Stewart, "Calculus : Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:

1	Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
3	Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
4	Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6	Srimantha Pal and Bhunia. S.C, " Engineering Mathematics " Oxford University Press, 2015.
7	Thomas. G. B., Hass. J, and Weir. M.D, " Thomas Calculus ", 14th Edition, Pearson India, 2018.

COURSE OUTCOMES:

On completion 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.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	1	0	0	0	0	2	0	2	-	-	-
CO2	3	3	1	1	0	0	0	0	2	0	2	-	-	-
CO3	3	3	1	1	0	0	0	0	2	0	2	-	-	-
CO4	3	3	1	1	0	0	0	0	2	0	2	-	-	-
CO5	3	3	1	1	0	0	0	0	2	0	2	-	-	-
Avg.	3	3	1	1	0	0	0	0	2	0	2	-	-	-

1 – Slight, 2 – Moderate, 3 –Substantial , BT – Bloom's Taxonomy


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UPHT24103	ENGINEERING PHYSICS	L	T	P	C	100
		3	0	0	3	
Course Objectives	- To make the students effectively to achieve an understanding of mechanics. - To enable the students to gain knowledge of electromagnetic waves and its applications. - To introduce the basics of oscillations, optics and lasers. - Equipping the students to be successfully understand the importance of quantum physics. - To motivate the students towards the applications of quantum mechanics.					

Unit-I	MECHANICS	(9)
Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M.I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum – Introduction to nonlinear oscillations.		
Unit-II	ELECTROMAGNETIC WAVES	(9)
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 –analogy between electrical and mechanical oscillating systems - 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 –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO ₂ laser, semiconductor laser –Basic applications of lasers in industry.		
Unit-IV	BASIC QUANTUM MECHANICS	(9)
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.		
Unit-V	APPLIED QUANTUM MECHANICS	(9)
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.		
Total No of Periods to be Taught		45 Periods


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TEXT BOOK:

1	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2	E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

REFERENCES:

1	R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2	Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3	K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.

COURSE OUTCOMES:

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

CO1:	Understand the importance of mechanics.
CO2:	Express their knowledge in electromagnetic waves.
CO3:	Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
CO4:	Understand the importance of quantum physics.
CO5:	Comprehend and apply quantum mechanical principles towards the formation of energy bands.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	-	-	-
CO2	3	3	2	1	2	1	-	-	-	-	-	-	-	-
CO3	3	3	2	2	2	1	-	-	-	-	-	-	-	-
CO4	3	3	1	1	2	1	-	-	-	-	-	-	-	-
CO5	3	3	1	1	2	1	-	-	-	-	-	-	-	-
Avg.	3	3	1.6	1.2	1.8	1	-	-	-	-	-	-	-	-


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCHT24104	ENGINEERING CHEMISTRY	L	T	P	C	100
		3	0	0	3	
Course Objectives	- To inculcate sound understanding of water quality parameters and water treatment techniques. - To impart knowledge on the basic principles and preparatory methods of nanomaterials. - To introduce the basic concepts and applications of phase rule and composites. - To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics. - To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.					

Unit-I	WATER AND ITS TREATMENT	(9)
Water: Sources and impurities, Water quality parameters: Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralisation and zeolite process.		
Unit-II	NANOCHEMISTRY	(9)
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.		
Unit-III	PHASE RULE AND COMPOSITES	(9)
Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.		


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Unit-IV	FUELS AND COMBUSTION	(9)
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO₂ emission and carbon foot print.		
Unit-V	ENERGY SOURCES AND STORAGE DEVICES	(9)
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles-working principles; Fuel cells: H ₂ -O ₂ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.		
Total No of Periods to be Taught		Total: 45 periods

TEXT BOOK:	
1	P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2018.
2	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3	S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCES:	
1	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2	O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3	Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4	Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

COURSE OUTCOMES:	
On completion of the course, the students will be able to	
CO1:	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2:	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3:	To apply the knowledge of phase rule and composites for material selection requirements.
CO4:	To recommend suitable fuels for engineering processes and applications.
CO5:	To recognize different forms of energy resources and apply them for suitable applications in energy sectors.


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Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	2	1	-	1	1	-	-	-	-	1	-	-
CO2	2	-	-	1	-	2	2	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	1	1	-	-	1	2	-	-	-	-	-	-	-
CO5	3	1	2	1	-	2	2	-	-	-	-	2	-	-
Avg.	2.8	1.3	1.6	1	-	1.5	1.8	-	-	-	-	1.5	-	-
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														


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Department	CSE	Programme Code & Name	Common to All
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Semester-I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UPST24105	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C	100
		3	0	0	3	
Course Objectives	- To understand the basics of algorithmic problem solving. - To learn to solve problems using Python conditionals and loops. - To define Python functions and use function calls to solve problems. - To use Python data structures - lists, tuples, dictionaries to represent complex data. - To do input/output with files in Python.					

Unit-I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	(9)
Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.		
Unit-II	DATA TYPES, EXPRESSIONS, STATEMENTS	(9)
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.		
Unit-III	CONTROL FLOW, FUNCTIONS, STRINGS	(9)
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-Elif else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.		
Unit-IV	LISTS, TUPLES, DICTIONARIES	(9)
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation		
Unit-V	FILES, MODULES, PACKAGES	(9)
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).		
Total No of Periods to be Taught		TOTAL: 45 Periods


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TEXT BOOK:

1	Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2	Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2	G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data,,Third Edition, MIT Press 2021

COURSE OUTCOMES:

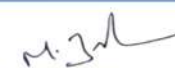
On completion of the course, the students will be able to

CO1:	Develop algorithmic solutions to simple computational problems.
CO2:	Develop and execute simple Python programs.
CO3:	Write simple Python programs using conditionals and looping for solving problems.
CO4:	Decompose a Python program into functions.
CO5:	Represent compound data using Python lists, tuples, dictionaries etc.
CO6:	Read and write data from/to files in Python programs

Mapping of COs with POs and PSOs

Cos / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2	PSO 3
CO1	3	3	3	3	2	-	-	-	-	2	2	3	3	-
CO2	3	3	3	3	2	-	-	-	-	2	2	3	-	-
CO3	3	3	3	3	2	-	-	-	-	2	-	3	-	-
CO4	2	2	-	2	2	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	1	-	2	-	-
CO6	2	2	-	-	2	-	-	-	-	1	-	2	-	-
Avg.	2	3	3	3	2	-	-	-	-	2	2	3	3	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UTAT24106	HERITAGE OF TAMIL	L	T	P	C	100
		1	0	0	1	
COURSE OBJECTIVES	• Understanding Sangam literature • Learning about the heritage of Tamil culture and the importance of rock art • Being able to recognize and identify the folk and martial art forms of Tamils • Understanding the principles of the Tamils • Understanding the contribution of Tamils to the Indian national movement and Indian culture					

UNIT 1	LANGUAGE AND LITERATURE	(3)
Language Families in India - Dravidian Languages –Tamil Classical Language - Classical Literature in Tamil–Secular Nature of Sangam Literature– Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land-Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.		
UNIT 2	HERITAGE – ROCK ART PAINTINGS TO MODERN ART–SCULPTURE	(3)
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
UNIT 3	FOLK AND MARTIAL ARTS	(3)
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
UNIT 4	THINAI CONCEPT OF TAMILS	(3)
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		
UNIT 5	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	(3)
Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India — Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine — Inscriptions & Manuscripts — Print History of Tamil Books.		
Total No of Periods to be Taught		Total: 15 periods


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TEXT BOOK:

1	1. தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும் கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர் இல, சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி –வைகை நதிக்கரையில் சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருதை -ஆற்றங்கரைநாகரிகம், (தொல்லியல்துறைவெளியீடு)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

REFERENCES:

1	Social Life of Tamils(Dr.K.K.Pillay) A joint publication of TNTB& ESCandRMRL–(in print)
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

COURSE OUTCOMES:

பாடநெறியின் முடிவில் மாணவர்கள்

CO1:	Gain The Knowledge About Various Literatures Of Tamil
CO2:	Learn The Uniqueness Of Tamil Cultural Heritage
CO3:	Find Various Art Forms Of Tamil Nadu
CO4:	Understand The Thina Cocept In Tamil
CO5:	Distinguish The Contribution Of Tamils To Indian National Movement And Indian Culture


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Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO2	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO3	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO4	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO5	-	-	-	-	-	1	1	-	-	1	-	1	-	-
Avg.	-	-	-	-	-	1	1	-	-	1	-	1	-	-
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UTAT24106	தமிழர் மரபு	L	T	P	C	100
		1	0	0	1	
பாடநெறி நோக்கங்கள்	- சங்க இலக்கியத்தை புரிந்து கொள்ளுதல் - தமிழ் கலாச்சாரத்தின் பாரம்பரியத்தையும் மற்றும் பாறை ஓவியத்தின் சிறப்பினையும் கற்றுத் தெளிதல் - தமிழர்களின் நாட்டுப்புற மற்றும் தற்காப்பு கலை வடிவங்களை அங்கீகரிக்கவும் அடையாளம் காண முடியும் - தமிழர்களின் திணைக் கோட்பாடுகள் உணர்தல் - இந்திய தேசிய இயக்கம் மற்றும் இந்திய கலாச்சாரத்திற்கு தமிழர்களின் பங்களிப்பை புரிதல்					

அலகு 1	மொழி மற்றும் இலக்கியம்	(3)
இந்திய மொழிக்குடும்பங்கள் - திராவிடமொழிகள் - தமிழ் ஒரு செம்மொழி தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம். ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிறுநிலக்கியங்கள் -தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.		
அலகு 2	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை சிற்பக்கலை	(3)
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் நாட்டுப்புறத் தெய்வங்கள் - குமரி முனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு		
அலகு 3	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	(3)
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஓயிலாட்டம். தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.		


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அலகு 4	தமிழர்களின் திணைக் கோட்பாடுகள்	(3)
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – சங்ககால நகரங்களும் துறை முகங்களும், சங்க கால தமிழர்களின் எழுத்தறிவும் கல்வி அறிவும் மற்றும் சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி		
அலகு 5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	(3)
இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் சுயமரியாதை இயக்கம் இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு- கல்வெட்டு மற்றும் எழுத்துப் படிகள் தமிழ்ப்புத்தகங்களின் அச்ச வரலாறு.		
Total No of Periods to be Taught		Total: 15 periods

TEXT BOOK:

1	தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும் கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர் இல, சுந்தரம். (விகடன்பிரசுரம்).
3	கீழடி –வைகை நதிக்கரையில் சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருநை -ஆற்றங்கரைநாகரிகம், (தொல்லியல்துறைவெளியீடு)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

REFERENCES:

1	Social Life of Tamils(Dr.K.K.Pillay)A joint publication of TNTB& ESCandRMRL–(in print)
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
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4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
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COURSE OUTCOMES:

பாடநெறியின் முடிவில் மாணவர்கள்

CO1:	தமிழ் இலக்கியங்களைப் பற்றிய அறிவைப் பெற முடியும்
CO2:	தமிழ் கலாச்சார பாரம்பரியத்தின் தனித்துவத்தைக் கற்றுக்கொள்ள முடியும்
CO3:	தமிழ்நாட்டின் பல்வேறு கலை வடிவங்களைக் கண்டறிதல்
CO4:	தமிழில் தினை கொள்கையைப் புரிந்துகொள்ளவும் முடியும்
CO5:	இந்திய தேசிய இயக்கத்திற்கும் இந்திய கலாச்சாரத்திற்கும் தமிழின் பங்களிப்பை அறிதல்

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO2	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO3	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO4	-	-	-	-	-	1	1	-	-	1	-	1	-	-
CO5	-	-	-	-	-	1	1	-	-	1	-	1	-	-
Avg.	-	-	-	-	-	1	1	-	-	1	-	1	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	CSE	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UPSL2413	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C	100
		0	0	4	2	
Course Objectives	• To understand the problem solving approaches. • To learn the basic programming constructs in Python. • To practice various computing strategies for Python-based solutions to real world problems. • To use Python data structures - lists, tuples, dictionaries. • To do input/output with files in Python.					

List of Exercises/Experiments

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)	
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).	
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)	
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)	
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)	
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)	
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)	
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)	
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)	
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)	
11. Exploring Pygame tool.	
12. Developing a game activity using Pygame like bouncing ball, car race etc.	
Total No of Periods to be Taught	60 Periods


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COURSE OUTCOMES:

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

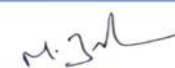
CO1:	Develop algorithmic solutions to simple computational problems
CO2:	Develop and execute simple Python programs
CO3:	Implement programs in Python using conditionals and loops for solving problems.
CO4:	Deploy functions to decompose a Python program
CO5:	Process compound data using Python data structures.
CO6:	Utilize Python packages in developing software applications.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1	ANACONDA JUPITER SOFTWARE	30
2	WINDOWS 10 OS, 6GB RAM	

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	3	3	-
CO2	3	3	3	3	2	-	-	-	-	2	2	3	-	-
CO3	3	3	3	3	2	-	-	-	-	2	-	3	-	-
CO4	2	2	-	2	2	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	1	-	2	-	-
CO6	2	2	-	-	2	-	-	-	-	1	-	2	-	-
Avg.	2	3	3	3	2	-	-	-	-	2	2	3	3	-
1 – Slight, 2 – Moderate, 3 –Substantial , BT – Bloom's Taxonomy														


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week				Credit	Maximum Marks
UPCL2412	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C	2	100
		0	0	4	2		

PHYSICS LABORATORY : (Any Seven Experiments)

Course Objectives	- To learn the proper use of various kinds of physics laboratory equipment. - To learn how data can be collected, presented and interpreted in a clear and concise manner. - To learn problem solving skills related to physics principles and interpretation of experimental data. - To determine error in experimental measurements and techniques used to minimize such error. - To make the student as an active participant in each part of all lab exercises.
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List of Exercises / Experiments

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.	
2. Simple harmonic oscillations of cantilever.	
3. Non-uniform bending - Determination of Young's modulus	
4. Uniform bending – Determination of Young's modulus	
5. Laser- Determination of the wave length of the laser using grating	
6. Air wedge - Determination of thickness of a thin sheet/wire	
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle b) Compact disc- Determination of width of the groove using laser.	
8 .Acoustic grating- Determination of velocity of ultrasonic waves in liquids.	
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids	
10. Post office box -Determination of Band gap of a semiconductor.	
11. Photoelectric effect.	
12. Michelson Interferometer.	
13. Melde's string experiment	
14. Experiment with lattice dynamics kit.	
Total No of Periods to be Taught	30 periods


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COURSE OUTCOMES:

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

CO1:	Understand the functioning of various physics laboratory equipment.
CO2:	Use graphical models to analyze laboratory data.
CO3:	Use mathematical models as a medium for quantitative reasoning and describing physical reality.
CO4:	Access, process and analyze scientific information.
CO5:	Solve problems individually and collaboratively.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	Torsional pendulum with accessories	5
2.	Simple harmonic oscillations of cantilever with accessories	5
3.	Non-uniform bending - Young's modulus with accessories	5
4.	Laser- Determination of the wave length of the laser using grating with accessories	5
5.	Air wedge with accessories	5
6.	Optical fibre with accessories Compact disc with accessories	5
7.	Ultrasonic interferometer	5

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-
Avg.	3	2.4	2.6	1	1								
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy													


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UPCL2412	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C	100
		0	0	4	2	

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

Course 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 alloys. - To demonstrate the synthesis of nanoparticles
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List of Exercises/Experiments	
1 Preparation of Na ₂ CO ₃ as a primary standard and estimation of acidity of a water sample using the primary standard	
2.Determination of types and amount of alkalinity in water sample. Split the first experiment into two	
3. Determination of total, temporary & permanent hardness of water by EDTA method.	
4. Determination of DO content of water sample by Winkler's method.	
5. Determination of chloride content of water sample by Argentometric method.	
6. Estimation of copper content of the given solution by Iodometry.	
7. Estimation of TDS of a water sample by gravimetry.	
8. Determination of strength of given hydrochloric acid using pH meter.	
9. Determination of strength of acids in a mixture of acids using conductivity meter.	
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration) .	
11. Estimation of iron content of the given solution using potentiometer	
12. Estimation of sodium /potassium present in water using flame photometer.	
13. Preparation of nanoparticles (TiO ₂ /ZnO/CuO) by Sol-Gel method	
14. Estimation of Nickel in steel.	
15. Proximate analysis of Coal	
Total No of Periods to be Taught	Total: 30 periods


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COURSE OUTCOMES:

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

CO1:	To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
CO2:	To determine the amount of metal ions through volumetric and spectroscopic techniques
CO3:	To analyse and determine the composition of alloys.
CO4:	To learn simple method of synthesis of nanoparticles.
CO5:	To quantitatively analyse the impurities in solution by electroanalytical techniques"

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	PH meter	15 nos
2.	Conductivity meter	15 nos
3.	Potentiometer	15 nos
4.	Flame photometer	4 nos
5.	Electronic Balance (Four digit)	1 no
6.	Hotplate with temperature controller	5 nos
7.	Hot Air Oven	1 no
8.	Muffle furnace	1 no
9.	Magnetic stirrer	2 nos

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	1	-	-	2	2	-	-	-	-	2	-	-
CO2	3	1	2	-	-	1	2	-	-	-	-	1	-	-
CO3	3	2	1	1	-	-	1	-	-	-	-	-	-	-
CO4	2	1	2	-	-	2	2	-	-	-	-	-	-	-
CO5	2	1	2	-	1	2	2	-	-	-	-	1	-	-
Avg.	2.6	1.3	1.6	1	1	1.4	1.8	-	-	-	-	1.3	-	-
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														


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Department	S&H	Programme Code & Name	Common to All
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Semester I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UENL2411	ENGLISH LABORATORY	L	T	P	C	100
		0	0	2	1	
Course Objectives	• To improve the communicative competence of learners • To help learners use language effectively in academic /work contexts • To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc. • To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts. • To use language efficiently in expressing their opinions via various media.					

Unit-I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; politeness strategies-making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example).		
Unit-II	NARRATION AND SUMMATION	6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings- engaging in small talk- describing requirements and abilities		
Unit-III	DESCRIPTION OF A PROCESS / PRODUCT	6
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.		
Unit-IV	CLASSIFICATION AND RECOMMENDATIONS	6
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.		
Unit-V	EXPRESSION	6
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes.		
Total No of Periods to be Taught		30 Periods


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ASSESSMENT PATTERN:

1.	One online / app based assessment to test listening /speaking
2.	End Semester ONLY listening and speaking will be conducted online.
3.	Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam .

COURSE OUTCOMES:

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

CO1:	To listen to and comprehend general as well as complex academic information
CO2:	To listen to and understand different points of view in a discussion
CO3:	To speak fluently and accurately in formal and informal communicative contexts
CO4:	To describe products and processes and explain their uses and purposes clearly and accurately
CO5:	To express their opinions effectively in both formal and informal discussions

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	3	3	3	3	3	3	3	-	-
CO2	3	3	3	3	1	3	3	3	3	3	3	3	-	-
CO3	3	3	3	3	1	3	3	3	3	3	3	3	-	-
CO4	3	3	3	3	1	3	3	3	3	3	3	3	-	-
CO5	3	3	3	3	1	3	3	3	3	3	3	3	-	-
Avg.	3	3	3	3	1	3	3	3	3	3	3	3	-	-

1 – Slight, 2 – Moderate, 3 – Substantial , BT – Bloom's Taxonomy


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Department	S&H	Programme Code & Name	Common to All
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Semester II

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UENT24201	PROFESSIONAL ENGLISH - II	L	T	P	C	100
		2	0	0	2	
Course Objectives	- To engage learners in meaningful language activities to improve their reading and writing skills - To learn various reading strategies and apply in comprehending documents in professional context - To help learners understand the purpose, audience, contexts of different types of writing - To develop analytical thinking skills for problem solving in communicative contexts - To demonstrate an understanding of job applications and interviews for internship and placements					

Unit-I	MAKING COMPARISONS	(6)
Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases		
Unit-II	EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING	(6)
Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds		
Unit-III	PROBLEM SOLVING	(6)
Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences.		
Unit-IV	REPORTING OF EVENTS AND RESEARCH	(6)
Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions		
Unit-V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	(6)
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses		
Total No of Periods to be Taught		30 Periods


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TEXT BOOK:

1	English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2	English for Science & Technology Cambridge University Press 2021.
3	Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1	Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2	Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3	Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4	Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5	Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

COURSE OUTCOMES:

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

CO1:	To compare and contrast products and ideas in technical texts.
CO2:	To identify and report cause and effects in events, industrial processes through technical texts
CO3:	To analyse problems in order to arrive at feasible solutions and communicate them in the written format.
CO4:	To present their ideas and opinions in a planned and logical manner
CO5:	To draft effective resumes in the context of job search.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	2	3	3	-	-	-
CO2	3	3	3	3	3	3	3	3	2	3	3	-	-	-
CO3	3	3	3	3	3	3	3	3	2	3	3	-	-	-
CO4	3	3	3	3	2	3	3	3	2	3	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	3	-	-	-
Avg.	3	3	3	3	2.75	3	3	3	2.2	3	3	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	EEE	Programme Code & Name	Common to 104 – CSE, 205 – IT 243 – AI&DS, 106 – ECE, 114 – MECH, 121 – BME
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Semester II

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UGEL24201	ENGINEERING PRACTICES LABORATORY	L	T	P	C	100
		0	0	4	2	
Course Objectives	- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common house hold wood work. - Wiring various electrical joints in common household electrical wire work. - 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 equipments; Making a tray out of metal sheet using sheet metal work. - 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.	
PART II: ELECTRICAL ENGINEERING PRACTICES	15
a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket b) Staircase wiring c) Fluorescent Lamp wiring with introduction to CFL and LED types. d) Energy meter wiring and related calculations/ calibration e) Study of Iron Box wiring and assembly f) Study of Fan Regulator (Resistor type and Electronic type using Diac /Triac /quadrac) g) Study of emergency lamp wiring/Water heater	
GROUP – B (MECHANICAL AND ELECTRONICS)	
PART III MECHANICAL ENGINEERING PRACTICES	15


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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) Study an elements of smart phone.
- b) Assembly and dismantle of LED TV.
- c) Assembly and dismantle of computer/ laptop

Total No of Periods to be Taught

60 Periods

COURSE OUTCOMES:

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

CO1:	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.
CO2:	Wire various electrical joints in common household electrical wire work.
CO3:	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 equipments; Make a tray out of metal sheet using sheet metal work.
CO4:	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB


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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	1	-	-	-	-	2	2	1	-
CO2	3	2	-	-	1	1	-	-	-	-	2	2	1	-
CO3	3	2	-	-	1	1	-	-	-	-	2	2	1	-
CO4	3	2	-	-	1	1	-	-	-	-	2	2	1	-
Avg.	3	2	-	-	1	1	-	-	-	-	2	2	1	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	S&H	Programme Code & Name	Common to All
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Semester II

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UGEL24202	COMMUNICATION LABORATORY	L	T	P	C	100
		0	0	4	2	
Course Objectives	- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context. - To analyse concepts and problems and make effective presentations explaining them clearly and precisely. - To be able to communicate effectively through formal and informal writing. - To be able to use appropriate language structures to write emails, reports and essays - To give instructions and recommendations that are clear and relevant to the context					

Unit-I		12
Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition-discussing progress toward goals-talking about experiences- talking about events in life- discussing past events-Writing: writing emails (formal & semi-formal).		
Unit-II		12
Speaking: discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.		
Unit-III		12
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.		
Unit-IV		12
Speaking: discussing the natural environment-describing systems-describing position and movement-explaining rules-(example- discussing rental arrangements)- understanding technical instructions-Writing: writing instructions-writing a short article		
Unit-V		12
Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing: job application(Cover letter + Curriculum vitae)-writing recommendations.		
Total No of Periods to be Taught		60 periods


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COURSE OUTCOMES:

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

CO1:	Speak effectively in group discussions held in a formal / semi formal contexts.
CO2:	Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
CO3:	Write emails, letters and effective job applications.
CO4:	Write critical reports to convey data and information with clarity and precision
CO5:	Give appropriate instructions and recommendations for safe execution of tasks

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	3	1	3	3	3	3	3	3	3	-	-
CO2	2	3	3	3	1	3	3	3	3	3	3	3	-	-
CO3	2	2	3	3	1	3	3	3	3	3	3	3	-	-
CO4	3	3	3	3	3	3	3	3	3	3	3	3	-	-
CO5	3	3	3	3	3	3	3	3	3	3	3	3	-	-
Avg.	2.4	2.8	3	3	1.8	3	3	3	3	3	3	3	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	MECHANICAL	Programme Code & Name	114 - Mechanical			
Semester						
Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UGET24201	ENGINEERING GRAPHICS	L	T	P	C	100
		2	0	4	4	
Course Objectives	1. Drawing engineering curves. 2. Drawing freehand sketch of simple objects. 3. Drawing orthographic projection of solids and section of solids. 4. Drawing development of solids 5. Drawing isometric and perspective projections of simple solids.					
CONCEPTS AND CONVENTIONS (Not for Examination) 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				(6+12)	
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.						
Unit-II	PROJECTION OF POINTS, LINES AND PLANE SURFACE				(6+12)	
Orthographic projection- principles-Principal 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 traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.						
Unit-III	PROJECTION OF SOLIDS AND FREEHAND SKETCHING				(6+12)	
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three-dimensional modeling of simple objects by CAD Software (Not for examination)						
Unit-IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES				(6+12)	
Sectioning of above 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. Practicing three-dimensional modeling of simple objects by CAD Software (Not for examination)						
Unit-V	ISOMETRIC AND PERSPECTIVE PROJECTIONS				(6+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 - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. Practicing three-dimensional modelling of isometric projection of simple objects by CAD Software (Not for Examination).						
Total No of Periods to be Taught			TOTAL: (L=30; P=60) 90 PERIODS			


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TEXT BOOK:

1	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019
2	Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3	Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES:

1	Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3	Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4	Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited,

COURSE OUTCOMES:

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

CO1:	Use BIS conventions and specifications for engineering drawing.
CO2:	Construct the conic curves, involutes and cycloid.
CO3:	Solve practical problems involving projection of lines.
CO4:	Draw the orthographic, isometric and perspective projections of simple solids.
CO5:	Draw the development of simple solids.

Mapping of COs with POs and PSOs

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	-	-	-	-	3	-	2	2	2
CO2	3	1	2	-	2	-	-	-	-	3	-	2	2	2
CO3	3	1	2	-	2	-	-	-	-	3	-	2	2	2
CO4	3	1	2	-	2	-	-	-	-	3	-	2	2	2
CO5	3	1	2	-	2	-	-	-	-	3	-	2	2	2
Avg.	3	1	2	-	2	-	-	-	-	3	-	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	S&H	Programme Code & Name	Common to All
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Semester II

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMAT24201	STATISTICS AND NUMERICAL METHODS	L	T	P	C	100
		3	1	0	4	
Course Objectives	• This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology. • To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems. • To introduce the basic concepts of solving algebraic and transcendental equations. • To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines. • To acquaint the knowledge of various techniques and methods of solving ordinary differential equations					

Unit-I	TESTING OF HYPOTHESIS	(9+3)
Sampling distributions - Tests for single mean, proportion and 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.		
Unit-II	DESIGN OF EXPERIMENTS	(9+3)
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design – 2^2 factorial design.		
Unit-III	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	(9+3)
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.		
Unit-IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION	(9+3)
Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.		
Unit-V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	(9+3)
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.		
Total No of Periods to be Taught		60 Periods


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TEXT BOOK:

1	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES:

1.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4.	Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
6.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010

COURSE OUTCOMES:

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

CO1:	Apply the concept of testing of hypothesis for small and large samples in real life problems.
CO2:	Apply the basic concepts of classifications of design of experiments in the field of agriculture
CO3:	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
CO4:	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
CO5:	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	0	0	0	2	0	2	-	-	-
CO2	3	3	1	1	1	0	0	0	2	0	2	-	-	-
CO3	3	3	1	1	1	0	0	0	2	0	2	-	-	-
CO4	3	3	1	1	1	0	0	0	2	0	2	-	-	-
CO5	3	3	1	1	1	0	0	0	2	0	2	-	-	-
Avg.	3	3	1	1	1	0	0	0	2	0	2	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	S&H	Programme Code & Name	Common to All
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Semester II

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UTAT24201	TAMILS AND TECHNOLOGY	L	T	P	C	100
		1	0	0	1	
COURSE OBJECTIVES	• To Understand About Weaving And Ceramic Technology Of Tamils • To Compare The Design And Constructive Technology Of Cheras, Cholas, Pallavas And Nayakkars • To Gain Knowledge In Various Manufacturein Technology Of Tamils • To Analyse The Agriculture And Fishery Knowledge Of Tamils • To Learn About Scientic Tamils And Its And Use In Online Platforms					

UNIT 1	WEAVINGANDCERAMICTECHNOLOGY	(3)
Weaving Industry during Sangam Age –Ceramic technology – Black and Red Ware Potteries (BRW) – Graffition Potteries.		
UNIT 2	DESIGNANDCONSTRUCTIONTECHNOLOGY	(3)
Designing and Structural construction House & Designs in house hold materials during Sangam Age - Building materials and Hero stones of Sangam age —Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places – Temples of Nayaka Period-Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal-Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.		
UNIT 3	MANUFACTURINGTECHNOLOGY	(3)
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins—Beads making-industries Stone beads-Glass beads – Terra cotta beads – Shell beads / bone beats – Archeological evidences-Gem stone types described in Silappathikaram.		
UNIT 4	UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY	(3)
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoomp of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries — Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
UNIT 5	SCIENTIFTAMIL&TAMILCOMPUTING	(3)
Development of Scientific Tamil - Tamil computing– Digitalization of Tamil Books–Development of Tamil Software –Tamil Virtual Academy–Tamil Digital Library – Online Tamil Dictionaries– Sorkuvai Project.		
Total No of Periods to be Taught		Total: 15 periods


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TEXT BOOK:	
1	தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித்தமிழ் – முனைவர் இல, சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி –வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருதை – ஆற்றங்கரை நாகரிகம், (தொல்லியல் துறை வெளியீடு)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

REFERENCES:	
1	Social Life of Tamils(Dr.K.K.Pillay) A joint publication of TNTB& ESC and RMRL–(in print)
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

COURSE OUTCOMES:	
பாடநெறியின் முடிவில் மாணவர்கள்	
CO1:	Relate The Weaving Ceramic Technology Of Tamils
CO2:	Understand The Knowledge Of Tamils In design And stone Construction Technology
CO3:	Recognize The Manufacturing Technology Knowledge Of Tamils
CO4:	Criticize The Agriculture And Fishery Knowledge Of Tamil
CO5:	Apply Scientific Tamil In Various Online Plat form

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Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	1	1	1	1	1	-	1	-	-
CO2	-	-	-	-	-	2	2	2	2	2	-	2	-	-
CO3	-	-	-	-	-	2	2	2	2	2	-	2	-	-
CO4	-	-	-	-	-	1	1	1	1	1	-	1	-	-
CO5	-	-	-	-	-	2	2	2	2	2	-	2	-	-
Avg.	-	-	-	-	-	2	2	2	2	2	-	2	-	-
1 – Slight, 2 – Moderate, 3 – Substantial , BT – Bloom's Taxonomy														


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Department	S&H	Programme Code & Name	Common to All
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Semester II

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UTAT24201	TAMILS AND TECHNOLOGY	L	T	P	C	100
		1	0	0	1	
பாடநெறி நோக்கங்கள்	- நெசவு மற்றும் பாணை தொழில்நுட்பத்தைப் புரிந்துகொள்ளல் - சேரர்கள், சோழர்கள், பல்லவர்கள் மற்றும் நாயக்கர்களின் கட்டுமான வடிவமைப்பு தொழில்நுட்பத்தை ஒப்பிடுதல் - தமிழர்களின் பல்வேறு உற்பத்தி தொழில்நுட்ப அறிவைப் பெறுதல். - தமிழர்களின் வேளாண்மை மற்றும் கடல்சார் அறிவை பகுப்பாய்வு செய்தல். - அறிவியல் தமிழையும் மற்றும் இணைய பயன்பாட்டையும் கற்றல்					

அலகு 1	நெசவுமற்றும்பாணைத்தொழில்நுட்பம்	(3)
சங்ககாலத்தில் நெசவுத்தொழில், பாணைத்தொழில்நுட்பம், கருப்பு சிவப்புபாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.		
அலகு 2	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	(3)
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமான பொருட்களும், வீட்டுப் பொருட்களில் வடிவமைப்பும். சங்க காலத்தில் நடுகல்லும் சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் மாமல்லபுரச் சிற்பங்களும், கோவில்களும் சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழி பாட்டுத் தலங்கள், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் செட்டிநாட்டு வீடுகள் பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ- சாரோசெனிக் கட்டிடக்கலை.		
அலகு 3	உற்பத்தித்தொழில்நுட்பம்	(3)
கப்பல் கட்டும் கலை உலோகவியல் – இரும்புத் தொழிற்சாலை இரும்பை உருக்குதல், எஃகு வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் மணி உருவாக்கும் தொழிற்சாலைகள் கல்மணிகள். கண்ணாடி மணிகள் – சங்கு மணிகள் சுடுமண் மணிகள் எலும்புத் துண்டுகள் தொல்வியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.		
அலகு 4	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்	(3)





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அணை, ஏரி, குளங்கள், மதகு சோழர் காலக் குழுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு கால் நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் கடல்சார் அறிவு - மீன்வளம் – அறிவுசார் சமூகம் முத்து மற்றும் முத்துக் குளித்தல்.

அலகு 5	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	(3)
அறிவியல் தமிழின் வளர்ச்சி கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் தமிழ் இணையக் கல்விக்கழகம் தமிழ் மின் நூலகம் இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத்திட்டம்.		
Total No of Periods to be Taught	Total: 15 periods	

TEXT BOOK:	
1	தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித்தமிழ் – முனைவர் இல, சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி –வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை – ஆற்றங்கரை நாகரிகம், (தொல்லியல் துறை வெளியீடு)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

REFERENCES:	
1	Social Life of Tamils(Dr.K.K.Pillay) A joint publication of TNTB& ESC and RMRL–(in print)
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5	Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)


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COURSE OUTCOMES:

பாடநெறியின் முடிவில் மாணவர்கள்

CO1:	நெசவு மற்றும் பாணை தொழில்நுட்பத்தைப் புரிந்துகொள்ள
CO2:	வடிவமைப்பு மற்றும் கட்டிட தொழில்நுட்பத்தில் தமிழர்களின் அறிவை பெறுவார்கள்
CO3:	தமிழர்களின் பல்வேறு உற்பத்தி தொழில்நுட்ப அறிவை கண்டறிவார்கள்
CO4:	தமிழர்களின் வேளாண்மை மற்றும் கடல்சார் அறிவை விவாதிப்பார்கள்.
CO5:	இணைய பயன்பாடுகளின் அறிவியல் தமிழை பயன்படுத்திப் பார்ப்பார்கள்

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	1	1	1	1	-	1	-	-
CO2	-	-	-	-	-	2	2	2	2	2	-	2	-	-
CO3	-	-	-	-	-	2	2	2	2	2	-	2	-	-
CO4	-	-	-	-	-	1	1	1	1	1	-	1	-	-
CO5	-	-	-	-	-	2	2	2	2	2	-	2	-	-
Avg.	-	-	-	-	-	2	2	2	2	2	-	2	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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UAIT24201		PRINCIPLES AND PRACTICES OF CROP PRODUCTION				
		Category	L	T	P	Credit
		BSC/ESC	2	0	2	3
Course objectives						
- To introduce the students to principles of agricultural and horticultural crop production - Understand the crop selection and establishment procedures. - Learn about the different management practices during crop establishment and growth. - To introduce the production practices of agricultural and horticultural crops. - To delineate the role of agricultural engineers in relation to various crop production practices.						
UNIT – I	AGRICULTURE AND CROP PRODUCTION					6
Introduction to agriculture and its crop production sub-sectors - field crop production and horticulture; Factors affecting crop growth and production: genetic (internal) and environmental (external) factors; Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices						
UNIT – II	CROP SELECTION AND ESTABLISHMENT					6
Regional and seasonal selection of crops; Systems of crop production; Competition among crop plants; Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage; Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing.						
UNIT – III	CROP MANAGEMENT					6
Crop water Management; Crop nutrition management - need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients including fertigation scheduling; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest.						
UNIT – IV	PRODUCTION PRACTICES OF AGRICULTURAL CROPS					6
Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereal crops, grain legumes, oil seed crops, sugarcane, and fiber crops, and special purpose crops such as those grown for green manure and fodder.						
UNIT – V	PRODUCTION PRACTICES OF HORTICULTURAL CROPS					6
Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, flower crops; Cultivation practices of representatives of each group; Special features of production of horticultural crops - green house cultivation.						
PRACTICAL						
- Identification of field and horticultural crops. - Seeds - estimation of seed rate, germination of seeds. - Nursery, demonstration on different types in field. - Fertilizers-type, estimation of recommended dose. - Weeds, identification of major weed type, demonstration on simple weeding implements. - Weedicide uses and caution. - Pest identification and control, demonstration of IPM methods. - Harvesting methods for various field and horticultural crops and implements used. - Observing in demonstration field, cultivation of wet land, dry land and garden land crops and documenting of growth stage and recording of biometric observations.						
TOTAL (L: 30 + P:30) = 60 PERIODS						



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TEXT BOOK:

1. Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.
2. Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 2005.
3. Handbook of Agriculture. ICAR Publications, New Delhi, 2011.

REFERENCES:

1. Bose T. K. and L.P.Yadav. Commercial Flowers, Naya Prakash, Calcutta.1989.
2. Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore. 2005
3. Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices, plantation crops, medicinal and aromatic plants. Rajalakshmi Publications, Nagercoil. 1993.
4. Kumar, N. "Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 7th edition, 2015.
5. Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications, New Delhi. 1989.

COURSE OUTCOMES:

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

- CO1** Students completing this course would have acquired knowledge on the basic principles of crop production
- CO2** Students will be able to select suitable crops and decide upon its establishment procedures
- CO3** Students will get knowledge on the different crop management practices.
- CO4** The students will have the required knowledge in the area of production of agricultural and horticultural crops.
- CO5** Students will be able to delineate their role in relation to various crop production practices.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	-	-	-	-	-	-	2	1	-	-	2	3	-
CO2	3	-	-	-	-	-	-	-	2	-	-	2	-	-
CO3	3	2	-	-	3	3	-	-	2	-	2	3	2	2
CO4	-	-	1	1	2	2	1	-	3	1	3	3	1	2
CO5	-	-	-	1	2	2	1	-	3	1	3	3	1	2
Avg.	3	2	1	1	2	2	1	2	2	1	3	3	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UBET24201	BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING													
<table><tr><td>Category</td><td>L</td><td>T</td><td>P</td><td>Credit</td></tr><tr><td>BSC/ESC</td><td>3</td><td>0</td><td>0</td><td>3</td></tr></table>					Category	L	T	P	Credit	BSC/ESC	3	0	0	3
Category	L	T	P	Credit										
BSC/ESC	3	0	0	3										
Course objectives														
- To introduce the basics of electric circuits and analysis - To impart knowledge in domestic wiring - To impart knowledge in the basics of working principles and application of electrical machines - To introduce analog devices and their characteristics - To introduce the functional elements and working of sensors and transducers.														
UNIT – I	ELECTRICAL CIRCUITS				9									
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only), Three phase supply – star and delta connection – power in three-phase systems														
UNIT – II	MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS				9									
Magnetic circuits-definitions-MMF, flux, reluctance, magnetic field intensity, flux density, fringing, self and mutual inductances-simple problems. Domestic wiring , types of wires and cables, earthing ,protective devices- switch fuse unit- Miniature circuit breaker- moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid														
UNIT – III	ELECTRICAL MACHINES				9									
Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, working principle and Applications of Transformer, three phase Alternator, Synchronous motor and Three Phase Induction Motor.														
UNIT – IV	ANALOG ELECTRONICS				9									
Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters, harmonics.														
UNIT – V	SENSORS AND TRANSDUCERS				9									
Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors,Strain gauge, LVDT, differential pressure transducer,optical and digital transducers, Smart sensors Thermal Imagers.														
TOTAL = 45 PERIODS														
TEXT BOOK:														
1.	D P Kothari and I.J Nagarath, “Basic Electrical and Electronics Engineering”, McGraw Hill Education (India) Private Limited, Second Edition, 2020													
2.	A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2015.													



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3.	S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
4.	James A Svoboda, Richard C. Dorf, Dorf's Introduction to Electric Circuits, Wiley, 2018
REFERENCES:	
1.	John Bird, "Electrical Circuit theory and technology", Routledge; 2017.
2.	Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
3.	Albert Malvino, David Bates, ' Electronic Principles , McGraw Hill Education; 7th edition, 2017
4.	Muhammad H. Rashid, "Spice for Circuits and electronics", 4th Edition., Cengage India, 2019.
5.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

COURSE OUTCOMES:

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

CO1:	Compute the electric circuit parameters for simple problems
CO2:	Explain the concepts of domestic wiring and protective devices
CO3:	Explain the working principle and applications of electrical machines
CO4:	Analyze the characteristics of analog electronic devices
CO5:	Explain the types and operating principles of sensors and transducers

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO2	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO3	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO4	2	1	1	-	-	-	1	-	-	-	-	-	-	-
CO5	2	1	1	-	-	-	1	-	-	-	-	-	-	-
Avg.	2	1	1	-	-	-	1	-	-	-	-	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UBEL24201	BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY				
	Category	L	T	P	Credit
	EEC/BSC	0	0	4	2

Course objectives

- To train the students in conducting load tests electrical machines
- To gain practical experience in experimentally obtaining the characteristics of electronic devices and rectifiers
- To train the students to measure three phase power and displacement

List of Exercises / Experiments:

- Verification of ohms and Kirchhoff's Laws.
- Three Phase Power Measurement.
- Load test on DC Shunt Motor.
- Load test on Self Excited DC Generator
- Load test on Single phase Transformer.
- Load Test on Induction Motor.
- Characteristics of PN and Zener Diodes
- Characteristics of BJT, SCR and MOSFET
- Design and analysis of Half wave and Full Wave rectifiers
- Measurement of displacement of LVDT

Total: 30 periods

COURSE OUTCOMES:

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

CO1:	Use experimental methods to verify the Ohm's law and Kirchhoff's Law and to measure three phase power
CO2:	Analyze experimentally the load characteristics of electrical machines
CO3:	Analyze the characteristics of basic electronic devices
CO4:	Use LVDT to measure displacement

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO87	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	1	2	-	-	1.5	2	-	-	-	-	-
CO2	2	3	1	2	-	-	1.5	2	-	-	-	-	-
CO3	2	3	1	2	-	-	1.5	2	-	-	-	-	-
CO4	2	3	1	2	-	-	1.5	2	-	-	-	-	-
Avg.	1.6	1.4	0.8	1.6	-	-	1.2	1.6	-	-	-	-	-

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UMAT24304		FOURIER SERIES AND LINEAR PROGRAMMING				
		Category	L	T	P	Credit
		PCC	3	1	0	4
Course objectives						
To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.						
UNIT – I	FOURIER SERIES					9
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value - Parseval’s identity— Harmonic analysis.						
UNIT – II	FOURIER TRANSFORMS					9
Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval’s identity.						
UNIT – III	LINEAR PROGRAMMING PROBLEMS					9
Mathematical formulation - Graphical method - Simplex method - Artificial variable techniques - Big M Method - Two phase Simplex method - Duality - Dual Simplex method.						
UNIT – IV	TRANSPORTATION AND ASSIGNMENT PROBLEMS					9
Matrix form - Loops in T.P - Initial basic feasible solutions - Transportation algorithm - Degeneracy in T.P - Assignment and Routing problems.						
UNIT – V	NON-LINEAR PROGRAMMING PROBLEMS					9
Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn – Tucker Conditions – Quadratic programming.						
Total: 45 periods						
TEXT BOOK:						
1.	Grewal B.S., “Higher Engineering Mathematics”, 44 th Edition, Khanna Publishers, New Delhi, 2018.					
2.	H.A. Taha, "Operations Research - An introduction”, 10 th Edition, Pearson Education, New Delhi, 2017.					
3.	Kanti Swarup, Guptha P.K. and Man Mohan, "Operations Research”, 5 th Edition, Sultan Chand & Sons, New Delhi, 2010.					
REFERENCES:						
1.	Kreyszig E, "Advanced Engineering Mathematics", 10 th Edition, John Wiley, New Delhi, India, 2016.					
2.	Ravindran, Philips and Solberg "Operations Research, Principles and Practice", 2 nd Edition, Wiley, New Delhi, 2007.					
3.	Frederick S Hillier and Gerald J. Lieberman, "Introduction to Operations Research”, Mc Graw Hill, New Delhi, 2017.					
4.	J.K. Sharma, " Operations Research - Theory and Applications ", Mac Millan India Ltd, 2 nd Edition, New Delhi, 2003.					



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COURSE OUTCOMES:

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

CO1	Apply Fourier series techniques used in wide variety of situations in which the functions used are not periodic and to solve boundary value problems.
CO2	Apply the Fourier transform techniques to solve boundary value problems.
CO3	Develop a fundamental understanding of linear programming models, able to develop a linear programming model from problem description, apply the Simplex method for solving linear programming problems.
CO4	Analyze the concept of developing, formulating, modeling and solving transportation and assignment problems.
CO5	Determine the optimum solution for non-linear programming problems.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	0	0	0	0	0	2	0	0	2	-	-	-
CO2	3	2	0	0	0	0	0	2	0	0	2	-	-	-
CO3	3	2	0	0	0	0	0	2	0	0	2	-	-	-
CO4	3	2	0	0	0	0	0	2	0	0	2	-	-	-
CO5	3	2	0	0	0	0	0	2	0	0	2	-	-	-
Avg.	3	2	0	0	0	0	0	2	0	0	2	-	-	-

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UAIT24301		PRINCIPLES OF SOIL SCIENCE AND ENGINEERING					
		Category	L	T	P	Credit	
		PCC	3	0	0	3	
Course objectives							
To expose the students to the fundamental knowledge on Soil physical parameters, Permeability – Compaction, Bearing Capacity and types and methods of soil survey and interpretative groupings							
UNIT – I		INTRODUCTION AND SOIL PHYSICS					9
Soil - definition - major components –Soil forming minerals and processes - soil profile -Physical properties - texture – density-porosity-consistence-colour-specific gravity - capillary and non- capillary -plasticity. Soil air - soil temperature - soil water - classification of soil water- Movement soil water. pH – Plant nutrient availability.							
UNIT – II		SOIL CLASSIFICATION AND SURVEY					9
Soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping- mapping units - base maps -preparation of survey reports - concepts and uses - Land Capability Classes and subclasses - soil suitability -Problem soils – Reclamation.							
UNIT – III		PHASE RELATIONSHIP AND SOIL COMPACTION					9
Phase relations- Gradation analysis- Atterberg Limits and Indices- Engineering Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.							
UNIT – IV		ENGINEERING PROPERTIES OF SOIL					9
Shear strength of cohesive and cohesionless - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test- -Permeability- Coefficient of Permeability-Darcy’s law-field and lab methods - Assessment of seepage - Compressibility.							
UNIT – V		BEARING CAPACITY AND SLOPE STABILITY					9
Bearing capacity of soils Factors affecting Bearing Capacity- Shallow foundations-Terzaghi's formula- BIS standards Slope Stability-Analysis of infinite and finite slopes- friction circle method slope protection measures							
Total: 45 periods							
TEXT BOOK:							
1.	Nyle C. Brady, “The Nature and Properties of Soil”, Macmillan Publishing Company, 10 th Edition, New York, 2008.						
2.	Punmia, B.C., “Soil Mechanics and Foundation “Laxmi Publishers, New Delhi, 2007.						
REFERENCES:							
1.	Edward J. Plaster., “Soil Science”, Cengage Learning India Ltd, New Delhi, 2009.						
2.	Arora, K.R. “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 2007.						
3.	Murthy, V.N.S. “Soil Mechanics and Foundation Engineering”, UBS Publishers and Distributors, New Delhi, 2007.						
4.	Sehgal, S.B., “Text Book of Soil Mechanics”, CBS Publishers and Distributors New Delhi, 2007.						



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COURSE OUTCOMES:

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

CO1 Understand the fundamental knowledge of soil physical parameters

CO2 Perform soil survey and classify soil based on its characteristics.

CO3 Explain the phase relationship and soil compaction.

CO4 Analyze Engineering properties of soil

CO5 Understand Concepts of bearing capacity and slope stability.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	2	-	-	-	-	1	2	1	1
CO2	3	1	2	1	1	1	-	-	-	-	1	2	1	1
CO3	3	2	2	1	1	1	-	-	-	-	1	1	1	1
CO4	3	1	2	1	1	2	-	-	-	-	1	2	1	1
CO5	3	2	2	1	1	1	-	-	-	-	1	2	1	1
Avg.	3	2	2	1	1	1	-	-	-	-	1	2	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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Mecheri, Salem Dt-636453, Tamilnadu



UAIT24302		FLUID MECHANICS AND MACHINES				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
- To introduce the students about the properties of the fluids, behavior of fluids under static, kinematic and dynamic conditions through the control volume approach and expose them to - The applications of the conservation laws and to impart basic knowledge of the dimensional analysis and model studies along with flow through pipes.						
UNIT- I	FLUID PROPERTIES AND FLUID STATICS					9
Definition and properties of fluid - Mass density – Specific weight - Specific volume – Specific gravity - Equation of state–Perfect gas–Viscosity–Vapour pressure–Compressibility and elasticity–Surface tension–Capillarity- Fluid statics–Fluid pressure and measurement–simple, differential and micromanometers–Mechanical gauges- Forces on plane and curved surfaces–Buoyancy and floatation–Stability of floating bodies.						
UNIT- II	FLUID KINEMATICS AND FLUID DYNAMICS					9
Classification of flows - Methods of analysis- Continuum hypothesis - System and Control volume approach - Streamline, streak-line and path-lines - Stream function - Velocity potentials - Flow nets - Application of control volume to continuity, energy and momentum–Euler’s equation of motion along a streamline–Bernoulli’s equation -Linear momentum equation–Applications.						
UNIT- III	FLOW THROUGH PIPES AND MODEL STUDIES					9
Reynolds experiment - Laminar flow through circular pipe - Darcy-Weisbach equation - Moody diagram - Major and minor losses in pipe flow – Total energy line – Hydraulic grade line – Siphon – Pipes in series and parallel- Equivalent pipes–Fundamental dimensions–Dimensional homogeneity–Buckingham Pi theorem–Dimensionless parameters–Similitude and model studies–Distorted and undistorted models.						
UNIT- IV	OPEN CHANNEL FLOWS					9
Types of flow – Characteristics of open channel - Chezy’s equation – Manning equation – Hydraulically efficient Channel sections - Critical depth – Specific energy application to channel transitions – Flow measurement in channels – Notches –Weirs - Parshall flume- Flow measurement in natural streams– float method – current meter.						
UNIT- V	PUMPS					9
Types of pumps – Head of pump – Losses and efficiencies – Selection of pump capacity – Centrifugal pump – Components – Working principle –Types of impellers – Priming – NPSH – Cavitations – Minimum speed to start the pump - Specific speed – Characteristics curves -Turbine pump - Submersible pump – Jet pump –Air lift pump - Reciprocating pump - Sludge pump.						
Total: 45 periods						
TEXT BOOK:						
1.	Streeter, V.L.Wylie, E.B. and Bedford K.W, Fluid Mechanics, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2017					
2.	Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House, New Delhi, 2019.					
3.	Subramanya K, Flow in Open Channels, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2019.					
REFERENCES:						
1.	Jain A.K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.					



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2.	SKSom; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Mc Graw Hill Education (India) Pvt.Ltd., 2017.
3.	Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, 2017.
4.	Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.

COURSE OUTCOMES:

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

CO1	Demonstrate the properties of fluid and its behavior in static conditions along with pressure measurements.
CO2	Apply the conservation laws applicable to fluid flows and its application Through fluid kinematics and dynamics.
CO3	Estimate losses in pipe lines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel and to understand the concept of application of Dimensional analysis in model studies.
CO4	Describe the basics characteristics of open channel flows and analysis of steady uniform flow with hydraulically efficient channel sections and to measure the flows in artificial / natural channels.
CO5	Analyze the classification, design and working principles of various pumps.

Mapping of Cos with Pos and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	2	1	1	2	1	2	3	2	1
CO2	3	3	2	1	1	2	2	1	2	1	2	3	3	2
CO3	3	3	2	3	3	2	3	2	2	1	2	3	3	2
CO4	3	3	3	3	3	3	3	2	2	1	2	3	3	3
CO5	3	3	3	3	3	3	3	2	2	1	2	3	3	3
Avg.	3	3	2	3	3	2	3	2	2	1	2	3	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIT24304		SURVEYING AND LEVELLING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To introduce the rudiments of plane surveying and geodetic principles to Agricultural Engineers and to learn the various methods of plane and geodetic surveying to solve the real-world problems. To introduce the concepts of Control Surveying. To introduce the basics of Astronomical Surveying						
UNIT – I	FUNDAMENTALS OF CONVENTIONAL SURVEYING					9
Definition – Classifications – Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging – Well conditioned triangles – Chain traversing – Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors and Local attraction – Magnetic declination – Dip – compass traversing.						
UNIT – II	LEVELLING					9
Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of leveling – Fly leveling – Check leveling – Procedure in leveling – Booking – Reduction – Curvature and refraction – Reciprocal						
UNIT – III	THEODOLITE SURVEYING					9
Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometric surveying – Stadia Tacheometry – Tangential Tacheometry – Trigonometric leveling – Single Plane method – Double Plane method.						
UNIT – IV	CONTROL SURVEYING AND ADJUSTMENT					9
Horizontal and vertical control – Methods – Triangulation – Traversing – Gale ‘s table – Trilateration – Concepts of measurements and errors – Error propagation and Linearization – Adjustment methods - Least square methods – Angles, lengths and levelling network.						
UNIT – V	MODERN SURVEYING					9
Total Station: Digital Theodolite, EDM, Electronic field book – Advantages – Parts and accessories – Working principle – Observables – Errors - Field procedure and applications. GPS: Advantages – System components – Signal structure – Selective availability and ant spoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors in GPS – Field procedure and applications.						
Total: 45 periods						
TEXT BOOK:						
1.	Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.					
2.	T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.					
REFERENCES:						
1.	R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012..					
2.	James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.					
3.	Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004.					
4.	S. K. Roy, Fundamentals of Surveying, Second Edition, Prentice^ Hall of India2010.					



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COURSE OUTCOMES:

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

CO1	Introduce the rudiments of various surveying and its principles.
CO2	Imparts knowledge in computation of levels of terrain and ground features
CO3	Imparts concepts of Theodolite Surveying for complex surveying operations
CO4	Understand the procedure for establishing horizontal and vertical control
CO5	Imparts the knowledge on modern surveying instruments.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	3	2	2	-	2	-	3	3	3
CO2	3	3	2	2	2	2	2	2	-	2	-	3	3	3
CO3	3	3	3	3	3	3	2	2	-	2	-	3	3	3
CO4	3	3	3	3	3	3	2	3	-	2	2	3	3	3
CO5	3	3	3	2	3	3	3	2	-	2	2	3	3	3
Avg.	3	2	3	2	3	3	2	2	-	2	2	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAITL24301		UNIT OPERATIONS IN AGRICULTURAL PROCESSING				
		Category	L	T	P	Credit
		PCC	2	0	2	3
Course objectives						
The students would be exposed to the fundamental knowledge in Evaporation, Filtration, Sedimentation Processing, Sieve analysis, Crystallization and Distillation in processing of agricultural produce.						
UNIT – I		EVAPORATION AND CONCENTRATION				6
Unit operations in food processing –conservation of mass and energy – overall view of an engineering process- dimensions and units – dimensional and unit consistency – dimensionless ratios-evaporation – definition – liquid characteristics – single and multiple effect evaporation- performance of evaporators and boiling point elevation – capacity – economy and heat balance- types of evaporators – once through and circulation evaporators – short tube evaporators and long tube evaporators – agitated film evaporator						
UNIT – II		MECHANICAL SEPARATION				6
Filtration – definition –filter media – types and requirements-constant rate filtration – constant pressure filtration – filter cake resistance-filtration equipment – rotary vacuum filter – filter press- sedimentation – gravitational sedimentation of particles in a fluid – Stoke’s law, sedimentation of particles in gas-cyclones – settling under sedimentation and gravitational sedimentation-centrifugal separations – rate of separations – liquid – liquid separation – centrifuge equipment.						
UNIT – III		SIZE REDUCTION				6
Size reduction – grinding and cutting – principles of comminuting – characteristics of comminuted products – particle size distribution in comminuted products-energy and power requirements in comminuting – crushing efficiency – Rittinger’s, Bond’s and Kick’s laws for crushing-size reduction equipment – crushers – jaw crusher, gyratory crusher- crushing rolls – grinders – hammer mills – rolling compression mills - attrition, rod, ball and tube mills – construction and operation.						
UNIT – IV		CONTACT EQUILIBRIUM SEPARATION				6
Contact equilibrium separation processes – concentrations – gas-liquid and solid-liquid equilibrium–equilibrium concentration relationships – operating conditions-calculation of separation in contact–equilibrium processes-gas absorption – rate of gas absorption – stage – equilibrium gas – absorption equipment-properties of tower packing – types – construction – flow through packed towers-extraction – rate of extraction – stage equilibrium extraction- equipment for leaching coarse solids – intermediate solids – basket extractor-extraction of fine material – Dorr agitator – continuous leaching – decantation systems – extraction towers-washing – equipment						
UNIT – V		CRYSTALLISATION AND DISTILLATION				6
Crystallization-Equilibrium Rate of crystal growth stage-Equilibrium Crystallization-Crystallizers Equipment- Classification-Construction and operation-Crystallizers-Tank-Agitated batch-Swenson-Walker and Vacuum Crystallizers-Distillation-Binary Mixtures-Flash and differential distillation-Steam distillation - Theory-Continuous distillation with rectification Vacuum distillation Batch Distillation-Operation and process-Advantages and limitation- Distillation equipment- Construction and operation-Factors influencing the operation						
Total: 30 Periods						



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LAB EXERCISES

1. Determination of thermal efficiency and economy of evaporator
2. Determination of separation efficiency of centrifugal separator
3. Determination of collection efficiency in cyclone separator
4. Determination of efficiency of liquid-solid separation by filtration
5. Determination of absorption efficiency in a packing tower
6. Performance evaluation of a sieve and determination of particle size of granular foods by sieve analysis
7. Determination of energy requirement in size reduction using the burr mill
8. Determination of energy requirement in size reduction using the ball mill and hammer mill
9. Determination of mixing index for solids
10. Determination of economy and thermal efficiency of rotary flash evaporator for Concentration of juice.
11. Performance evaluation of a steam distillation process
Total: 30 Periods
Total: 30 +30 = 60 Periods

TEXT BOOK:

1.	Earle, R.L., "Unit operations in Food Processing", Pergamon Press, Oxford, U.K, 1985.
2.	McCabe, W.L., and Smith, J.C., "Unit Operations of Chemical Engineering", Mc-Graw-Hill Inc., Kosaido Printing Ltd., Tokyo, 1990.
3.	Geankoplis, C.J. "Transport Processes and Separation Process Principles", 4 th Edition, Prentice Hall, 2003.

REFERENCES:

1.	Coulson, J.M and J.F. Richardson. Chemical Engineering. Volume I to V. The Pergamon Press. New York, 1999.
2.	Albert Ibarz and Gustavo V. Barbosa-Canovas. Unit Operations in Food Engineering. CRC Press LLC, Florida, 2003.

COURSE OUTCOMES

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

CO1	Examine the evaporation process and types of evaporators for food industry													
CO2	Analyze the principles of filtration and mechanical separation equipment													
CO3	Identify size reduction and grinding equipment and understand the factors affecting the process													
CO4	Identify the gas-liquid and solid-liquid equilibrium concepts and factors influencing equilibrium separation process.													
CO5	Differentiate crystallization and distillation processes and identify processing equipment.													
	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	2	1	1	-	-	-	-	1	1	1	1
CO2	2	3	1	1	1	1	-	-	-	-	1	1	1	1



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CO3	2	3	1	1	1	1	-	-	-	-	1	1	1	1
CO4	2	3	1	2	1	1	-	-	-	-	1	1	1	1
CO5	2	3	1	2	1	1	-	-	-	-	1	1	1	1
Avg.	2	3	1	2	1	1	-	-	-	-	1	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy



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Mecheri, Salem Dt-636453, Tamilnadu



UMETL24305		MECHANICS OF MACHINES				
		Category	L	T	P	Credit
		PE	3	0	2	4
Course objectives						
1. To study the basic components of mechanisms, analyze the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and design cam mechanisms for specified output motions. 2. To study the basic concepts of toothed gearing and kinematics of gear trains 3. To Analyze the effects of friction in machine elements 4. To Analyze the force-motion relationship in components subjected to external forces and analyze standard mechanisms. 5. To Analyze the undesirable effects of unbalances resulting from prescribed motions in mechanism and the effect of dynamics of undesirable vibrations.						
UNIT – I		KINEMATICS OF MECHANISMS				9
Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons – cams – classifications – displacement diagrams – layout of plate cam profiles – derivatives of followers motion – circular arc and tangent cams.						
UNIT – II		Gears And Gear Trains				9
Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.						
UNIT – II		Friction In Machine Elements				9
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads Belt and rope drives – Friction aspects in brakes						
UNIT – IV		Force Analysis				
Applied and Constrained Forces – Free body diagrams – Static equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D’Alembert’s principle – superposition principle – Dynamic force Analysis in simple machine members.						
UNIT – V		Balancing And Vibration				9
Static and Dynamic balancing – Balancing of revolving and reciprocating masses free vibrations – Equations of motion – Natural frequency – Damped Vibration – bending critical speed of simple shaft- Torsional vibration -Forced vibration – Harmonic forcing – Vibration isolation.						
						TOTAL = 45 PERIODS
LAB EXERCISES						
1. Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus. 2. Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum 3. Single degree of freedom Spring Mass System – Determination of natural Frequency 4. Multi degree freedom suspension system – Determination of influence coefficient. 5. Balancing of rotating & reciprocating masses. 6. Transverse vibration of Free-Free beam – with and without concentrated masses. 7. Forced Vibration of Cantilever beam – Mode shapes and natural frequencies. 8. Determination of transmissibility ratio using vibrating table. 9. Critical or Whirling Speed of a Rotating Shaft. 10. Determination of torsional natural frequency of single and Double Rotor systems.						
						TOTAL = 30 PERIODS



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TOTAL: 30+45 =75 PERIODS

TEXT BOOK:

1. Uicker, J.J., Pennock G.R and Shigley, J.E., “Theory of Machines and Mechanisms”, Oxford University Press, 2017.
2. Ramamurthi. V, “Mechanics of Machines”, Narosa Publishing House, 3rd edition 2019.

REFERENCES:

1. Amitabha Ghosh and Asok Kumar Mallik, “Theory of Mechanisms and Machines”, Affiliated East-West Pvt. Ltd., 1988.
2. Rao. J.S. and Dukkupati.R.V. “Mechanism and Machine Theory”, New Age International Pvt. Ltd., 2nd edition, 2014.
3. Rattan, S.S, “Theory of Machines”, McGraw-Hill Education Pvt. Ltd., 5th edition 2019
4. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill, 2013.
5. Wilson and Sadler, Kinematics and Dynamics of Machinery, Pearson, 2008.

COURSE OUTCOMES:

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

CO1	Discuss the basics of mechanism
CO2	Solve problems on gears and gear trains
CO3	Examine friction in machine elements
CO4	Calculate static and dynamic forces of mechanisms
CO5	Calculate the balancing masses and their locations of reciprocating and rotating masses. Computing the frequency of free vibration, forced vibration and damping coefficient.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	1	-	-	-	1	3	-	1
CO2	3	2	2	-	2	-	1	-	-	-	1	3	-	1
CO3	3	2	2	-	2	-	1	-	-	-	1	3	-	1
CO4	3	2	2	-	2	-	1	-	-	-	1	3	-	1
CO5	3	2	2	-	2	-	1	-	-	-	1	3	-	1
Avg.	3	2	2	-	2	-	1	-	-	-	1	3	-	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy



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UAIL24301		FLUID MECHANICS LABORATORY											
		Category	L	T	P	Credit							
		EEC/BSC	0	0	4	2							
Course objectives													
Students should able to verify the principles studied in theory by performing the experiments in the laboratory.													
List of Exercises / Experiments:													
1. Calibration of Rota meter													
2. Flow through Venturimeter													
3. Flow through a circular Orifice													
4. Determination of mean velocity by Pitot tube													
5. Flow through a Triangular Notch													
6. Flow through a Rectangular Notch													
7. Determination of friction coefficient in pipes													
8. Determination of losses due to bends, fittings and elbows													
9. Characteristics of Centrifugal pump													
10. Characteristics of Submersible pump													
11. Characteristics of Reciprocating pump													
Total: 30 periods													
REFERENCES / MANUALS / SOFTWARES:													
1.	Laboratory manual												
2.	Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2017.												
3.	Subramanya K, Fluid Mechanics and Hydraulic Machines, Tata Mc Graw Hill Edu. Pvt.Ltd.2011												
COURSE OUTCOMES:													
On completion of the course, the students will be able to													
CO1	Apply Bernoulli equation for calibration of flow measuring devices.												
CO2	Measure friction factor in pipes and compare with Moody diagram												
CO3	Determine the performance characteristics of roto dynamic pumps.												
CO4	Determine the performance characteristics of positive displacement pumps.												
Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	1	3	2	2	1	2	1	2	2	1
CO2	3	2	1	1	3	2	2	1	2	1	2	3	1
CO3	3	3	2	1	3	3	2	1	2	1	2	3	2
CO4	3	3	2	1	3	3	2	1	2	1	2	3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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UAIL24302		SOIL SCIENCE LABORATORY											
		Category	L	T	P	Credit							
		EEC/BSC	0	0	3	1.5							
Course objectives													
Students should able to verify various quality aspects of soil and water studied in theory by performing experiments in the laboratory.													
List of Exercises / Experiments:													
1. Identification of rock sand minerals													
2. Collection and processing of soil samples													
3. Determination of soil moisture, EC and pH													
4. Field density determination by Core Cutter and Sand Replacement method													
5. Specific gravity determination by Pycnometer													
6. Textural analysis of soil by International Pipette method													
7. Grain size analysis by using Mechanical shaker													
8. Determination of Organic carbon													
9. Estimation of Gypsum requirements													
Total: 30 periods													
REFERENCES / MANUALS / SOFTWARES:													
1.	Laboratory manual												
2.	Punmia, B.C, “Soil Mechanics and Foundation Engineering”, Laxmi Publishers, New Delhi. 2007.												
3.	Laboratory Manual, Centre for Water Resources, Anna University, Chennai. 2012.												
COURSE OUTCOMES:													
On completion of the course, the students will be able to													
CO1	Explain soil physical properties and compare the properties based on soil and water system												
CO2	Apply standard laboratory methods to identify soil minerals and determine physical and chemical properties for effective soil evaluation and improvement.												
CO3	Analyze the soil chemical properties to classify the arable and problem soils to develop different reclamation practices												
Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	1	2	–	–	–	1	2	2	1
CO2	3	2	2	3	3	2	–	1	1	1	2	3	2
CO3	2	3	3	2	2	3	1	–	1	1	2	3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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UAIL24303		SURVEYING AND LEVELLING LABORATORY											
								Category		L	T	P	Credit
								EEC/BSC		0	0	3	1.5
Course objectives													
At the end of the course the student will possess knowledge about survey field techniques													
List of Exercises / Experiments:													
1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset													
2. Compass Traversing – Measuring Bearings & arriving included angles													
3. Fly levelling using Dumpy level & Tilting level													
4. Check levelling													
5. Measurements of horizontal angles by reiteration and repetition and vertical angles													
6. Determination of elevation of an object using single plane method when base is Accessible/inaccessible.													
7. Determination of Tacheometric Constants													
8. Heights and distances by stadia Tacheometry													
9. Traverse using Total station and Area of Traverse													
10. Determination of distance and difference in elevation between two inaccessible points using Total station													
Total: 45 periods													
REFERENCES / MANUALS / SOFTWARES:													
1.	Laboratory manual												
2.	T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 24th Reprint, 2015.												
3.	Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 17th Edition, 2016.												
COURSE OUTCOMES:													
On completion of the course, the students will be able to													
CO1	Impart knowledge on the usage of basic surveying instruments like chain/tape, compass and levelling instruments												
CO2	Able to use levelling instrument for surveying operations												
CO3	Able to use theodolite for various surveying operations												
Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	3	2	3	3	3	3	3	1	3	3
CO2	3	2	3	-	3	3	3	3	3	3	1	3	3
CO3	3	1	2	-	3	2	-	3	-	-	2	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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USD24301	Soft – Skill 1				
	Category	L	T	P	Credit
	MC	2	0	0	0

Course objectives

- To understand oneself and manage own emotions
- To inculcate the Grooming and mannerism
- To know different methods for faster numerical computations
- To learn logical reasoning skills.
- Enhance Problem – Solving Skills

UNIT – I	NUMBER SYSTEM/PHONETICS	6
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Introduction –Discussing Divisibility Rule-HCF –LCM –Decimal Fraction
 Introduction-Standard Phonetic Alphabet- Introduction to vowel & Consonant accent neutralization

UNIT – II	AVERAGE AND DIRECTION SENSE/ONE WORD SUBSTITUTES	6
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Introduction-Basic Problem in Average-Direction Sense Problem
 Introduction-The One which can be substituted for the given word/Sentence

UNIT – III	TIME AND WORK/PERSONAL COMMUNICATION	6
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Basic Concept of Time and Work-Efficiency Related Sums on Time and Work
 Day to day conversation with family members-Neighbors-Friends-Relatives

UNIT – IV	PROFIT AND LOSS/PUBLIC SPEAKING	6
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Introduction-Problem on Profit and Loss
 Introduction –Anchoring /Master of ceremony –Welcome address –Proposing vote of Thanks- Introducing Speaker – Conducting Meetings- Making Announcements

UNIT – V	AREA, SURFACE AREA AND VOLUME PROBLEMS/ERROR CORRECTION	6
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Introduction about the Area Problems – Area, Surface Area and Volume for Square Rectangle –Triangle, Cylinder
 Introduction –Spot the Error in the sentence and correct it.

Total: =30 periods

TEXT BOOK:

- Training And Placement Book [TKEC]
- Quantitative Aptitude By R.S. Aggarwal

REFERENCES:

- R.S. Aggarwal, Quantitative Aptitude”, Seventh edition, S. Chand Publication.
- <http://www.mastguru.com/arithmetic-aptitude-questions-answers>
- <https://prepinsta.com>

COURSE OUTCOMES:

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

CO1	Practice manners and etiquettes in day-to-day life.
CO2	Be confident and motivated to plan the activities according to personality types
CO3	Build Confidence in Mathematics
CO4	Solve mathematical problems by applying logical thinking.
CO5	Apply different techniques for faster calculations



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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	2	-	-	-	-	-	3	3	1
CO2	2	2	2	2	1	2	-	-	-	-	-	2	3	2
CO3	3	2	2	2	1	1	-	-	-	-	-	1	2	3
CO4	3	3	2	2	1	1	-	-	-	-	-	2	1	3
CO5	2	1	2	1	3	2	-	-	-	-	-	2	2	3
Avg.	2.4	1.8	2	1.6	1.4	1.6	-	-	-	-	-	2	2.2	2.4

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIT24401		TRACTORS AND ENGINE SYSTEMS				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To introduce the students to the different systems and working principles of tractor, power tiller, makes of tractors and power tillers.						
UNIT- I		TRACTORS				9
Classification of tractors – Tractor engines – construction of engine blocks, cylinder head and crank case – features of Cylinder, piston, connecting rod and crankshaft – firing order combustion chambers.						
UNIT- II		ENGINE SYSTEMS				9
Valves – inlet and outlet valves – valve timing diagram. Air cleaner – exhaust – silencer. Cooling systems – lubricating Systems – fuel system – governor – electrical system.						
UNIT- III		TRANSMISSION SYSTEMS				9
Transmission – clutch - gear box - sliding mesh – constant mesh – synchromesh. Differential, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system.						
UNIT- IV		HYDRAULICS YSTEMS				9
Hydraulic system – working principles, three-point linkage – draft control – weight transfer, theory of traction – tractive Efficiency – tractor chassis mechanics – stability – longitudinal and lateral. Controls – visibility – operators seat.						
UNIT- V		POWER TILLER, BULLDOZER AND TRACTOR TESTING				9
Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors, power tillers and bulldozers. Bulldozer- salient features – turning mechanism, track mechanism, components –operations performed by bulldozers. Types of tests – test procedure – need for testing & evaluation of farm tractor –Test code for performance Testing of tractors and power tillers.						
Total: 45 periods						
TEXT BOOK:						
1.	Jain, S.C. and C.R.Rai. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi, 1999.					
REFERENCES:						
1.	Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley New Eastern Pvt. Ltd., Delhi, 1997.					
2.	Domkundwar A.V.A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi, 1999.					
3.	Black, P.O. Diesel engine manual. Taraporevala Sons &Co., Mumbai, 1996.					
4.	Grouse, W.H. and Anglin, D.L. Automotive mechanics. Macmillan McGraw - Hill, Singapore, Indian Standard Codes for Agricultural Implements Published by ISI, New Delhi, 1993.					
5.	Jagadeeshwar Sahay, Elements of Agricultural Engineering, Standard Publishers Co., New Delhi, 2010.					



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COURSE OUTCOMES:

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

CO1	Get an idea on various machinery available for farm mechanization.
CO2	Calculate the valve timing of an IC engine and represent by a drawing.
CO3	Gain knowledge on the transmission system of a tractor.
CO4	Understand the hydraulic system in a tractor and estimate the traction.
CO5	Gain knowledge on power tillers, bulldozers and different tractor testing procedures.

Mapping of Cos with Pos and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	2	3	-	2	-	-	-	2	3	3	3
CO2	2	3	3	2	3	-	2	-	-	-	2	3	3	2
CO3	2	3	3	3	3	-	1	-	-	-	2	3	3	2
CO4	3	3	3	2	3	-	2	-	-	-	2	3	3	2
CO5	2	3	3	3	3	-	2	-	1	2	2	3	3	2
Avg.	2	3	3	2	3	-	2	-	-	2	2	3	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIT24402		SOIL AND WATER CONSERVATION ENGINEERING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
Get a sound knowledge in the problems associated with soil erosion. Introduce the estimation of soil erosion. Impart knowledge in various practices to control erosion. Study about the water conservation principles and techniques. Get an idea about sedimentation and its control measures.						
UNIT – I	SOIL EROSION PRINCIPLES					9
Approaches to soil conservation – Soil conservation in India - Erosion – Agents - Causes - Mechanics of water erosion – Soil erosion problems - Types of water erosion: Raindrop erosion, Sheet erosion, Rill erosion, Gully erosion, Stream bank erosion – Classification of Gully – Gully Control Structures: Drop Spillway, Drop Inlet, Chute Spillways - Prerequisites for soil and water conservation measures.						
UNIT – II	ESTIMATION OF SOIL EROSION					9
Runoff computation for soil conservation: SCS-CN method – Evolution of Universal Soil Loss Equation: Applications and Limitations – Modified Universal Soil Loss Equation – Revised Universal Soil Loss Equation- Permissible erosion – Land use capability classification - Classification of eroded soils.						
UNIT – III	EROSION CONTROL MEASURES					9
Agronomic practices: contour cultivation - strip cropping – tillage practices – Soil management practices – Bunding: Types and design specifications - Mechanical measures for hill slopes – Terracing: Classification and design specification of bench terrace – Grassed waterways: Location, construction and maintenance – Types of temporary and permanent gully control structures.						
UNIT – IV	WATER CONSERVATION MEASURES					9
In-situ soil moisture conservation – Water harvesting principles and techniques: Micro catchments, catchment yield using morphometric analysis - Farm ponds: Components, Design, Construction and Protection – Check dams – Earthen dam – Retaining wall.						
UNIT – V	SEDIMENTATION					9
Sediment: Sources – Types of sediment load – Mechanics of sediment transport – Estimation of bed load – Sediment Graph - Reservoir sedimentation: Basics - Factors affecting sediment distribution pattern, Rates of reservoir sedimentation - Silt Detention Tanks – sediment control methods.						
Total: 45 periods						
TEXT BOOK:						
1.	Suresh, R., “Soil and Water Conservation Engineering”, Standard Publication, New Delhi, 2007.					
2.	Ghanshyam Das, “Hydrology and Soil Conservation Engineering”, Prentice Hall of India Private Limited, New Delhi, 2000.					
3.	“Sedimentation Engineering”, 2006, ASCE manual and Report on Engineering Practice No. 54, Edited by Vito A. Vanoni. ASCE publishing.					
REFERENCES:						
1.	Murthy, V.V.N., “Land and Water Management Engineering”, Kalyani Publishers, Ludhiana, 1998.					
2.	Gurmail Singh, “A Manual on Soil and Water Conservation”, ICAR Publication, New Delhi, 1982.					
3.	Mal, B.C., “Introduction to Soil and Water Conservation Engineering”, Kalyani Publishers, New Delhi, 2002.					



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COURSE OUTCOMES:

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

CO1	Gain fundamental knowledge on the concepts of erosion and sedimentation.
CO2	Gain knowledge about evolution of Universal Soil Loss Equation: and its applications.
CO3	Explain and design erosion control measures types and design specifications
CO4	Have sufficient knowledge on soil and water conservation measures.
CO5	Have sufficient knowledge on reservoir sedimentation and sediment control methods.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PSO 1	PSO 2	PS O3
CO1	2	2	3	2	2	2	1	1	3	2	2	2	2	1
CO2	2	2	3	2	2	1	3	2	3	2	2	2	2	1
CO3	2	3	3	2	2	3	1	1	1	2	2	2	2	1
CO4	3	3	3	3	2	1	3	1	2	2	2	2	2	1
CO5	3	3	3	3	2	1	1	2	3	2	2	2	2	1
Avg.	2	2	3	2	2	2	2	1	2	2	2	2	2	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIT24403		STRENGTH OF MATERIALS				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To understand the stresses developed in bars, compound, bars, beams, shafts, cylinders and spheres.						
UNIT- I	STRESS, STRAIN AND DEFORMATION OF SOLIDS					9
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains - thin shells -circumferential and longitudinal stresses in thin cylinders - deformation of thin cylinder – stresses in spherical shells – Deformation of spherical shells.						
UNIT- II	ANALYSIS OF PLANE TRUSSES					9
Determinate and indeterminate plane trusses–determination of member forces by method of joints, method of sections and method of tension coefficient.						
UNIT- III	TRANSVERSE LOADING AND STRESSES IN BEAM					9
Beams – types- transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over-hanging beams. Theory of simple bending– bending stress distribution – Shear stress distribution - flitched beams – carriage springs.						
UNIT- IV	TORSION					9
Torsion formula- stresses and deformation in circular and hollows shafts– Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs - carriage springs.						
UNIT- V	DEFLECTION OF BEAMS					9
Computation of slopes and deflections in determinate beams-Double Integration method–Macaulay’s method–Area moment method–Conjugate beam method.						
Total: 45 periods						
TEXTBOOK:						
1.	Bansal, R.K. "Strength of Materials", Laxmi Publications (P) Ltd.,2007					
2.	Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2007					
REFERENCES:						
1.	Egor.P. Popov “Engineering Mechanics of Solids” Prentice Hall of India, New Delhi,2001					
2.	Subramanian R. "Strength of Materials", Oxford University Press, Oxford HigherEducationSeries,2007.					
3.	Hibbeler, R.C. "Mechanics of Materials", Pearson Education, Low Price Edition, 2007					
4.	Ferdinand P. Beer, Russell Johnson, Jr. and John J. Dewole" Mechanics of Materials", Tata McGraw Hill Publishing co. Ltd., New Delhi, 2005.					

COURSE OUTCOMES:

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

CO1	Find the stress distribution and strains in regular and composite structures Subjected to axial loads.
CO2	Evaluate the stresses in plane trusses
CO3	Assess the shear force, bending moment and bending stresses in beams
CO4	Apply torsion equation in design of circular shafts and helical springs
CO5	Analyze the slope and deflection of beams and buckling loads of columns under Different boundary conditions .



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Mapping of COs with Pos and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	1	-	1	-	-	-	1	1	3	3	1
CO2	3	2	2	1	-	1	-	-	-	-	1	3	3	1
CO3	3	2	2	1	-	1	-	-	-	1	1	3	3	1
CO4	3	1	2	1	-	1	-	-	-	1	1	3	3	1
CO5	3	2	2	1	-	1	-	-	-	1	1	3	3	1
Avg.	3	2	2	1	-	1	-	-	-	1	1	3	3	1

1 –Slight,2–Moderate, 3–Substantial, BT–Bloom’s Taxonomy



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UAIT24404		HYDROLOGY AND WATER RESOURCES ENGINEERING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To introduce to the students, the concepts of hydrological processes, hydrological extremes and groundwater. To prepare the students to quantify, regulate and manage water resources.						
UNIT – I	PRECIPITATION AND ABSTRACTIONS					9
Hydrological cycle - Meteorological measurements – Types and forms of precipitation - Rain gauges - Spatial analysis of rainfall data using Thiessen polygon and Iso-hyetal methods - Interception – Evaporation: Measurement, Evaporation suppression methods – Infiltration: Horton’s equation - Double ring infiltrometer - Infiltration indices.						
UNIT – II	RUNOFF					9
Catchment: Definition, Morphological characteristics - Factors affecting runoff - Run off estimation using Strange’s table and empirical methods - SCS-CN method – Stage discharge relationship - Flow measurements - Hydrograph – Unit Hydrograph – IUH.						
UNIT – III	HYDROLOGICAL EXTREMES					9
Natural Disasters - Frequency analysis - Flood estimation - Flood management - Definitions of drought: Meteorological, Hydrological, Agricultural and Integrated - IMD method - NDVI analysis - Drought Prone Area Programme (DPAP).						
UNIT – IV	RESERVOIRS					9
Classification of reservoirs - Site selection - General principles of design - Spillways -Elevation- Area-Capacity curve - Storage estimation - Sedimentation - Life of reservoirs – Rule curve.						
UNIT – V	GROUNDWATER AND MANAGEMENT					9
Origin - Classification and types - Properties of aquifers - Governing equations – Steady and unsteady flow - Artificial recharge - RWH in rural and urban areas.						
						Total: 45 periods
TEXT BOOK:						
1.	Subramanya K, "Engineering Hydrology"- Tata McGraw Hill, 2010					
2.	Jayarami Reddy P, "Hydrology", Tata McGraw Hill, 2008.					
REFERENCES:						
1.	David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007					
2.	Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.					
3.	Raghunath. H.M., "Hydrology", Wiley Eastern Ltd., 1998.					
4.	Bhagu R. Chahar, Groundwater Hydrology, McGraw Hill Education (India) Pvt Ltd, New Delhi, 2017.					

COURSE OUTCOMES:

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

CO1	Define the hydrological processes and their integrated behaviour in catchments
CO2	Apply the knowledge of hydrological processes to address basin characteristics, runoff and hydrograph
CO3	Explain the concept of hydrological extremes and its management strategies
CO4	Describe the principles of storage reservoirs



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CO5	Understand and apply the concepts of groundwater management													
Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	2	1	2	-	2	2	-	2	2	2	2
CO2	2	2	2	2	1	2	-	3	2	-	2	2	2	3
CO3	2	2	2	1	-	2	-	2	2	2	2	2	2	2
CO4	2	2	1	1	1	3	2	2	2	-	3	2	2	3
CO5	2	2	2	2	1	3	2	3	2	2	3	2	2	3
Avg.	2	2	1	2	1	2	1	2	2	1	2	2	2	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy														



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UESST24401		ENVIRONMENTAL SCIENCES AND SUSTAINABILITY				
		Category	L	T	P	Credit
		PCC	2	0	0	2
Course 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 nonrenewable resources, causes of their degradation and measures to preserve them. - To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.						
UNIT – I		ENVIRONMENT AND BIODIVERSITY				6
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, 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.						
UNIT – II		ENVIRONMENTAL POLLUTION				6
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHSMS). Environmental protection, Environmental protection acts .						
UNIT – III		RENEWABLE SOURCES OF ENERGY				6
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.						
UNIT – IV		SUSTAINABILITY AND MANAGEMENT				6
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability- from unsustainability to sustainability-millennium development goals, and protocols- Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.						
UNIT – V		SUSTAINABILITY PRACTICES				6
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles- carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio- economic and technological change.						
Total: 30 periods						
TEXT BOOK:						
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.					



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3.	Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4.	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5.	Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7.	Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCE BOOK:

1.	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. edition 2010.
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, Third Edition, 2015.
5.	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

COURSE OUTCOMES:

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

CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the 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 the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	3	-	-	-	-	2	-	-	-
CO3	3	-	1	-	-	2	-	-	-	-	2	-	-	-
CO4	3	2	1	1	-	2	-	-	-	-	2	-	-	-
CO5	3	2	1	-	-	2	-	-	-	-	1	-	-	-
Avg.	2.8	1.8	1	1	-	2.4	-	-	-	-	1.8	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UMETL24301	ENGINEERING THERMODYNAMICS				
	Category	L	T	P	Credit
	PCC	3	0	2	4
Course objectives					
• To impart knowledge on various forms of energy, energy transfer and energy interactions. • Impart knowledge on the second law of thermodynamics in analyzing the performance of thermal devices. • Impart knowledge on availability and applications of second law of thermodynamics. • Teach the various properties of steam through steam tables and Mollier chart. • Impart knowledge on the macroscopic properties of ideal and real gases.					
UNIT – I	FIRST LAW OF THERMODYNAMICS				9
Thermodynamic systems, Properties and processes Thermodynamic Equilibrium -Displacement work - P-V diagram. Thermal equilibrium - Zeroth law – Concept of temperature and Temperature Scales. First law – application to closed and open systems – steady and unsteady flow processes.					
UNIT – II	SECOND LAW AND CONCEPT OF ENTROPY				9
Heat Engine – Refrigerator - Heat pump. Statements of second law and their equivalence & corollaries. Carnot cycle - Reversed Carnot cycle - Performance - Clausius inequality. Concept of entropy - T-s diagram - Tds Equations - Entropy change for a pure substance, Principle of increase in entropy.					
UNIT – III	EXERGY ANALYSIS				9
High- and low-grade energy, Exergy and Anergy, Availability and Irreversibility for open and closed system processes - I and II law Efficiency, Applications of II Law.					
UNIT – IV	PROPERIES OF PURE SUBSTANCES, Ideal AND REAL GASES				9
Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Determination of dryness fraction of wet and very wet steam. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart. Properties of Ideal gas, real gas - comparison. Equations of state for ideal gas. Real Gas, Vander Waal's relation - Reduced properties - Compressibility factor - Principle of Corresponding states – Generalized Compressibility Chart.					
UNIT – V	GAS MIXTURES AND THERMODYNAMIC RELATIONS				9
Gas mixtures, Maxwell relations - Tds Equations - heat capacities relations - Energy equation, Joule-Thomson experiment - Clausius- Clapeyron equation					
Total = 45 Periods					
List of Experiments					
1. Determination of Temperature Using Thermometer Based on Zeroth Law of Thermodynamics.					
2. Verification of First Law using a air compressor unit.					
3. To determine power requirement of to drive the blower.					
4. Determination of COP of a Vapour Compression Refrigeration System.					
5. Study of Heat Pump and Heat Engine.					
6. Exergy Loss Evaluation in a Heat Exchanger.					
7. Determination of Availability (Exergy) in a 4-Stroke Diesel Engine					
8. Measurement of Condenser Efficiency Using Vertical and Horizontal Surface Condensers.					
9. Study and Understanding of Thermal Power Generation Cycle at Mettur Thermal Power Station.					
10. Measure the Joule-Thomson coefficient (μ) and observe cooling/heating during throttling.					
Total: 30 Periods					
Total: 45L+30L=75 Periods					



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TEXT BOOK:	
1.	Nag.P.K., “Engineering Thermodynamics”, 6 th Edition, Tata McGraw Hill (2017), New Delhi
2.	Cengel, Y and M. Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill, 8th Edition, 2015
REFERENCES:	
1.	Rathakrishnan, E., “Fundamentals of Engineering Thermodynamics”, 2nd Edition, Prentice Hall of India Pvt. Ltd, 2006.
2.	E. Natarajan, Engineering Thermodynamics-Fundamentals and Applications, First Edition 2019, ISBN: 93-1568-61-3, Anuragam Publication
3.	Chattopadhyay, P, “Engineering Thermodynamics”, 2nd Edition Oxford University Press, 2016
4.	Claus Borgnakke and Richard E. Sonntag, “Fundamentals of Thermodynamics”, 7th Edition, Wiley Eastern, 2009.
5.	Venkatesh. A, “Basic Engineering Thermodynamics”, Universities Press (India) Limited, 2007.
6.	Moran & Shapiro, “Principles of Engineering Thermodynamics”, 8th Edition, Wiley Eastern,

Note: Steam Tables with Mollier Chart and Compressibility Chart shall be supplied during Examination.

COURSE OUTCOMES:	
On completion of the course, the students will be able to	
CO1	Explain the thermodynamic properties and solve the problems related to closed and open systems.
CO2	Select the second law of thermodynamics and entropy principle to various thermodynamic systems.
CO3	Use the various thermodynamic relations to available and unavailable energy.
CO4	Calculate the properties of steam using PV diagrams, H-S diagrams and steam power cycle.
CO5	Explain the thermodynamic relations and compute properties of gas mixtures

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	2	1	-	1	-	-	-	-	1	2	1	2
CO2	2	3	2	1	-	1	-	-	-	-	1	3	1	2
CO3	2	3	2	1	1	-	-	-	-	-	1	3	2	2
CO4	2	3	2	1	-	1	-	-	-	-	1	2	2	2
CO5	2	3	2	1	-	1	-	-	-	-	1	2	1	2
Avg.	2	3	2	1	2	2	-	-	-	-	1	2.4	1.4	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy														



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UAIL24402		STRENGTH OF MATERIALS LABORATORY											
		Category	L	T	P	Credit							
		EEC/BSC	0	0	4	2							
Course objectives													
To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.													
List of Exercises / Experiments:													
1. Tension test on steel rod													
2. Compression test on wood													
3. Double shear test on metal													
4.Torsion test on mild steel rod													
5. Impact test on metal specimen (Izod and Charpy)													
6.Hardness test on metals (Rockwell and Brinell Hardness Tests)													
7. Deflection test on metal beam													
8. Compression test on helical spring													
9.Deflection test on carriage spring													
Total: 60 periods													
REFERENCES / MANUALS / SOFTWARES:													
1.	Laboratory manual												
2.	Strength of Materials Laboratory Manual, Anna University, Chennai-600025.												
3.	IS1786-2008(Fourth Revision, Reaffirmed2013), ‘High strength deformed bar sand wires for concrete reinforcement– Specification’, 2008.												
COURSE OUTCOMES													
On completion of the course, the students will be able to													
CO1	Find the stress distribution and strains in regular and composite structures subjected to axial loads												
CO2	Assess the shear force, bending moment and bending stresses in beams												
CO3	Apply torsion equation in design of circular shafts and helical springs												
Mapping of COs with POs and PSOs													
COs/P Os	PO 1	PO 2	P O3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PS O1	PSO 2
CO1	2	2	2	1	-	1	-	-	-	2	1	3	3
CO2	3	1	2	1	-	1	-	-	-	2	1	3	3
CO3	3	2	2	1	-	1	-	-	-	2	1	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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 UAIL24401		 TRACTOR AND FARM ENGINES LABORATORY											
								Category	L	T	P	Credit	
								EEC/BSC	0	0	2	1	
Course objectives													
To make the students conversant with the anatomy of farm tractor and farm engines.													
To make them understand the working principle of IC engines, clutch, gearbox, differential and final drive.													
List of Exercises / Experiments:													
1. Identification and study of different components of diesel engine.													
2. Identification and study of different components of petrol engine.													
3. Method of working of diesel engine with the help of working models.													
4. Method of working of diesel engine with the help of working models.													
5. Dismantling and assembly of diesel engine.													
6. Dismantling and assembly of petrol engine.													
7. Study of clutch – components and method of working.													
8. Study of gear box – components and method of working.													
9. Study of differential and final drive – components and method of working.													
10. Study of braking system and steering system – components and method of working.													
11. Study of hydraulic system and PTO system in a tractor.													
12. Study of electrical system, instruments in the dashboard and controls – components: dynamo, starting motor, battery, lights, horn, odometer, ampere meter, accelerator, brake, differential lock, PTO lever, hydraulic lever, draft and Position control lever.													
												Total: 30 periods	
REFERENCES / MANUALS / SOFTWARES:													
1.	Laboratory manual.												
2.	Jagadeeshwar Sahay. 2019. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi.												
3.	Michael, A.M. and Ohja, T.P. 2018. Principles of Agricultural Engineering Volume I. Jain Brothers, Jodhpur.												
COURSE OUTCOMES:													
On completion of the course, the students will be able to													
CO1	Understand the working of tractors, power tillers and their functions.												
CO2	Identify and rectify problems in the functioning of tractors and power tillers.												
CO3	Summarize the ergonomics of tractors and power tillers.												
Mapping of Cos with Pos and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	1	3	1	-	-	1	2	1	3	3
CO2	3	1	2	1	3	1	-	-	1	2	1	3	3
CO3	3	2	2	1	3	1	-	-	1	2	1	3	3
Avg.	3	2	2	1	3	1	-	-	1	2	1	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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USD24401		Soft – Skill 2				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course objectives						
I. To learn the Number Series and develop Social Communication						
II. To learn Time Speed Distance and develop work glossary						
III. To develop Grammar usage and learn to solve problems on ages.						
IV. To develop Personality development & Logical thinking.						
V. To learn email ethics and logical ability.						
UNIT – I	NUMBER SERIES & SOCIAL COMMUNICATION					6
Introduction-Number Series-Simplification						
Introduction-Telephone Calls (Formal and Informal)-Colleagues in workspot -Sharing jokes						
UNIT – II	TIME, SPEED AND DISTANCE & WORK GLOSSARY					6
Introduction-Problem on Time & Distance-Problem on Trains Heteronym-Homonym-Homophone-Activity Based Learning						
UNIT – III	AGES AND SYLLOGISM & GRAMMER USAGE					6
Problem On Ages-Syllogism-Problem on Sets and Venn Diagram Introduction-Parts of Speech-Noun-Verb- Pronoun-Adverb-Adjective-Conjunction-Preposition-Interjection						
UNIT – IV	LOGICAL REASONING & PERSONALITY DEVELOPMENT					6
Introduction-Alphabet Coding and Decoding –Coding with Numbers-Seating Arrangement Analyzing Strength and Weakness-Time Management						
UNIT – V	FINGURE SERIES, ODD ONE OUT, VOCABULARY & EMAIL ETIQUETTE					6
Introduction-Figure Matrix-Figure Series						
Prefix-Suffix-Synonyms-Antonyms-Word Analogy						
Total: =30 periods						
TEXT BOOK:						
1.	Training And Placement Book [TKEC]					
2.	Quantitative Aptitude by R.S. Aggarwal					
REFERENCES:						
1.	http://www.mastguru.com/arithmetric-aptitude-questions-answers					
2.	http://www.careerride.com/post /arithmetric-aptitude-questions-answers					
3.	http://www.englishforeveryone.org					

COURSE OUTCOMES:	
On completion of the course, the students will be able to	
CO1	Cultural Competence
CO2	Apply concepts real world scenarios
CO3	Identify and explain grammatical concepts
CO4	Identify and analyze logical fallacies
CO5	Students will understand the importance of professionalism in email communication



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Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	1	2	2	-	-	-	1	-	-	-
CO2	2	2	2	-	1	1	1	-	-	-	1	-	-	-
CO3	2	2	2	-	1	1	1	1	1	-	1	-	-	-
CO4	2	2	2		1	1	1	1	1	-	1	-	-	-
CO5	2	2	2	-	1	1	1	1	1	-	1	-	-	-
Avg.	2	2	1.6	-	1	1.2	1.2	0.6	0.6	-	1	-	-	-
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														



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UAIT24501		FARM EQUIPMENT AND MACHINERY				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To introduce the students to the working principles of farm equipments, tillage implements. To expose the students to farm mechanization benefits and constraints, identification of components of primary and secondary tillage implements.						
UNIT – I		FARM MECHANIZATION				9
Farm mechanisation – objectives. Tillage - objectives - methods – primary tillage implements - secondary tillage implements - animal drawn ploughs - construction. Types of farm implements – trailed, mounted . Field capacity - forces acting on tillage tool.						
UNIT – II		PRIMARY AND SECONDARY TILLAGE IMPLEMENTS				9
Mould board plough- attachments – mould board shapes and types. Disc plough – force representation on disc – Types of disc ploughs – Subsoiler plough - Rotary plough. Cultivators - types - construction. Disc harrows - Bund former - ridger – leveller. Basin lister-Wetland preparation implements.						
UNIT – III		SOWING AND FERTILIZING EQUIPMENT				9
Crop planting - methods - row crop planting systems - Devices for metering seeds – furrow openers – furrow closers- types – Types of seed drills and planters – calibration-fertilizer metering devices - seed cum fertilizer drills – paddy transplanters – nursery tray machines.						
UNIT – IV		WEEDING AND PLANT PROTECTION EQUIPMENT				9
Weeding equipment – hand hoe – long handled weeding tools – dryland star weeder – wetland conoweeder and rotary weeder – Engine operated and tractor weeders. Sprayers –types classification Methods of atomization, spray application rate, droplet size determination – Volume median diameter, numerical median diameter – drift control.						
UNIT – V		HARVESTING MACHINERY				9
Principles of cutting crop, types of harvesting machinery, vertical conveyor reaper and binder combine harvesters, balers, threshers, tractor on top combine harvester, combine losses.						
Total: 45 periods						
TEXT BOOK:						
1.	Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors Delhi 6., 2010.					
2.	Michael and Ohja. Principles of Agricultural Engineering. Jain brothers, New Delhi., 2005					
REFERENCES:						
1.	Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.					
2.	Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi., 1996.					
3.	Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990.					



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COURSE OUTCOMES:

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

- CO1: To understand the basics of mechanizing a farm.
- CO2: To understand the components of various tillage equipment.
- CO3: To study about different sowing and fertilizing attachments and stand-alone units.
- CO4: To study about weeder attachments and sprayers.
- CO5: To study about combine harvester-thresher for various crops.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	-	-	-	1	-	2	3	3	1
CO2	2	2	2	2	3	-	-	-	1	-	2	3	3	1
CO3	2	2	2	2	3	-	2	-	1	-	2	3	3	1
CO4	2	2	2	2	3	-	2	-	1	-	2	3	3	1
CO5	2	2	2	2	3	-	2	-	1	-	2	3	3	1
Avg.	2	2	2	2	3	-	2	-	1	-	2	3	3	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIL24501		Farm Machinery Laboratory				
		Category	L	T	P	Credit
		EEC/BSC	0	0	4	2
Course objectives						
The students will be introduced to the practice of different farm machinery in the field on tillage, sowing, plant protection, harvesting and threshing; care and maintenance; lubrication; fits and tolerances and replacements; adjustments of farm machines; dismantling and reassembling of a disc harrow, seed-cum fertilizer drill and sprayer, engine pumps						
List of Exercises / Experiments :						
1. Identification of major systems of a tractor and general guidelines on preliminary check measures before starting a tractor - procedure for starting, running and stopping the tractor.						
2. Identification of components of power tiller, their maintenance and study on preliminary check measures and safety aspects before starting a power tiller - procedure for starting, running and stopping the power tiller.						
3. Field operation and adjustments of ploughs						
4. Field operation and adjustments of harrows						
5. Field operation and adjustments of cultivators						
6. Field operation of sowing and planting equipment and their adjustments						
7. Field operation of plant protection equipment						
8. Field operation on mowers and reapers						
9. Field operation of combine and determination of field losses						
10. Field operation of threshers and their performance evaluation						
11. Studies on methods of repair, maintenance and off-season storage of farm equipment						
12. Opening and reassembly of disc harrows, determination and adjustment of tilt and disc angles						
13. Hitching of agricultural implements and trailers						
14. Study and operation of bulldozer						
15. Visit to agro-manufacturers						
		Total: 30 periods				
REFERENCES / MANUALS / SOFTWARES:						
1.	Laboratory manual					
2.	John A Havers and Frank W Stubbs, Handbook of Heavy Construction, McGraw-Hill book Company, New York, 1971.					



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3.	Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.
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COURSE OUTCOMES:

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

CO1:	To identify major systems in a tractor and general guidelines on preliminary check measures before starting a tractor.
CO2:	To have knowledge of the field operations and management of tillage implements.
CO3:	To have knowledge of the field operations and management of seeder devices and plant protection equipment.
CO4:	To have knowledge of the field operations and management of harvesters, threshers and combines.
CO5:	To have knowledge of the field operations and management of heavy earth moving machinery.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	3	1			1		2	3	1
CO2	2	3	3	2	3	1			1		2	3	1
CO3	2	3	3	2	3	1	2		1		2	3	1
CO4	2	3	3	2	3	1	2		1		2	3	1
CO5	2	3	3	2	3	1	2		1		2	3	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIL24502		ICT in Agricultural Engineering Laboratory											
								Category	L	T	P	Credit	
								EEC/BSC	0	0	4	2	
Course objectives													
To gain practical knowledge on various technologies in information and communication for agriculture.													
List of Exercises / Experiments :													
1. Configuring timers for automatic switching “on and off” of irrigation systems													
2. Experience with solenoid valves for pressurized irrigation													
3. Using sensors for Agro meteorological measurements													
4. Employing Printed Circuit Board(PCB) or Bread board for controlling or triggering an agricultural system													
5. Use of mobile apps for controlling or triggering an agricultural system													
6. Construction of crop growth functions(bestfit) for crop yields simulations													
7. Image processing as tool for biotic and abiotic stress identification													
8. Experience with existing open source crop simulation models													
9. Exposing cloud resources for agricultural applications													
10. Developing automated agro advisory systems													
												Total: 60 periods	
REFERENCES / MANUALS / SOFTWARES:													
1.	Laboratory manual												
COURSE OUTCOMES:													
On completion of the course, the students will be able to													
CO1:	Knowledge on meteorological measurements												
CO2:	Obtain knowledge on triggering an agricultural system												
CO3:	Knowledge on Image processing as tool for biotic and abiotic stress identification												
CO4:	Ability to conduct Spatial analysis of rainfall data and design water storage reservoirs												
Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	2	2	-	-	1	2	2	3	3
CO2	-	2	2	2	1	1	2	-	-	-	2	3	3
CO3	-	-	-	-	2	3	-	-	1	-	2	3	3
3CO4	2	-	3	3	1	3	-	-	-	2	2	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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UIDL24001		IDEA LAB																			
<table><tr><td>Category</td><td>L</td><td>T</td><td>P</td><td>Credit</td></tr><tr><td>EEC</td><td>0</td><td>0</td><td>2</td><td>1</td></tr></table>												Category	L	T	P	Credit	EEC	0	0	2	1
Category	L	T	P	Credit																	
EEC	0	0	2	1																	
Course objectives																					
- To introduce basic 3D modeling and additive manufacturing - To familiarize with PCB design and prototyping - To explore design software and laser cutting for fabrication - To perform basic turning operation on a lathe machine - To introduce reverse engineering using a 3D scanner																					
List of Exercises / Experiments:																					
1. Design a personalized keychain and 3D print it.																					
2. Design a simple LED blinking circuit, mill the PCB, and solder components.																					
3.Design and cut a personalized name plate from acrylic or wood																					
4. Design and Machine a Cylindrical Rod to Desired Dimensions Using a Lathe.																					
5. Design a 3D Model by Scanning a Real-World Object Using a 3D Scanner																					
										Total: 30 periods											
REFERENCES / MANUALS / SOFTWARES:																					
1.	Laboratory manual																				
2.	Suitable Software																				
COURSE OUTCOMES:																					
On completion of the course, the students will be able to																					
CO1:	Apply basic design thinking principles to conceptualize and develop simple prototypes using digital fabrication tools such as 3D printers, scanners, and PCB machines.																				
CO2:	Demonstrate the ability to operate modern prototyping equipment like laser cutters, CNC machines, and lathes to fabricate mechanical and electronic components.																				
CO3:	Integrate mechanical design, electronics, and fabrication techniques to develop interdisciplinary solutions for real-world problems through hands-on experimentation																				
Mapping of COs with POs and PSOs																					
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11										
CO1	2	2	3	1	3	1															
CO2	2	2	2	2	3	2															
CO3	3	3	3	2	3	2															
1 – Slight, 2 – Moderate, 3 –Substantial, BT – Bloom’s Taxonomy																					



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USD24501		Soft – Skill 3				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course objectives						
		I. To learn the Number Problem, Square and Cube Problems II. To learn Analytical and Interview Skills III. To develop Skills in Business Aptitude and Resume Building IV. To develop Skills in Data Interpretation and Sufficiency. V. To improve Mathematical Skill on Probability and Basic Grammer				
UNIT – I	PROBLEMS ON NUMBERS & GROUP DISCUSSION					6
Introduction-Problem on Numbers –Square root Problems- Cube Root-Surds and Indices GD Introduction –GD gauge –Company’s Perspective-Preparation						
UNIT – II	ANALYTICAL REASONING &INTERVIEW SKILLS					6
Introduction, Problems on Analytical and Reasoning-Nonverbal Reasoning Introduction for Interview Skill-Before The Interview, During The Interview, After The Interview						
UNIT – III	BUSINESS APTITUDE & RESUME BUILDING					6
Introduction-Problem Percentage-Problem on Partnership Purpose of Resume Building –Types-Includes-Formal-Sample-Tips						
UNIT – IV	DATA INTERPRETATION AND SUFFICIENCY/BLOOD RELATION					6
Introduction-Table Charts-Bar Charts – Pie Charts- Line Charts-Data Sufficiency Introduction Of Blood Relation-Objectives-Relation Ships –Example-Exercise						
UNIT – V	PERMUTATION & COMBINATIONS, PROBABILITY/GRAMMER					6
Introduction - Problem on Permutation & Combination-Problems On Probability, Comparison Of Ranks Introduction Of Basic Grammar-Punctuation & Spelling.						
Total: =30 periods						
TEXT BOOK:						
1.	Training And Placement Book [TKEC]					
2.	Staff Materials & Notes					
REFERENCES:						
1.	Quantitative Aptitude By R.S.Aggarwal					
2.	https://prepinsta.com					

COURSE OUTCOMES:	
On completion of the course, the students will be able to	
CO1:	Advanced Mathematical Skills.
CO2:	Complex Problem Solving Skill.
CO3:	Build Confidence in Mathematics
CO4:	Solve mathematical problems by applying logical thinking.
CO5:	Apply different techniques for faster calculations



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	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	-	-	-	-	-	3	3	2
CO2	3	3	3	3	2	2	-	-	-	-	-	3	3	2
CO3	3	2	2	1	1	3	-	-	-	-	-	2	3	2
CO4	3	3	2	2	2	2	-	-	-	-	-	3	3	2
CO5	2	2	2	1	3	3	-	-	-	-	-	2	2	3
Avg.	2.8	2.4	2.2	1.8	1.8	2.4	-	-	-	-	-	2.6	2.8	2.2
	1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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UAIL24503		Internship I				
		Category	L	T	P	Credit
		EEC	0	0	0	1
Course objectives						
To enable the students to • Get connected with industry/laboratory/research institute • Get practical knowledge on production process in the industry and develop skills to solve related problems • Develop skills to carry out research in the research institutes/laboratories • The students individually undergo training in reputed firms/ research institutes / laboratories for the specified duration. After the completion of training, a detailed report should be submitted within ten days from the commencement of next semester. The students will be evaluated as per the Regulations.						
						No. of. Weeks: 02

COURSEOUTCOMES:	
On completion of the course, the students will be able to	
CO1:	Plant layout, machinery, organizational structure and production processes in the firm or research Facilities in the laboratory/research institute
CO2:	Analysis of industrial/ research problems and their solutions
CO3:	Documenting of material specifications, machine and process parameters, testing parameters and Results
CO4:	Preparing of Technical report and presentation



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UAIT24601		POST- HARVEST TECHNOLOGY				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
	The students would be exposed to fundamental knowledge in engineering properties of agricultural materials, different Post Harvest operations and processing methods of harvested crops and storage of crops					
UNIT – I	FUNDAMENTALS OF POST HARVESTING					9
Post harvest technology – introduction –objectives –post harvest losses of cereals, pulses and oilseeds – importance - optimum stage of harvest. Threshing – traditional methods mechanical threshers – types-principles and operation- moisture content –measurement –direct and indirect methods – moisture meters – equilibrium moisture content.						
UNIT – II	PSYCHROMETRY AND DRYING					9
Psychrometry – importance – Psychrometric charts and its uses – Drying – principles and theory of drying – thin layer and deep bed drying – Hot air drying – methods of producing hot air – Types of grain dryers – selection – construction, operation and maintenance of dryers – Design of dryers.						
UNIT – III	CLEANING AND GRADING					9
Principles - air screen cleaners – adjustments - cylinder separator - spiral separator – magnetic separator - colour sorter - inclined belt separator – length separators - effectiveness of separation and performance index.						
UNIT – IV	SHELLING AND HANDLING					9
Principles and operation – maize sheller, husker sheller for maize – groundnut decorticator – castor sheller – material handling – belt conveyor –screw conveyor – chain conveyor – bucket elevators – pneumatic conveying.						
UNIT – V	CROP PROCESSING					9
Paddy processing – parboiling of paddy – methods – merits and demerits – dehusking of paddy – methods – merits and demerits – rice polishers –types – constructional details – polishing –layout of modern rice mill - wheat milling – pulse milling methods – oil seed processing – millets processing.						
Total: 45 periods						
TEXT BOOK:						
1.	Chakraverty, A. Post harvest technology for Cereals, Pulses and oilseeds. Oxford & IBH publication Pvt Ltd, New Delhi, Third Edition, 2000.					
2.	Sahay, K.M., and Singh, K.K. Unit operations of Agricultural Processing. Vikas publishing house Pvt. Ltd., New Delhi, 1994.					
REFERENCES:						
1.	Pande, P.H. Principles of Agriculture Processing. Kalyani Publishers, Ludhiana, 1994.					
2.	Henderson, S.M. and R.L. Perry. Agricultural Process Engineering. John Wiley and Sons, New York. 1955.					



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COURSE OUTCOMES:

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

CO1:	Understand the importance of post-harvest processing and determine moisture content of products
CO2:	Perform drying of agricultural products and analyze performance of dryers
CO3:	Recognize the working principles of grain cleaning and grading devices and able to select suitable equipment for cereal grains, oilseeds, and pulses
CO4:	Understand the operation of post-harvest equipment like shellers, conveyors
CO5:	Different Post Harvest operations and processing methods of harvested crops.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	-	-	-	-	1	3	3	1
CO2	2	2	3	1	1	1	-	-	-	-	1	3	3	1
CO3	2	2	3	1	1	1	-	-	-	-	1	3	3	1
CO4	2	2	3	1	1	1	-	-	-	-	1	3	3	1
CO5	2	2	3	1	1	1	-	-	-	-	1	3	3	1
Avg.	2	2	3	1	1	1	-	-	-	-	1	3	3	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIT24602		IRRIGATION AND DRAINAGE ENGINEERING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
• Inculcate water resources development and various parameters required for irrigation scheduling and its requirement • Understand different kinds of irrigation system and choose appropriate system for a given environment. • Introduce different types of water control and diversion structures for planning the irrigation system. • Understand canal, tank irrigation and command area development. • Understand the basic concepts for planning, design and management of land drainage works in field areas						
UNIT – I	WATER RESOURCES AND IRRIGATION REQUIREMENT					9
Water Resources- River basins-Development and Utilization in India and Tamil Nadu-Irrigation – duty and delta - Rooting characteristics - Moisture use of crop, Evapotranspiration - ET plot – Crop water requirement - Effective rainfall - Scheduling - Irrigation requirement - Irrigation frequency, Irrigation efficiencies.						
UNIT – II	METHODS OF IRRIGATION					9
Methods of Irrigation – Surface and Subsurface methods – Drip and Sprinkler - Hydraulics and design - Erodible and non-erodible, Kennedy’s and Lacey’s theories, Materials for lining water courses and field channel, Water control and diversion structure - Underground pipeline irrigation system						
UNIT – III	DIVERSION AND IMPOUNDING STRUCTURES					9
Head works –Weirs and Barrage –Types of impounding structures - Factors affecting, location of dams -Forces on a dam -Design of Gravity dams- Earth dams, Arch dams – Spillways –Energy dissipaters.						
UNIT – IV	CANAL IRRIGATION AND COMMAND AREA DEVELOPMENT					9
Classification of canals- Alignment of canals – Design of irrigation canals– Regime theories - Canal Head works – Canal regulators - Canal drops – Cross drainage works – Canal Outlet, Escapes –Lining and maintenance of canals - Excess irrigation and water logging problem - Command area - Concept, Components of CADP - On Farm Development works, Farmers committee - its role for water distribution and system operation - rotational irrigation system.						
UNIT – V	AGRICULTURAL DRAINAGE					9
Agricultural drainage - Drainage coefficient; principles of flow through soils, Darcy’s law – infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage - Pipe materials - mole drains, drainage wells, Leaching requirements - irrigation and drainage water quality - recycling of drainage water for irrigation.						
Total: 45 periods						
TEXT BOOK:						
1.	Dilip Kumar Majumdar., “Irrigation Water Management”, Prentice-Hall of India, New Delhi, 2008.					
2.	Michael, A.M., “Irrigation Engineering”, Vikas Publishers, New Delhi, 2008.					
3.	Garg, S.K., “Irrigation Engineering,” Laxmi Publications, New Delhi, 2008.					
4.	Ritzema, H.P., “Drainage Principles and Applications”, Publication No. 16, International Institute of Land Reclamation and Improvement, Netherlands, 1979.					



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REFERENCES:	
1.	Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co, New Delhi, 2008.
2.	Murthy, V.V.N. Land and water management, Kalyani publishing, New Delhi, 1998.
3.	Bhattacharya, A.K., and Michael, A.M., “Land Drainage – Principles, Methods and Applications”, Konark Publishers Pvt. Ltd., New Delhi, 2003.
4.	Irrigation water Management, Training Manual No 6, Drainage of Irrigated Lands, Food and Agriculture Organisation, Rome 1996
5.	Kessler, J., “Drainage Principles and Applications”, Vol. II and IV, International Institute of Land Reclamation and Improvement, Netherlands, 1979.

COURSE OUTCOMES:

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

CO1:	The students will have knowledge and skills on Planning, design, operation and management of Water Resources and Irrigation Requirement.														
CO2:	The student will gain knowledge on different methods of irrigation including canal irrigation.														
CO3:	Obtain knowledge on different types Diversion and Impounding Structures														
CO4:	Understand the concept Canal Irrigation and Command Area Development														
CO5:	Understand the concept recycling of drainage water for irrigation.														
	Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6		PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	2		2	1	2	2	2	2	2	1
CO2	2	2	3	2	2	3		2	2	2	2	2	2	2	1
CO3	2	2	2	2	2	3		1	1	2	2	2	2	2	1
CO4	3	3	2	3	2	3		1	1	2	2	2	2	2	1
CO5	3	3	3	3	2	1		2	2	2	2	2	2	2	1
Avg.	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1
	1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy														



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UAIL24601	POST-HARVEST TECHNOLOGY LABORATORY				
	Category	L	T	P	Credit
	EEC/BSC	0	0	2	1

Course objectives

After the end of this lab, students will be able to determine various engineering properties of grains, test and evaluate different post harvesting machineries.

List of Exercises / Experiments:

1. Determination of moisture content of grains by oven method and moisture meter.
2. Determination of porosity of grains.
3. Determination of coefficient of friction and angle of repose of grains.
4. Testing of paddy thresher & paddy winnower.
5. Testing of groundnut decorticator & maize sheller
6. Evaluation of thin layer drier
7. Evaluation of L.S.U. drier.
8. Determining the efficiency of bucket elevator and screw conveyor
9. Evaluation of shelling efficiency of rubber roll sheller
10. Determining the oil content of oilseeds.
11. Visit to modern rice mill
12. Visit to pulse milling industry

Total: 30 periods

REFERENCES / MANUALS / SOFTWARES:

1. Laboratory manual
2. Pande, P.H. Principles of Agriculture Processing. Kalyani Publishers, Ludhiana, 1994.
3. Henderson, S.M. and R.L. Perry. Agricultural Process Engineering. John Wiley and Sons, New York. 1955.

COURSE OUTCOMES:

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

- | | |
|------|---|
| CO1: | Determine the different engineering properties of biological materials and their importance |
| CO2: | Determine the efficiency of various post-harvest equipment |

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3	1	1	1				1		1	3	3
CO2	2	1	3	1	1	1				1		1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIL24602		CAD for Agriculture Machinery Laboratory											
		Category	L	T	P	Credit							
		EEC/BSC	0	0	4	2							
Course objectives													
To draft the agricultural engineering related machineries and structures manually and also by computer aided methods.													
List of Exercises / Experiments:													
1.Design and Drawing of Underground pipeline system													
2.Design and Drawing of Check dam													
3. Design and Drawing of Mould board plough													
4. Design and Drawing of Disk plough													
5.Design and Drawing of Post harvest technology units (threshers and winnowers)													
6. Design and Drawing of Biogas plant.													
7.Introduction & demonstration on 3D modeling softwares like Pro/E, Creo,Solid works, Solid Edge etc.													
Total: 60 periods													
REFERENCES / MANUALS / SOFTWARES:													
1.	Laboratory manual												
2.	Michael,A.M.“Irrigation Theory and Practice”,Vikas Publishing House, NewDelhi,1999.												
3.	Rai,G.D.“Non-conventional Sources of Energy”, Khanna publishers, New Delhi,1995.												
COURSE OUTCOMES:													
On completion of the course, the students will be able to													
CO1:	Understand the plan and layout of underground pipes, post harvesting units and check dams.												
CO2:	Design and draw the components using computer aided methods												
Mapping of COs with POs and PSOs													
COs/POs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O2
CO1	2	1	3	1	3	1				1	1	3	3
CO2	2	1	3	1	3	1				1	1	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy													



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UAIL24603	Mini Project				
	Category	L	T	P	Credit
	EEC	0	0	4	2
Course objectives					
1. The objective of mini project is to enable students to work in groups of not more than three members in each group on a project involving analytical, experimental, design, simulation or combination of these in the area chemical or allied engineering 2. The student shall carry out a 'mini project work in the sixth semester. This Mini project work carries 2 credits. 3. The student is given an option to carry out this mini project work either in the college or in an industry or in a research laboratory or in a higher learning institution. 4. The project work will be carried out under supervision of a project guide from the department. In case of student carrying out the 5. project work outside the college, an external guide from the relevant organization shall be assigned in addition to the internal guide from the department 6. The student is required to literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. 7. On completion of the work, a project report/ Thesis should be prepared and submitted to the Department. 8. This Mini project report will be evaluated by a project evaluation committee comprising of internal expert and external expert.					
					No. of. Hours: 60

COURSE OUTCOMES:	
Upon the completion of this course, the students will be able to	
CO1:	Apply class room theory by collecting literature pertaining to the purpose project
CO2:	Demonstrate the ability to work in teams
CO3:	Write technical documents and make oral presentations related to the work completed.
CO4:	Manage a project within a stipulated time period
CO5:	Apply professional ethics and responsibilities.



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USD24601	Soft – Skill 4				
	Category	L	T	P	Credit
	MC	2	0	0	0

Course objectives

- I. To learn the essence of Ratio and Proportion
- II. To learn a problems related to Simple Interest and Compound Interest
- III. To develop Skills in Solving Problems Related to Boats and Streams.
- IV. To develop Skills in solving Problems Related to Height and Distance.
- V. To improve a Skill in Solving Problem on Allegation or Mixture

UNIT – I	RATIO AND PROPORTION, PIPES AND CISTERNS	6
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Introductions-Pipes & Outlet Problem-Problem on Ratio & Proportion

UNIT – II	SIMPLE INTEREST AND COMPOUND INTEREST & SPEAKING ACTIVITY	6
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Introduction-Simple Interest-Compound Interest-Different Rules-Present worth

UNIT – III	BOAT AND STREAM, CALENDAR & LOGICAL ARRANGEMENT OF WORDS	6
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Introduction-Upstream & Downstream problems-Problems on Calendar
Introduction of Classification-Logical Arrangement of Words

UNIT – IV	HEIGHT AND DISTANCE, CLOCK	6
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Introduction-Trigonometry Formulas- Angle of Elevation-Angle of Depression –Problem On Clock

UNIT – V	ALLIGATION OR MIXTURE & STATEMENT & CONCLUSION	6
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Introduction – Alligation -Mean Price-Rule of Allegation-Problem On Mixture
Introduction to Statement and Conclusion –Exercise for Statement and Conclusion.

Total: =30 periods

TEXT BOOK:

1. Training And Placement Book [TKEC]
2. Staff Materials & Notes

REFERENCES:

1. Quantitative Aptitude By R.S.Aggarwal
2. <https://prepinsta.com>

COURSE OUTCOMES:

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

CO1:	Advanced Mathematical Skills.
CO2:	Complex Problem-Solving.
CO3:	Data Analysis
CO4:	Real World Applications.
CO5:	To Understand and apply mathematical concepts on Statement and Conclusion



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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	1	2	1	1	3	3	2	2
CO2	3	3	3	3	2	1	1	2	2	2	3	3	3	3
CO3	2	2	2	3	3	1	1	2	2	2	2	2	3	2
CO4	3	2	3	2	2	2	1	2	2	2	3	3	2	2
CO5	3	3	2	2	2	1	2	2	2	1	3	3	2	3
Avg.	3	2.4	2.4	2.4	2	1.2	1.2	2	1.8	1.6	2.8	2.8	2.4	2.4

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIT24701		REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
- To introduce the principles and basic concepts of Remote Sensing and GIS - To introduce the remote sensing systems, data products and analysis - To introduce concepts of GIS 9 Map and their influences - To introduce the spatial data models, analysis and presentation techniques - To study the applications of Remote Sensing and GIS in agriculture, soil and water resources						
UNIT – I		CONCEPTS OF REMOTE SENSING AND SATELLITES				9
Definition- Historical background - Components of remote sensing – Energy source, electromagnetic spectrum, radiation principle, platforms and sensors - Active and passive remote sensing interference - Atmospheric effects on remote sensing – Energy interaction with earth surface feature - Data acquisition - Reflectance, spectral signatures for water, soil and vegetation. Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT, SPOT & IRS - Resolution - Recent satellites with its applications						
UNIT – II		DATA PRODUCTS AND IMAGE ANALYSIS				9
Data products –based on level of processing- o/p – scale – area/coverage – data availability – data ordering- data price - Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.						
UNIT – III		CONCEPTS OF GIS				9
Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.						
UNIT – IV		DATA INPUT AND ANALYSIS				9
Data – Spatial, Non-Spatial – Database models – Hierarchical network, Relational and Object-Oriented Data Models – Raster and Vector – Methods of Data input – Data Editing – Files and formats – Data structure – Data compression. Introduction to analysis – Measurements – Queries – Reclassification – Simple spatial analysis – Buffering – Neighboring functions – Map overlay – Vector and raster – Spatial interpolation –Digital Elevation Modelling						
UNIT – V		APPLICATION OF RS AND GIS				9
Crop Acreage estimation - Estimation of Crop Water Requirement – Crop condition - Soil mapping – classification of soil with digital numbers – soil erosion mapping- reservoir sedimentation using image processing - Inventory of water resources – water quality assessment - Application of Remote Sensing and GIS in Precision Agriculture - Monitor Crop Health - Management Decision Support Systems						
TEXT BOOK:						
1.	Anji Reddy. M, Remote Sensing and Geographical Information Systems, BS Publications, Hyderabad, 2001					
2.	Lillesand, T. M., and Kiefer, R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 2000.					
REFERENCES:						
1.	Bettinger, P., and Michael, G.W., “Geographical Information System: Applications in Forestry and Natural Resources Management,” Tata McGraw–Hill Higher Education, New Delhi, 2003					
2.	Ian Heywood., “An Introduction to GIS”, Pearson Education, New Delhi, 2001.					
3.	Jeffery Star and John Estes, “Geographical Information System – An Introduction,” Prentice Hall India Pvt. Ltd., New Delhi, 1998.					
4.	Patel A.N & Surendra Singh, “Remote sensing principles & applications”, Scientific Publishers, Jodhpur, 1992					



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COURSE OUTCOMES:

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

CO1: Understand the remote sensing principles and systems.

CO2: Gain sufficient knowledge on satellite data processing and available data products

CO3: Know the concept of GIS and its tools.

CO4: Have knowledge on data input and analysis techniques.

CO5: Utilize these advanced techniques in addressing the real world problems.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	1	1	1	1	2	3	2	2	2
CO2	3	2	3	2	1	2	1	-	1	2	3	2	2	2
CO3	3	3	2	-	1	-	-	2	2	3	3	2	2	2
CO4	2	3	1	-	-	3	1	-	1	2	2	2	2	2
CO5	2	3	2	3	2	3	1	2	1	2	2	2	2	2
Avg.	3	3	2	1	1	2	1	1	1	2	3	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UGET24707		HUMAN VALUES AND ETHICS				
		Category	L	T	P	Credit
		PCC	2	0	0	2
Course objectives:						
- To create awareness about values and ethics enshrined in the Constitution of India To sensitize students about the democratic values to be upheld in the modern society. To inculcate respect for all people irrespective of their religion or other affiliations. - To instill the scientific temper in the students' minds and develop their critical thinking. - To promote sense of responsibility and understanding of the duties of citizen.						
UNIT – I		DEMOCRATIC VALUES				9
Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in Governance – World Democracies: French Revolution, American Independence, Indian Freedom Movement. Reading Text: Excerpts from John Stuart Mills' On Libert						
UNIT – II		SECULAR VALUES				9
Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices. Reading Text: Excerpt from Secularism in India: Concept and Practice by Ram Puniyani						
UNIT – III		SCIENTIFIC VALUES				9
Scientific thinking and method: Inductive and Deductive thinking, Proposing and testing Hypothesis, Validating facts using evidence based approach – Skepticism and Empiricism – Rationalism and Scientific Temper. Reading Text: Excerpt from The Scientific Temper by Antony Michaelis R						
UNIT – IV		SOCIAL ETHICS				9
Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices. Reading Text: Excerpt from 21 Lessons for the 21st Century by Yuval Noah Harari						
UNIT – V		SCIENTIFIC ETHICS				9
Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society. Reading Text: Excerpt from American Prometheus: The Triumph and Tragedy of J.Robert Oppenheimer by Kai Bird and Martin J. Sherwin.						
Total: 45 periods						
REFERENCES:						
1.	The Nonreligious: Understanding Secular People and Societies, Luke W. Galen Oxford University Press, 2016.					
2.	Secularism: A Dictionary of Atheism, Bullivant, Stephen; Lee, Lois, Oxford University Press, 2016.					
3.	The Oxford Handbook of Secularism, John R. Shook, Oxford University Press, 2017.					
4.	The Civic Culture: Political Attitudes and Democracy in Five Nations by Gabriel A. Almond and Sidney Verba, Princeton University Press,					
5.	Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January 2022					



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COURSE OUTCOMES:

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

CO1:	Identify the importance of democratic, secular and scientific values in harmonious functioning of social life
CO2:	Practice democratic and scientific values in both their personal and professional life.
CO3:	Find rational solutions to social problems.
CO4:	Behave in an ethical manner in society
CO5:	Practice critical thinking and the pursuit of truth.



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UGET24702		TOTAL QUALITY MANAGEMENT				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course 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 planning Customer 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 Capability Bench 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						
TEXT BOOK:						
1.	Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe 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.					



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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 .

COURSE OUTCOMES:

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

CO1:	Identify the importance of democratic, secular and scientific values in harmonious functioning of social life
CO2:	Practice democratic and scientific values in both their personal and professional life.
CO3:	Find rational solutions to social problems.
CO4:	Behave in an ethical manner in society
CO5:	Practice critical thinking and the pursuit of truth.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	3	-	-	-	-	-	-	-	-	3	2	-	3
CO2	-	-	-	-	-	3	-	-	-	-	3	-	2	-
CO3	-	-	-	-	3	-	-	3	-	-	-	-	2	3
CO4	-	2	-	-	3	3	2	-	-	-	3	3	2	-
CO5	-	-	3	-	-	3	2	-	-	-	-	-	-	-
Avg.	-	2.5	3	-	3	3	2	3	-	-	3	2.5	2	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy



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UAITL24701		RENEWABLE ENERGY IN AGRICULTURAL ENGINEERING				
		Category	L	T	P	Credit
		PCC	2	0	2	4
Course objectives						
- To impart the fundamental knowledge on the importance of Bio resources, Bio energy and reactors. - To study Slurry handling - To study Bio reactors/ fermenters - To study Alcohol and ethanol production and To study Energy and Environment.						
UNIT – I		BIO RESOURCE – AN INTRODUCTION				6
Bio resource – origin – biomass types and characteristics- biomass conversion technologyBiodegradation - steps in biogas production- parameters affecting gas production- Types of biogas plants- Construction details- operation and maintenance.						
UNIT – II		BIO ENERGY				6
Slurry handling- enrichment and utilization – Biogas appliances- Biochemical characteristics of bio resources- Bioenergetics –Biocatalysis –Kinetics of product formation.						
UNIT – III		BIO REACTORS AND FERMENTORS				6
Bio reactors/ fermentors – Batch type – continuous stirred tank reactors- Biological waste water treatment- Activated sludge process- Downstream processing-Recovery and purification of products.						
UNIT – IV		ALCOHOL PRODUCTION				6
Alcohol ethanol production - Acid hydrolysis - enzyme hydrolysis-Methanol synthesis - Antibiotics enzymes-principles of thermo chemical conversion – combustion - pyrolysis- Gasification – types of gasifiers.						
UNIT – V		ENERGY AND ENVIRONMENT				6
Principles of operation- chemical reaction- cleaning and cooling - Utilization- Improved wood burning stove - Energy plantations- Biomass briquetting - co generation- Impact on Environment – – Bioenergy policy.						
Total: 30 periods						
PRACTICAL						
1. Characterization of biomass – proximate analysis						
2. To Study Gasifier						
3. To Study Briquetting Machine						
4. To Study Solar Distillation						
5. To Study about Solar Pumping						
6. Experimental study on Grid connected and Standalone 1kWp Solar Power System						
7. Demonstrate on Wind Turbines and Generator Components with working principles						
8. Demonstrate on Solar PV Components and Battery Charging system with working principles						
9. Industrial Visit on Hydel Power and Identify the components and working principles						
10. Experimental and Testing of Solar PV cells						
Total: 30 periods						
TEXT BOOK:						
1.	Rai G.D,Non conventional sources of Energy, Khanna publishers, New Delhi, 1995.					
2.	Bouley James .E & David Follis - Biochemical Engineering Fundamentals Mc Graw-Hill publishing company, Tokyo.1986					
REFERENCES:						
1.	Chawla O.P, Advances in Biogas Technology ICAR publication New Delhi 1986					



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COURSE OUTCOMES:

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

CO1:	The students will be able to understand the concepts of bio energy sources and its applications.
CO2:	Gain sufficient knowledge on Bioenergy.
CO3:	Know the concept of Bioreactors and Fermentors and their working principles.
CO4:	Have knowledge on production of alcohol.
CO5:	Utilize these advanced techniques in conserving energy and protecting the environment.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	1	1	1	1	2	3	2	2	2
CO2	3	2	3	2	1	2	1	-	1	2	3	2	2	2
CO3	3	3	2	-	1	-	-	2	2	3	3	2	2	2
CO4	2	3	1	-	-	3	1	-	1	2	2	2	2	2
CO5	2	3	2	3	2	3	1	2	1	2	2	2	2	2
Avg.	3	3	2	1	1	2	1	1	1	2	3	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy

UAIL24701	REMOTE SENSING AND GIS LABORATORY					
Category		L	T	P	Credit	
EEC/BSC		0	0	4	2	

Course objectives

To introduce the principles and basic concepts of Remote Sensing and GIS through hands on training.

List of Exercises / Experiments:

- | |
|--|
| 1. Measurement of relief displacement using parallax bar |
| 2. Stereoscopic vision test |
| 3. Aerial photo interpretation-visual |
| 4. Satellite images interpretation-visual |
| 5. Introduction to QGIS |
| 6. Geo-referencing of images |
| 7. Image enhancement practice |
| 8. Supervised classification practice |
| 9. Unsupervised classification practice |
| 10. Database Management Systems |
| 11. Spatial data input and editing – Digitising |
| 12. Raster analysis problems–Data base query |
| 13. GIS applications in DEM and its analysis |
| 14. GIS application in watershed analysis |
| 15. GIS application in rainfall-runoff modeling |
| 16. GIS application in soil erosion modeling |

Total: 30 periods

REFERENCES / MANUALS / SOFTWARES:

- | | |
|----|--|
| 1. | Laboratory manual |
| 2. | FloydF.Sabins.2005.“Remote Sensing: Principles and Interpretation”, IIIedition. Freeman and Company New York. |
| 3. | Jensen, J.R., 2004. “Introductory Digital Image Processing: A Remote Sensing Perspective”. Prentice –Hall. New Jerse |

COURSE OUTCOMES:

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

- | | |
|------|---|
| CO1: | Gain sufficient knowledge on satellite data processing and available data products. |
| CO2: | Know the concept of GIS and its tools. |
| CO3: | Have knowledge on data input and analysis techniques |
| CO4: | Utilize these advanced techniques in addressing problems in various fields of agricultural engineering. |



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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	2	2	-	-	1	2	2	2	2
CO2	-	2	2	2	1	1	2	-	-	-	2	2	2
CO3	-	-	-	-	2	3	-	-	1	-	2	2	2
CO4	2	-	3	3	1	3	-	-	-	2	2	2	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy													



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UAIL24702		Irrigation Field Laboratory				
		Category	L	T	P	Credit
		EEC/BSC	0	0	2	1
Course objectives						
Students should be able to verify the principles studied in theory by performing the experiments in lab.						
List of Exercises / Experiments:						
1.To study various instruments in the Meteorological Laboratory						
2. Determination of infiltration rate using double ring and digital infiltrometer						
3. Determination of soil moisture wetting pattern for irrigation scheduling						
4. Design of Drip irrigation system						
5. Design of sprinkler irrigation system						
6. Measurement of flow properties in open irrigated channels (flumes, notches)						
7. Evaluation of surface irrigation						
8. Determination of uniformity coefficient for drip irrigation system						
9. Determination of uniformity coefficient for sprinkler system (catch can method)						
10. To conduct experiment on disc filter for micro irrigation systems						
						Total: 30 periods
REFERENCES / MANUALS / SOFTWARES:						
1.	Laboratory manual					
2.	Michael, A.M.,“Irrigation Theory and Practice”, Vikas Publishing House, NewDelhi,1999.					
3.	Asawa,G.L.,“IrrigationEngineering”,NewAgeInternationalPrivateLimited,NewDelhi,1996.					
COURSE OUTCOMES:						
On completion of the course, the students will be able to						
CO1:	On the completion of the course the student will have the knowledge on various meteorological instruments and understanding the concept of different irrigational systems in the laboratory tests.					
CO2:	The student will gain knowledge on infiltrometer					
CO3:	Obtain knowledge on Drip irrigation system with all accessories					
CO4:	Obtain knowledge on sprinkler irrigation system with all accessories					



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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	2	2	-		1	2	2	3	3
CO2	-	2	2	2	1	1	2		-	-	2	3	3
CO3	-	-	-	-	2	3	-		1	-	2	3	3
CO4	2	-	3		1	3		-	-	2	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIL24703		Internship II				
		Category	L	T	P	Credit
		EEC	0	0	0	1
Course objectives						
To enable the students to - Get connected with industry/laboratory/research institute - Get practical knowledge on production process in the industry and develop skills to solve related problems - Develop skills to carry out research in the research institutes/laboratories - The students individually undergo training in reputed firms/ research institutes / laboratories for the specified duration. After the completion of training, a detailed report should be submitted within ten days from the commencement of next semester. The students will be evaluated as per the Regulations.						
						No. of. Weeks: 02

COURSEOUTCOMES:	
On completion of the course, the students will be able to	
CO1:	Plant layout, machinery, organizational structure and production processes in the firm or research Facilities in the laboratory/research institute
CO2:	Analysis of industrial/ research problems and their solutions
CO3:	Documenting of material specifications, machine and process parameters, testing parameters and Results
CO4:	Preparing of Technical report and presentation



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UAIL24801	Project Work/Internship				
	Category	L	T	P	Credit
	EEC	0	0	20	10
Course objectives					
To train the students in - Identifying problem and developing the structured methodology to solve the identified problem in the industry or research problem at research Institution or college. - Conducting experiments, analyze and discuss the test results, and make conclusions. - Preparing project reports and presentation - The students shall individually / or as group work on a specific topic approved by the Department. The student can select any topic which is relevant to his/her specialization of the programme. The student should continue the work on the selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work, results and discussion, conclusion and references should be prepared as per the format prescribed by the University and submitted to the Head of the department. The students will be evaluated based on the report and viva-voce examination by a panel of Examiners as per the Regulations.					
TOTAL: 300 PERIODS					

COURSEOUTCOMES:	
At the end of the project, the student will be able to	
CO1:	Formulate and analyze problem/create a new product /process.
CO2:	Design and conduct experiments to find solution
CO3:	Analyze the results and provide solution for the identified problem, prepare project report and Make presentation.



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UMC24001		CONSTITUTION OF INDIA				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course objectives						
The course is intended to • To equip the students with understanding of Constitution of India. • To gain insights into the fundamental rights, duties. • To introduce the various aspects of Union Government & State Government. • To understand about amendments and emergency provisions in the constitution.						
UNIT – I	INTRODUCTION TO INDIAN CONSTITUTION					6
Meaning of the constitution law and constitutionalism - historical perspective of the constitution - salient features and characteristics of the constitution of India						
UNIT – II	FUNDAMENTAL RIGHTS AND DUTIES					6
Features of Fundamental Rights – Political/Cultural/Social/Educational Rights - Writs - Features of the Directive Principles - List of Fundamental Duties - Significance of Fundamental Rights/Duties.						
UNIT – III	UNION GOVERNMENT					6
President (Election, Qualifications, Oath, Term, Impeachment, Vacancy, Powers and Functions of the President) - Vice-President (Election, Qualifications, Oath, Term, Vacancy, Powers and Functions of the Vice-President) - Prime Minister (Appointment, Oath, Term, Salary, Powers and Functions of the Prime Minister).						
UNIT – IV	STATE GOVERNMENT					6
Governor (Appointment, Conditions, Term, Powers, Functions and Constitutional Position of Governor) - Chief Minister (Appointment, Oath, Term, Powers, and Functions of Chief Minister) - Council of Ministers (Central/State) (Appointment, Oath, Salary, Responsibility and Composition of the Council of Ministers).						
UNIT – V	AMENDMENT TO CONSTITUTION AND EMERGENCY PROVISIONS					6
Amendment of the constitutional powers and procedure - the historical perspectives of the constitutional amendments in India.						
National emergency, president rule, financial emergency local self-government - constitutional scheme in India						
Total: 30 periods						
SUGGESTED READING:						
1.	The Constitution of India,1950(Bare Act),Government Publication.					
2.	Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.					
3.	M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.					
4.	D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.					



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COURSE OUTCOMES:

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

CO1:	The students will be able to gain knowledge about the constitutional law of India
CO2:	The students will be able to understand the fundamental rights and duties of a citizen
CO3:	The students will learn about the role and responsibilities of the Union Government as outlined in the Constitution.
CO4:	The students will learn about the role and responsibilities of the State Government as outlined in the Constitution.
CO5:	The students will be able to analyze the amendments and emergency provisions in the constitution

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	3	3	-	2	-	2	-	-	-
CO2	2	2	-	-	-	3	3	1	2	-	2	-	-	-
CO3	2	2	-	-	-	3	3	1	2	-	2	-	-	-
CO4	2	2	-	-	-	3	3	1	2	-	2	-	-	-
CO5	2	2	-	-	-	3	3	-	2	-	2	-	-	-
Avg.	2	1.8	-	-	-	3	3	1	2	-	2	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UMC24002		DISASTER RISK REDUCTION AND MANAGEMENT				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course objectives						
To impart knowledge on concepts related to disaster, disaster risk reduction, disaster management To acquaint with the skills for planning and organizing disaster response						
UNIT – I	HAZARDS, VULNERABILITY AND DISASTER RISKS					6
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies- Inter relations between Disasters and Sustainable development Goals						
UNIT – II	DISASTER RISK REDUCTION (DRR)					6
Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies.- Relevance of indigenous Knowledge, appropriate technology and Local resources.						
UNIT – III	DISASTER MANAGEMENT					6
Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level- (NDMA –SDMA-DDMA-NRDF- Civic Volunteers)						
UNIT – IV	TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT					6
Early warning systems -Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment. - Elements of Climate Resilient Development –Standard operation Procedure for disaster response – Financial planning for disaster Management						
UNIT – V	DISASTER MANAGEMENT: CASE STUDIES					6
Discussion on selected case studies to analyse the potential impacts and actions in the contest of disasters-Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.- Field work-Mock drill						
Total : 30 Periods						
TEXT BOOK:						
1.	Taimpo (2016), Disaster Management and Preparedness, CRC Publications					
2.	Singh R (2017), Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications					
3.	Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN- 13: 978-9380386423					



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4.	Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
REFERENCES:	
1.	Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
2.	Government of India, National Disaster Management Policy, 2009.
3.	Shaw R (2016), Community based Disaster risk reduction, Oxford University Press

COURSE OUTCOMES:

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

CO1:	To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction
CO2:	To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction
CO3:	To develop disaster response skills by adopting relevant tools and technology
CO4:	Enhance awareness of institutional processes for Disaster response in the country
CO5:	Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	3	2	3	-	2	2	-	-	2	-	2	-	1
CO2	3	3	3	3	-	2	1	-	-	2	-	2	-	1
CO3	3	3	3	3	-	2	2	-	-	-	-	2	-	1
CO4	3	3	2	3	-	2	1	-	-	2	-	2	-	1
CO5	3	3	2	3	-	2	2	-	-	2	-	3	-	1
Avg.	3	3	3	3	-	2	2	-	-	2	-	2	-	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy



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UMC24003	ELEMENTS OF LITERATURE				
	Category	L	T	P	Credit
	MC	2	0	0	0
Course objectives					
To make the students aware about the finer sensibilities of human existence through an art form. The students will learn to appreciate different forms of literature as suitable modes of expressing human experience					
COURSE CONTENTS					
Introduction to Elements of Literature					
1.Relevance of literature					
a) Enhances Reading, thinking, discussing and writing skills. b) Develops finer sensibility for better human relationship. c) Increases understanding of the problem of humanity without bias. d) Providing space to reconcile and get a cathartic effect.					
2. Elements of fiction					
a) Fiction, fact and literary truth. b) Fictional modes and patterns. c) Plot character and perspective.					
3. Elements of poetry					
a) Emotions and imaginations. b) Figurative language. c) (Simile, metaphor, conceit, symbol, pun and irony) d) Personification and animation e) Rhetoric and trend.					
4.Elements of drama					
a) Drama as representational art. b) Content mode and elements. c) Theatrical performance. d) Drama as narration, mediation and persuasion. e) Features of tragedy, comedy and satire.					
READINGS:					
a) An Introduction to the Study of English Literature, W.H. Hudson, Atlantic, 2007. b) An Introduction to Literary Studies, Mario Klarer, Routledge, 2013. c) The Experience of Poetry, Graham Mode, Open college of Arts with Open Univ Press, 1991. d) The Elements of Fiction: A Survey, Ulf Wolf (ed), Wolfstuff, 2114. e) The Elements of Drama, J.L.Styan, Literary Licensing, 2011.					
3.1 Textbook:					
3.2 *Reference Books:: To be decided by the teacher and student, on the basis of individual student so as to enable him or her to write the term paper.					
OTHER SESSION:					
4.1 *Tutorials:					
4.2 *Laboratory:					
4.3 *Project: The students will write a term paper to show their understanding of a particular piece of literature					



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4*ASSESSMENT:

5.1 HA:

5.2 Quizzes-HA:

5.3 Periodical Examination: one

5.4 Project/Lab: one (under the guidance of the teachers the students will take a volume of poetry, fiction or drama and write a term paper to show their understanding of it in a given context; sociological, psychological, historical, autobiographical etc.

5.5 Final Exam:

Total: 30 periods

COURSE OUTCOMES:

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

CO1	Recognize the relevance of literature in enhancing life skills and human understanding.
CO2	Identify and describe key elements of fiction, poetry, and drama.
CO3	Analyze the use of figurative language and rhetorical devices in poetry and prose.
CO4	Interpret and evaluate dramatic forms based on structure and performance.
CO5	Compose a term paper demonstrating critical understanding of a chosen literary work.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	-	-	-	-	-	3	3	3
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	3	2	2	3	2	-	-	-	-	-	-	3	3	3

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UMC24004		FILM APPRECIATION				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course Objectives						
In this course on film appreciation, the students will be introduced broadly to the development of film as an art and entertainment form. It will also discuss the language of cinema as it evolved over a century. The students will be taught as to how to read a film and appreciate the various nuances of a film as a text. The students will be guided to study film joyfully						
Theme - A: The Component of Films						
A-1: The material and equipment A-2: The story, screenplay and script A-3: The actors, crew members, and the director A-4: The process of film making... structure of a film						
Theme - B: Evolution of Film Language						
B-1: Film language, form, movement etc. B-2: Early cinema... silent film (Particularly French) B-3: The emergence of feature films: Birth of a Nation B-4: Talkies						
Theme - C: Film Theories and Criticism/Appreciation						
C-1: Realist theory; Auteurists C-2: Psychoanalytic, Ideological, Feminists C-3: How to read films? C-4: Film Criticism / Appreciation						
Theme – D: Development of Films						
D-1: Representative Soviet films D-2: Representative Japanese films D-3: Representative Italian films D-4: Representative Hollywood film and the studio system						
Theme - E: Indian Films						
E-1: The early era E-2: The important films made by the directors E-3: The regional films E-4: The documentaries in India						
READING:						
A Reader containing important articles on films will be prepared and given to the students. The students must read them and present in the class and have discussion on these.						
Total: 30 periods						



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COURSE OUTCOMES:

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

CO1	Understand the technical and creative components involved in the process of film production.
CO2	Trace the historical evolution of film language from silent cinema to talkies and analyze its impact on storytelling.
CO3	Apply major film theories (realist, auteur, psychoanalytic, feminist, and ideological) to analyze and interpret films.
CO4	Develop critical appreciation and interpretive skills to evaluate films from various aesthetic, cultural, and political lenses.
CO5	Examine the development of national cinemas such as Soviet, Japanese, Italian, and Hollywood traditions.
CO6	Analyze the evolution and diversity of Indian cinema, including regional films and documentaries.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	2	-	-	-	-	-	3	2	2
CO2	3	3	2	3	-	2	-	-	-	-	-	2	3	3
CO3	3	3	3	3	2	2	-	-	-	-	-	2	3	3
CO4	3	3	3	3	3	3	-	-	-	-	-	2	3	3
CO5	3	3	2	3	2	2	-	-	-	-	-	2	3	3
CO6	3	3	2	3	2	3	-	-	-	-	-	2	3	3
Avg.	3.0	2.8	2.3	2.7	2.2	2.3	-	-	-	-	-	2.2	2.8	2.8

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UMC24005		INTRODUCTION TO GENDER STUDIES												
										Category	L	T	P	Credit
										MC	2	0	0	0
Course Objectives														
- To introduce foundational concepts such as sex, gender, patriarchy, socialization, power, and stereotypes to understand gendered structures in society. - To explore major feminist theories (Liberal, Marxist, Socialist, Radical, Psychoanalytic, Postmodernist, Ecofeminist) and their approaches to gender. - To provide a historical and socio-political understanding of global and local women's movements and their impact on gender discourse. - To examine how language constructs and reflects gender identities and power relations through narratives and linguistic forms. - To analyze the representation of gender in mainstream, alternative, and social media, with emphasis on stereotypes and visual culture.														
UNIT – I		CONCEPTS												6
Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.														
UNIT – II		FEMINIST THEORY												6
Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.														
UNIT – III		WOMEN’S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL												6
Rise of Feminism in Europe and America. Women’s Movement in India.														
UNIT – IV		GENDER AND LANGUAGE												6
Linguistic Forms and Gender. Gender and narratives														
UNIT – V		GENDER AND REPRESENTATION												6
Advertising and popular visual media.														
Gender and Representation in Alternative Media. Gender and social media.														
Total: 30 periods														
COURSE OUTCOMES:														
At the end of the course the students would be able to														
CO1	Students will be able to understand the relevance of literature in human life and appreciate its aspects in developing finer sensibilities.													
Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	-	-	-	-	-	3	3	3
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	3	2	2	3	2	-	-	-	-	-	-	-	3	3	3

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UMC24006		INDUSTRIAL SAFETY				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course objectives						
The course is intended to give knowledge of various safety management principles, various safety systems, various machine guarding devices, hazard identification techniques, energy sources, systems & applications and the need in the present context.						
UNIT – I	SAFETY INTRODUCTION					6
Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization-objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages.						
UNIT – II	PERSONAL PROTECTION IN WORK ENVIRONMENT					6
Personal protection in the work environment, Types of PPEs, Personal protective equipment respiratory and non-respiratory equipment. Standards related to PPEs. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate.						
UNIT – III	SAFETY ISSUES IN CONSTRUCTION					6
Introduction to construction industry and safety issues in construction Safety in various construction operations – Excavation and filling – Under-water works – Under-pinning & Shoring – Ladders & Scaffolds – Tunneling – Blasting – Demolition – Confined space – Temporary Structures.						
UNIT – IV	SAFETY HAZARDS IN MACHINES					8
Machinery safeguard-Point-of-Operation, Principle of machine guarding -types of guards and devices. Safety in turning, and grinding. Welding and Cutting-Safety Precautions of Gas welding and Arc Welding. Material Handling- Classification-safety consideration- manual and mechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking. Material Handling equipment-operation & maintenance. Maintenance of common elements-wire rope, chains slings, hooks, clamps. Hearing Conservation Program in Production industries.						
UNIT – V	HAZARD IDENTIFICATION AND ANALYSIS					4
Hazard and risk, Types of hazards –Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment.						
Total: =30 periods						
TEXT BOOK:						
1.	R.K Jain (2000) Industrial Safety, Health and Environment management systems, Khanna Publications.					
2.	Paul S V (2000), Safety management System and Documentation training Programme handbook, CBS Publication					
REFERENCES:						
1.	Krishnan, N.V. (1997). Safety management in Industry. Jaico Publishing House, New Delhi.					
2.	John V. Grimaldi and Rollin H.Simonds. (1989) Safety management. All IndiaTraveller Book Seller,					



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	Delhi.
3.	Ronald P. Blake. (1973). Industrial safety. Prentice Hall, NewDelhi

COURSE OUTCOMES:

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

CO1:	Describe the theories of accident causation and preventive measures of industrial accidents.
CO2:	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
CO3:	Explain different issues in construction industries.
CO4:	Describe various hazards associated with different machines and mechanical material handling.
CO5:	Utilize different hazard identification tools in different industries with the knowledge of different types of chemical hazards

	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	1	2	2	-	-	-	1	-	-	-
CO2	2	2	2	-	1	1	1	-	-	-	1	-	-	-
CO3	2	2	2	-	1	1	1	1	1	-	1	-	-	-
CO4	2	2	2		1	1	1	1	1	-	1	-	-	-
CO5	2	2	2	-	1	1	1	1	1	-	1	-	-	-
Avg.	2	2	1.6	-	1	1.2	1.2	0.6	0.6	-	1	-	-	-
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UMC24007		INTERPERSONAL SKILLS				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course objectives						
Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills. Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities. improve general and academic listening skills Make effective presentations.						
UNIT – I Foundations of Listening and Speaking Skills						6
Listening as a key skill- its importance- speaking- give personal information- ask for personal information- express ability- enquire about ability- ask for clarification Improving pronunciation basics taking lecture notes- preparing to listen to a lecture- articulate a complete idea as opposed to producing fragmented utterances						
UNIT – II Effective Communication and Clarity in Speech						6
Listen to process information- give information, as part of simple explanation- conversation starters: small talk- stressing syllables and speaking clearly- intonation patterns- compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.						
UNIT – III Building Fluency and Everyday Interactions						6
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk- greet- respond to greetings- describe health and symptoms- invite and offer- accept- decline- take leave- listen for and follow the gist- listen for detail						
UNIT – IV Active Listening and Group Interaction						6
Being an active listener: giving verbal and non-verbal feedback- participating in a group discussion summarizing academic readings and lectures conversational speech listening to and participating in conversations- persuade						
UNIT – V Presentation Skills and Collaborative Communication						6
Formal and informal talk- listen to follow and respond to explanations, directions and instructions in academic and business contexts- strategies for presentations and interactive communication group/pair presentations- negotiate disagreement in group work.						
						Total: 30 periods
TEXT BOOK:						
1.	Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.					
2.	Richards. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010					
REFERENCES:						
1.	Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.					
2.	Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.					
3.	Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014					
4.	Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.					
5.	Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013					



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COURSE OUTCOMES:

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

CO1:	Demonstrate effective listening and speaking strategies to express and gather personal information clearly.													
CO2:	Interpret process-based information and participate in informal conversation with correct pronunciation and intonation.													
CO3:	Use lexical chunks and phrases to improve fluency and accuracy in short speeches and daily interactions.													
CO4:	Apply active listening strategies and participate effectively in group discussions and academic contexts.													
CO5:	Engage in formal/informal talk and deliver structured presentations in academic and professional environments.													
	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	3	3	3
CO3	3	2	3	2	3	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	3	3	3
Avg.	3	2.6	3	2.2	2.6	-	-	-	-	-	-	3	3	2.8
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UMC24008		PERSONALITY AND CHARACTER DEVELOPMENT				
		Category	L	T	P	Credit
		MC	2	0	0	0
Course objectives						
- To understand the dimensions of personality, theories of Freud and Erickson, and the importance of personality growth - To develop positive attitudes and motivation through awareness of influencing factors and self-drive - To build self-esteem and interpersonal effectiveness through self-awareness and behavior understanding - To enhance problem-solving, leadership, and time management skills for overall personality refinement - To improve employability skills like resume writing, group discussion, and interviews through practical engagement						
UNIT – I		INTRODUCTION TO PERSONALITY DEVELOPMENT				6
The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.						
UNIT – II		ATTITUDE & MOTIVATION				6
Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self-motivation- Factors leading to de-motivation						
UNIT – III		SELF-ESTEEM				6
Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-esteem - Symptoms - Personality having low self esteem - Positive and negative self esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.						
UNIT – IV		OTHER ASPECTS OF PERSONALITY DEVELOPMENT				6
Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management Work ethics –Good manners and etiquette.						
UNIT – V		EMPLOYABILITY QUOTIENT				6
Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview - Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions						
Total: 30 periods						
TEXT BOOK:						
1.	Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.					
2.	Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16th Edition: Prentice Hall.					



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REFERENCES:

1.	Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi. Tata McGraw-Hill 1988.
2.	Heller, Robert. Effective leadership. Essential Manager series. Dk Publishing, 2002
3.	Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4.	Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5.	Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6.	Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7.	Smith, B . Body Language. Delhi: Rohan Book Company. 2004

COURSE OUTCOMES:

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

CO1:	Explain the concept and dimensions of personality and analyze theories of Freud and Erickson													
CO2:	Identify the role of attitude and motivation in personal success and apply strategies to stay self-motivated													
CO3:	Recognize types of self-esteem and behaviors; develop assertiveness and interpersonal relationship skills													
CO4:	Demonstrate skills in body language, leadership, stress management, and decision-making for personality growth													
CO5	Apply practical techniques for enhancing employability including resume writing, interviews, and group discussion techniques													
	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	2	2	2	-	-	-	-	2	2	2
CO2	3	3	3	3	2	2	3	-	-	-	-	3	3	3
CO3	2	2	3	3	2	2	3	-	-	-	-	3	3	3
CO4	3	3	3	3	3	3	3	-	-	-	-	3	3	3
CO5	2	2	3	2	3	3	3	-	-	-	-	3	3	3
Avg.	2.6	2.6	2.8	2.6	2.4	2.4	2.8	-	-	-	-	2.8	2.8	2.8
	1 – Slight, 2 – Moderate, 3 – Substantial , BT – Bloom’s Taxonomy													



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UMC24009	WELL-BEING WITH TRADITIONAL PRACTICES-YOGA, AYURVEDA AND SIDDHA				
	0	L	T	P	Credit
	MC	2	0	0	0
Course objectives					
- To enjoy life happily with fun filled new style activities that help to maintain health also - To adapt a few lifestyle changes that will prevent many health disorders - To be cool and handbill every emotion very smoothly in every walk of life - To learn to eat cost effective but healthy foods that are rich in essential nutrients - To develop immunity naturally that will improve resistance against many health disorders					
UNIT – I	HEALTH AND ITS IMPORTANCE				6
Health: Definition - Importance of maintaining health - More importance on prevention than treatment Ten types of health one has to maintain - Physical health - Mental health - Social health - Financial health - Emotional health - Spiritual health - Intellectual health - Relationship health - Environmental health - Occupational/Professional heath. Present health status - The life expectancy-present status - mortality rate - dreadful diseases - Non-communicable diseases (NCDs) the leading cause of death - 60% - heart disease – cancer – diabetes - chronic pulmonary diseases - risk factors – tobacco – alcohol - unhealthy diet - lack of physical activities. Types of diseases and disorders - Lifestyle disorders – Obesity – Diabetes - Cardiovascular diseases – Cancer – Strokes – COPD - Arthritis - Mental health issues. Causes of the above diseases / disorders - Importance of prevention of illness - Takes care of health - Improves quality of life - Reduces absenteeism - Increase satisfaction - Saves time Simple lifestyle modifications to maintain health - Healthy Eating habits (Balanced diet according to age) Physical Activities (Stretching exercise, aerobics, resisting exercise) - Maintaining BMI-Importance and actions to be taken					
UNIT – II	DIET				6
Role of diet in maintaining health - energy one needs to keep active throughout the day - nutrients one needs for growth and repair - helps one to stay strong and healthy - helps to prevent diet-related illness, such as some cancers - keeps active and - helps one to maintain a healthy weight - helps to reduce risk of developing lifestyle disorders like diabetes – arthritis – hypertension – PCOD – infertility – ADHD – sleeplessness -helps to reduce the risk of heart diseases - keeps the teeth and bones strong. Balanced Diet and its 7 Components - Carbohydrates – Proteins – Fats – Vitamins – Minerals - Fibre and Water. Food additives and their merits & demerits - Effects of food additives - Types of food additives - Food additives and processed foods - Food additives and their reactions. Definition of BMI and maintaining it with diet: Importance - Consequences of not maintaining BMI - different steps to maintain optimal BM. Common cooking mistakes: Different cooking methods, merits and demerits of each method					
UNIT – III	ROLE OF AYURVEDA & SIDDHA SYSTEMS IN MAINTAINING HEALTH				6
AYUSH systems and their role in maintaining health - preventive aspect of AYUSH - AYUSH as a soft therapy. Secrets of traditional healthy living - Traditional Diet and Nutrition - Regimen of Personal and Social Hygiene - Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation and healthy living environment - Sadvritta (good conduct) - for conducive social life. Principles of Siddha & Ayurveda systems - Macrocosm and Microcosm theory - Pancheeekarana Theory / (Five Element Theory) 96 fundamental Principles - Uyir Thathukkal (Tri- Dosha Theory) - Udal Thathukkal Prevention of illness with our traditional system of medicine -Primary Prevention - To decrease the number of new cases of a disorder or illness - Health promotion/education,					



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and - Specific protective measures - Secondary Prevention - To lower the rate of established cases of a disorder or illness in the population (prevalence) - Tertiary Prevention - To decrease the amount of disability associated with an existing disorder.

UNIT – IV MENTAL WELLNESS 6

Emotional health - Definition and types - Three key elements: the subjective experience - the physiological response - the behavioral response - Importance of maintaining emotional health - Role of emotions in daily life - Short term and long term effects of emotional disturbances - Leading a healthy life with emotions - Practices for emotional health - Recognize how thoughts influence emotions - Cultivate positive thoughts - Practice self- compassion - Expressing a full range of emotions.

Stress management - Stress definition - Stress in daily life - How stress affects one's life - Identifying the cause of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help) - Complications of stress mismanagement.

Sleep - Sleep and its importance for mental wellness - Sleep and digestion.

Immunity - Types and importance - Ways to develop immunity

UNIT – V YOGA 6

Definition and importance of yoga - Types of yoga - How to Choose the Right Kind for individuals according to their age - The Eight Limbs of Yoga - Simple yogasanas for cure and prevention of health disorders - What yoga can bring to our life.

Total: 30 periods

TEXT BOOK:

1. Nutrition and Dietetics - Ashley Martin, Published by White Word Publications, New York, NY 10001, USA
2. Yoga for Beginners_ 35 Simple Yoga Poses to Calm Your Mind and Strengthen Your Body,

REFERENCES:

1. What We Know About Emotional Intelligence How It Affects Learning, Work, Relationships, and Our Mental Health, by Moshe Zeidner, Gerald Matthews, and Richard D. Roberts. A Bradford Book, The MIT Press, Cambridge, Massachusetts, London, England
2. The Mindful Self-Compassion Workbook, Kristin Neff, Ph.D Christopher Germer, Ph.D, Published by The Guilford Press A Division of Guilford Publications, Inc.370 Seventh Avenue, Suite 1200, New York, NY 10001

COURSE OUTCOMES:

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

CO1:	Learn the importance of different components of health
CO2:	Gain confidence to lead a healthy life
CO3:	Learn new techniques to prevent lifestyle health disorders

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	2	1	3	2	-	-	-	-	-	-	3	2	2
CO2	2	2	2	3	3	-	-	-	-	-	-	2	3	2
CO3	3	3	1	3	3	-	-	-	-	-	-	2	3	3



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CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	2.7	2.3	1.3	3.0	2.7	2.3	2.7	2.3	2.7	2.3	1.3	3.0	2.7	2.3	2.7
	1 – Slight, 2 – Moderate, 3 – Substantial , BT – Bloom’s Taxonomy														



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UAIPE2401		REFRIGERATION AND COLD STORAGE				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
		- To interpret principles of operation of different Refrigeration & Air conditioning systems To understand the types of compressors and expansion devices and their applications - To combine the parameters involved in design of the various air conditioning and cold storage systems.				
UNIT – I	REFRIGERATION PRINCIPLES AND COMPONENTS					9
Refrigeration principles - refrigeration effect coefficient of performance -units of refrigeration - Refrigeration components -compressor-classification-principle and working- condensers-types construction, principle and working. Evaporators - types-principle and working. Expansion device types construction, principle and working. Refrigerants properties classification comparison and advantages chloroflouro carbon (CFC) refrigerants - effect on environmental pollution - alternate refrigerants						
UNIT – II	VAPOUR COMPRESSION AND VAPOUR ABSORPTION CYCLE					9
Simple vapour compression cycle - T-S diagram - p-h chart- vapour compression system-different types-vapour absorption cycle simple and practical vapour absorption system- advantages- ideal vapour absorption system- Electrolux refrigerator Lithium bromide refrigeration-construction and principles.						
UNIT – III	APPLIED PSYCHROMETRY					9
Principle and properties of psychrometry, Representation of various psychrometric processes on psychrometric chart and their analysis, by-pass factor, sensible heat factor, room sensible heat factor, equipment sensible heat factor, grand sensible heat factor, apparatus dew point, ventilation and infiltration, energy efficiency ratio. Use of psychrometric charts. Cooling and heating load calculations						
UNIT – IV	AIR CONDITIONING SYSTEM					9
Air conditioning systems-equipment used-classification-comfort and Industrial air conditioning system- winter, summer and year- round air conditioning system- unitary and central air conditioning system- application of refrigeration and air conditioning-domestic refrigerator and freezer- ice manufacture.						
UNIT – V	APPLICATIONS OF REFRIGERATION IN FOOD PROCESSING AND PRESERVATION					9
Cooling and heating load estimation, cold storage design, types of cooling plants for cold storage. Insulation properties and types of insulation material. Cold storage for milk, meat, fruits, vegetables, poultry and marine products. Refrigerated Transport, Handling and Distribution, Cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display. Sensors for cold storage management.						
TOTAL: 45 PERIODS						
FOR FURTHER READING						
Design of cold storage system- IoT in cold storage management						
REFERENCES:						
1.	C. P. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill Publishing Company Private Limited, New Delhi, 2008					
2.	Langley and C. Billy, Refrigeration and Air conditioning, Ed. 3, Engle wood Cliffs (NJ), Prentice Hall of India, New Delhi, 2009					
3.	Roy J. Dossat, Principles of Refrigeration, Pearson Education, New Delhi, 2007					
4.	N. F Stoecker and Jones, Refrigeration and Air Conditioning, Tata McGraw Hill, New Delhi, 2008					
5.	Manohar Prasad, Refrigeration and Air Conditioning, Wiley Eastern Ltd., 2007					



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6.	J. B Hains, Automatic Control of Heating & Air conditioning, Tata McGraw Hill Publishing Company Private Limited, 2005
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COURSE OUTCOMES:

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

CO1:	Select appropriate components of the refrigeration unit and analyze the effect of different refrigerants on environment													
CO2:	Differentiate various refrigeration cycles and its applicability													
CO3:	Apply knowledge of psychrometry for air conditioning & various food processing operations													
CO4:	Apply the knowledge of refrigeration and air conditioning in persevering foods using domestic and industrial refrigeration systems													
CO5:	Choose and design appropriate cold storage system for ensuring the product quality													
	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	2	1	-	-	-	1	2	2	2
CO2	3	1	2	1	1	-	1	-	-	-	1	2	2	2
CO3	3	2	2	1	1	-	1	-	-	-	1	2	2	2
CO4	3	1	2	1	1	2	1	-	-	1	1	2	2	2
CO5	3	2	2	1	2	1	1	-	-	1	1	2	2	2
Avg.	3	2	2	1	1	1	1	-	-	1	1	2	2	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy														



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UAIPE2402		FOOD AND DAIRY ENGINEERING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
• To acquire better understanding of the food concentration and thermal processing of foods • To know the physical and thermal properties of milk and different methods of milk processing and milk products • To gain knowledge on the theory, methods, and equipment for the various unit operations of dairy industry						
UNIT – I	BASIC PROPERTIES AND THERMAL PROCESSING OF FOODS MATERIALS					9
Constituents of food and their energy values – rheological properties of food materials- texture of food materials -viscometry - Concentrations of foods - freeze concentration - membrane concentration -Thermal processing of foods - product-time-temperature relationships - cooking, blanching pasteurization techniques-UHT Processing - sterilization of solid and liquid foods- batch and continuous sterilization equipment-interaction of heat energy on food components - kinetics of microbial destruction - Preservation by retort processing - principles and applications- microwave and radio frequency heating in food processing-Canning- Aseptic packaging.						
UNIT – II	DRYING AND DEHYDRATION					9
Food spoilage - causes for spoilage -Moisture content - free moisture - bound and unbound moisture - equilibrium moisture content - Water activity - sorption behaviour of foods - types of dryers - drum, spray, Freeze drying, dryers-advantages and disadvantages - dehydration - methods of dehydration osmotic dehydration						
UNIT – III	MILK PROCESSING					9
Physical, chemical, thermal and rheological properties of milk - storage tanks. Receiving handling and testing of milk - storage. Pasteurization - application- equipment - Low Temperature Long Time - High Temperature Short Time - Ultra High Temperature pasteurization, filling packaging of milk and milk products						
UNIT – IV	DAIRY EQUIPMENT AND PRODUCTS					9
Homogenisation - theory and working of homogenisers - high pressure homogenization of milk and other food suspensions - design criteria for homogenizing equipment- cream separation principles - types of separators. Clarifiers - butter churns - ghee manufacture - equipment - whey manufacture- techniques - equipment - ice cream freezers - condensed milk - milk powder manufacturing drying equipment- milk products - paneer - casein - probiotic dairy products - kefirmilk plant sanitation requirements - Cleaning in-place and its functions.						
UNIT – V	ADVANCED TECHNOLOGIES IN FOOD PROCESSING					9
Non-thermal and other alternate thermal processing in Food processing - Nanotechnology: History-fundamental concepts - tools and techniques Nanomaterials - applications in food packaging and products, implications, environmental impact of nanomaterials and their potential effects on global economics, regulation of nanotechnology.						
FOR FURTHER READING						TOTAL: 45 PERIODS
	Waste utilisation and energy conservation in dairy industry - Utilisation of whey for energy generation through biomethanation, energy conservation opportunities in dairy industry and packaging of dry products.					



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REFERENCES:

1.	R. Paul Singh and Dennis R. Heldman. Introduction to Food Engineering. 5th edition Academic Press, USA. 2013.
2.	Heldman, Dennis R., Daryl B. Lund, and Cristina Sabliov, eds. Handbook of food engineering. CRC press, 2018.
3.	H.G. Kessler, Food Engineering and Dairy Technology, Freising, Germany, Verlag A.Kessler, 1981
4.	Sukumar De, Outlines of Dairy: Technology, Oxford University Press, 2001
5.	Minj, Jagrani, Aparna Sudhakaran, and Anuradha Kumari, eds. Dairy Processing: Advanced Research to Applications. Singapore: Springer, 2020
6.	V. Chelladurai, and Digvir S. Jayas. Nanoscience and nanotechnology in foods and beverages. CRC Press, 2018.

COURSE OUTCOMES:

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

CO1:	Explain physio-chemical properties of food material and select suitable thermal processing method for food products based on their properties
CO2:	Compare food drying systems and assess their limitations in applying different food products
CO3:	Explain physical, chemical and thermal properties of milk and compare milk processing techniques
CO4:	Apply various milk processing equipment for processing and producing milk products and evaluate their performance
CO5:	Assess the application and limitations of advanced food processing techniques

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	1	-	-	-	-	-	2	2	2
CO2	1	1	2	3	2	1	-	-	-	-	-	2	2	2
CO3	2	1	1	1	1	1	-	-	-	-	-	2	2	2
CO4	1	1	2	3	1	1	-	-	-	1	-	2	2	2
CO5	2	1	1	3	3	1	-	-	-	2	-	2	2	2
Avg.	2	1	1	3	2	1	-	-	-	1	-	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2403		PROCESS ENGINEERING OF FRUITS AND VEGETABLES				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
Implement specific post-harvest handling technique for storage and transport of fruits and vegetables Apply preservation techniques to produce value added fruits and vegetable products Learn the industrial scale processing and preservation methods to extend the shelf life of fruit and vegetable commodities						
UNIT – I		HARVESTING, HANDLING AND STORAGE OF FRUITS AND VEGETABLES				9
Fruits and vegetables: classification, nutritional profile - Harvesting of fruits and vegetables - maturity indices - post harvest physiology - handling - pre-cooling and storage - Storage under ambient condition, low temperature storage - chilling, frozen storage- chilling injury, freeze burn. Controlled atmosphere storage, Modified atmosphere storage - concepts and methods - gas composition - Changes during storage						
UNIT – II		PRESERVATION OF FRUITS AND VEGETABLES BY VALUE ADDITION				9
Methods of fruit and vegetable preservation - Processing using sugar- Preparation of jam, jelly, marmalade, squash, RTS, crush, nectar, cordial, fruit bar, preserves, candies and carbonated, fruit beverages. Processing using salt – Brining - Preparation of pickles, chutney and sauces, ketchup. Machinery involved in processing of fruits and vegetables product						
UNIT – III		PRESERVATION BY DRYING AND DEHYDRATION				9
Drying and dehydration - Types of driers - Solar, cabinet, fluidized bed drier, spouted bed drier, heat pump drier, vacuum drier and freeze drier - Applications. Preparation of product. Changes during drying and dehydration. Problems related to storage of dried and dehydrated products.						
UNIT – IV		MINIMAL PROCESSING AND FERMENTATION				9
Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables, Minimal Processing of Fruits and Vegetables. Preservation by fermentation - wine, vinegar, cider and sauerkraut.						
UNIT – V		CANNING AND BOTTLING				9
Canning - principles, types of cans - preparation of canned products - packing of canned products - spoilage of canned foods. Bottling of fruit and vegetable. Precautions in canning operations. General considerations in establishing a commercial fruit and vegetable cannery, machineries involved in canning and bottling unit. Total: 45 periods						
FOR FURTHER READING Topping of sugar/salt, Hybrid drier, safe level of irradiation, solid state fermentation, layout of fruit/vegetable canning unit						
TEXT BOOK:						
1.	Norman W. Desrosier, and James N. Desrosier. The Technology of Food Preservation 4th Edition, CBS Publisher & Distributions, New Delhi, 2004.					
REFERENCES:						



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1.	R.P. Srivastava and S. Kumar, Fruit and Vegetable Preservation: Principles and Practices, Third Edition, CBS Publishers & Distributors-New Delhi, 2002.
2.	A. Chakraverty, A.S. Mujumdar, G.S.Vijaya Raghavan and H.S. Ramaswamy, Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices. CRC Press, USA, 2003.
3.	Girdhari Lal, G. S.Siddappa and G.L. Tandon, Preservation of Fruits and Vegetables, Indian Council of Agricultural Research, New Delhi, 2009
4.	D.K. Salunkhe, and S.S. Kadam, Handbook of Fruit Science and Technology: Production Composition and Processing, Marcel Dekker, New York, 1995.
5.	K.Sharma, Stevan J.Mulvaney and Syed S.H. Rizvi, Food Process Engineering-Theory and Laboratory equipments, John Wiley & Sons, New York, 2000.

COURSE OUTCOMES:

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

CO1:	Implement low temperature, modified atmosphere and controlled atmospheric storage methods for storage of fruits and vegetables
CO2:	Produce value added products from fruits and vegetables by using suitable preservation method (sugar, salt or dehydration)
CO3:	Produce dehydrated fruits and vegetables
CO4:	Apply minimal processing and fermentation methods to produce value added products from fruits and vegetables
CO5:	Plan to produce canned and bottled fruits and vegetables

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	1	2	1	2	1	1	1	1	2	2	2
CO2	2	2	1	2	1	1	1	1	2	2	2	1	1	1
CO3	1	1	1	1	1	2	1	1	1	1	1	1	2	2
CO4	2	2	2	3	1	2	1	2	1	1	1	1	1	1
CO5	2	1	1	2	3	1	2	1	2	1	3	1	1	1
Avg.	1	1	2	1	2	2	1	1	1	2	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2404		STORAGE AND PACKAGING TECHNOLOGY				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To study about the different storage structures To learn about the different packaging materials and various methods of packaging to improve the shelf life of the products To understand the concepts of Controlled Atmosphere Storage and Modified Atmosphere Packaging						
UNIT – I		STORAGE ENVIRONMENT AND STORAGE STRUCTURES				9
Storage losses in agricultural commodities. Physical properties of grain affecting storability- Factors of spoilage- fungi and mycotoxins- Treatments for enhancing shelf life- Fumigation Processes for bag storage piles. Rural storage structures- Bag Storage and its Design. Parameters and types of storage structure. Bulk Storage in silos and large Bins Construction of Silos, Problems of Silo storage, relative Costs of Silo and Bag Storage. Quality Changes and remedial measures of Grains during storages. Design considerations and heat load calculation of cold storage						
UNIT – II		INTRODUCTION TO PACKAGING				9
Introduction Protection of Food products major role and functions of food packaging Effect of environmental factors, mechanical forces and biological factors on food quality and shelf life. Estimating the shelf life requirement accelerated storage studies. Tests on packaging materials Mechanical strength (Tension, notch and tearing strengths), Gas and water vapour transmission rates.						
UNIT – III		CONTROLLED ATMOSPHERE STORAGE AND MODIFIED ATMOSPHERE PACKAGING				9
Introduction and concept of CA Storage Equipment for creating, maintaining and measuring controlled atmosphere - Biochemical aspects of CA storage - Static & Dynamic CA, Fruit Ripening, Hypobaric and Hyperbaric Storage. Effects of concentrations of compositional gases on Fruits and vegetables. MAP-Film & Coating types, Permeability, Gas Flushing, Perforation, Absorbents, Humidity, Temperature, Chilling Injury, Shrink wrapping, Vacuum Packing, Modified Interactive Packaging, Minimal Processing, Equilibrium Modified Atmosphere Packaging, Effect of scavengers						
UNIT – IV		CANNING				9
Metal Cans and Glass Bottles as Packaging. Types of Metallic cans. Basics of Canning operations, Can closures. Glass jars and Bottles in food packaging, Design features and applications, Sterilization of bottles, advantages and problems, Bottle and jar closures, different types of caps and liners used. Plastics used and their Specific applications - Polyethylene (LDPE and HDPE),Cellulose, Polypropylene (PP), Polyesters, Polyvinylidene Chloride (PVDC Diofan, Ixan andSaran),Polyvinyl chloride, Copolymers their applications. Closing and sealing of Rigid plasticcontainers Seal types.						
UNIT – V		FLEXIBLE FILMS PACKAGING				9
Formation of Films and pouches, Co-extruded films and Laminates applications. Filling and Sealing of pouches and flexible plastic containers, Pouch form fill seal machines: Rigid and Semi rigid plastic packaging. Fabrication methods Thermo forming, Blow moulding, Injection moulding, Extrusion Blow moulding applications. Laminated Paper board Cartons, Fibre Board and Corrugated Card Board packaging - applications. Nano packaging and smart packaging. Printing on packages, Bar codes, Nutrition labeling and legislative requirements. Sensors and IoT in Food packaging						
						Total: 45 periods



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TEXT BOOK:

1. Sahay, K.M. and K.K.Singh. 1996. Unit operations of agricultural processing. Vikas Publishing House Pvt. Ltd., New Delhi.
2. Food Packaging Technology, Hand book, 2004. NIIR Board, New Delhi.
3. Pandey, P.H.2002. Post harvest engineering of horticultural crops through objectives. Saroj Prakasam. Allahabad

REFERENCES:

1. Samuel Matz, The Chemistry and Technology of Cereals as Food and Feed, Chapman & Hall, 1992
2. N.L.Kent and A.D.Evans, Technology of Cereals (4th Edition) Elsevier Science (Pergaman), Oxford, UK,1994
3. Ruth H. Matthews: Pulses & Chemistry, Technology and Nutrition Mercel Dekker Inc., USA,1989
4. Gordon L. Robertson, Food Packaging- Principles and Practice Marcel Dekker Inc, USA, 1993
5. Donald Downing, Complete Course in Canning (3 Volumes) CTI Publications Inc, USA, 1996

COURSE OUTCOMES:

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

- | | |
|------|---|
| CO1: | Possess the knowledge on Storage environment and storage structures |
| CO2: | The students will have a clear understanding of various methods of storage and different packaging techniques for food. |
| CO3: | Determine the principles of Controlled Atmosphere Storage and Modified Atmosphere Packaging |
| CO4: | Differentiate various canning systems and their application in food industry |
| CO5: | Apply the knowledge to choose suitable flexible packaging film and the sealing technique for processed foods. |

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	1	2	1	1	1	1	1	1	2
CO2	1	1	2	3	2	1	1	1	2	1	2	1	1	1
CO3	2	1	1	1	1	1	1	2	1	1	1	2	1	1
CO4	1	1	2	3	1	1	2	1	1	1	1	1	2	1
CO5	2	1	1	3	3	1	2	1	2	1	3	1	1	1
Avg.	2	1	1	3	2	1	1	1	1	2	2	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2405		FOOD PROCESS EQUIPMENT AND DESIGN				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
Impart knowledge on basic principles of designing equipment for food processing Become familiar with design and manufacture of storage tanks, pulpers, heat exchangers, driers etc. Provide an idea about devising cold storage units, freezers etc.						
UNIT – I		PROCESS EQUIPMENT DESIGN				9
Introduction on process equipment design, principles and selection of food processing equipment Application of design engineering for processing equipment.						
UNIT – II		DESIGN PROCEDURE				9
Design parameters and general design procedure, Material specification, Types of material for process equipment, Design codes, Pressure vessel design, Design of cleaners						
UNIT – III		HEAT EXCHANGER				9
Design of tubular heat exchanger, shell and tube heat exchanger and plate heat exchanger Problems on tubular heat exchanger, shell and tube type heat exchanger and plate heat exchanger						
UNIT – IV		CONVEYING SYSTEM				9
Design of belt conveyer, screw conveyer and bucket elevator, Design of dryers. Design of milling equipment.						
UNIT – V		CAD				9
Optimization of design with respect to process efficiency, energy and cost, Computer Aided Design.						
Total: 45 periods						
TEXT BOOK:						
1.	Rajput R K, 2008 Heat and Mass Transfer. S Chand Publishers					
2.	Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing Co. Ltd., New Delhi.					
3.	Dash, S.K., Bebartta, J.P. and Kar, A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.					
4.	Sahay, K.M. and Singh, K.K. 1994. Unit operations of Agricultural Processing. Vikas Publishing house Pvt. Ltd. New Delhi					
REFERENCES:						
1.	Earle, R.L. 2003. Unit Operations in Food Processing. Pergamon Press. Oxford. U.K.					
2.	Henderson, S.M., and Perry, R. L. Agricultural Process Engineering, Chapman and hall, London					
3.	McCabe, W.L., Smith J.C. and Harriott, P. Unit operations of Chemical Engineering. McGraw Hill.					
4.	Singh, R. Paul. and Heldman, R.Dennis. 2004. Introduction to Food Engineering. 3rd Edition.Academic Press, London.					



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Mecheri, Salem Dt-636453, Tamilnadu



COURSE OUTCOMES:

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

CO1:	Analyze the various process equipment design.
CO2:	Understand the design procedure the development of vessels and cleaners.
CO3:	Analyze the different types heat exchanger methods
CO4:	Apply the different methods of conveying system
CO5:	Optimize the variables using CAD for the process equipment design.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	2	2	1	1	1	1	1	2	1
CO2	2	1	2	1	2	2	1	1	2	1	2	1	1	2
CO3	1	1	1	2	1	1	1	2	1	1	1	2	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO5	2	1	2	1	2	1	1	1	1	2	2	1	2	2
Avg.	1	2	2	1	2	1	1	1	1	2	2	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2406		FOOD PLANT DESIGN AND MANAGEMENT				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
State the different specifications and processes involved in the design and development of food processing plant Define the processes involved in layout design Evaluate the projects and cost estimation of designing food plant Outline the product cost and plant overheads Perform profitability analysis in food processing industry.						
UNIT – I	PLANT LAYOUT-INTRODUCTION					9
Design considerations of processing agricultural and food products. Plant design concepts and general design considerations: Plant layout, plant location, location factors and their interaction with plant location, location theory models, and computer aided selection of the location. Human factors in design, selection of materials of construction and standard component, design standards and testing standards						
UNIT – II	PROCESS ECONOMICS OF PLANT LAYOUT					9
Feasibility analysis and preparation of feasibility report: plant size, factors affecting plant size and their interactions, estimation of break-even and economic plant size; Product and process design, process selection, process flow charts, Plant utilities, electricity, water, steam, air, raw material requirements and computer aided development of flow charts						
UNIT – III	DEVELOPMENT AND PRESENTATION OF LAYOUT					9
building materials, estimation of capital investment, analysis of plant costs and profitability's, management techniques in plant design including applications of network analysis, preparation of project report and its appraisal.						
UNIT – IV	FOOD PROCESSING PLANT & EQUIPMENT LAYOUT					9
Plant layout and design of bakery and biscuit industries; fruits and vegetables processing industries including beverages; milk and milk products; meat, poultry and fish processing industries. Equipment layout in Food Industries : Basic understanding of equipment layout and. Preparation of flow sheets for material movement and utility consumption in food plants.						
UNIT – V	PROJECT EVALUATION AND COST ESTIMATION					9
Preparation of flow sheets for material movement and utility consumption in food plants; Application of Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM) in project planning and monitoring; Cost estimation for a Food Plant; Scale-up. Case Study: Preparation of plant layout and cost estimation for a food processing plant						
Total: 45 periods						
REFERENCES:						
1.	Maroulis, Z.B. and Saravacos, G.D. . Food Process Design. Marcel Dekker Inc,. 2003.					
2.	Antonio Lopez-Gomez, Gustavo V. Barbosa-Canovas,“Food Plant Design (Food Science and Technology)”, CRC Press, 2005.					
3.	Towler, G. and Sinnott, R.K. Chemical Engineering design principles, practice and Economics of Plant and Processe. 2nd Edition. Elsevier.2012.					
4.	Theunis C. Robberts . Food plant engineering system. II Edition, CRC Press, Washington, 2013.					
5.	M Moore, Mac Millan, Plant Layout & Design. Lames, New York, 1971.					
6.	Langley and C. Billy, Refrigeration and Air conditioning, Ed. 3, Engle wood Cliffs (NJ), Prentice					



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COURSE OUTCOMES:

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

CO1:	Design and construct the well-equipped food processing plant for effective processing													
CO2:	List the start – to – end facilities, infrastructure, utilities, investments along with the government regulations and specifications for plant layout													
CO3:	Evaluate and estimate the capital investments and methods of cost estimation of designing food plants													
CO4:	Assess the overall production cost, profitability and factors involved in the cost estimation of products manufactured													
CO5:	Analyze the problems involved in deciding the level of manufacture of a food product													
	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	3	1	1	2	2	-	-	1	1	1	1	1
CO2	1	1	3	2	1	2	2	-	-	3	1	3	3	3
CO3	1	1	3	2	1	2	2	-	-	3	1	3	3	3
CO4	2	1	3	2	1	2	2	-	-	3	1	3	3	3
CO5	1	1	3	3	1	2	2	-	-	3	1	3	3	3
Avg.	2	1	3	2	1	2	2	-	-	3	1	3	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy														



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UAIPE2407		EMERGING TECHNOLOGIES IN FOOD PROCESSING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
Understand and apply the different emerging technologies in processing of foods Familiarize about the equipment used for the processing of foods by novel technologies Compare the application of alternate thermal and non-thermal processing techniques on foods						
UNIT – I		HIGH PRESSURE PROCESSING				9
Principles - Mechanism and applications of high pressure processing to food systems - High pressure processing of salads, meats and sea foods, fruits and fruit products -Effect of high pressure on microorganisms, enzymes, textural and nutritional quality of foods - Other applications of high pressure processing - High Pressure Freezing: principles and equipment, types of high pressure freezing process, microbiological and enzymatic inactivation after high pressure freezing.						
UNIT – II		PULSED ELECTRIC FIELDS PROCESSING				9
Principles - Mechanism - PEF treatment systems - Main processing parameters PEF technology - Equipment - Applications - Mechanisms of microbial and enzyme inactivation. PEF processing of solid foods, liquid foods and beverages. Food safety aspects of pulsed electric fields.						
UNIT – III		FOOD IRRADIATION				9
Introduction - Fundamentals of food Irradiation - Type and sources of radiation, dosimetry, mode of action of ionizing radiation - Direct and indirect effect, radiation effect on food constituents, Dose requirement for different products and regulations.						
UNIT – IV		ALTERNATIVE NON THERMAL PROCESSING TECHNIQUES				9
High intensity pulsed light technology:- principles of PLT technology - Technological aspects of PLT - Effects of PLT technology on microorganisms and food quality. Ultrasound Processing: Principle of ultrasound - Fundamentals - Ultrasound as a processing and food preservation tool - Effect of ultra sound on properties of foods - Applications of ultrasound in microbial inactivation, assisted drying, extraction, osmotic dehydration, detection of foreign bodies, filtration and freezing - challenges in ultrasound processing. Radio frequency electric fields: equipment, applications for heating and drying, effect of radio frequency electrical field on inactivation of microorganisms.						
UNIT – V		ALTERNATIVE THERMAL PROCESSING TECHNIQUES				9
Hurtle technology- Microwave heating and microwave drying: Microwaves - dielectric heating, dielectric properties of foods - thermal properties of foods - Recent developments in microwave heating - combined microwave-vacuum drying, microwave freeze-drying - applications. Case Study – development of a nonthermal processing technique for food and beverages.						
						Total: 45 periods
REFERENCES:						
1.	Emerging Technologies for Food Processing. Da-Wen Sun (Ed), Academic Press, 2 Edition, 2014.					
2.	Novel Food Processing Technologies. M. P. Cano, M. S. Tapia, and G. V. BarbosaCanovas, CRC Press, 1st Edition, 2004.					
3.	Maria Laura Passos, Claudio P. Ribeiro, Innovation in Food Engineering: New Techniques and Products, CRC press, 2010					
4.	Howard Q. Zhang, Gustavo V. Barbosa-Canovas, V. M. Balasubramaniam, C. Patrick Dunne, Daniel F. Farkas, James T. C. Yuan, Nonthermal Processing Technologies for Food,2000					



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COURSE OUTCOMES:

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

CO1:	Understand the effect of high-pressure processing on microbial inactivation of foods
CO2:	Apply the principle of pulsed electric field and analyze the impact of pulsed electric field processing for both solid and liquid foods
CO3:	Apply and assess the irradiation dosage requirement for foods
CO4:	Apply non thermal technologies for inactivation of microorganisms and improve the food quality
CO5:	Apply advanced thermal treatments for food processing and preservation

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	1	3	2	2	1	-	-	-	-	1	1	1
CO2	1	1	1	3	2	2	1	-	-	-	-	1	1	1
CO3	1	2	1	3	2	2	1	-	-	-	-	1	1	1
CO4	2	1	1	3	2	2	1	-	-	-	-	1	1	1
CO5	2	1	1	3	2	2	1	-	-	-	-	1	1	1
Avg.	2	2	1	3	2	2	1	-	-	-	-	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2408		FARM POWER AND MACHINERY MANAGEMENT					
		Category	L	T	P	Credit	
		PCC	3	0	0	3	
Course objectives							
To expose the student with the mechanization status in the country and management techniques for future requirements.							
UNIT – I		FARM MECHANIZATION					9
The role of farm mechanization and its relationship to productivity, employment, social and Technological change.- Farm Power availability- Mechanization status in India–performance index of power source and farm machinery - Scheduling of farm operations							
UNIT – II		COST ANALYSIS					9
Farm records and inventory control - cost analysis of machinery: fixed cost and variable costs, effect of inflation on cost;Cost economics of tractor and farm machinery – land preparation, planting , intercultural, plant protection and harvesting machinery cost calculation							
UNIT – III		MACHINERY SELECTION					9
Selection of tractor and farm machinery – Matching implements for different hp- computation of hp requirement - optimum machinery and Replacement criteria; Break-even analysis, reliability and cash flow problems;							
UNIT – IV		FARM MACHINERY OPERATION AND MANAGEMENT					9
Operations and adjustments of Land preparation , planting, intercultural, plant protection and harvesting machinery – management of machinery .							
UNIT – V		CUSTOM HIRING MODELS					9
Establishment of CHC-operationalization – Custom hiring models – case studies of custom hiring – Custom hiring project formulation – ownership vs custom hiring services- Economic viability of custom hiring service units – Replacement of farm machinery							
Total: 45 periods							
TEXT BOOK:							
1.	Donnell Hunt , Farm Power and Machinery Management						
2.	Johl S S and Kapur T R 1989. Fundamentals of Farm Business Management, Kalyani Publishers , Ludhiana						
REFERENCES:							
1.	Mahajan M 2001. Industrial Engineering and Production Management Dhanpet Rai and Co (P) Ltd. New Delhi						
2.	Sharma D N and S.Mukesh, 2013. Farm Power and Machinery Management, Jain Brothers, New Delhi.						



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COURSE OUTCOMES:

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

CO1: Have knowledge about the present status of farm mechanization

CO2: Be able to optimally select machinery for varying uses.

CO3: Be able to plan for mechanization of the farm.

CO4: Be able to estimate the cost of machinery.

CO5: Be able to create custom hiring centre's

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	2	3	3	2	2	1	3	3	3	3	1
CO2	3	1	2	2	3	2	2	2	1	3	3	3	3	1
CO3	3	1	3	2	3	3	2	2	1	3	3	3	3	1
CO4	3	2	2	3	3	3	2	2	1	3	3	3	3	1
CO5	3	3	3	3	3	3	2	2	1	3	3	3	3	1
Avg.	3	2	2	2	3	3	2	2	1	3	3	3	3	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2409		TESTING AND EVALUATION OF FARM MACHINERY AND EQUIPMENT				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
Learn out testing of tractors and all other agricultural equipment and machinery						
UNIT – I		TESTING OF AGRICULTURAL TRACTORS				9
Testing and evaluation system in India - Agricultural machinery situation -Mechanization policy – future prospects - standardization efforts - type of testing systems – General regulations - terminology- basic measurements, speed, fuel consumption, smoke density and power measurement - test items, specifications checking - PTO performance test- engine test, drawbar performance test - field test procedures -interpretation of results						
UNIT – II		TESTING OF TILLAGE AND SOWING EQUIPMENT				9
Testing of tillage machinery - laboratory test (hardness testing, chemical analysis) - field test (rate of work, quality of work, draft measurement, fuel consumption) - seed drill - laboratory test (seed drill calibration) - field checking and field tests						
UNIT – III		TESTING OF INTERCULTURAL EQUIPMENT				9
Testing and evaluation of weeders - types of tests for weeder - types of pesticide application equipment - terminology - types of tests for sprayers - testing methods - types of test for duster - testing methods						
UNIT – IV		TESTING OF COMBINE HARVESTER				9
Types of grain combines - combine systems - test items - procedure for laboratory testing - materials for field test - observations during field tests - sample analysis- data analysis - summary of performance parameters - analysis of field test data						
UNIT – V		SAFETY TESTING OF AGRICULTURAL MACHINERY				9
Types of agricultural machinery accidents - causes of agricultural machinery accidents - technical measurements for ensuring safety - methods of safety testing- ROPS and FOPS -safety precautions						
Total: 45 periods						
TEXT BOOK:						
1.	Metha M.L., SR.Verma, K Mishra and VK Sharma. 1995. Testing and Evaluation of Agricultural Machinery, National Agricultural Technology Information Centre, Ludhiana					
2.	Indian Standards Test Codes related to tractors, power tillers and agricultural implements					
REFERENCES:						
1.	Anonymous. 1983. RNAM Test Codes & Procedures for Farm Machinery. Technical Series 12.					
2.	Nebraska Tractor Test Codes for Testing Tractors, Nebraska, USA.					



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COURSE OUTCOMES:

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

CO1:	Understand the basics of testing procedures and standards of tractor testing
CO2:	Understand the testing procedures and standards of tillage, sowing equipment
CO3:	Understand the testing procedures and standards of intercultural equipment
CO4:	Understand the testing procedures and standards of harvesting equipment
CO5:	Understand the safety standards and testing procedures

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	-	1	1	1	3	-	2	3	2	2	2
CO2	3	1	2	-	1	1	1	3	-	2	3	2	2	2
CO3	3	1	2	-	1	1	1	3	-	2	3	2	2	2
CO4	3	1	2	-	1	1	1	3	-	2	3	2	2	2
CO5	-	-	2	-	1	1	1	3	-	2	-	2	2	2
Avg.	3	1	2	-	1	1	1	3	-	2	3	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2410		BIOCHEMICAL AND THERMOCHEMICAL CONVERSION OF BIOMASS				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To expose the students with different bio and thermal conversion of biomass.						
UNIT – I		BIOMASS CHARACTERIZATION				9
Biomass – types – fuels from biomass. Terms and units used in biomass production. Biomass fuel characterization – physical, chemical and thermal – energy release. Supply chain – harvesting / collection transportation and processing. Briquetting – types – pelletizing.						
UNIT – II		BIOCHEMICAL CONVERSION				9
Biochemical degradation – factors affecting biogas production - types of biogas plants – construction details – operation and maintenance – utilization of biogas - slurry handling, utilization and enrichment – high rate bio methanation process – landfills – bioethanol – feedstock – process – utilization - composting - methods – machinery						
UNIT – III		THERMO CHEMICAL CONVERSION BY COMBUSTION				9
Thermochemical degradation. stoichiometric air requirement - Combustion process – chemistry of combustion - combustion zones - emissions. Cofiring of biomass. Incinerators - layout. Combustion of wastes and MSW. Wood burning stoves - types- operation.						
UNIT – IV		THERMOCHEMICAL CONVERSION BY GASIFICATION AND PYROLYSIS				9
Biomass gasification – chemistry of gasification – types of gasifier – Gas cleaning & conditioning - utilization of producer gas - emissions – commercial gasifies plants. Pyrolysis – product recovery – types - biochar – bio oil – operation – recovery..						
UNIT – V		COGENERATION AND WASTE HEAT RECOVERY				9
Cogeneration technologies – cycles – topping – bottoming – problems – applications – selection. Waste heat recovery - plate heat exchangers - waste heat boilers - heat pumps - thermic fluid heaters - selection of waste heat recovery..						
Total: 45 periods						
TEXT BOOK:						
1.	Chawla, O.P.1986. “Advances in Biogas Technology”. ICAR Publication, New Delhi.					
2.	Rao. S and B.B. Parulekar. 2000. Energy Technology – Non conventional, Renewable and Conventional. Khanna Publishers, New Delhi					
3.	Horlock JH, 1987. Cogeneration - Heat and Power, Thermodynamics and Economics, Oxford Press.					
REFERENCES:						
1.	Khandelwal K.C. and Mahdi, S.S. 1986. Biogas Technology. Tata Mc Graw Hill Pub. Co. Ltd., New Delhi					
2.	Srivastava, P.K., Shukla, B.D. and Ojha, T.P. 1993. Technology and application of biogas. Jain Brothers, New Delhi.					
3.	Mathur,A.N.and Rathore,N.S.1993.,Biogas production Management and Utilisation. Himanshu Publication. New Delhi.					
4.	Chakraverty, A. 1993. Biotechnology and other alternate technologies for utilisation of biomass. Oxford and IBH Publishing Co., New Delhi.					



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COURSE OUTCOMES:

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

CO1:	Biomass identification and classes
CO2:	Biomass characters and biochemical conversion.
CO3:	Thermo chemical conversion techniques and cogeneration from waste
CO4:	To know about application of biomass conversion
CO5:	Analyse the energy generated from waste

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	1	3	3	-	2	1	3	2	2	2	2
CO2	3	1	2	2	3	3	2	-	2	1	3	2	2	2	2
CO3	3	1	3	2	3	3	3	-	2	1	3	2	2	2	2
CO4	3	2	2	3	3	3	3	-	2	1	3	2	2	2	2
CO5	3	3	3	3	3	3	3	-	2	1	3	2	2	2	2
Avg.	3	2	2	2	3	3	3	-	2	1	3	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2411		WASTE AND BY PRODUCT UTILIZATION				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To expose the students with different byproducts of food industry and waste water management of any industry.						
UNIT – I	INTRODUCTION TO WASTE WATER TREATMENT					9
Types and formation of by-products and waste; magnitude of Waste generation in different food processing industries; concept scope and maintenance of waste management and effluent treatment						
UNIT – II	CHEMICAL PROPERTIES					9
Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbigy of waste, other ingredients like insecticide, pesticides and fungicides residues.						
UNIT – III	BY-PRODUCTS UTILIZATION					9
Waste utilization in various industries, furnaces and boilers run on agricultural wastes and by-products, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and utilization, waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, concept of vermi-composting						
UNIT – IV	PROCESSING TECHNIQUES					9
Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation, Secondary treatments: Biological and chemical oxygen demand for different food plant waste- trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, Tertiary treatments						
UNIT – V	ADVANCED WASTE WATER TREATMENT PROCESSES					9
Sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal, Assessment, treatment and disposal of solid waste; and biogas generation.						
Total: 45 periods						
TEXT BOOK:						
1.	Huang, R.T. 1982. Compost Engineering: Principles and Practices. John Willey & Sons, New York.					
REFERENCES:						
1.	Standards, ASAE: Manure Production and Characteristics. ASAE, NewYork.					
2.	USDA: Agricultural Waste Management Field Hand Book, New York, USA.					



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COURSE OUTCOMES:

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

CO1:	Types of waste and influences
CO2:	Waste water management from any food industry.
CO3:	By product utilization from processing plants of cereals, pulses
CO4:	Hands on training in wastewater treatment process
CO5:	Advance procession techniques for waste water treatment

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	2	1	3	2	2	1	3	2	2	2	2
CO2	3	1	2	2	3	3	2	2	1	3	2	2	2	2
CO3	3	1	3	2	3	3	2	2	1	3	2	2	2	2
CO4	3	2	2	3	3	3	2	2	1	3	2	2	2	2
CO5	3	3	3	3	3	3	2	2	1	3	2	2	2	2
Avg.	3	2	2	2	3	3	2	2	1	3	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2412		HUMAN ENGINEERING AND SAFETY IN FARM MACHINERY OPERATIONS				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To impart the fundamental knowledge to the student on the importance of human engineering and safety in the field of agriculture machinery.						
UNIT – I		ERGONOMICS				9
Ergonomics- introduction- Role of ergonomics in Agriculture - Human metabolism- energy liberation in human body- Types of human metabolism- energy requirements at work - acceptable work load.						
UNIT – II		PHYSIOLOGICAL FUNCTIONS				9
Human Skeletal system – muscle, structure and function - Physiological stress - Efficiency of work -Physical functions-Age and individual differences in physical functions- Physiological and operational criteria of physical activity.						
UNIT – III		ENERGY EXPENDITURE				9
Energy expenditure of activities-keeping energy expenditure within bounds- Energy expenditure of Spraying- Weeding operations - Movements of body members- Strength and endurance of movements - Movement of body members related to Agricultural activities - Speed and accuracy of movements - Time and distance of movements - Reaction time						
UNIT – IV		ANTHROPOMETRY				9
Anthropometry – introduction- Types of data- Principles of applied anthropometry - concept of percentile – Normal distribution – Estimating the range – Minimum and Maximum dimensions- Cost benefit analysis applications of anthropometric data. Anthropometric consideration in tool / equipment design.						
UNIT – V		HUMAN SAFETY				9
Dangerous machine (Regulation) act, Rehabilitation and compensation to accident victims, Safety gadgets for spraying, threshing, Chaff cutting and tractor & trailer operation etc.						
Total: 45 periods						
TEXT BOOK:						
1.	Ernest and Mc Cormick, E.L. (1970). <i>Human factors in engineering and design</i> . McGraw Hill Co., New York.					
2.	Grandjean, E. (1988). <i>Fitting the task to the man</i> . Taylor and Francis, London.					
3.	Liljedhal, J.B, Carleton, W.M, Smith, P.K and David, M. (1978). <i>Tractors and power units</i> . John Wiley and sons, New York.					
4.	Murrel, K.H.F. (1978). <i>Ergonomics, Man in his working environment</i> . Chapman and Hall, London.					
REFERENCES:						
1.	Astrand, O.P and Rodhal, J. (1977). <i>Work Physiology</i> . Mc Graw hill Co. New York.					
2.	https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/risk_management/ss_handbook/media/Chap17_1200.pdf					
3.	http://www.derby.ac.uk/online/course/ergonomics-msc					
4.	http://www.online.colostate.edu/certificates/ergonomics/					
5.	http://www.cdc.gov/nchs/data/nhanes/nhanes3/cdrom/nchs/manuals/anthro.pdf					



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Mecheri, Salem Dt-636453, Tamilnadu



COURSE OUTCOMES:

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

- CO1: Understand the importance of human factors and their application in system development.
- CO2: Know the effect of visual, auditory and factual displays in human performance.
- CO3: Understand the importance of optimum work-rest cycles in endurance.
- CO4: Be able to ideally design the work space in accordance to anthropometry.
- CO5: Have the general understanding safety features and regulation acts in farm machinery.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	2	1	3	2	2	1	3	3	1	1	1
CO2	3	1	2	2	3	3	2	2	1	3	3	1	1	1
CO3	3	1	3	2	3	3	2	2	1	3	3	1	1	1
CO4	3	2	2	3	3	3	2	2	1	3	3	1	1	1
CO5	3	3	3	3	3	3	2	2	1	3	3	1	1	1
Avg.	3	2	2	2	3	3	2	2	1	3	3	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2413		PRECISION FARMING EQUIPMENT				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To learn about the fundamentals of precision farming principles and application of precision farming equipment						
UNIT – I	ROLE OF ELECTRONICS IN AGRICULTURAL ENGINEERING					9
Role of electronics in agricultural engineering for precision agriculture. Basics of precision agriculture, tools for implementation of precision agriculture. Introduction of GIS/GPS positioning system for precision farming. Use of GIS and GPS in farm machinery and equipment.						
UNIT – II	SENSORS, MICROCONTROLLER AND ACTUATOR FOR PRECISION AGRICULTURE					9
Types of sensor- principle and concept of different sensor like ultrasonic, proximity, PIR, IR, radar, pressure, gas, temperature, moisture, strain /weight, colour sensor etc. used in agriculture. Microcontroller: Arduino, Raspberry Pi and PLC Actuator : DC Motor, Pump, linear Actuator etc. - Basic input circuits and signal conditioning systems – amplifiers and filters.						
UNIT – III	PRECISION FARMING CONCEPTS AND PRECISION FARMING MACHINERY					9
Precision farming concepts- Map based system- Real time system – Combination Map and real time system - components of PF – Site specific management- Constraints of PF- Precision tillage, planting, intercultural, plant protection and harvesting equipment, laser guided leveller, power sprayer, straw chopper cum spreader, straw bailer, combine harvester etc.						
UNIT – IV	SITE-SPECIFIC MANAGEMENT SYSTEM					9
Site-specific nutrient management- weeds management- Agro-chemicals and fertilizer management, data sources and decision making for site-specific management. Grain quality and yield. Yield monitoring and mapping, soil sampling and analysis.						
UNIT – V	UNMANNED VEHICLES AND IOT IN AGRICULTURE					9
UAV -Drones- Types - applications – rules and regulations – Autonomous ground vehicles – Robotics- platforms and unmanned agricultural vehicles- IoT - crop yield estimates- threat identification- crop insurance-pesticides spraying, environmental monitoring- protected cultivation-food quality monitoring etc,						
Total: 45 periods						
TEXT BOOK:						
1.	Brase, T.A. 2006. Precision Agriculture. Thomson Delmar Learning, New York.					
2.	Hermann, J.H. 2013. Precision in Crop Farming, Site Specific Concepts and Sensing Methods: Applications and Results. Springer, Netherlands.					
3.	Krishna, K. R. 2016. Push Button Agriculture Robotics, Drones, Satellite-Guided Soil and Crop Management. Apple Academic Press					
4.	Srivastava,A K., Carroll E.G., Roger P. R. and Dennis R.B.2006. Engineering Principles of Agricultural Machines. American Society of Agricultural and Biological Engineers, USA.					
5.	Zhang, Q. 2015. Precision Agriculture Technology for Crop Farming. CRC Press, New York.					
6.	Kepner, R.A., Bainer, R. and Berger, E.L. 1978. Principles of Farm Machinery.AVI Publ.					
7.	Sahay, K.M. and Singh, K.K. 1994. Unit Operation of Agricultural Processing. Vikas Publ. House.					
8.	Michael, A.M. 2007. Irrigation: Theory and Practice. Vikash Publishing House Pvt. Ltd., New Delhi.					
9.	Rai G.D. 1994. Non-conventional sources of energy. Khanna Publishers, Delhi					



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COURSE OUTCOMES:

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

CO1:	Understand the role of electronics in precision farming
CO2:	Analyze the principles and applications of sensors, micro controllers and actuators in precision farming equipment
CO3:	Understand the precision farming concepts and machinery
CO4:	Understand about site specific management system and unmanned vehicles & IoT applications
CO5:	Analyze the application of sensors and electronics in farm machinery

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	3	2	2	1	3	3	2	2	2
CO2	3	2	2	1	3	3	2	2	1	3	3	2	2	2
CO3	3	2	3	1	3	3	2	2	1	3	3	2	2	2
CO4	3	2	2	1	3	3	2	2	1	3	3	2	2	2
CO5	3	3	3	1	3	3	2	2	1	3	3	2	2	2
Avg.	3	2	2	1	3	3	2	2	1	3	3	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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Mecheri, Salem Dt-636453, Tamilnadu



UAIPE2414		SOLAR AND WIND ENERGY SYSTEM				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To learn about the fundamental aspects of solar energy availability, solar energy conversion technologies To understand about the fundamental aspects of wind energy availability and wind power generators To acquire the knowledge on the alternate sources of energy such as geothermal energy, wave energy, tidal energy, OTEC energy, fuel cells and energy storage						
UNIT – I	SOLAR ENERGY RADIATION AND SOLAR THERMAL COLLECTORS					9
Solar radiation availability - radiation measurement -transmittance - absorptance flat plate collectors - heat transfer correlations - collector efficiency - heat balance -absorber plate - types - selective surfaces. Solar driers types heat transfer performance of solar dryers agro industrial applications.						
UNIT – II	SOLAR CONCENTRATING COLLECTORS AND PV TECHNOLOGY					9
Optically concentrating collectors- types reflectors - solar thermal power stations principle and applications - solar stills- types- solar pond performance- characteristics applications. Photovoltaics types characteristic-load estimation batteries invertors operation system controls. PV system installations standalone systems- PV powered water pumping system sizing and optimization hybrid system solar technologies in green buildings.						
UNIT – III	WIND MAPPING ANALYSIS AND CHARACTERISTICS OF WIND					9
Nature of wind - wind structure and measurement - wind power laws - velocity and power duration curves-aero foil - tip speed ratio - torque and power characteristics power coefficients - Betz coefficient						
UNIT – IV	WIND MILL DESIGN AND APPLICATIONS					9
Turbines- Wind mill - classification - power curve. Upwind and downwind systems - transmission rotors pumps - generators - standalone system - grid system -batteries. Wind energy storage - wind farms wheeling and banking - and certification procedures.						
UNIT – V	ALTERNATE ENERGY SOURCES					9
Ocean energy - off shore and on shore ocean energy conversion technologies - OTEC principles - open and closed cycles. Tidal energy - high and low tides - tidal power - tidal energy conversion. Geothermal energy - resources - classification and types of geothermal power plants. Nuclear energy - reactions -fusion, fission, hybrid reactors. Fuel cell - principle and operation - classification and types. Energy storage- pumped hydro and underground pumped hydro - compressed air - battery - flywheel - thermal.						
						Total: 45 periods
TEXT BOOK:						
1.	Rai., G.D. “Solar Energy Utilization ” Khanna publishers, New Delhi, 2002.					
2.	More, H.S and R.C. Maheshwari, “ Wind Energy Utilization in India” CIAE Publication – Bhopal, 1982.					
3.	Solanki, C.S. “Renewable Energy Technologies: A Practical guide for beginners”. PHI learning Pvt. Ltd, New Delhi. 2008.					
REFERENCES:						
1.	Solanki, C.S. “Solar Photovoltaic Technology and Systems”, PHI learning Pvt. Ltd., New Delhi, 2013.					
2.	Rai., G.D. “Solar Energy Utilization ” Khanna publishers, New Delhi, 2002.					
3.	Rao. S and B.B. Parulekar. “Energy Technology – Non conventional, Renewable and Conventional”. Khanna Publishers, Delhi, 2000.					
4.	Rajput. R.K. “Non- Conventional Energy Sources and Utilization”, S. Chand & Company Pvt. Ltd, New Delhi, 2013.					

COURSE OUTCOMES:

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

CO1:	Understand the basics of solar energy and solar thermal energy conversion technologies and compare direct mode and indirect mode solar dryers
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CO2:	Analyze the principles and applications of solar thermal power stations, solar pond and solar stills
CO3:	Understand the wind power laws and calculate the torque and power characteristics of wind energy
CO4:	Design wind mills and test the units for certification
CO5:	Understand the principles of geothermal energy, wave energy, tidal energy, OTEC energy, fuel cells and analyze their applications

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	3	2	2	1	3	3	2	2	2
CO2	3	2	2	1	3	3	2	2	1	3	3	2	2	2
CO3	3	2	3	1	3	3	2	2	1	3	3	2	2	2
CO4	3	2	2	1	3	3	2	2	1	3	3	2	2	2
CO5	3	3	3	1	3	3	2	2	1	3	3	2	2	2
Avg.	3	2	2	1	3	3	2	2	1	3	3	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2415	WATERSHED PLANNING AND MANAGEMENT				
	Category	L	T	P	Credit
	PCC	3	0	0	3

Course objectives

To provide the technical know-how of analyzing the degradation of soil and water resources and implementation of the measures for soil and water conservation.

To provide a comprehensive treatise on the engineering practices of watershed management for realizing the higher benefits of watershed management

UNIT – I	INTRODUCTION	9
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Watershed – Definition - concept - Objectives – Land capability classification - Watershed Based Land Use Planning- Watershed Characteristics: Classification and Measurement- priority watersheds - land resource regions in India- Importance of Watershed Properties for Watershed Management.

UNIT – II	WATERSHED PLANNING	9
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Importance of Watershed Planning - Utility of Hydrologic Data in Watershed Planning -Watershed Delineation - Planning principles – collection of data – present land use - Preparation of watershed development plan - Estimation of costs and

UNIT – III	WATERSHED MANAGEMENT	9
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Participatory watershed Management - run off management - Factors affecting runoff - Temporary & Permanent gully control measures - Water conservation practices in irrigated lands - Soil and moisture conservation practices in dry lands

UNIT – IV	WATER CONSERVATION PRACTICES	9
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In-situ & Ex-situ moisture conservation principle and practices - Afforestation principle - Micro catchment water harvesting - Ground water recharge – percolation ponds -Water harvesting Design of Water Harvesting Structures - Farm pond - Supplemental irrigation - Evaporation suppression - Seepage reduction

UNIT – V	WATERSHED DEVELOPMENT PROGRAMME	9
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River Valley Project (RVP) - Hill Area Development Programme (HADP) - National Watershed Development Programme for Rain fed Agriculture (NWDPA) - Other similar projects operated in India – Govt. of India guidelines on watershed development programme - Watershed based rural development – infrastructure development - Use of Aerial photography and Remote sensing in watershed management - Role of NGOs in watershed development.

Total: 45 periods

TEXT BOOK:

1. Suresh, R. 2005. Soil and Water Conservation Engineering, Standard Publishers & Distributors, New Delhi.
2. Ghanshyam Das, “Hydrology and Soil Conservation Engineering”, Prentice Hall of India Private Limited, New Delhi, 2000.

REFERENCES:

1. Gurmeh Singh et al. 2004. Manual of soil and water conservation practices. Oxford & IBH publishing Co. New Delhi.
2. Suresh, R. 2008. Land and water management principles, Standard Publishers & Distributors, New Delhi
3. Tripathi R.P. and H.P.Singh 2002, Soil erosion and conservation, Willey Eastern Ltd., New Delhi
4. Murthy, V.V.N. 2005, Land and water management, Kalyani publishing, New Delhi
5. Tideman, E.M., “Watershed Management”, Omega Scientific Publishers, New Delhi, 1996.

COURSE OUTCOMES:

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

CO1: The students will be able to describe the watershed management concepts

CO2: The students will be able to describe the components involved in watershed planning



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CO3:	The students will able to describe the methods of water harvesting structures
CO4:	The students will able to design and construct the soil conservation structures
CO5:	The students will able to prioritize and execute the watershed development programme

	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	3	2	2	2	1	2	2	2	2	2	2
CO2	3	2	3	2	3	3	3	1	3	3	2	2	2	2
CO3	3	2	3	2	2	2	2	2	2	2	2	2	2	2
CO4	3	2	2	1	2	2	3	1	1	2	2	2	2	2
CO5	2	2	1	2	3	2	3	2	1	1	2	2	2	2
Avg.	3	2	2	2	2	2	3	1	2	2	2	2	2	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy														



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UAIPE2416		GROUNDWATER AND WELL ENGINEERING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
	To acquaint and equip the students with the techniques of groundwater development and management					
UNIT – I	GROUND WATER OCCURRENCE					9
Occurrence of groundwater, temporal and spatial variability of groundwater, methods for groundwater exploration, determination of aquifer parameters, pumping tests, assessment of groundwater potential						
UNIT – II	WELL CONSTRUCTION					9
Groundwater structures, groundwater development and utilization, types of water wells, design and construction of water wells, drilling methods, well development, well maintenance and rehabilitation, groundwater monitoring, monitoring wells, design and construction of monitoring wells						
UNIT – III	GROUNDWATER POLLUTION					9
Groundwater development and quality considerations, groundwater contamination, sources and causes of groundwater pollution, contaminated systems and their rehabilitation, groundwater bioremediation, management of salt water ingress in inland and coastal aquifers.						
UNIT – IV	GROUNDWATER MANAGEMENT					9
Management of declining and rising water table, Natural and artificial groundwater recharge, Groundwater recharge basins and injection wells. Groundwater management in irrigation command, conjunctive water use, water lifting, different types of pumps, selection of pumps, pump characteristics curve, cost of groundwater pumping, comparative economics of surface and groundwater use for irrigation						
UNIT – V	GROUNDWATER DEVELOPMENT POLICIES					9
Major issues related to groundwater development and management in India, Legal aspects of groundwater exploitation, Diagnostic survey of sick wells/tube wells and their rehabilitation.						
Total: 45 periods						
TEXT BOOK:						
1.	Walton, W.C. 1976. Groundwater Resource Evaluation. Mc Graw Hill. New York.					
2.	Karanth, K.R. 1987. Groundwater Assessment, Development and Management. Tata-mcgraw Hill. New Delhi.					
3.	Michael, A.M. and Khepar, S.D. 1989. Water Well and Pump Engineering. Tata-mcgraw Hill Publ. Co. New Delhi.					
REFERENCES:						
1.	Giordano, M. and Villholth, K.G. 2007. The Agricultural Groundwater Revolution Volume 3.					
2.	CABI Head Office, Nosworthy Way, Wallingford, Oxfordshire, OX10 8DE, UK Ghosh, N.C. and Sharma, K.D. 2006. Groundwater Modelling and Management.					
3.	Madan Kumar Jha and Stefan Peiffer Applications of Remote Sensing and GIS Technologies in Groundwater Hydrology: Past, Present and Future.					



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COURSE OUTCOMES:

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

CO1:	The students will be able to describe the concepts of aquifer parameters
CO2:	The students will be able to describe the components involved in Groundwater structures
CO3:	The students will be able to describe the Groundwater development and quality considerations
CO4:	The students will be able to describe the Management of declining and rising water table
CO5:	The students will be able to prioritize and execute the Groundwater development programme

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	3	1	2	2	2	2	2	2
CO2	3	2	2	2	3	3	3	1	3	3	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	2	3	2	1	2	1	3	1	1	2	2	2	2	2
CO5	2	1	1	2	3	3	3	2	1	1	2	1	1	1
Avg.	2	2	2	2	2	2	3	1	2	2	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2417		DESIGN OF MICRO-IRRIGATION SYSTEM				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To understand the basic concepts, tools, and skills used to deliver water efficiently and effectively on both a field and garden scale efficiency						
To learn about the role of irrigation water in agriculture, and the environmental factors that influence the type, frequency, and duration of irrigation						
To learn about the resources and essential skills needed to determine the proper timing and volume of irrigation, using both qualitative and quantitative methods						
UNIT – I		MICRO IRRIGATION CONCEPT AND APPLICATIONS				9
Micro irrigation -Merits, demerits, types and components of micro irrigation system- Present status, Scope and potential problem of micro irrigation - Micro-irrigation applications: Hills, arid lands, coastal and wastelands, Financial Assistance for Promotion of Micro Irrigation in India.						
UNIT – II		DRIP IRRIGATION DESIGN				9
Drip irrigation - Components- Dripper- types and equations governing flow through drippers- Wetting pattern- Chemigation application- Pump capacity -Installation- Operation and maintenance of Drip irrigation system. – Design of surface and sub-surface drip irrigation.						
UNIT – III		SPRINKLER IRRIGATION DESIGN.				9
Sprinkler irrigation- Components and accessories - Hydraulic design - Sprinkler selection and spacing- Capacity of sprinkler system - types - Sprinkler performance- Sprinkler discharge- Water distribution pattern- Droplet size, filtering unit, fertigation - System maintenance						
UNIT – IV		ECONOMIC ANALYSIS				9
Standardization and Quality Assurance of Micro Irrigation System Components. Terminologies in Economic Analysis, Optimal Flow Criterion for Economic Drip Irrigation Pipes Selection, Economic Viability of Micro Irrigation in Different Crops						
UNIT – V		AUTOMATION IN MICRO IRRIGATION				9
Automation, Need for Automation of Irrigation, Merits and Demerits of Automation, Semiautomatic and Fully Automatic Systems of Automation, Components of Automation System, Types of Controls and Automation in Micro Irrigation.						
Total: 45 periods						
TEXT BOOK:						
1.	Suresh, R., “Principles of Micro-Irrigation Engineering”, Standard Publishers Distributors,New Delhi, 2010.					
2.	Michael, A.M., “Irrigation Theory and Practice”, Vikas Publishers, New Delhi, 2002.					
REFERENCES:						
1.	Modi, P.N., and Seth, S.M., “Hydraulics and Fluid Mechanics”, Standard Book House, New Delhi, 1991					
2.	Jack Keller and Rond Belisher., “Sprinkler and Trickle Irrigation”, Vannistrand Reinhold, New York, 1990.					
3.	Sivanappan R.K., “Sprinkler Irrigation”, Oxford and IBH Publishing Co., New Delhi, 1987.					
4.	Keller.J and D. Karmeli, “Trickle Irrigation Design”, Rainbird sprinkler Irrigation anufacturing Corporation, Glendora, California, USA					



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COURSE OUTCOMES:

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

CO1:	Categorize the different types of pumps and water lifting devices based on the principle, components, and working efficiency
CO2:	Explain the working principle of centrifugal pump as well as its characteristics with efficiencies and design the centrifugal pump including impeller design, casing and other parts of pumps.
CO3:	Estimate water budgets and hydraulics used to develop irrigation schedules through micro irrigation based on crop geometry
CO4:	Design drip and sprinkler irrigation system including, main line, sub main and laterals designs by consider pump capacity
CO5:	Design green house irrigation system and advanced types of irrigation including lift irrigation and automation

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	1	2	2	3	2	2	3	3	3
CO2	2	2	3	2	2	3	2	2	3	2	2	3	3	3
CO3	2	2	3	2	2	3	2	2	3	2	2	3	3	3
CO4	2	2	3	2	2	3	2	2	3	2	2	3	3	3
CO5	2	2	3	2	2	1	2	2	3	2	2	3	3	3
Avg.	2	2	3	2	2	2	2	2	3	2	2	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2418		PROTECTED CULTIVATION				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To impart knowledge on the protected cultivation of vegetables, fruits and flower crops.						
To sensitize the students on hi-tech production technology of fruits and vegetables and flower crops.						
To learn and practices the various production practices of flower and other high value crops						
UNIT – I		PROTECTED CULTIVATION AND ITS TYPES				9
Importance and methods of protected culture in horticultural crops. Importance and scope of protected cultivation, different growing structures of protected culture viz., green house, poly house, net house, poly tunnels, screen house, protected nursery house. Study of environmental factors influencing green house production, cladding / glazing / covering material, ventilation systems, cultivation systems including nutrient film technique / hydroponics / aeroponic culture, growing media and nutrients, canopy management, micro irrigation and fertigation systems.						
UNIT – II		PROTECTED CULTIVATION OF VEGETABLE CROPS				9
Protected cultivation technology for vegetable crops: Hi-tech protected cultivation techniques for tomato, capsicum nursery, cucumber, gherkins strawberry and melons, integrated pest and disease management, post harvest handling.						
UNIT – III		PROTECTED CULTIVATION OF FLOWER CROPS				9
Protected cultivation technology for flower crops: Hi-tech protected cultivation of cut roses, cut chrysanthemum, carnation, gerbera, asiatic lilies, anthurium, orchids, cut foliages and fillers, integrated pest and disease management, postharvest handling.						
UNIT – IV		PRECISION FARMING TECHNIQUES				9
Concept and introduction of precision Farming: importance, definition, principles and concepts. Role of GIS and GPS. Mobile mapping system and its application in precision farming. Design, layout and installation of drip and fertigation in horticultural crops, role of commuters in developing comprehensive systems needed in site specific management (SSM), georeferencing and photometric correction. Sensors for information gathering, geostatistics, robotics in horticulture, postharvest process management (PPM), remote sensing, information and data management and crop growth models, GIS based modeling,VRT, robotics and drones in agriculture						
UNIT – V		PRECISION FARMING FOR HORTICULTURAL CROPS				9
Precision farming techniques for horticultural crops: Precision farming techniques for tomato, chilli, bhendi, bitter gourd, bottle gourd, cauliflower, cabbage, grapes, banana, rose, jasmine, chrysanthemum, marigold, tuberose, china aster, turmeric, coriander, coleus and gloriosa						
Total: 45 periods						
TEXT BOOK:						
1.	Joe.J.Hanan. 1998. Green houses: Advanced Technology for Protected Horticulture, CRC Press, LLC. Florida					
2.	Paul V. Nelson. 1991. Green house operation and management. Ball publishing USA.					
REFERENCES:						
1.	Lyn. Malone, Anita M. Palmer, Christine L. Vloghat Jach Dangeermund. Mapping out world: GIS lessons for Education, ESRI press, 2002					
2.	David Reed, Water, media and nutrition for green house crops. Ball publishing USA, 1996					
3.	Adams, C.R. K.M. Bandford and M.P. Early, Principles of Horticulture, CBS publishers and distributors, Daryaganj, New Delhi, 1996.					



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Mecheri, Salem Dt-636453, Tamilnadu



COURSE OUTCOMES:

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

CO1:	The students will be able to describe the different methods of protected cultivation practices available for vegetable crops and flowers
CO2:	The students will be able to assess the technology available for vegetable crops
CO3:	The students will be able to assess the technology available for flower crops
CO4:	The students will be able to assess precision farming techniques using sensors and Geographic information systems for the crops
CO5:	The students will be able to assess the technology available for horticulture crops

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	3	2	2	2	1	2	2	2	1	1	1
CO2	3	2	2	2	3	3	3	1	3	3	2	1	1	1
CO3	3	2	2	2	2	2	2	2	2	2	3	2	2	2
CO4	3	3	2	1	2	2	3	1	1	2	2	1	1	1
CO5	2	1	1	2	3	3	3	2	1	1	2	2	2	2
Avg.	3	2	2	2	2	2	3	1	2	2	2	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2419		ON-FARM WATER MANAGEMENT				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
• Understand the fundamental design of irrigation channels and diversion structures. • Study about command area development. • Know about availability and utilization of water resources. • Impart knowledge on water use efficiency. • Get an idea about automation of irrigation systems and water policies.						
UNIT – I		DESIGN OF IRRIGATION CHANNELS				9
Design of Erodible (earthen), Non-Erodible (lined) & Alluvial channels (pre-fabricated) - Kennedy’s and Lacey’s Theories; Materials for Lining watercourses and field channel; Water control and Diversion structure - Design - Land grading - Land Levelling methods.						
UNIT – II		COMMAND AREA				9
Command area - Concept - CADA Programmes in Tamil Nadu; Duty of water expression - relationship between duty and delta; Warabandhi - water distribution and Rotational Irrigation System - Participatory irrigation management.						
UNIT – III		CONJUNCTIVE USE OF SURFACE AND GROUNDWATER				9
Availability of water - rainfall, canal supply and groundwater - conjunctive use - crop calendar Irrigation demand - water requirement and utilization - Prediction of over and under utilization of water - Dependable rainfall – Rainfall analysis by Markov chain method - Probability matrix.						
UNIT – IV		WATER BALANCE				9
Groundwater balance model - Weekly water balance - Performance indicators Appropriateness Adequacy, Dependability, Equity, Reliability, Timeliness and efficiency - conjunctive use plan by optimization; Agricultural productivity indicators - Water use efficiency.						
UNIT – V		DESIGN OF FARM DRAINAGE SYSTEM				9
Agricultural drainage – types and Concept - Issues; Principles of flow through soils - Darcy’s law - drainage coefficient -Infiltration theory; Surface drainage - methods - design - Random drainage - Herringbone - Grid iron types -Design of Open Drains. Steady State flow - Dupit’sForchimerassumptions -Hooghoudt’s equation; Methods & Design – Mole drains - Drainage wells - Pipe materials -Problem soils - Leaching Requirements; Land reclamation - methods of Reclamation.						
Total: 45 periods						
TEXT BOOK:						
1.	Michael, A.M. 2006. “Irrigation Theory and practice”, Vikas publishing house, New Delhi					
2.	Michael, A.M. and Ojha, T.P. “Principles of Agricultural Engineering -Vol II “,Jain Brothers, New Delhi,2002.					
REFERENCES:						
1.	Israelson,“Irrigation principles and practices”, John Wiley & sons, New York, 2002.					
2.	Modi, P.N., “Irrigation and water resources and water power engineering”, Standard Book House, New Delhi,2002.					
3.	Suresh, R., “Land and water management principles”, Standard Publishers & Distributors,New Delhi,2008					



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COURSE OUTCOMES:

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

CO1:	The students will be able to design irrigation channels and diversion structures.
CO2:	The students will be able to organize the different CAD programme and involved farmers to participate
CO3:	The students will be able to inspect the conjunctive use of water resources by farmers
CO4:	The students will be able to identify water balance between productivity and water use efficiency in agricultural land
CO5:	The students will be able to design the surface and subsurface drainage systems.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	2	3	2	2	2	3	1	1	1
CO2	3	2	2	2	3	2	3	1	3	1	2	1	1	1
CO3	2	2	1	3	3	3	2	2	2	2	3	2	2	2
CO4	3	3	2	2	2	2	1	3	1	2	2	1	1	1
CO5	2	1	3	2	3	3	3	2	1	3	3	2	2	2
Avg.	2	2	2	2	3	2	3	2	2	2	3	1	1	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2420		IRRIGATION WATER QUALITY AND WASTE WATER MANAGEMENT				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
• To know the basics concepts of irrigation water quality • To impart knowledge on water quality for irrigation purposes, besides relevant environmental problems and recycle and reuse concepts • To understand the importance of water quality for irrigation and major uses of water and the role environmental issues.						
UNIT – I		WATER QUALITY				9
Physical and chemical properties of water – Suspended and dissolved solids – EC and pH – major ions – Water quality investigation – Sampling design - Samplers and automatic samplers – Data collection platforms – Field kits – Water quality data storage, analysis and inference – Software packages						
UNIT – II		IRRIGATION WATER QUALITY				9
Water quality for irrigation – Salinity and permeability problem – Root zone salinity – Irrigation practices for poor quality water – Saline water irrigation – Future strategies						
UNIT – III		WATER POLLUTION				9
Sources and Types of pollution – Organic and inorganic pollutants - BOD – DO relationships – impacts on water resources – NPS pollution and its control – Eutrophication control - Water treatment technologies – Constructed wetland.						
UNIT – IV		RECYCLING AND REUSE OF WATER				9
Multiple uses of water – Reuse of water in agriculture – Low cost waste water treatment technologies - Economic and social dimensions - Packaged treatment units – Reverse osmosis and desalination in water reclamation.						
UNIT – V		WATER QUALITY MANAGEMENT				9
Principles of water quality – Water quality classification – Water quality standards - Water quality indices – TMDL Concepts – Water quality models						
						Total: 45 periods
TEXT BOOK:						
1.	George Tchobanoglous, Franklin Louis Burton, Metcalf & Eddy, H. David Stense, "Waste water Engineering: Treatment and Reuse", McGraw-Hill, 2022..					
2.	Vladimir Novonty, "Water Quality: Diffuse pollution and watershed Management", 2nd edition, John Wiley & Sons, 2003					
3.	Mackenzie L Davis, David A Cornwell, "Introduction to Environmental Engineering", McGraw Hill 2006					
4.	Stum, M and Morgan, A., "Aquatic Chemistry", Plenum Publishing company, USA, 1985					
5.	Lloyd, J.W. and Heathcote, J.A., "Natural inorganic chemistry" in relation to groundwater resources, Oxford University Press, Oxford, 1988					



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COURSE OUTCOMES:

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

CO1:	The students will be able to describe the parameters of water quality
CO2:	The students will be able to describe the concepts of water quality for irrigation
CO3:	The students will be able to describe the water pollution and quality considerations
CO4:	The students will be able to describe the recycling and reuse of water
CO5:	The students will be able to describe the management of water quality

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	2	3	2	2	2	3	3	3	3
CO2	3	2	2	2	3	2	3	1	2	2	2	2	2	2
CO3	2	2	1	3	3	3	2	2	2	2	2	3	3	3
CO4	3	3	2	2	2	1	3	3	1	2	2	2	2	2
CO5	2	1	3	2	3	3	3	2	1	3	3	3	3	3
Avg.	2	2	2	2	3	2	3	2	2	2	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAIPE2421		CLIMATE CHANGE AND ADAPTATION				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
• To know the basics, importance of global warming • To know the concept of mitigation measures against global warming • To learn about the global warming and climate change.						
UNIT – I	EARTHS CLIMATE SYSTEM					9
Role of ozone in environment ozone layer ozone depleting gases Green House Effect, Radiative effects of Greenhouses Gases Hydrological Cycle Green House Gases and Global Warming Carbon Cycle.						
UNIT – II	ATMOSPHERE AND ITS COMPONENTS					9
Importance of Atmosphere - Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere- Composition of the atmosphere Atmospheric stability- Temperature profile of the atmosphere - Lapse rates - Temperature inversion - effects of inversion on pollution dispersion.						
UNIT – III	IMPACTS OF CLIMATE CHANGE					9
Causes of Climate change: Change of Temperature in the environment Melting of ice Pole-sea level rise- Impacts of Climate Change on various sectors Agriculture, Forestry and Ecosystem Water Resources Human Health Industry, Settlement and Society Methods and Scenarios Projected Impacts for Different Regions Uncertainties in the Projected Impacts of Climate Change Risk of Irreversible Changes.						
UNIT – IV	CLIMATE CHANGES AND ITS CAUSES					9
Climate change and Carbon credits - CDM - Initiatives in India-Kyoto Protocol Intergovernmental Panel on Climate change - Climate Sensitivity and Feedbacks - The Montreal Protocol - UNFCCCIPCC - Evidences of Changes in Climate and Environment - on a Global Scale and in India.						
UNIT – V	CLIMATE CHANGE AND MITIGATION MEASURES					9
Clean Development Mechanism -Carbon Trading -examples of future Clean Technology - Biodiesel - Natural Compost - Eco-Friendly Plastic - Alternate Energy -Hydrogen - Bio-fuels - Solar Energy - Wind - Hydroelectric Power - Mitigation Efforts in India and Adaptation funding Key Mitigation Technologies and Practices-Energy Supply - Transport - Buildings- Industry-Agriculture - Forestry - Carbon sequestration- Carbon capture and storage (CCS) - Municipal solid Waste (MSW) & Bio waste, Biomedical, Industrial waste International and Regional cooperation.						
Total: 45 periods						
FOR FURTHER READINGS						
Sequestration of carbon through renewable energy technologies						
TEXT BOOK:						
1.	Sangam Shrestha, Mukand S. Babel and Vishnu Prasad Pandey, 2014, Climate Change and Water Resources, CRC Press an imprint of the Taylor & Francis Group.					
2.	Intergovernmental Panel on Climate Change: https://www.ipcc.ch/					
REFERENCES:						
1.	Adaptation and mitigation of climate Scientific Technical Analysis, Cambridge University Press, Cambridge, 2006					
2.	Atmospheric Science, J.M. Wallace and P.V. Hobbs, Elsevier / Academic Press 2006					
3.	Jan C. van Dam, Impacts of Climate Change and Climate Variability on Hydrological Regimes?, Cambridge University Press, 2003					



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COURSE OUTCOMES:

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

CO1:	Demonstrate an understanding of how the threats and opportunities of predicted climate changes will influence specific sectors at global and regional scale
CO2:	Identify the relationship between atmosphere and its components
CO3:	Analyze the impacts of climate change on environment parameters
CO4:	Evaluate the scientific insights underlying the assessment reports of the IPCC, with a focus on impacts, adaptation and mitigation
CO5:	Critically evaluate the relative opportunities and needs for mitigation and adaptation (including vulnerability assessments) in a variety of sectoral contexts

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	3	1	2	2	2	1	1	1
CO2	3	2	2	3	3	2	3	1	3	3	2	1	1	1
CO3	2	1	1	2	3	3	2	2	2	2	3	2	2	2
CO4	3	3	2	1	2	1	3	1	1	2	2	2	2	3
CO5	2	1	1	2	3	3	3	2	1	1	2	3	3	3
Avg.	2	2	2	2	3	2	3	1	2	2	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UIAIPE2422		INTEGRATED FARMING SYSTEM				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
This course will improve the student skills in the area of farming system research and optimization methodology to design individual integrated farming system in scientific manner						
UNIT – I		INTRODUCTION OF FARMING SYSTEM				9
Farming system – introduction – scope of farming system – importance – concept – principles of farming system - Types of farming systems – Advantages and limitations - suitability – factors affecting the farming system						
UNIT – II		INTEGRATED FARMING SYSTEM				9
Integrated farming system-historical background - objectives and characteristics advantages of IFS – Components of IFS - Integrated Farming System in Wetland – IFS in garden land -- IFS in dryland and fallow land.						
UNIT – III		LIVESTOCK PRODUCTION IN IFS				9
IFS With Goats and Sheep – housing and feeding management – deworming – Young stock management - Dairy Farming in IFS - Fodder production in IFS - IFS With poultry rearing - Duck farming – Rabbit farming – Piggery						
UNIT – IV		IFS COMPONENTS				9
Agroforestry – definition – types of agroforestry system – benefits of agroforestry system– Aquaculture - Fish cum agriculture and horticulture – Beekeeping – types and cast of bees – care and management in beekeeping – Sericulture - Mulberry cultivation – Silkworm rearing – Organic farming – Azolla – Small scale nursery.						
UNIT – V		RESOURCE RECYCLING IN IFS				9
Resource recycling in wetland IFS - Resource flow in crop + dairy + biogas + spawn + silviculture In IFS - Biogas production through IFS – Resource recycling in crop + goat IFS - Uses and features of biogas - Structure and function of Dheenabandhu Gas plant - Vermicompost - Preparation of vermicompost from farm residue – Mushroom production in IFS..						
Total: 45 periods						
TEXT BOOK:						
1.	Nanda, Sankarsana. Integrated farming system practices: challenges and opportunities. New India Publishing Agency, 2016.					
2.	Ravikiran Vasant Mane, Integrated Farming System: A Strategy for Sustainable Farm Production & Livelihood Security, Scitus Academics, 2016					
REFERENCES:						
1.	Zaman, Integrated Farming System and Agricultural, New India Publishing Agency, 2019					
2.	Nanwal R. K. Farming System and Sustainable Agriculture, Kalyani Publishers, 2017					

COURSE OUTCOMES:

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

CO1:	Understand practical knowledge on specialized in different farming system.
CO2:	Apply the farm wastes with recycle use of different IFS components
CO3:	Analysis of comparative benefits of the different IFS components
CO4:	Design a farming system model for wetland, garden land and dry land
CO5:	Evaluate the extent of wetland, garden land and dry land Integrated Farming System



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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	3	1	3	3	1	3	3	2	2	2	2
CO2	2	2	2	2	1	2	2	1	2	3	1	2	2	3
CO3	2	2	3	2	3	2	2	3	2	3	1	2	3	3
CO4	3	3	3	3	2	3	3	3	1	3	3	3	3	3
CO5	3	3	3	3	2	3	3	2	2	3	3	3	3	3
Avg.	2	2	3	3	2	3	3	2	2	3	2	2	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy														



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UIAPE2423		AGRICULTURAL BUSINESS MANAGEMENT				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
• To introduce the importance of Agri-business management, its characteristics and principles • To impart knowledge on the functional areas of Agri-business like Marketing management, Product pricing methods and Market potential assessment.						
UNIT – I		CONCEPTS OF AGRICULTURAL BUSINESS				9
Agri-business - scope, characteristics, types. Management - importance, definition, management and administration, management thoughts, Small business - characteristics and stages of growth - Management functions - planning, organizing, leading.						
UNIT – II		AGRI – BUSINESS ORGANIZATION				9
Principles, forms of agri-business organizations, staffing, directing, supervision and motivation. Controlling - types, performance evaluation and control techniques. Management approaches - Profit Centered Approach, Management by objectives and Quality Circles. Strength, Weakness, Opportunities and Threat (SWOT) Analysis.						
UNIT – III		AGRICULTURAL MARKETING				9
Functional areas of Agri-business - Production and Operations management - functions, planning physical facilities and managing quality. Agro-inputs and products inventory management - raw material procurement, inventory types, and costs. Marketing management- Marketing environment, marketing mix - Agricultural input marketing firms.						
UNIT – IV		AGRICULTURAL BUSINESS FINANCE				9
Forms of agri-business organizations - Role of lead bank in agribusiness finance - Financial management. Acquiring capital- Budget analysis. Concepts and determinants- Business project scheduling of raw material procurement - production management - launching products (branding, placement) - Input marketing promotion activities.						
UNIT – V		MARKET PROMOTION AND HUMAN RESOURCES				9
Agricultural products - marketing promotion activities - product pricing methods. District Industries Centre – Consumer survey - Agricultural inputs retailing - Market potential assessment - types of distribution channels - Return on Investment - Personnel management. Recruitment, selection and training - Technology in Agri Business.						
Total: 45 periods						
TEXT BOOK:						
1.	Himanshu, “Agri Business Management – Problems and prospects”, Ritu Publications, Jaipur, 2005.					
2.	Smita Diwase, “Indian Agriculture and Agribusiness Management”, Krishi resource Management Network, Pune 2004.					
REFERENCES:						
1.	Chandra Prasanna, “Projects: Preparation, Appraisal, Budgeting and Implementation”, Tata McGraw Hill Publications, New Delhi, 2001.					
2.	Kotler, P., “Marketing Management. Analysis, Planning and Control”, Prentice Hall Inc., New York, 2001.					
3.	Rao, V.S.P., and Narayana, P.S., “Principles and Practices of Management”, Konark Publishing Private Limited, New Delhi, 2001.					
4.	Tripathy, P.C., and Reddy, P.N., “Principles of Management”, Tata McGraw Hill Publications, New Delhi, 2000.					



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COURSE OUTCOMES:

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

CO1:	Understand the concepts and fundamentals of management with reference to agribusiness.
CO2:	Gain knowledge about organization and functioning of different institutions involved in agriculture marketing
CO3:	Understand the different concepts of inventory management of agricultural inputs
CO4:	Expose students to various concepts of financing Agri Business
CO5:	Have the knowledge of marketing agricultural products and the techniques involved

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	2	1	1	-	-	2	1	1	1
CO2	-	2	1	2	1	3	1	-	-	1	2	1	1	1
CO3	2	3	3	3	3	2	-	-	2	2	2	2	2	2
CO4	-	3	3	1	1	1	-	1	-	3	2	2	2	2
CO5	2	1	3	2	3	3	2	1	2	2	2	3	3	3
Avg.	2	3	3	2	3	3	1	1	2	2	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UIAPE2424		SUSTAINABLE AGRICULTURE AND FOOD SECURITY				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To study the importance of sustainable agriculture for the growing population, various resources required and their sustainability. Importance of science, food security and ecological balance.						
UNIT – I		SUSTAINABILITY OF NATURAL RESOURCE				9
Land Resources of India, Population and land, Land utilization, Net Area Sown, changes in cropping pattern, land degradation. Rainfall forecasting - Adequacy of Rainfall for crop growth – Rainfall, Drought and production instability – Irrigation potential – Available, created and utilized – River basins; Watersheds and Utilizable surface water – Utilizable water in future (Ground water & Surface water)						
UNIT – II		SUSTAINABLE AGRICULTURE				9
Sustainable agriculture-definition. Agro-ecosystems - Impact of climate change on Agriculture, Effect on crop yield, effect on Soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance.						
UNIT – III		ORGANIC FARMING				9
Natural farming principles – Sustainability in rain fed farming – organic farming – principles and practices. Organic farming-regulation and sustainability – The scale and productivity of organic sustainable systems.						
UNIT – IV		SUSTAINABLE FOOD PRODUCTION FOR FOOD SECURITY				9
Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force –Vertical farming – Controlled Environment Agriculture – Genetics diversity – GMO’s. Sustainable food security indicators and index – Indicator of sustainability of food Security.						
UNIT – V		POLICES AND PROGRAMMES FOR SUSTAINABLE AGRICULTURE AND FOOD SECURITY				9
Food and Crop Production polices – Agricultural credit Policy – Crop insurance –Policies of Natural Resources Use – Policies for sustainable Livelihoods – Virtual water and trade - Sustainable food Security Action Plan.						
Total: 45 periods						
TEXT BOOK:						
1.	M.S.Swaminathan, Science and sustainable food security, World Scientific Publishing Co., Singapore, 2010.					
2.	B.K.Desai and Pujari, B.T. Sustainable Agriculture: A vision for future, New India Publishing Agency, New Delhi, 2007					
REFERENCES:						
1.	Swarna S. Vepa et al., Atlas of the sustainability of food security. MSSRF, Chennai, 2004.					
2.	Sithamparanathan, J., Rengasamy, A., Arunachalam, N. Ecosystem principles and sustainable agriculture, Scitech Publications, Chennai, 1999.					
3.	Tanji, K. K., and Yaron, B. Management of water use in agriculture, Springer Verlag, Berlin, Germany, 1994.					



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COURSE OUTCOMES:

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

CO1:	Understand methods to sustain land resources.
CO2:	Cognize approaches to sustain water resources and its utilization for agriculture and allied activities.
CO3:	Design and develop new, improved and sustainable systems of agriculture and allied activities.
CO4:	Understand new technologies for improving food security.
CO5:	Comprehend policies to achieve sustainable farming and food security.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	3	3	3	3	1	3	1	1	1
CO2	3	2	1	3	3	3	3	3	3	1	3	1	1	1
CO3	2	2	1	2	3	3	2	3	3	1	3	2	2	2
CO4	3	2	1	1	3	3	3	3	3	1	3	2	2	2
CO5	2	2	1	2	3	3	3	3	3	2	3	3	3	3
Avg.	2	2	1	2	3	3	3	3	3	1	3	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAPIE2425		SYSTEMS ANALYSIS IN AGRICULTURAL ENGINEERING				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To introduce the students to the application of systems concept to irrigation planning and management. Optimization technique for modeling water resources systems, irrigation management and advanced optimization techniques to cover the socio-technical aspects will be taught.						
UNIT – I		SYSTEM CONCEPTS				9
Definition, classification, and characteristics of systems – Scope and steps in systems engineering – Need for systems approach to water resources and irrigation.						
UNIT – II		LINEAR PROGRAMMING				9
Introduction to operations research – Linear programming, problem formulation, graphical solution, solution by simplex method – Sensitivity analysis, application to design and operation of reservoir, single and multipurpose development plans – Irrigation water allocation- Cropping pattern optimization.						
UNIT – III		SIMULATION				9
Basic principles and concepts – Random variate and random process – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic and stochastic simulation – Irrigation Scheduling.						
UNIT – IV		DYNAMIC PROGRAMMING				9
Bellman’s optimality criteria, problem formulation and solutions – Application to design and operation of reservoirs, Single and multipurpose reservoir development plans – Applications in Irrigation management.						
UNIT – V		OPTIMIZATION TECHNIQUES				9
Integer and parametric linear programming – Applications to Irrigation water management- Goal programming models with applications.						
Total: 45 periods						
TEXT BOOK:						
1.	Vedula, S., and Majumdar, P.P. Water Resources Systems – Modeling Techniques and Analysis Tata McGraw Hill, New Delhi, Fifth reprint, 2010.					
2.	Gupta, P.K., and Man Mohan, “Problems in Operations Research”, (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.					
REFERENCES:						
1.	Chaturvedi, M.C., “Water Resources Systems Planning and Management”, Tata McGraw Hill, New Delhi, 1997.					
2.	Taha, H.A., “Operations Research”, McMillan Publication Co., New York, 1995.					
3.	Hiller, F.S., and Liebermann, G.J., “Operations Research”, CBS Publications and Distributions, New Delhi, 1992.					



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COURSE OUTCOMES:

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

CO1:	Understand practical knowledge on specialized in different water resources and irrigation system.
CO2:	Apply the Linear programming for crop planning and scheduling.
CO3:	Apply the Dynamic Programming for reservoir release for irrigation management.
CO4:	Design a reservoir irrigation system simulation model for efficient water management
CO5:	To evaluate the application of optimization techniques used to address the socio- technical aspects irrigation water management.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	3	1	2	3	1	3	3	2	2	1	2
CO2	2	3	2	2	1	2	2	1	2	2	1	2	2	1
CO3	3	3	3	2	1	2	2	3	2	2	1	3	2	1
CO4	3	2	3	3	3	3	1	3	1	3	3	3	3	1
CO5	3	3	3	3	3	3	1	2	1	3	3	3	3	2
Avg.	3	3	3	3	2	3	2	2	2	2	2	3	2	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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UAPIE2426		IT IN AGRICULTURAL SYSTEM				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To introduce the students to areas of agricultural systems in which IT and computers play a major role. To also expose the students to IT applications in precision farming, environmental control systems agricultural systems management and weather prediction models.						
UNIT – I		PRECISION FARMING				9
Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.						
UNIT – II		ENVIRONMENT CONTROL SYSTEMS				9
Artificial light systems, management of crop growth in greenhouses, simulation of CO2 consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.						
UNIT – III		AGRICULTURAL SYSTEMS MANAGEMENT				9
Agricultural systems - managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources, Linear programming, Project scheduling, Artificial intelligence and decision support systems.						
UNIT – IV		WEATHER PREDICTION MODELS				9
Importance of climate variability and seasonal forecasting, Understanding and predicting world’s climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying climate forecasts.						
UNIT – V		E-GOVERNANCE IN AGRICULTURAL SYSTEMS				9
Expert systems, decision support systems, Agricultural and biological databases, e-commerce, e business systems & applications, Technology enhanced learning systems and solutions, e learning, Rural development and information society.						
						Total: 45 periods
TEXT BOOK:						
1.	National Research Council, “Precision Agriculture in the 21st Century”, National Academies Press, Canada, 1997..					
2.	H. Krug, Liebig, H.P. “International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation”, 1989.					
REFERENCES:						
1.	Peart, R.M., and Shoup, W. D., “Agricultural Systems Management”, Marcel Dekker, New York, 2004					
2.	Hammer, G.L., Nicholls, N., and Mitchell, C., “Applications of Seasonal Climate”, Springer, Germany, 2000.					



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COURSE OUTCOMES:

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

- CO1: The students shall be able to understand the applications of IT in remote sensing applications such as Drones etc.
- CO2: The students will be able to get a clear understanding of how a greenhouse can be automated and its advantages.
- CO3: The students will be able to apply IT principles and concepts for management of field operations.
- CO4: The students will get an understanding about weather models, their inputs and applications.
- CO5: The students will get an understanding of how IT can be used for e-governance in agriculture.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	2	3	3	3	1	3	3	3	1	1	1
CO2	3	3	3	3	3	3	3	1	3	3	3	1	1	1
CO3	2	3	3	2	3	3	2	2	3	3	3	2	2	2
CO4	3	3	3	1	3	3	3	1	3	3	3	2	2	2
CO5	2	3	3	2	3	3	3	2	3	3	3	3	3	3
Avg.	2	3	3	2	3	3	3	1	3	3	3	2	2	2

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UAPIE2427		AUTOMATION IN AGRICULTURE				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To know the operation of various electronic circuits and its applications.						
To get adequate knowledge about various sensors and robots used in agricultural processes						
To learn automation techniques in agricultural system.						
UNIT – I	INTRODUCTION					9
Fundamental of electronics Passive devices -semiconductor devices - transistors - diode circuits - amplifie circuits. Integrated circuits and operational amplifier - logic gates - flip flop - counters digital to analog analog to digital converters- microprocessor.						
UNIT – II	PRECISION FARMING					9
Precision farming -Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modelling.						
UNIT – III	ROBOTICS IN AGRICULTURE					9
Fundamental of Robotics - types – application. Agricultural robots - types- function - application. Future trends in automation in agriculture						
UNIT – IV	AUTOMATION USING IoT					9
Use of different sensors - Temperature and humidity sensor - Soil Moisture Sensor - Water Level Depth Detector, Raspberry Pi Arduino UNO.						
UNIT – V	AUTOMATION OF AGRICULTURE OPERATION					9
Automation of agricultural operations using IoT based systems - Smart Irrigation System- Automation in Greenhouse – Drones. Case Study- Automation of greenhouse/farm operations..						
Total: 45 periods						
TEXT BOOK:						
1.	Zhang, Q. and Pierce, F.J. eds., 2013. Agricultural automation: fundamentals and practices. CRC Press.					
2.	Choudhury, A., Biswas, A., Singh, T.P. and Ghosh, S.K. eds., 2022. Smart Agriculture Automation Using Advanced Technologies: Data Analytics and Machine Learning, Cloud Architecture, Automation and IoT.					
REFERENCES:						
1.	National Research Council, Precision Agriculture in the 21st Century, National Academies Press, Canada, 1997					
2.	Young, S.L. and Pierce, F.J. eds., 2013. Automation: The future of weed control in cropping systems. Springer Science & Business Media.					
3.	Nof, S.Y. ed., 2009. Springer handbook of automation. Berlin, Heidelberg: Springer Berlin Heidelberg.					
4.	Billingsley, J., 2019. Robotics and automation for improving agriculture. Burleigh Dodds Science Publishing Limited.					
5.	McNulty, P. and Grace, P.M. eds., 2009. Agricultural Mechanization and Automation-Volume II (Vol. 2) EOLSS Publications.					



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COURSE OUTCOMES:

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

CO1:	Exemplify the working operations of electronic devices and processors
CO2:	Interpret the necessity of sensor requirements for precision farming practices
CO3:	Understand the basics of robotics and their applications in agriculture
CO4:	Apply the IOT concepts in cropping practices
CO5:	Interpolate the concept of automation in governing the agricultural systems

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	1	3	1	-	-	-	-	-	1	1	1
CO2	2	1	1	1	3	1	-	-	-	-	-	1	1	1
CO3	2	1	1	1	3	1	-	-	-	-	-	2	2	2
CO4	2	1	1	1	3	1	-	-	-	-	-	2	2	2
CO5	2	1	1	1	3	1	-	-	-	1	-	3	3	3
Avg.	2	1	1	1	3	1	-	-	-	1	-	2	2	2

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UAPIE2428		LANDSCAPE ARCHITECTURE				
		Category	L	T	P	Credit
		PCC	3	0	0	3
Course objectives						
To understand the paradigms in landscape architecture in the post-industrial revolution era and to understand the multifaceted dimensions of landscape architecture such as ecology, environment and sustainability. To study the contemporary landscape and the manifestation in the western and Indian contexts.						
UNIT – I		BASICS OF LANDSCAPE ARCHITECTURE				9
Site analysis, synthesis, suitability, landscape zoning and planning with landscape land uses for medium to large scale projects. Evolving an open space structure for the site and suggesting a suitable landscape treatment with respect to ecological, functional, cultural and visual contexts.						
UNIT – II		LANDSCAPE FORMULATIONS				9
Process for landscape project formulation and landscape design development based on synthesis. Examining how humans occupy exterior space and combines this information with the principles of design to create garden scale models..						
UNIT – III		SITE MOBILIZATION				9
Site mobilization; Sequence of site activity, site protection measures, site implementation checklist. Design and detailing of hard landscapes: Roads, paving, barriers, edge conditions -functions, types, criteria for selection, design aspects, details.						
UNIT – IV		ILLUMINATION				9
Outdoor lighting: Definition of technical terms, types of electrical lighting, types of fixtures, auxiliary fixtures. Principles of design for outdoor illumination, design and type of effects with electrical lighting. Safety precautions and drawbacks of electrical lighting, electrical accessories and their installation. Solar energy and lighting.						
UNIT – V		IRRIGATION FEATURES				9
Water features and Irrigation systems: Design of water features such as swimming pools, cascades, fountains etc., and their technical requirements. Consideration for design and detail of water bodies and natural ponds. Design of irrigation system – landscape area types, Course Overviews and design, water needs and sources, application, methods of installation. Control systems, scheduling and maintenance.						
Total: 45 periods						
TEXT BOOK:						
1.	Simonds. J. O. 1961. Landscape Architecture: The Shaping of Man's Natural Environment. F.W. Dodge Cooperation, London Harris.C.W. and Din, N.T. 1997. Time Saver Standards For Landscape Architecture. Mcgraw – Hill International Edition, Arch. Series .					
2.	Starke .B. and Simonds, J. O. 2013. Landscape Architecture: A Manual of Site Planning and Design. 5th edition. McGraw-Hill Professional.					
REFERENCES:						
1.	Shaheer, M., Dua, G.W. and Pal, A.2012. Landscape Architecture in India: A Reader. Indian Journal of Landscape Architecture					
2.	Reid, G. W. 1993. From Concept to Form: In Landscape Design. John Wiley & Sons.					



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COURSE OUTCOMES:

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

CO1:	To equip the students to do landscape working drawings and preparation of bill of quantities and estimation.
CO2:	To understand the design solutions for larger sites and express the same using models.
CO3:	To understand the different concepts of landscape formulations.
CO4:	To acquire the knowledge of illumination and lighting.
CO5:	To obtain the knowledge on design of water bodies and irrigation systems.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	3	1	3	2	1	1	3	1	2	2	3
CO2	2	3	3	3	2	3	1	1	1	2	2	3	2	2
CO3	2	2	2	2	1	2	1	1	1	2	1	2	2	1
CO4	2	3	3	2	3	2	1	1	2	3	1	3	2	3
CO5	2	3	3	3	1	3	2	1	3	3	3	3	2	1
Avg.	2	3	3	3	2	3	1	1	2	3	2	3	2	3

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Department	Mechanical	Programme Code & Name				114 - Mechanical	
Semester							
Course Code	Course Name		Hours/Week			Credit	Maximum Marks
USD24301	SOFT SKILL 1		L	T	P	C	100
			2	0	0	0	
Course Objectives	1. To understand oneself and manage own emotions						
	2. To include the Grooming and mannerism						
	3. To know different methods for faster numerical computations						
	4. To learn logical reasoning skills.						
	5. To Enhance Problem – Solving Skills						

Unit-I	NUMBER SYSTEM/PHONETICS	(6)
Introduction –Discussing Divisibility Rule-HCF –LCM –Decimal Fraction Introduction-Standard Phonetic Alphabet-Introduction to vowel & Consonant accent neutralization		
Unit-II	AVERAGE AND DIRECTION SENSE/ONE WORD SUBSTITUTES	(6)
Introduction-Basic Problem in Average-Direction Sense Problem Introduction-The One which can be substituted for the given word/Sentence.		
Unit-III	TIME AND WORK/PERSONAL COMMUNICATION	(6)
Basic Concept of Time and Work-Efficiency Related Sums on Time and Work Day to day conversation with family members-Neighbors-Friends-Relatives		
Unit-IV	PROFIT AND LOSS/PUBLIC SPEAKING	(6)
Introduction-Problem on Profit and Loss Introduction –Anchoring /Master of ceremony –Welcome address – Proposing vote of Thanks- Introducing Speaker – Conducting Meetings- Making Announcements		
Unit-V	AREA, SURFACE AREA AND VOLUME PROBLEMS/ERROR CORRECTION	(6)
Introduction about the Area Problems – Area, Surface Area and Volume for Square Rectangle –Triangle, Cylinder Introduction –Spot the Error in the sentence and correct it.		
Total No of Periods to be Taught		30


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TEXT BOOK:

1	Training And Placement Book [TKEC]
2	Quantitative Aptitude by R. S. Aggarwal

REFERENCES:

1	R.S. Aggarwal,” Quantitative Aptitude”, Seventh edition, S.Chand Publication.
2	http://www.mastguru.com/arithmatic-aptitude-questions-answers
3	https://prepinsta.com

COURSE OUTCOMES:

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

CO1:	Practice manners and etiquettes in day-to-day life.
CO2:	Be confident and motivated to plan the activities according to personality types.
CO3:	Build Confidence in Mathematics.
CO4:	Solve mathematical problems by applying logical thinking.
CO5:	Apply different techniques for faster calculations.

Mapping of COs with POs and PSOs

COs /POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	2	-	-	-	-	-	3	3	1
CO2	2	2	2	2	1	2	-	-	-	-	-	2	3	2
CO3	3	2	2	2	1	1	-	-	-	-	-	1	2	3
CO4	3	3	2	2	1	1	-	-	-	-	-	2	1	3
CO5	2	1	2	1	3	2	-	-	-	-	-	2	2	3
Avg.	2.4	1.8	2	1.6	1.4	1.6	-	-	-	-	-	2	2.2	2.4

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Department	Mechanical	Programme Code & Name	114-Mechanical
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
USD24401	SOFT SKILL 2	L	T	P	C	100
		2	0	0	0	
Course Objectives	1.	To learn the Number Series and develop Social Communication				
	2.	To learn Time Speed Distance and develop work glossary				
	3.	To develop Grammar usage and learn to solve problems on ages.				
	4.	To develop Personality development & Logical thinking.				
	5.	To learn email ethics and logical ability.				

Unit-I	NUMBER SERIES & SOCIAL COMMUNICATION	(6)
Introduction-Number Series-Simplification Introduction-Telephone Calls (Formal and Informal)- Colleagues in work spot -Sharing jokes.		
Unit-II	TIME, SPEED AND DISTANCE & WORK GLOSSARY	(6)
Introduction-Problem on Time & Distance-Problem on Trains Heteronym-Homonym-Homophone-Activity Based Learning.		
Unit-III	AGES AND SYLLOGISM & GRAMMER USAGE	(6)
Problem on Ages-Syllogism-Problem on Sets and Venn Diagram Introduction-Parts of Speech-Noun-Verb-Pronoun-Adverb-Adjective-Conjunction-Preposition-Interjection.		
Unit-IV	LOGICAL REASONING & PERSONALITY DEVELOPMENT	(6)
Introduction-Alphabet Coding and Decoding –Coding with Numbers-Seating Arrangement Analyzing Strength and Weakness-Time Management.		
Unit-V	FINGURE SERIES, ODD ONE OUT, VOCABULARY & EMAIL ETIQUETTE	(6)
Introduction-Figure Matrix-Figure Series Prefix-Suffix-Synonyms-Antonyms-Word Analogy.		
Total No of Periods to be Taught		30


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TEXT BOOK:

1	Training And Placement Book [TKEC]
2	Quantitative Aptitude By R.S.Aggarwal

REFERENCES:

1	R.S. Aggarwal, "Quantitative Aptitude", Seventh edition, S.Chand Publication.
2	http://www.mastguru.com/arithmetric-aptitude-questions-answers
3	https://prepinsta.com

COURSE OUTCOMES:

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

CO1:	Cultural Competence
CO2:	Apply concepts real world scenarios
CO3:	Identify and explain grammatical concepts
CO4:	Identify and analyze logical fallacies
CO5:	Students will understand the importance of professionalism in email communication

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	1	2	2	-	-	-	1	-	-	-
CO2	2	2	2	-	1	1	1	-	-	-	1	-	-	-
CO3	2	2	2	-	1	1	1	1	1	-	1	-	-	-
CO4	2	2	2		1	1	1	1	1	-	1	-	-	-
CO5	2	2	2	-	1	1	1	1	1	-	1	-	-	-
Avg.	2	2	1.6	-	1	1.2	1.2	0.6	0.6	-	1	-	-	-

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Department	Mechanical	Programme Code & Name				114-Mechanical
Semester						
Course Code	Course Name	Hours/Week			Credit	Maximum Marks
USD24501	SOFT SKILL 3	L	T	P	C	100
		2	0	0	0	
Course Objectives	1. To learn the Number Problem, Square and Cube Problems.					
	2. To learn Analytical and Interview Skills.					
	3. To develop Skills in Business Aptitude and Resume Building.					
	4. To develop Skills in Data Interpretation and Sufficiency.					
	5. To improve Mathematical Skill on Probability and Basic Grammer					

Unit-I	PROBLEMS ON NUMBERS & GROUP DISCUSSION	(6)
Introduction-Problem on Numbers –Square root Problems- Cube Root-Surds and Indices GD Introduction –GD gauge –Company’s Perspective-Preparation.		
Unit-II	ANALYTICAL REASONING &INTERVIEW SKILLS	(6)
Introduction, Problems on Analytical and Reasoning-Nonverbal Reasoning Introduction for Interview Skill-Before the Interview, During the Interview, After the Interview.		
Unit-III	BUSINESS APTITUDE & RESUME BUILDING	(6)
Introduction-Problem Percentage-Problem on Partnership Purpose of Resume Building –Types-Includes-Formal-Sample-Tips.		
Unit-IV	DATA INTERPRETATION AND SUFFICIENCY/BLOOD RELATION	(6)
Introduction-Table Charts-Bar Charts – Pie Charts- Line Charts-Data Sufficiency Introduction of Blood Relation-Objectives-Relation Ships –Example-Exercise		
Unit-V	PERMUTATION & COMBINATIONS, PROBABILITY/GRAMMER	(6)
Introduction - Problem on Permutation & Combination-Problems on Probability, Comparison of Ranks Introduction of Basic Grammar-Punctuation & Spelling.		
Total No of Periods to be Taught		30


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TEXT BOOK:

1	Training And Placement Book [TKEC]
2	Quantitative Aptitude by R. S. Aggarwal

REFERENCES:

1	R.S. Aggarwal, "Quantitative Aptitude", Seventh edition, S. Chand Publication.
2	http://www.mastguru.com/arithmetric-aptitude-questions-answers
3	https://prepinsta.com

COURSE OUTCOMES:

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

CO1:	Advanced Mathematical Skills.
CO2:	Complex Problem-Solving Skill.
CO3:	Build Confidence in Mathematics.
CO4:	Solve mathematical problems by applying logical thinking.
CO5:	Apply different techniques for faster calculations.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	-	-	-	-	-	3	3	2
CO2	3	3	3	3	2	2	-	-	-	-	-	3	3	2
CO3	3	2	2	1	1	3	-	-	-	-	-	2	3	2
CO4	3	3	2	2	2	2	-	-	-	-	-	3	3	2
CO5	2	2	2	1	3	3	-	-	-	-	-	2	2	3
Avg.	2.8	2.4	2.2	1.8	1.8	2.4	-	-	-	-	-	2.6	2.8	2.2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	Mechanical	Programme Code & Name	114-Mechanical
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
USD24601	SOFT SKILL 4	L	T	P	C	100
		2	0	0	0	
Course Objectives	1.	To learn the essence of Ratio and Proportion.				
	2.	To learn a problem related to Simple Interest and Compound Interest.				
	3.	To develop Skills in Solving Problems Related to Boats and Streams.				
	4.	To develop Skills in solving Problems Related to Height and Distance.				
	5.	To improve a Skill in Solving Problem on Allegation or Mixture.				

Unit-I	RATIO AND PROPORTION, PIPES AND CISTERNS	(6)
Introductions - Pipes & Outlet Problem - Problem on Ratio & Proportion.		
Unit-II	SIMPLE INTEREST AND COMPOUND INTEREST & SPEAKING ACTIVITY	(6)
Introduction-Simple Interest-Compound Interest-Different Rules-Present worth.		
Unit-III	BOAT AND STREAM, CALENDAR & LOGICAL ARRANGEMENT OF WORDS	(6)
Introduction-Upstream & Downstream Problems-Problems on Calendar Introduction of Classification-Logical Arrangement of Words.		
Unit-IV	HEIGHT AND DISTANCE, CLOCK	(6)
Introduction-Trigonometry Formulas- Angle of Elevation-Angle of Depression –Problem on Clock.		
Unit-V	ALLIGATION OR MIXTURE, STATEMENT & CONCLUSION	(6)
Introduction – Alligation -Mean Price-Rule of Allegation-Problem on Mixture Introduction to Statement and Conclusion –Exercise for Statement and Conclusion.		
Total No of Periods to be Taught		30


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TEXT BOOK:

1	Training And Placement Book [TKEC]
2	Quantitative Aptitude By R.S.Aggarwal

REFERENCES:

1	R.S. Aggarwal, "Quantitative Aptitude", Seventh edition, S.Chand Publication.
2	http://www.mastguru.com/arithmetic-aptitude-questions-answers
3	https://prepinsta.com

COURSE OUTCOMES:

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

CO1:	Advanced Mathematical Skills.
CO2:	Complex Problem-Solving.
CO3:	Data Analysis.
CO4:	Real World Applications.
CO5:	Mathematical concepts on Statement and Conclusion.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	1	2	1	1	3	3	2	2
CO2	3	3	3	3	2	1	1	2	2	2	3	3	3	3
CO3	2	2	2	3	3	1	1	2	2	2	2	2	3	2
CO4	3	2	3	2	2	2	1	2	2	2	3	3	2	2
CO5	3	3	2	2	2	1	2	2	2	1	3	3	2	3
Avg.	3	2.4	2.4	2.4	2	1.2	1.2	2	1.8	1.6	2.8	2.8	2.4	2.4

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Department	MECHANICAL	Programme Code & Name				Mandatory Courses- All Branches
Semester						
Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24001	DISASTER RISK REDUCTION AND MANAGEMENT	L	T	P	C	100
		2	0	0	0	
Course Objectives	✓ To impart knowledge on concepts related to disaster, disaster risk reduction, disaster management ✓ To acquaint with the skills for planning and organizing disaster response					

Unit-I	HAZARDS, VULNERABILITY AND DISASTER RISKS	(9)
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies- Inter relations between Disasters and Sustainable development Goals		
Unit-II	DISASTER RISK REDUCTION (DRR)	(9)
Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies.- Relevance of indigenous Knowledge, appropriate technology and Local resources.		
Unit-III	DISASTER MANAGEMENT	(9)
Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level- (NDMA –SDMA-DDMA-NRDF- Civic Volunteers)		
Unit-IV	TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT	(9)
Early warning systems -Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment. - Elements of Climate Resilient Development –Standard operation Procedure for disaster response – Financial planning for disaster Management		
Unit-V	DISASTER MANAGEMENT: CASE STUDIES	(9)


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Discussion on selected case studies to analyse the potential impacts and actions in the contest of disasters-Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.- Field work-Mock drill

Total No of Periods to be Taught

Total : 30 Periods

TEXT BOOK:

1	Taimpo (2016), Disaster Management and Preparedness, CRC Publications
2	Singh R (2017), Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications
3	Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN- 13: 978-9380386423
4	Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

REFERENCES:

1	Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
2	Government of India, National Disaster Management Policy, 2009.
3	Shaw R (2016), Community based Disaster risk reduction, Oxford University Press

COURSE OUTCOMES:

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

CO1:	To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction
CO2:	To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction
CO3:	To develop disaster response skills by adopting relevant tools and technology
CO4:	Enhance awareness of institutional processes for Disaster response in the country
CO5:	Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity


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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	-	-	2	2	-	-	2	-	2	-
CO2	3	3	3	3	-	-	2	1	-	-	2	-	2	-
CO3	3	3	3	3	-	-	2	2	-	-	-	-	2	-
CO4	3	3	2	3	-	-	2	1	-	-	2	-	2	-
CO5	3	3	2	3	-	-	2	2	-	-	2	-	3	-
Avg.	3	3	3	3	-	-	2	2	-	-	2	-	2	-

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Department	MECHANICAL	Programme Code & Name	Mandatory Courses- All Branches
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24002	ELEMENTS OF LITERATURE	L	T	P	C	100
		2	0	0	0	
Course Objectives	To make the students aware about the finer sensibilities of human existence through an art form. The students will learn to appreciate different forms of literature as suitable modes of expressing human experience					

COURSE CONTENTS

	Introduction to Elements of Literature	(5)
1.Relevance of literature		
a) Enhances Reading, thinking, discussing and writing skills. b) Develops finer sensibility for better human relationship. c) Increases understanding of the problem of humanity without bias. d) Providing space to reconcile and get a cathartic effect.		
2. Elements of fiction		
a) Fiction, fact and literary truth. b) Fictional modes and patterns. c) Plot character and perspective.		
3. Elements of poetry		
a) Emotions and imaginations. b) Figurative language. c) (Simile, metaphor, conceit, symbol, pun and irony) d) Personification and animation e) Rhetoric and trend.		
4.Elements of drama		
a) Drama as representational art. b) Content mode and elements. c) Theatrical performance. d) Drama as narration, mediation and persuasion. e) Features of tragedy, comedy and satire.		
READINGS:		(5)
a) An Introduction to the Study of English Literature, W.H. Hudson, Atlantic, 2007. b) An Introduction to Literary Studies, Mario Klarer, Routledge, 2013. c) The Experience of Poetry, Graham Mode, Open college of Arts with Open Univ Press, 1991. d) The Elements of Fiction: A Survey, Ulf Wolf (ed), Wolfstuff, 2114. e) The Elements of Drama, J.L.Styan, Literary Licensing, 2011.		


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OTHER SESSION:		(5)
	4.1 *Tutorials: 4.2 *Laboratory: 4.3 *Project: The students will write a term paper to show their understanding of a particular piece of literature	
4*ASSESSMENT:		
	5.1 HA: 5.2 Quizzes-HA: 5.3 Periodical Examination: one 5.4 Project/Lab: one (under the guidance of the teachers the students will take a volume of poetry, fiction or drama and write a term paper to show their understanding of it in a given context; sociological, psychological, historical, autobiographical etc. 5.5 Final Exam:	
	Total No of Periods to be Taught	Total: 30 periods

TEXT BOOK:	
1	3.1 Textbook: 3.2 *Reference Books:: To be decided by the teacher and student, on the basis of individual student so as to enable him or her to write the term paper.

COURSE OUTCOMES:	
On completion of the course, the students will be able to	
CO1	Recognize the relevance of literature in enhancing life skills and human understanding.
CO2	Identify and describe key elements of fiction, poetry, and drama.
CO3	Analyze the use of figurative language and rhetorical devices in poetry and prose.
CO4	Interpret and evaluate dramatic forms based on structure and performance.
CO5	Compose a term paper demonstrating critical understanding of a chosen literary work.

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Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	-	-	-	-	-	-	3	3
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	3	2	2	3	2	-	-	-	-	-	-	-	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														

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Department	MECHANICAL	Programme Code & Name	Mandatory Courses- All Branches
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24003	FILM APPRECIATION	L	T	P	C	100
		2	0	0	0	
Course Objectives	In this course on film appreciation, the students will be introduced broadly to the development of film as an art and entertainment form. It will also discuss the language of cinema as it evolved over a century. The students will be taught as to how to read a film and appreciate the various nuances of a film as a text. The students will be guided to study film joyfully.					

Unit-I	THE COMPONENT OF FILMS	(6)
The material and equipment, The story, screenplay and script, The actors, crew members, and the director, The process of film making, Structure of a film		
Unit-II	EVOLUTION OF FILM LANGUAGE	(6)
Film language, form, movement etc, Early cinema, Silent film (Particularly French), The emergence of feature films: Birth of a Nation, Talkies		
Unit-III	FILM THEORIES AND CRITICISM/APPRECIATION	(6)
Realist theory: Auteurists, Psychoanalytic, Ideological, Feminists, How to read films? Film Criticism / Appreciation		
Unit-IV	DEVELOPMENT OF FILM	(6)
Representative Soviet films, Representative Japanese films, Representative Italian films, Representative Hollywood film and the studio system.		
Unit-V	INDIAN FILMS	(6)
The early era, The important films made by the directors, The regional films, The documentaries in India		
READING: A Reader containing important articles on films will be prepared and given to the students. The students must read them and present in the class and have discussion on these.		
Total No of Periods to be Taught		Total: 30 Periods


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COURSE OUTCOMES:

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

CO1:	Gain a comprehensive understanding of filmmaking components and techniques
CO2:	Explore the historical evolution of film language and major milestones.
CO3:	Develop critical analysis skills through the study of various film theories.
CO4:	Broaden cultural awareness by analyzing representative films from diverse contexts.
CO5:	Appreciate the development and diversity of Indian cinema

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Department	MECHANICAL	Programme Code & Name	Mandatory Courses- All Branches
------------	------------	-----------------------	---------------------------------

Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24004	INTRODUCTION TO GENDER STUDIES	L	T	P	C	100
		2	0	0	0	
Course Objectives	✓ To introduce foundational concepts such as sex, gender, patriarchy, socialization, power, and stereotypes to understand gendered structures in society. ✓ To explore major feminist theories (Liberal, Marxist, Socialist, Radical, Psychoanalytic, Postmodernist, Ecofeminist) and their approaches to gender. ✓ To provide a historical and socio-political understanding of global and local women's movements and their impact on gender discourse. ✓ To examine how language constructs and reflects gender identities and power relations through narratives and linguistic forms. ✓ To analyze the representation of gender in mainstream, alternative, and social media, with emphasis on stereotypes and visual culture.					

Unit-I	CONCEPTS	(6)
Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.		
Unit-II	FEMINIST THEORY	(6)
Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.		
Unit-III	WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL	(6)
Rise of Feminism in Europe and America. Women's Movement in India.		
Unit-IV	GENDER AND LANGUAGE	(6)
Linguistic Forms and Gender. Gender and narratives		
Unit-V	GENDER AND REPRESENTATION	(6)
Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.		
Total No of Periods to be Taught		Total: 30 periods


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Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	-	-	-	-	-	-	3	3
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	3	2	2	3	2	-	-	-	-	-	-	-	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														

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Department	MECHANICAL	Programme Code & Name	Mandatory Courses- All Branches
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24005	INDUSTRIAL SAFETY	L	T	P	C	100
Course Objectives	The course is intended to give knowledge of various safety management principles, various safety systems, various machine guarding devices, hazard identification techniques, energy sources, systems & applications and the need in the present context.					

Unit-I	SAFETY INTRODUCTION	(6)
Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization-objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages.		
Unit-II	PERSONAL PROTECTION IN WORK ENVIRONMENT	(6)
Personal protection in the work environment, Types of PPEs, Personal protective equipment respiratory and non-respiratory equipment. Standards related to PPEs. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate.		
Unit-III	SAFETY ISSUES IN CONSTRUCTION	(6)
Introduction to construction industry and safety issues in construction Safety in various construction operations – Excavation and filling – Under-water works – Under-pinning & Shoring – Ladders & Scaffolds – Tunneling – Blasting – Demolition – Confined space – Temporary Structures.		
Unit-IV	SAFETY HAZARDS IN MACHINES	(8)
Machinery safeguard-Point-of-Operation, Principle of machine guarding -types of guards and devices. Safety in turning, and grinding. Welding and Cutting-Safety Precautions of Gas welding and Arc Welding. Material Handling-Classification-safety consideration- manual and mechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking. Material Handling equipment-operation & maintenance. Maintenance of common elements-wire rope, chains slings, hooks, clamps. Hearing Conservation Program in Production industries.		
Unit-V	HAZARD IDENTIFICATION AND ANALYSIS	(4)
Hazard and risk, Types of hazards –Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment.		
Total No of Periods to be Taught		30 periods
TEXT BOOK:		


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1	R.K Jain (2000) Industrial Safety, Health and Environment management systems, Khanna Publications.
2	Paul S V (2000), Safety management System and Documentation training Programme handbook, CBS Publication

REFERENCES:

1	Krishnan, N.V. (1997). Safety management in Industry. Jaico Publishing House, New Delhi.
2	John V. Grimaldi and Rollin H.Simonds. (1989) Safety management. All India Traveller Book Seller, Delhi.
3	Ronald P. Blake. (1973). Industrial safety. Prentice Hall, New Delhi

COURSE OUTCOMES:

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

CO1:	Describe the theories of accident causation and preventive measures of industrial accidents.
CO2:	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
CO3:	Explain different issues in construction industries.
CO4:	Describe various hazards associated with different machines and mechanical material handling.
CO5:	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	1	2	2	2	-	-	-	1	-	-
CO2	2	2	2	-	1	1	1	1	-	-	-	1	-	-
CO3	2	2	2	-	1	1	1	1	1	1	-	1	-	-
CO4	2	2	2		1	1	1	1	1	1	-	1	-	-
CO5	2	2	2	-	1	1	1	1	1	1	-	1	-	-
Avg.	2	2	1.6	-	1	1.2	1.2	1.2	0.6	0.6	-	1	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Mecheri, Salem Dt-636453, Tamilnadu



Department	MECHANICAL	Programme Code & Name	Mandatory Courses- All Branches
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24006	INTERPERSONAL SKILLS	L	T	P	C	100
		2	0	0	0	
Course Objectives	✓ Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills. ✓ Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities. ✓ improve general and academic listening skills ✓ Make effective presentations.					

Unit-I	(6)
Listening as a key skill- its importance- speaking- give personal information- ask for personal information- express ability- enquire about ability- ask for clarification Improving pronunciation pronunciation basics taking lecture notes- preparing to listen to a lecture- articulate a complete idea as opposed to producing fragmented utterances	
Unit-II	(6)
Listen to a process information- give information, as part of a simple explanation- conversation starters: small talk- stressing syllables and speaking clearly- intonation patterns- compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.	
Unit-III	(6)
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk- greet- respond to greetings- describe health and symptoms- invite and offer- accept- decline- take leave- listen for and follow the gist- listen for detail	
Unit-IV	(6)
Being an active listener: giving verbal and non-verbal feedback- participating in a group discussion summarizing academic readings and lectures conversational speech listening to and participating in conversations- persuade	
Unit-V	(6)
Formal and informal talk- listen to follow and respond to explanations, directions and instructions in academic and business contexts- strategies for presentations and interactive communication group/pair presentations- negotiate disagreement in group work.	
Total No of Periods to be Taught	Total: 30 periods


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TEXT BOOK:

1	Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2	Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1	Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2	Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3	Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
4	Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5	Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013

COURSE OUTCOMES:

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

CO1:	Demonstrate effective listening and speaking strategies to express and gather personal information clearly.
CO2:	Interpret process-based information and participate in informal conversation with correct pronunciation and intonation.
CO3:	Use lexical chunks and phrases to improve fluency and accuracy in short speeches and daily interactions.
CO4:	Apply active listening strategies and participate effectively in group discussions and academic contexts.
CO5:	Engage in formal/informal talk and deliver structured presentations in academic and professional environments.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	-	-	-	-	-	-	-	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	-	3	3
CO3	3	2	3	2	3	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	-	3	3
Avg.	3	2.6	3	2.2	2.6	-	-	-	-	-	-	-	3	3

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Department	MECHANICAL	Programme Code & Name	Mandatory Courses- All Branches
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24007	PERSONALITY AND CHARACTER DEVELOPMENT	L	T	P	C	100
		2	0	0	0	
Course Objectives	To understand the dimensions of personality, theories of Freud and Erickson, and the importance of personality growth.					
	To develop positive attitudes and motivation through awareness of influencing factors and self-drive.					
	To build self-esteem and interpersonal effectiveness through self-awareness and behavior understanding.					
	To enhance problem-solving, leadership, and time management skills for overall personality refinement.					
	To improve employability skills like resume writing, group discussion, and interviews through practical engagement.					

Unit-I	INTRODUCTION TO PERSONALITY DEVELOPMENT	6
The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.		
Unit-II	ATTITUDE & MOTIVATION	6
Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation		
Unit-III	SELF-ESTEEM	6
Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-esteem - Symptoms - Personality having low self esteem - Positive and negative self esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.		
Unit-IV	OTHER ASPECTS OF PERSONALITY DEVELOPMENT	6
Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management Work ethics – Good manners and etiquette.		
Unit-V	EMPLOYABILITY QUOTIENT	6


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Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions

Total No of Periods to be Taught

Total: 30 periods

TEXT BOOK:

- | | |
|---|---|
| 1 | Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill. |
| 2 | Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16th Edition: Prentice Hall. |

REFERENCES:

- | | |
|---|---|
| 1 | Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill 1988. |
| 2 | Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002 |
| 3 | Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003 |
| 4 | Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001 |
| 5 | Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004). |
| 6 | Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005. |
| 7 | Smith, B . Body Language. Delhi: Rohan Book Company. 2004 |

COURSE OUTCOMES:

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

- | | |
|------|--|
| CO1: | Explain the concept and dimensions of personality and analyze theories of Freud and Erickson |
| CO2: | Identify the role of attitude and motivation in personal success and apply strategies to stay self-motivated |
| CO3: | Recognize types of self-esteem and behaviors; develop assertiveness and interpersonal relationship skills |
| CO4: | Demonstrate skills in body language, leadership, stress management, and decision-making for personality growth |
| CO5: | Apply practical techniques for enhancing employability including resume writing, interviews, and group discussion techniques |


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Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	2	-	-	-	-	-	2	2
CO2	3	3	3	3	2	2	3	-	-	-	-	-	3	3
CO3	2	2	3	3	2	2	3	-	-	-	-	-	3	3
CO4	3	3	3	3	3	3	3	-	-	-	-	-	3	3
CO5	2	2	3	2	3	3	3	-	-	-	-	-	3	3
Avg.	2.6	2.6	2.8	2.6	2.4	2.4	2.8	-	-	-	-	-	2.8	2.8
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														

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Department	MECHANICAL	Programme Code & Name	Mandatory Courses- All Branches
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UMC24008	WELL-BEING WITH TRADITIONAL PRACTICES-YOGA, AYURVEDA AND SIDDHA	L	T	P	C	100
		2	0	0	0	
Course Objectives	To enjoy life happily with fun filled new style activities that help to maintain health also					
	To adapt a few lifestyle changes that will prevent many health disorders					
	To be cool and handbill every emotion very smoothly in every walk of life					
	To learn to eat cost effective but healthy foods that are rich in essential nutrients					
	To develop immunity naturally that will improve resistance against many health disorders					

Unit-I	HEALTH AND ITS IMPORTANCE	(6)
Health: Definition - Importance of maintaining health - More importance on prevention than treatment Ten types of health one has to maintain - Physical health - Mental health - Social health - Financial health - Emotional health - Spiritual health - Intellectual health - Relationship health - Environmental health - Occupational/Professional health. Present health status - The life expectancy-present status - mortality rate - dreadful diseases - Non-communicable diseases (NCDs) the leading cause of death - 60% - heart disease - cancer - diabetes - chronic pulmonary diseases - risk factors - tobacco - alcohol - unhealthy diet - lack of physical activities. Types of diseases and disorders - Lifestyle disorders - Obesity - Diabetes - Cardiovascular diseases - Cancer - Strokes - COPD - Arthritis - Mental health issues. Causes of the above diseases / disorders - Importance of prevention of illness - Takes care of health - Improves quality of life - Reduces absenteeism - Increase satisfaction - Saves time Simple lifestyle modifications to maintain health - Healthy Eating habits (Balanced diet according to age) Physical Activities (Stretching exercise, aerobics, resisting exercise) - Maintaining BMI-Importance and actions to be taken		
Unit-II	DIET	(6)
Role of diet in maintaining health - energy one needs to keep active throughout the day - nutrients one needs for growth and repair - helps one to stay strong and healthy - helps to prevent diet-related illness, such as some cancers - keeps active and - helps one to maintain a healthy weight - helps to reduce risk of developing lifestyle disorders like diabetes - arthritis - hypertension - PCOD - infertility - ADHD - sleeplessness - helps to reduce the risk of heart diseases - keeps the teeth and bones strong. Balanced Diet and its 7 Components - Carbohydrates - Proteins - Fats - Vitamins - Minerals - Fibre and Water. Food additives and their merits & demerits - Effects of food additives - Types of food additives - Food additives and processed foods - Food additives and their reactions Definition of BMI and maintaining it with diet Importance - Consequences of not maintaining BMI - different steps to maintain optimal BM Common cooking mistakes Different cooking methods, merits and demerits of each method		
Unit-III	ROLE OF AYURVEDA & SIDDHA SYSTEMS IN MAINTAINING HEALTH	(6)


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AYUSH systems and their role in maintaining health - preventive aspect of AYUSH - AYUSH as a soft therapy.
Secrets of traditional healthy living - Traditional Diet and Nutrition - Regimen of Personal and Social Hygiene
- Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation and healthy living environment - Sadvritta (good conduct) - for conducive social life.

Principles of Siddha & Ayurveda systems - Macrocosm and Microcosm theory - Panchcheekarana Theory / (Five Element Theory) 96 fundamental Principles - Uyir Thathukkal (Tri- Dosha Theory) - Udal Thathukkal

Prevention of illness with our traditional system of medicine

Primary Prevention - To decrease the number of new cases of a disorder or illness - Health promotion/education, and - Specific protective measures - Secondary Prevention - To lower the rate of established cases of a disorder or illness in the population (prevalence) - Tertiary Prevention - To decrease the amount of disability associated with an existing disorder.

Unit-IV	MENTAL WELLNESS	(6)
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Emotional health - Definition and types - Three key elements: the subjective experience - the physiological response - the behavioral response - Importance of maintaining emotional health - Role of emotions in daily life - Short term and long term effects of emotional disturbances - Leading a healthy life with emotions - Practices for emotional health - Recognize how thoughts influence emotions - Cultivate positive thoughts - Practice self-compassion - Expressing a full range of emotions. **Stress management** - Stress definition - Stress in daily life - How stress affects one's life - Identifying the cause of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help) - Complications of stress mismanagement.

Sleep - Sleep and its importance for mental wellness - Sleep and digestion.

Immunity - Types and importance - Ways to develop immunity

Unit-V	YOGA	(6)
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Definition and importance of yoga - Types of yoga - How to Choose the Right Kind for individuals according to their age - The Eight Limbs of Yoga - Simple yogasanas for cure and prevention of health disorders - What yoga can bring to our life.

Total No of Periods to be Taught	Total: 30 periods
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TEXT BOOK:

1	Nutrition and Dietetics - Ashley Martin, Published by White Word Publications, New York, NY 10001, USA
2	Yoga for Beginners_ 35 Simple Yoga Poses to Calm Your Mind and Strengthen Your Body,

REFERENCES:

1	WHAT WE KNOW ABOUT EMOTIONAL INTELLIGENCE How It Affects Learning, Work, Relationships, and Our Mental Health, by Moshe Zeidner, Gerald Matthews, and Richard D. Roberts. A Bradford Book, The MIT Press, Cambridge, Massachusetts, London, England
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2	The Mindful Self-Compassion Workbook, Kristin Neff, Ph.D Christopher Germer, Ph.D, Published by The Guilford Press A Division of Guilford Publications, Inc.370 Seventh Avenue, Suite 1200, New York, NY 10001
3	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4799645/
4	Simple lifestyle modifications to maintain health https://www.niddk.nih.gov/health-information/diet-nutrition/changing-habits-better-health#:~:text=Make%20your%20new%20healthy%20habit,t%20have%20time%20to%20cook.
5	Read more: https://www.legit.ng/1163909-classes-food-examples-functions.html
6	https://www.yaclass.in/p/science-state-board/class-9/nutrition-and-health-5926
7	Benefits of healthy eating https://www.cdc.gov/nutrition/resources-publications/benefits-of-healthy-eating.html
8	Food additives https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/food-additives
9	BMI https://www.hsph.harvard.edu/nutritionsource/healthy-weight/ https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who-recommendations
10	Yoga https://www.healthifyme.com/blog/types-of-yoga/ https://yogamedicine.com/guide-types-yoga-styles/ Ayurveda : https://vikaspedia.in/health/ayush/ayurveda-1/concept-of-healthy-living-in-ayurveda
11	Siddha : http://www.tkd.res.in/tkd/langdefault/Siddha/Sid_Siddha_Concepts.asp
12	CAM : https://www.hindawi.com/journals/ecam/2013/376327/
13	Preventive herbs : https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3847409/

COURSE OUTCOMES:

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

CO1:	Learn the importance of different components of health
CO2:	Gain confidence to lead a healthy life
CO3:	Learn new techniques to prevent lifestyle health disorders

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	-	-	-	-	-	-	-	3	2
CO2	2	2	2	3	3	-	-	-	-	-	-	-	2	3
CO3	3	3	1	3	3	-	-	-	-	-	-	-	2	3
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg.	2.7	2.3	1.3	3.0	2.7	2.3	2.7	2.3	2.7	2.3	1.3	3.0	2.7	2.3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	BME	Programme Code & Name			Open to all Departments		
Semester							
Course Code	Course Name		Hours/Week		Credit	Maximum Marks	
UBMOE2410	BASICS OF MICROBIAL TECHNOLOGY		L	T	P	C	100
			3	0	0	3	
Course Objectives	The student should be made to: The objective is to offer basic concepts of biochemistry to students with diverse background in life sciences including but not limited to the structure and function of various biomolecules and their metabolism.						

Unit-I	BASICS OF MICROBES AND ITS TYPES	(9)
Introduction to microbes, existence of microbes, inventions of great scientist and history, types of microorganisms – Bacteria, Virus, Fungi.		
Unit-II	MICROBIAL TECHNIQUES	(9)
Sterilization – types – physical and chemical sterilization, Decontamination, Preservation methods, fermentation, Cultivation and growth of microbes, Diagnostic methods.		
Unit-III	PATHOGENIC MICROBES	(9)
Infectious Disease – Awareness, Causative agent, Prevention and control - Cholera, Dengu, Malaria, Diarrhea, Tuberculosis, Typhoid, Covid, HIV.		
Unit-IV	BENEFICIAL MICROBES	(9)
Applications of microbes–Clinical microbiology, agricultural microbiology, Food Microbiology, Environmental Microbiology, Animal Microbiology, Marine Microbiology.		
Unit-V	PRODUCTS FROM MICROBES	(9)
Fermented products–Fermented Beverages, Curd, Cheese, Mushroom, Agricultural products– Biopesticide, Biofertilizers, Vermi compost, Pharmaceutical products - Antibiotics, Vaccines		
Total No of Periods to be Taught		45 periods

TEXT BOOK:		
1	TalaronK,TalaronA,Casita,PelczarandReid.FoundationsinMicrobiology,W.C.Brown Publishers, 1993.	
2	PelczarMJ,ChanECSandKreinNR,Microbiology,TataMcGrawHillEdition,NewDelhi, India.	
3	PrescottL.M.,HarleyJ.P.,Kl3einDA,Microbiology,3rdEdition,Wm.C.BrownPublishers, 1996.	


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REFERENCES:

1	Berg, Jeremy M.etal.“Biochemsitry”,6thEdition,W.H.Freeman&Co., 2006.
2	Murray,R.K.,etal“Harper’sIllustratedBiochemistry”,31stEdition,McGraw-Hill,2018.
3	Voet,D.andVoet,J.G.,“Biochemistry”,4thEdition,JohnWiley&SonsInc.,2010.

COURSE OUTCOMES:

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

CO1:	Students will learn about various kinds of biomolecules and their physiological role.
CO2:	Students will gain knowledge about various metabolic disorders and will help them to know the importance of various biomolecules in terms of disease correlation.
CO3:	Students will learn about various kinds of Infectious Disease – Awareness, Causative agent, Prevention and control
CO4:	Students will gain knowledge beneficial microbes
CO5:	Students will learn about various kinds of products from microorganisms

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO3
CO1	3	3	1	1	1	-	-	-	-	-	1		-	-
CO2	3	3	1	1	1	-	-	-	-	-	1		-	-
CO3	3	3	1	1	1	-	-	-	-	-	1		-	-
CO4	3	3	1	1	1	-	-	-	-	-	1		-	-
CO5	3	3	1	1	1	-	-	-	-	-	1		-	-
Avg.	3	3	1	1	1	-	-	-	-	-	1		-	-

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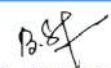


Department	BME	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UBMOE2402	RADIOLOGICAL EQUIPMENT	L	T	P	C	100
		3	0	0	3	
Course Objectives	The student should be made to: • Understand generation of x-rays and its uses in imaging. • Learn different types of radio diagnostic techniques. • Know techniques used for visualizing different sections of the body. • Learn radiation therapy methodologies and the radiation safety.					

Unit-I	MEDICAL X-RAY EQUIPMENT	(9)
Nature of X-rays- X-Ray absorption – Tissue contrast. X- Ray Equipment (Block Diagram) – X-Ray Tube, the collimator, Bucky Grid, power supply, Digital Radiography- discrete digital detectors, storage phosphor and film scanning, X-ray Image Intensifier tubes – Fluoroscopy – Digital Fluoroscopy. Angiography, cine Angiography. Digital subtraction Angiography. Mammography.		
Unit-II	COMPUTED TOMOGRAPHY	(9)
Principles of tomography, CT Generations, X- Ray sources- collimation- X- Ray detectors-Viewing systems- spiral CT scanning – Ultra fast CT scanners. Image reconstruction techniques- back projection and iterative method.		
Unit-III	MAGNETIC RESONANCE IMAGING	(9)
Fundamentals of magnetic resonance- Interaction of Nuclei with static magnetic field and Radio frequency wave- rotation and precession – Induction of magnetic resonance signals – bulk magnetization – Relaxation processes T1 and T2. Block Diagram approach of MRI system- system magnet (Permanent, Electromagnet and Super conductors), generations of gradient magnetic fields, Radio Frequency coils (sending and receiving), shim coils, Electronic components, MRI.		
Unit-IV	NUCLEAR MEDICINE SYSTEM	(9)
Applications of microbes–Clinical microbiology, agricultural microbiology, Food Microbiology, Environmental Microbiology, Animal Microbiology, Marine Microbiology.		
Unit-V	RADIATION THERAPY AND RADIATION SAFETY	(9)
Radiation therapy – linear accelerator, Telegamma Machine. SRS –SRT,-Recent Techniques in radiation therapy - 3DCRT – IMRT – IGRT and Cyber knife- radiation measuring instruments- Dosimeter, film badges, Thermo Luminescent dosimeters- electronic dosimeter- Radiation protection in medicine- radiation protection principles.		
Total No of Periods to be Taught		45 periods


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TEXT BOOK:

1	Steve Webb, The Physics of Medical Imaging, Adam Hilger, Philadelphia, 1988 (Units I, II, III & IV).
2	R.Hendee and Russell Ritenour “Medical Imaging Physics”, Fourth Edition William, Wiley-Liss, 2002.

REFERENCES:

1	Gopal B. Saha “Physics and Radiobiology of Nuclear Medicine”- Third edition Springer, 2006.
2	B.H.Brown, PV Lawford, R H Small wood , D R Hose, D C Barber, “Medical physics and biomedical Engineering”, - CRC Press, 1999
3	Myer Kutz, “Standard handbook of Biomedical Engineering and design”, McGraw Hill, 2003.
4	P.Ragunathan, “Magnetic Resonance Imaging and Spectroscopy in Medicine

COURSE OUTCOMES:

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

CO1:	Describe the working principle of X-ray machine and its applications.
CO2:	Illustrate the principle of Computed Tomography (CT).
CO3:	Interpret the techniques used for visualizing various sections of the body using Magnetic Resonance Imaging (MRI).
CO4:	Demonstrate the applications of radionuclide imaging / nuclear medicine imaging.
CO5:	Outline the methods of radiation safety and protection.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	1	-	-	-	-	-	-	1	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	1	-	-	-
CO3	3	3	1	1	-	-	-	-	-	-	1	-	-	-
CO4	3	3	1	1	-	-	-	-	-	-	1	-	-	-
CO5	3	3	1	1	1	-	-	-	-	-	1	-	-	-
Avg.	3	3	1	1	1	-	-	-	-	-	1	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy


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Department	BME	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UBMOE2403	FUNDAMENTALS OF CELL AND MOLECULAR BIOLOGY	L	T	P	C	100
		3	0	0	3	
Course Objectives	• To provide knowledge on the fundamentals of cell biology. • To understand the signalling mechanisms. • To Understand basic principles of molecular biology at intracellular level to regulate growth, division and development					

Unit-I	INTRODUCTION TO CELL	(9)
Cell, cell wall and Extracellular Matrix (ECM), composition, cellular dimensions, Evolution, Organization, differentiation of prokaryotic and Eukaryotic cells, Virus, bacteria, cyanobacteria, mycoplasma and prions		
Unit-II	CELL ORGANELLES	(9)
Molecular organization, biogenesis and function Mitochondria, endoplasmic reticulum, Golgi apparatus, plastids, chloroplast, leucoplast, centrosome, lysosome, ribosome, peroxisome, Nucleus and nucleolus. Endo membrane system, concept of compartmentalization		
Unit-III	BIO-MEMBRANE TRANSPORT	(9)
Physiochemical properties of cell membranes. Molecular constitute of membranes, asymmetrical organization of lipids and proteins. Solute transport across membrane's-fick's law, simple diffusion, passive-facilitated diffusion, active transport- primary and secondary, group translocation, transport ATP ases, membrane transport in bacteria and animals. Transport mechanism- mobile carriers and pores mechanisms. Transport by vesicle formation, endocytosis, exocytosis, cell respiration		
Unit-IV	CELL CYCLE	(9)
Cell cycle- Cell division by mitosis and meiosis, Comparison of meiosis and mitosis, regulation of cell cycle, cell lysis, Cytokinesis, Cell signaling, Cell communication, Cell adhesion and Cell junction, cell cycle checkpoints.		
Unit-V	CENTRAL DOGMA	(9)
Overview of Central dogma DNA replication: Meselson & Stahl experiment, bi-directional DNA replication, Okazaki fragments. Structure and function of mRNA, rRNA and tRNA. RNA synthesis: Initiation, elongation and termination of RNA synthesis Introduction to Genetic code- Steps in translation: Initiation, Elongation and termination of protein synthesis.		
Total No of Periods to be Taught		45 periods


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TEXT BOOK:

1	Cooper, G.M. and R.E. Hansman “The Cell: A Molecular Approach”, 8th Edition, Oxford University Press, 2018
2	Friefelder, David. “Molecular Biology.” Narosa Publications, 1999

REFERENCES:

1	Lodish H, Berk A, Matsudaira P, Kaiser CA, Krieger M, Schot MP, Zipursky L, Darnell J. Molecular Cell Biology, 6th Edition, 2007
2	Becker, W.M. etal., “The World of the Cell”, 9 th Edition, Pearson Education, 2003.
3	Campbell, N.A., J.B. Reece and E.J. Simon “Essential Biology”, VIIrd Edition, Pearson International, 2007

COURSE OUTCOMES:

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

CO1:	Understanding of cell at structural and functional level.
CO2:	Understand the central dogma of life and its significance.
CO3:	Comprehend the basic mechanisms of cell division.
CO4:	Study on the Cell cycle
CO5:	Students will learn about Central dogma

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO2	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO3	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO4	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO5	3	2	3	1	-	-	-	-	-	-	1	-	-	-
Avg.	3	2	3	1	-	-	-	-	-	-	1	-	-	-

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Department	BME	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UBMOE2404	HUMAN PHYSIOLOGY	L	T	P	C	100
		3	0	0	3	
Course Objectives	The student should be made to: The objective is to offer basic concepts of biochemistry to students with diverse background in life sciences including but not limited to the structure and function of various biomolecules and their metabolism.					

Unit-I	BASIC ELEMENTS OF HUMAN BODY	(9)
Cell: Structure and organelles - Functions of each component in the cell. Cell membrane –transport across membrane – origin of cell membrane potential – Action potential. Tissue: Types – Specialized tissues – functions.		
Unit-II	SKELETAL AND RESPIRATORY SYSTEM	(9)
Skeletal system: Bone types and functions – Joint - Types of Joint - Cartilage and functions. Respiratory System: Components of respiratory system – Respiratory Mechanism. Types of respiration - Oxygen and carbon dioxide transport and acid base regulation		
Unit-III	CIRCULATORY SYSTEM	(9)
Blood composition - functions of blood – functions of RBC. WBC types and their functions. Blood groups – importance of blood groups – identification of blood groups. Blood vessels- Structure of heart – Properties of Cardiac muscle – Conducting system of heart – Cardiac cycle – ECG - Heart sound		
Unit-IV	URINARY AND SPECIAL SENSORY SYSTEM	(9)
Urinary system: Structure of Kidney and Nephron. Mechanism of Urine formation and acid base regulation – Urinary reflex – Homeostasis and blood pressure regulation by urinary system. Special senses: Eye and Ear.		
Unit-V	NERVOUS SYSTEM	(9)
Structure of a Neuron – Types of Neuron. Synapses and types. Conduction of action potential in neuron. Brain – Divisions of brain lobes - Cortical localizations and functions - EEG. Spinal cord – Tracts of spinal cord - Reflex mechanism – Types of reflex. Autonomic nervous system and its functions.		
Total No of Periods to be Taught		45 periods


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TEXT BOOK:

1	Elaine.N. Marieb, “Essential of Human Anatomy and Physiology”, Eight Edition, Pearson Education, New Delhi ,2007.
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REFERENCES:

1	Gillian Pocock, Christopher D. Richards, The human Body – An introduction for Biomedical and Health Sciences, Oxford University Press, USA, 2009
2	William F.Ganong, “Review of Medical Physiology”, 22 nd Edition, Mc Graw Hill, New Delhi, 2005

COURSE OUTCOMES:

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

CO1:	Describe basic structural and functional elements of human body.
CO2:	Explain organs and structures involving in system formation and functions.
CO3:	Identify all systems in the human body.
CO4:	Study on the Urinary system and sensory system
CO5:	Students will learn about nervous system

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO2	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO3	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO4	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO5	3	2	3	1	-	-	-	-	-	-	1	-	-	-
Avg.	3	2	3	1	-	-	-	-	-	-	1	-	-	-

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Department	BME	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UBMOE2405	LIFESTYLE DISEASES	L	T	P	C	100
		3	0	0	3	
Course Objectives	• To study the cell types and differentiation. • To study basics about stem cells and its applications • To understand the methods and design involved in tissue engineering					

Unit-I	INTRODUCTION	(9)
Lifestyle diseases – Definition ; Risk factors – Eating, smoking, drinking, stress, physical activity, illicit drug use ; Obesity, diabetes, cardiovascular diseases, respiratory diseases, cancer; Prevention – Diet and exercise		
Unit-II	CANCER	(9)
Types - Lung cancer, Mouth cancer, Skin cancer, Cervical cancer, Carcinoma oesophagus; Causes Tobacco usage, Diagnosis – Biomarkers, Treatment		
Unit-III	CARDIOVASCULAR DISEASES	(9)
Coronary atherosclerosis – Coronary artery disease; Causes -Fat and lipids, Alcohol abuse -- Diagnosis - Electrocardiograph, echocardiograph, Treatment, Exercise and Cardiac rehabilitation		
Unit-IV	DIABETES AND OBESITY	(9)
Types of Diabetes mellitus; Blood glucose regulation; Complications of diabetes – Paediatric and adolescent obesity – Weight control and BMI		
Unit-V	RESPIRATORY DISEASES	(9)
Chronic lung disease, Asthma, COPD; Causes - Breathing pattern (Nasal vs mouth), Smoking – Diagnosis - Pulmonary function testing		
Total No of Periods to be Taught		45 periods

TEXT BOOK:	
1	R. Kumar & Meenal Kumar, “Guide to Prevention of Lifestyle Diseases”, Deep & Deep Publications, 2003
2	Gary Eggar et al, “Lifestyle Medicine”, 3rd Edition, Academic Press, 2017


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REFERENCES:

1	James M.R, "Lifestyle Medicine", 2nd Edition, CRC Press, 2013
2	Akira Miyazaki et al, "New Frontiers in Lifestyle-Related Disease", Springer, 2008

COURSE OUTCOMES:

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

CO1:	Explain the concept of lifestyle diseases, their causes, risk factors, and preventive measures.
CO2:	Describe different types of cancer, their causes, diagnosis methods, and treatment approaches.
CO3:	Analyze cardiovascular diseases, their risk factors, diagnostic techniques, treatment, and rehabilitation.
CO4:	Illustrate the types of diabetes mellitus, obesity, complications, and methods for weight control using BMI.
CO5:	Discuss respiratory diseases such as asthma and COPD, their causes, diagnosis, and prevention.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO2	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO3	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO4	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO5	3	2	3	1	-	-	-	-	-	-	1	-	-	-
Avg.	3	2	3	1	-	-	-	-	-	-	1	-	-	-

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Department	BME	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UBMOE2406	PATHOLOGY AND MICROBIOLOGY	L	T	P	C	100
		3	0	0	3	
Course Objectives	• Gain a knowledge on the structural and functional aspects of living organisms. • Know the etiology and remedy in treating the pathological diseases. • Empower the importance of public health.					

Unit-I	CELL DEGENERATION, REPAIR AND NEOPLASIA	(9)
Cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification, cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, spread of tumours. Autopsy and biopsy.		
Unit-II	FLUID AND HEMODYNAMIC DERRANGEMENTS	(9)
Edema, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock. Hematological disorders-Bleeding disorders, Leukaemias, Lymphomas		
Unit-III	MICROSCOPES	(9)
Light microscope – bright field, dark field, phase contrast, fluorescence, Electron microscope (TEM & SEM). Preparation of samples for electron microscope. Staining methods – simple, gram staining and AFB staining.		
Unit-IV	MICROBIAL CULTURES	(9)
Morphological features and structural organization of bacteria, growth curve, identification of bacteria , culture media and its types , culture techniques and observation of culture.		
Unit-V	IMMUNOLOGY	(9)
Natural and artificial immunity, opsonization, phagocytosis, inflammation, Immune deficiency syndrome, antibodies and its types, antigen and antibody reactions, immunological techniques: immune diffusion, immuno electrophoresis, RIA and ELISA, monoclonal antibodies. Disease caused by bacteria, fungi, protozoal, virus and helminthes		
Total No of Periods to be Taught		45 periods


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TEXT BOOK:

1	Old RW, Primrose SB, "Principles of Gene Manipulation, An Introduction to Genetic Engineering", Blackwell Science Publications, 1993.
2	Principles of Genome Analysis and Genomics by S.B.Primrose and R.M.Twyman, 3rd Ed. (Blackwell Publishing).

REFERENCES:

1	Isil Aksan Kurnaz, "Techniques in Genetic Engineering", CRC Press, 2015.
2	Oksana Ableitner, "Introduction to Molecular Biology: Working with DNA and RNA (essentials)", Springer International, 2022.
3	Arun K. Shukla, "Proteomics in Biology", Academic Press, 2017.o

COURSE OUTCOMES:

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

CO1:	Analyze structural and functional aspects of living organisms.
CO2:	Explain the function of microscope
CO3:	Discuss the importance of public health.
CO4:	Describe methods involved in treating the pathological diseases
CO5:	Study about the immunology and immune system

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO2	3	2	3	1	-	-	-	-	-	-	1	-	-	-
CO3	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO4	3	2	3	1	-	-	1	1	-	-	1	-	-	-
CO5	3	2	3	1	-	-	-	-	-	-	1	-	-	-
Avg.	3	2	3	1	-	-	-	-	-	-	1	-	-	-

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Department	BME	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UBMOE2407	MEDICAL ELECTRONICS	L	T	P	C	100
		3	0	0	3	
Course Objectives	The students will be exposed to electrical and non-electrical physiological measurements and bioamplifiers					

Unit-I	BIO POTENTIAL ELECTRODES	(9)
Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode-skin interface, half cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits		
Unit-II	ELECTRODE CONFIGURATIONS	(9)
Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode.		
Unit-III	BIO AMPLIFIER	(9)
Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference		
Unit-IV	MEASUREMENT OF NON-ELECTRICAL PARAMETERS	(9)
Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods. Blood flow measurement Electromagnetic and ultrasound blood flow measurement. Cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method,		
Unit-V	BIO-CHEMICAL MEASUREMENT	(9)
Biochemical sensors - pH, pO ₂ and pCO ₂ , Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).		
Total No of Periods to be Taught		45 periods


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TEXT BOOK:

1	John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004. (Units I, II & V)
2	Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003. (Units II & IV)

COURSE OUTCOMES:

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

CO1:	Perform electrical and non-electrical physiological measurements
CO2:	Explain the function of bio amplifiers.
CO3:	Students will learnt about bio amplifier AC and DC
CO4:	Measurement of non-electrical parameters blood pressure
CO5:	Students will learnt about biochemical measurements

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	POS1	PSO2	PSO3
CO1	3	2	1	-	-	1	1	-	-	-	-	-	-	-
CO2	3	2	1	-	-	1	1	-	-	-	-	-	-	-
CO3	3	2	1	-	-	1	1	-	-	-	-	-	-	-
CO4	3	2	1	-	-	1	1	-	-	-	-	-	-	-
CO5	3	2	1	-	-	1	1	-	-	-	-	-	-	-
Avg.	3	2	1	-	-	1	1	-	-	-	-	-	-	-

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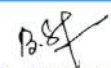


Department	BME	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UBMOE2408	ASSIST DEVICES	L	T	P	C	100
		3	0	0	3	
Course Objectives	• Study various mechanical techniques that will help failing heart. • Learn the functioning of the unit which does the clearance of urea from the blood • Understand the tests to assess the hearing loss and development of electronic devices to compensate for the loss. • Know the various orthotic devices and prosthetic devices to overcome orthopedic problems. • Understand electrical stimulation techniques used in clinical applications.					

Unit-I	CARDIAC ASSIST DEVICES	(9)
Principle of External counter pulsation techniques, intra-aortic balloon pump, Auxillary ventricle and schematic for temporary bypass of left ventricle, prosthetic heart valves.		
Unit-II	HEMODIALYSERS	(9)
Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters.		
Unit-III	HEARING AIDS	(9)
Common tests – audiograms, air conduction, bone conduction, masking techniques, SISI, Hearing aids – principles, drawbacks in the conventional unit, DSP based hearing aids.		
Unit-IV	PROSTHETIC AND ORTHODIC DEVICES	(9)
Hand and arm replacement – different types of models, externally powered limb prosthesis, feedback in orthodic system, functional electrical stimulation, and sensory assist devices.		
Unit-V	RECENT TRENDS	(9)
Transcutaneous electrical nerve stimulator, bio-feedback.		
Total No of Periods to be Taught		45 periods


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TEXT BOOK:

1	Levine S.N. (ed), "Advances in Bio-medical Engineering and Medical physics", Vol. I, II, IV, inter university publications, New York, 1968 (Unit I, IV, V).
2	Kolff W.J, "Artificial Organs", John Wiley and sons, New York, 1976. (Unit II).

REFERENCES:

1	D.S. Sunder, "Rehabilitation Medicine", 3 rd Edition, Jaypee Medical Publication, 2010.
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COURSE OUTCOMES:

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

CO1:	Explain the functioning and usage of electromechanical units which will restore normal functional ability of particular organ that is defective temporarily or permanently
CO2:	Explain the functioning and usage of hemodialysers and its functional parameters
CO3:	To study about the Common tests – audiograms, air conduction, bone conduction
CO4:	Knowledge on prosthetic and orthodic devices
CO5:	To know about the knowledge on recent trends

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	1	-	1	-	1	-	-	-	-
CO2	3	2	1	-	-	1	-	1	-	1	-	-	-	-
CO3	3	2	1	-	-	1	-	1	-	1	-	-	-	-
CO4	3	2	1	-	-	1	-	1	-	1	1	-	-	-
CO5	3	2	1	-	-	1	-	1	-	1	1	-	-	-
Avg.	3	2	1	-	-	1	-	1	-	1	1	-	-	-

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Department	Chemical Engineering	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCHOE2401	NANOMATERIALS AND APPLICATIONS	L	T	P	C	100
		3	0	0	3	
Course Objectives	- Understanding the classification and types of polymers. understand different types of nanomaterials for the future engineering applications - Gaining knowledge on polymer analysis and solution properties - Having knowledge on the structure and properties of bulk polymers - Having knowledge on the commercial polymers - Acquiring knowledge on polymer processing techniques					

Unit-I	NANOMATERIALS	(9)
Introduction, Classification: 0D, 1D, 2D, 3D nanomaterials and nano-composites, their mechanical, electrical, optical, magnetic properties; Nanomaterials versus bulk materials.		
Unit-II	THERMODYNAMICS & KINETICS OF NANOSTRUCTURED MATERIALS	(9)
Size and interface/interphase effects, interfacial thermodynamics, phase diagrams, diffusivity, grain growth, and thermal stability of nanomaterials.		
Unit-III	PROCESSING	(9)
Bottom-up and top-down approaches for the synthesis of nanomaterials, mechanical alloying, chemical routes, severe plastic deformation, and electrical wire explosion technique.		
Unit-IV	STRUCTURAL CHARACTERISTICS	(9)
Principles of emerging nanoscale X-ray techniques such as small angle X-ray scattering and X-ray absorption fine structure (XAFS), electron and neutron diffraction techniques and their application to nanomaterials; SPM, Nanoindentation, Grain size, phase formation, texture, stress analysis		
Unit-V	APPLICATIONS	(9)
Applications of nanoparticles, quantum dots, nanotubes, nanowires, nanocoatings; applications in electronic, electrical and medical industries.		
Total No of Periods to be Taught		45

TEXT BOOK:

1	Bhusan, Bharat (Ed), "Springer Handbook of Nanotechnology", 2nd edition, 2007.
2	Carl C. Koch (ed.), Nanostructured Materials, Processing, Properties and Potential Applications, NOYES PUBLICATIONS, Norwich, New York, U.S.A.


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REFERENCES:

1	Poole C.P, and Owens F.J., Introduction to Nanotechnology, John Wiley 2003.
2	Nalwa H.S., Encyclopedia of Nanoscience and Nanotechnology, American Scientific Publishers 2004.

COURSE OUTCOMES:

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

CO1:	Evaluate nanomaterials and understand the different types of nanomaterials
CO2:	Recognise the effects of dimensionality of materials on the properties
CO3:	Process different nanomaterials and use them in engineering applications
CO4:	Use appropriate techniques for characterizing nanomaterials
CO5:	Identify and use different nanomaterials for applications in different engineering fields.

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	3	-	-	-	-	-	-	-	2	1	2
CO2	3	1	2	2	-	-	-	-	-	-	-	2	2	2
CO3	3	2	1	2	-	-	-	-	-	-	-	2	2	2
CO4	3	1	-	3	-	-	-	-	-	-	-	2	2	2
CO5	3	2	2	2	-	-	-	-	-	-	-	2	2	2
Avg.	2.8	1.6	1.7	2.2	-	-	-	-	-	-	-	2	1.8	2

1 – Slight, 2 – Moderate, 3 –Substantial , BT – Bloom's Taxonomy

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Department	Chemical Engineering	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCHOE2402	POLYMER TECHNOLOGY	L	T	P	C	100
		3	0	0	3	
Course Objectives	- Understanding the classification and types of polymers. understand different types of nanomaterials for the future engineering applications - Gaining knowledge on polymer analysis and solution properties - Having knowledge on the structure and properties of bulk polymers - Having knowledge on the commercial polymers - Acquiring knowledge on polymer processing techniques					

Unit-I	INTRODUCTION TO POLYMERS AND POLYMERIZATIONS	(9)
Polymers - Basic concepts - Classification - Natural and synthetic polymers, thermoplasts and thermosets. Polymerization - Addition, condensation, ring opening, copolymerization, ionic and coordination polymerization - Kinetics of polymerization.		
Unit-II	POLYMER ANALYSIS AND SOLUTION PROPERTIES	(9)
Molecular weight and distribution- Number average, weight average, viscosity average and Z-average molecular weight - Determination by light scattering, solution viscosity and gel permeation chromatography. Degree of polymerization. Glass transition temperature - Theory and measurements. Polymer solutions- Solubility and swelling, Thermodynamics of polymer solutions, Phase separation in polymer solutions.		
Unit-III	STRUCTURE AND PROPERTIES OF BULK POLYMERS	(9)
Morphology and order in crystalline polymers -crystal structure of polymers, morphology of polymer single crystals. Rheology and the mechanical properties of polymers - Viscous flow, kinetic theory of rubber elasticity and viscoelasticity, stress-strain behavior, compression vs tensile tests, deformation of solid polymers. Thermal analysis of polymers using TGA and DSC.		
Unit-IV	MANUFACTURE AND PROPERTIES OF COMMERCIAL POLYMERS	(9)
Hydrocarbon plastics and elastomers - low density (branched) polyethylene, high density (linear) polyethylene, polypropylene, natural rubber, rubbers derived from butadiene. Other carbon chain polymers polystyrene, acrylic polymers, poly(vinyl esters) and derived polymers. Heterochain thermoplastics - Polyamides. Thermosetting resins - Phenolic resins and amino resins.		
Unit-V	POLYMER PROCESSING TECHNIQUES	(9)
Plastic molding techniques - Injection, blow, extrusion and compression. Processing agents - Fillers, plasticizers, and other additives. Fiber Technology - Textile and fabric properties, spinning - wet and dry methods - fiber treatments. Elastomer technology - Compounding and elastomer properties, vulcanization and reinforcement.		
Total No of Periods to be Taught		45

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TEXT BOOK:

1	Billmeyer F.W., Textbook of Polymer Science, Third Edition, Wiley Interscience, 1984.
2	Charles E., Carraher Jr., Seymour/carraher's polymer chemistry, Seventh Edition, CRC Press, 2012.

REFERENCES:

1	Fried J.R., Polymer Science and Technology, Second Edition, Prentice Hall of India Pvt Ltd., 2003.
2	Bhatnagar M.S., A Textbook of Polymers, Vol. 2, S.Chand and Company Ltd., 2012s.

COURSE OUTCOMES:

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

CO1:	Understand the basic concepts of polymer science and identify the polymerization techniques and its kinetics.
CO2:	Assess the molecular weight distribution techniques, glass transition, and solution properties like thermodynamics, phase separations.
CO3:	Explain the morphology, rheology, mechanical and thermal properties of bulk polymers.
CO4:	Compare and analyze the manufacture and properties of commercial polymers.
CO5:	Apply the knowledge in assessing the polymeric, fiber and elastomer processing techniques.

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	-	3	-	-	-	2	3	1	-	2	-
CO2	2	3	3	-	3	-	-	-	2	3	1	-	2	-
CO3	2	3	3	-	3	1	-	-	-	3	1	-	2	-
CO4	2	3	3	-	3	1	-	-	2	3	1	-	2	-
CO5	2	3	3	-	3	1	-	-	2	3	1	-	2	-
Avg.	2	3	3	-	3	1	-	-	2	3	1	-	2	-

1 – Slight, 2 – Moderate, 3 –Substantial , BT – Bloom's Taxonomy

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Department	Chemical Engineering	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCHOE2403	ENZYME ENGINEERING	L	T	P	C	100
		3	0	0	3	
Course Objectives	Focuses on the introduction to enzymes and gives an overview of kinetics, production, immobilization, fermentation process and its industrial applications.					

Unit-I	ENZYMES AND KINETICS	(9)
Classification of enzymes; Principle of enzymatic catalysis; Enzyme kinetics-Factors affecting the enzyme activity- Concentration, pH and temperature. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten Equation, Km, Vmax, L.B Plot, Turnover number, Kcat. Kinetics of Enzyme Inhibition.		
Unit-II	ENZYME PRODUCTION	(9)
Extraction of crude enzyme from plant, animal and microbial source; Purification of enzymes by the help of different methods. Methods of characterization of enzymes; criteria of purity. Unit of enzyme activity - definition and importance. Development of enzyme assays.		
Unit-III	ENZYME IMMOBILIZATION	(9)
Immobilization Type: Adsorption, Matrix entrapment, Encapsulation, Cross linking, Covalent binding and their examples; Advantages and disadvantages of different immobilization techniques. Structure & stability of immobilized enzymes, kinetic properties of immobilized enzymes- partition effect, diffusion effect.		
Unit-IV	LARGE SCALE PRODUCTION	(9)
Fermentation using continuously stirred aerated tank bioreactors. Mixing power correlation. Determination of volumetric mass transfer rate of oxygen from air bubbles and effect of mechanical mixing and aeration on oxygen transfer rate, heat transfer and power.		
Unit-V	INDUSTRIAL APPLICATIONS OF ENZYMES	(9)
Industrial Enzymes in:Dairy, Bread making, Starch processing, Brewing; Bioethanol production and other fermentation processes; Thermophilic enzymes, amylases, lipases, proteolytic enzymes in Meat and Leather industry, Cellulose degrading enzymes in Paper and Pulp industry; Metal degrading and pollutant degradation. Biosensors		
Total No of Periods to be Taught		45

TEXT BOOK:

1	Nicolas C. Price and Lewis Stevens, "Fundamentals of enzymology: Cell and Molecular Biology of Catalytic Proteins", 3rd Edition, Oxford University Press, United States of America, 2000 for Unit I.
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2	Young JeYoo, Yan Feng, Yong Hwan Kim Camila Flor J. Yagonia, "Fundamentals of Enzyme Engineering", 1st Edition, Springer Inc, United Kingdom, 2017 for Units II, III, IV & V.
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REFERENCES:

1	Trevor Palmer and Philip Bonner, "Enzymes: Biochemistry, Biotechnology and Clinical Chemistry", 2nd Edition, Woodhead Publishing, United Kingdom, 2001.
2	Nalwa H.S., Encyclopedia of Nanoscience and Nanotechnology, American Scientific Publishers 2004

COURSE OUTCOMES:

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

CO1:	Classify enzymes and elaborate the principles of catalysis and enzyme kinetics
CO2:	Describe the enzyme production, purification, characterisation and assay
CO3:	Outline the immobilization of enzymes
CO4:	Elaborate the large scale fermentation process using bioreactors
CO5:	Apply enzyme science in its industrial applications

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	1	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	1	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	-	-
Avg.	3	3	3	3	-	-	-	-	-	-	-	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy

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Department	Chemical Engineering	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCHOE2404	Bio Energy Resources	L	T	P	C	100
		3	0	0	3	
Course Objectives	Focuses on the introduction to bioenergy and gives an overview of resources, gasification and combustion processes.					

Unit-I		(9)
Energy perspective: Current methods, Biomass possibilities. Fundamental concepts in understanding biofuel and bioenergy production: Mass Balances, Energy Balances, Thermodynamics, Organic compounds, Chemistry of plant materials resources.		
Unit-II		(9)
Biogas technology: Feedstock for producing biogas; Microbial and biochemical aspects and operating parameters for biogas production, Kinetics and mechanism. Dry and wet fermentation, Digestors for rural application-High rate digesters for industrial waste water treatment.		
Unit-III		(9)
Pyrolysis and thermo-chemical conversion: Thermo-chemical conversion of lignocellulosic biomass. Incineration for safe disposal of hazardous waste, Biomass processing for liquid fuel production, Pyrolysis of biomass-pyrolysis regime, effect of particle size, temperature, and products obtained.		
Unit-IV		(9)
Comparison of Bio-energy Sources, Biorefinery, Biofuels for Transportation, Vegetable Oils as Engine Fuels. Biodiesel as Engine Fuel: Engine Emissions from Biodiesel, Biodiesel production by using various microorganisms, algae and Transesterification process, methods of biodiesel production.		
Unit-V		(9)
Combustion of biomass and cogeneration systems: Combustion of woody biomass-theory, calculations and design of equipment, Cogeneration in biomass processing industries. Case studies: Combustion of rice husk, Use of bagasse for cogeneration		
Total No of Periods to be Taught	45	

TEXT BOOK:

1	Anju Dahiya, Bioenergy: Biomass to biofuels First Edition, Academic Press, 2014.
2	Li, Yebo, and Samir Kumar Khanal. Bioenergy: principles and applications. John Wiley & Sons, 2016.


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REFERENCES:

1	Vaughn C Nelson, Kenneth L. Starcher. Introduction to bioenergy. CRC Press, 2017.
2	Wall, Judy D., Caroline S. Harwood, and Arnold Demain. "Bioenergy." Bioenergy.. ASM Press, 2008.

COURSE OUTCOMES:

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

CO1:	Understand the fundamental knowledge on energy perspective
CO2:	Learn the production of biogas
CO3:	Gather knowledge on the operations of incineration, pyrolysis.
CO4:	Understand the comparison of bioenergy sources
CO5:	Knowledge on the types of combustion of biomass.

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	2	2	1	1	1	1	2	1	2
CO2	2	-	2	1	2	2	2	1	1	1	2	2	2	2
CO3	2	1	2	1	2	2	2	2	1	1	2	2	1	2
CO4	2	1	2	1	2	2	2	1	1	1	2	2	2	2
CO5	2	2	2	2	2	2	2	1	1	1	2	2	1	2
Avg.	2	1	2	1	2	2	2	1	1	1	1	2	1	2

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Department	Chemical Engineering	Programme Code & Name	Open to all Departments
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Semester

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCHOE2405	CHEMICAL PROCESS SAFETY	L	T	P	C	100
		3	0	0	3	
Course Objectives	- Teach the principles of safety applicable to the design, and operation of chemical process plants. - Ensure that potential hazards are identified and mitigation measures are in place to prevent unwanted release of energy. - Learn about the hazardous chemicals into locations that could expose employees and others to serious harm. - Focuses on preventing incidents and accidents during large scale manufacturing of chemicals and pharmaceuticals. - Ensure that the general design of the plant is capable of complying with the dose limits in force and with the radioactive releases.					

Unit-I	SAFETY IN THE STORAGE AND HANDLING OF CHEMICALS AND GASES	(9)
Types of storage-general considerations for storage layouts- atmospheric venting, pressure and temperature relief - relief valve sizing calculations - storage and handling of hazardous chemicals and industrial gases, safe disposal methods, reaction with other chemicals, hazards during transportation - pipe line transport - safety in chemical laboratories.		
Unit-II	CHEMICAL REACTION HAZARDS	(9)
Hazardous inorganic and organic reactions and processes, Reactivity as a process hazard, Detonations, Deflagrations, and Runaways, Assessment and Testing strategies, Self - heating hazards of solids, Explosive potential of chemicals, Structural groups and instability of chemicals, Thermochemical screening.		
Unit-III	SAFETY IN THE DESIGN OF CHEMICAL PROCESS PLANTS	(9)
Design principles -Process design development -types of designs, feasibility survey, preliminary design, Flow diagrams, piping and instrumentation diagram, batch versus continuous operation, factors in equipment scale up and design, equipment specifications - reliability and safety in designing - inherent safety - engineered safety - safety during startup and shutdown - non destructive testing methods - pressure and leak testing - emergency safety devices - scrubbers and flares- new concepts in safety design and operation- Pressure vessel testing standards- Inspection techniques for boilers and reaction vessels.		
Unit-IV	SAFETY IN THE OPERATION OF CHEMICAL PROCESS PLANTS	(9)
Properties of chemicals - Material Safety Data Sheets - the various properties and formats used - methods available for property determination. Operational activities and hazards -standards operating procedures - safe operation of pumps, compressors, heaters, column, reactors, pressure vessels, storage vessels, piping systems - effects of pressure, temperature, Flow rate and humidity on operations - corrosion and control measures- condition monitoring - control valves - safety valves - pressure reducing valves, drains, bypass valves, inert gases. Chemical splashes, eye irrigation and automatic showers.		

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Unit-V	SAFETY AND ANALYSIS	(9)
Safety vs reliability- quantification of basic events, system safety quantification, Human error analysis, Accident investigation and analysis, OSHAS 18001 and OSHMS.		
Total No of Periods to be Taught		45

TEXT BOOK:	
1	George Kanwaty, "Introduction to Work Study ", ILO, Geneva, 1996, ISBN: 9221071081 ISBN-13: 9789221071082
2	Enrick N. L., "Time study manual for Textile industry", Wiley Eastern (P) Ltd., 1989, ISBN: 0898740444 ISBN-13: 9780898740448
REFERENCES:	
1	Norberd Lloyd Enrick., "Industrial Engineering Manual for Textile Industry", Wiley Eastern (P) Ltd., New Delhi, 1988, ISBN: 0882756311 ISBN-13: 9780882756318
2	Chuter A. J., "Introduction to Clothing Production Management", Wiley-Black well Science, U.S. A., 1995, ISBN: 0632039396 ISBN-13: 9780632039395

COURSE OUTCOMES:	
On completion of the course, the students will be able to	
CO1:	Differentiate between inherent safety and engineered safety and recognize the importance of safety in the design of chemical process plants.
CO2:	Develop thorough knowledge about safety in the operation of chemical plants.
CO3:	Apply the principles of safety in the storage and handling of gases.
CO4:	Identify the conditions that lead to reaction hazards and adopt measures to prevent them.
CO5:	Develop thorough knowledge about safety and analysis.

Mapping of COs with POs and PSOs														
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	2	1	1	2	2	1	1	1
CO2	1	2	2	2	2	1	2	1	2	2	2	2	1	1
CO3	1	2	2	1	1	2	2	1	2	1	2	2	1	3
CO4	1	2	2	1	1	1	2	1	1	1	1	2	2	1
CO5	2	2	3	2	2	1	2	1	1	2	2	1	1	3
Avg.	2	1	1	1	2	1	2	2	2	2	2	2	1	2
1 – Slight, 2 – Moderate, 3 –Substantial , BT – Bloom's Taxonomy														


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Department	CIVIL	Programme Code & Name	Open to all Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCEOE2401	ARCHITECTURAL HERITAGE OF INDIA	L	T	P	C	100
		3	0	0	3	
Course Objectives	● To help students understand the history and styles of Indian architecture. ● To create awareness about preserving India’s architectural heritage.					

Unit-I	INDUS VALLEY CIVILIZATION	(9)
Indus valley civilization – Chronological introduction – Construction style – Materials used – The cities Harappa, lothal and Mohenjo-Daro, The great bath – The granary at Harappa – The assembly hall – Ajanta-Ellora Cave temples – Mahabodhi temple complex		
Unit-II	SOUTH INDIAN ARCHITECTURE	(9)
Chera-Chola-Pandya architecture – Chronological introduction – Construction style – Materials used – Brihadeeswarar Temple – Meenakshi Temple – Kalinga – Chalukya – Pallava architecture – Mahabalipuram stone temples – Khajuraho – Muskin Bhanvi – Konark Sun Temple – Hoysala – Vijayanagara architecture – twin temples Mosale – Virupaksha temple Raya Gopura at Hampi		
Unit-III	MUGHAL ARCHITECTURE	(9)
Mughal architecture – Chronological introduction – Construction style – Materials used – Qutub Minar – Taj Mahal – Humayun's Tomb – Redfort – Fatehpur Sikri – Agra fort – Jama Masjid – Rajput civil architecture – Chronological introduction – Construction style – Materials used – All hill forts of Rajasthan		
Unit-IV	BRITISH ARCHITECTURE	(9)
British colonial architecture – Chronological introduction – Construction style – Materials used – Buildings in Chennai, Mumbai, Shimla – Churches – Mountain railways of India-bridges.		
Unit-V	COLONIAL ARCHITECTURE	(9)
Other colonial architecture – Portuguese-Dutch-French-Danish – Chronological introduction – Construction style – Materials used – Churches – Churches and Convents of Goa and Cochi – French town of Puducherry – Tranquebar fort – Bungalow on the beach		
Total No of Periods to be Taught		45 periods

TEXT BOOK:	
1	Bindia Thapar, Surat Kumar Manto, and Suparna Bhalla., Introduction to Indian Architecture: Arts of Asia, Periplus Editions (HK) Ltd, Hong Kong, First Edition, 2005
2	Sandhya Ketkar., The History of Indian Art, Jyotsna Prakashan Publisher, Maharashtra, E – Edition, 2020


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REFERENCES:

1	Christopher Tadgell., The History of Architecture in India, Phaidon Press Ltd, New York, First Edition, 1990
2	Mark M. Jarzombek, Vikramaditya Prakash, Francis D. K. Ching., A Global History of Architecture, John Wiley & Sons, Hoboken, Second Edition, 2010
3	https://nptel.ac.in/courses/124106009
4	https://ncert.nic.in/textbook/pdf/kefa106.pdf

COURSE OUTCOMES:

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

CO1:	Illustrate various materials used and construction style of Indus Valley Civilization
CO2:	Demonstrate the materials used and construction style of Chera, Chola and Pandya architecture
CO3:	Describe the materials used and construction style of Mughal architecture
CO4:	Explain the various materials and construction style of British architecture
CO5:	Describe various materials and construction style of Portuguese, Dutch, French and Danish

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	2	-	2	-	-	-	-	3	-	-	-
CO2	3	3	-	2	-	2	-	-	-	-	3	-	-	-
CO3	3	3	-	1	-	2	-	-	-	-	3	-	-	-
CO4	3	3	-	2	-	2	-	-	-	-	3	-	-	-
CO5	3	3	-	1	-	2	-	-	-	-	3	-	-	-
Avg.	3	3	-	2	-	2	-	-	-	-	3	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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Department	CIVIL	Programme Code & Name	Open to all Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCEOE2402	BUILDING PLANNING AND CONSTRUCTION	L	T	P	C	100
		3	0	0	3	
Course Objectives	● To teach the basic principles of building planning and design. ● To provide knowledge about construction methods and materials.					

Unit-I	FUNCTIONAL PLANNING OF BUILDINGS	(9)
Types of Buildings, Aspects and Principles of Building Planning, Building By - laws and Regulations, Site Selection criteria, Orientation of Building and its relation to surrounding environment, Sustainability and Green Buildings - Building Bye - laws and Building code of India 2016.		
Unit-II	BUILDING COMPONENTS AND FOUNDATIONS	(9)
Lintels, arches, different types of floors-concrete, mosaic, terrazzo floors, pitched, flat and curved roofs, lean-to roof, coupled roofs, trussed roofs, king and queen post trusses; RCC roofs, madras terrace/shell roofs. Foundations: Shallow foundations, spread, combined, strap and mat footings.		
Unit-III	ALTERNATIVE MATERIALS AND MASONRY	(9)
Structure, properties, seasoning of timber; Classification of various types of woods used in buildings, defects in timber; Alternative materials for wood, galvanized iron, fibre-reinforced plastics, steel, aluminium and glass; Types of masonry, English and Flemish bonds, rubble and ashlar masonry, cavity and partition walls - Light weight concrete blocks – merits and demerits.		
Unit-IV	FLOORS, ROOFS AND STAIRCASES	(9)
Components of a floor, materials used for floor construction, Different types of flooring, Ground floor and upper floors, Types of roofs, Basic roofing elements and Roof coverings. Functional requirements of a good stair, type of stairs, planning a stair case.		
Unit-V	DAMP PROOFING AND FIRE PROTECTION	(9)
Damp proofing and Fire protection: Causes and effect of dampness on buildings, Materials and methods used for damp proofing, Fire hazards, Grading of buildings according to fire resistance, Fire resisting properties of common building materials, Fire resistant construction.		
Total No of Periods to be Taught		45 periods

TEXT BOOK:	
1	Varghese P. C., Building construction, PHI Learning Pvt. Ltd, New Delhi ,Second Edition, 2016.
2	B. C. Punmia , Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publications, New Delhi, Eleventh Edition, 2019.



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REFERENCES:

1	S. K. Duggal, Building Materials II, New Age International (P) Limited, New Delhi, Fourth Edition, 2016,
2	Bulding Bye-laws 2019
3	National Building Code of India, 2016.
4	www.nptel.ac.in/courses/105101088/2_home.htm

COURSE OUTCOMES:

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

CO1:	Outline the factors to be considered in planning and construction of buildings
CO2:	Infer the different components and Foundations of building in their construction practices.
CO3:	Interpret masonry and alternative materials of wood, aluminum and glass.
CO4:	Discuss different types of floors, roofs and the materials which are commonly used for construction.
CO5:	Explain about dampness and fire resistance in buildings

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	3	-	-	-	-	2	-	-	-
CO2	3	2	-	2	-	3	-	-	-	-	2	-	-	-
CO3	2	-	-	2	-	3	-	-	-	-	2	-	-	-
CO4	3	2	-	2	-	3	-	-	-	-	2	-	-	-
CO5	3	2	-	2	-	3	-	-	-	-	2	-	-	-
Avg.	3	2	1	2	-	3	-	-	-	-	2	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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Department	CIVIL	Programme Code & Name	Open to all Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCEOE2403	ELEMENTARY CIVIL ENGINEERING	L	T	P	C	100
		3	0	0	3	
Course Objectives	● To introduce the fundamental concepts and branches of civil engineering. ● To create awareness about basic materials, tools, and construction practices.					

Unit-I	OVERVIEW OF CIVIL ENGINEERING	(9)
History of Civil Engineering - Role and Functions of Civil Engineer - Fields of Civil Engineering - Importance of Civil Engineering		
Unit-II	BASICS OF SURVEYING	(9)
Introduction - Basic Definitions (Surveying, leveling, Plans, Maps, Scales) - Introduction to divisions of surveying - Classification of surveying - Fundamental principles of surveying - Measurement in Surveying - Phases of Surveying MODERN TOOLS OF SURVEYING AND MAPPING: Introduction to Global Positioning System - Remote Sensing and Geographic Information System		
Unit-III	FUNDAMENTALS OF BUILDING MATERIALS	(9)
Bricks – stones – sand – M-sand - cement – fly ash - silica fume - mortar- concrete – steel – glass - wood plastics – ceramics		
Unit-IV	COMPONENTS OF BUILDING	(9)
Foundations – stone masonry – brick masonry – beams – columns – lintels – roofing – flooring – plastering- damp proofing weathering course		
Unit-V	STRUCTURES	(9)
Introduction to dams, weirs, barrages and check dams - Role of transportation in national development - Modes of transportation - Introduction to road traffic and traffic control - Introduction to mass transportation system		
Total No of Periods to be Taught		45 periods

TEXT BOOK:	
1	Anurag Kandya, Elements of Civil Engineering, Charotar Publishing House Pvt. Ltd, Gujarat, Third Edition, 2017.
2	Palanichamy M.S., Basic Civil Engineering, Tata McGraw-Hill, New Delhi, Fourth Edition, 2011.



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REFERENCES:

1	Poonam Sharma & Swati Rajput, Sustainable Smart Cities in India – Challenges and Future Perspectives, Springer, First Edition, 2017.
2	Dr.B.C.Punamia, Surveying, Laxmi Publication, New Delhi, Seventh Edition, 2016.
3	https://nptel.ac.in/courses/105102088
4	https://byjusexamprep.com/civil-engineering-exams/building-materials

COURSE OUTCOMES:

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

CO1:	Provide an overview of civil engineering
CO2:	Explain the basics of surveying , modern tools of surveying and mapping
CO3:	Summarize the fundamentals of building materials in civil engineering
CO4:	Explain the components of building structures.
CO5:	Interpret various infrastructures of civil engineering in construction

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	1	-	-	-	-	1	-	-	-
CO2	2	1	-	-	-	2	-	-	-	-	1	-	-	-
CO3	2	1	-	-	-	2	-	-	-	-	1	-	-	-
CO4	2	1	-	-	-	2	-	-	-	-	1	-	-	-
CO5	3	2	1	-	-	3	-	-	-	-	1	-	-	-
Avg.	3	2	1	-	-	3	-	-	-	-	1	-	-	-

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Department	CIVIL	Programme Code & Name	Open to all Departments
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Course Code	Course Name	Hours/Week				Credit	Maximum Marks
UCEOE2404	ENERGY AND ENVIRONMENT	L	T	P	C		
		3	0	0	3		100
Course Objectives	• To provide basic knowledge about different energy sources and their uses. • To create awareness about environmental issues and sustainable practices.						

Unit-I	INTRODUCTION	(9)
Overview on the Earth's energy requirements-Climate Change-Origins of the terrestrial atmosphere-Earth's early atmosphere- Introduction to Climate-Layers of the atmosphere.		
Unit-II	GLOBAL ATMOSPHERIC ISSUES	(9)
Composition of the present day atmosphere-Introduction to Atmospheric chemistry-Green House Gases, and the O ₃ - depletion problem-Post Industrial Revolution Scenario		
Unit-III	ENERGY BALANCE	(9)
Earth Atmosphere System- Solar and Terrestrial Radiation- Absorption of Radiation by gases.-Energy balance- Solar variability and the Earth's Energy Balance.		
Unit-IV	ATMOSPHERIC CHEMISTRY AND CLIMATE	(9)
The Global Temperature Record.-Possible effects of Global Warming. – Indian Context. Atmospheric Chemistry and Climate Change- Atmospheric Aerosol and Cloud Effects on Climate.		
Unit-V	ENVIRONMENTAL VARIABILITY	(9)
Natural (volcanoes, forest fires) and Anthropogenic (Antarctic Ozone Hole, Global Warming).-Green House Gas theory.- Effects of urbanization- Landscape changes-Influence of Irrigation-Desertification and Deforestation		
Total No of Periods to be Taught		45 periods

TEXT BOOK:	
1	Peter E Hodgson, Energy the Environment and Climate Change, Imperial College Press, London, First Edition, 2010
2	Ahluwalia V K, Energy and Environment, The Energy and Resources Institute, New Delhi, First Edition, 2019


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REFERENCES:

1	Richard Wolfson, Energy, Environment, and Climate, Publisher: W. W. Norton & Company, New York, Second Edition, 2011
2	Saeed Moaveni, Energy, Environment, and Sustainability with Mind Tap, Cengage India Private Limited, New Delhi, First Edition, 2017
3	Wilbanks, T., Bilello D, Schmalzer D, Scott, Climate Change and Energy Supply and Use: Technical Report for the U.S. Department of Energy in Support of the National Climate Assessment., Island Press, Washington, 2013
4	Frank T. Princiotta, Global Climate Change - The Technology Challenge, Springer Publisher, New York, First Edition, 2011

COURSE OUTCOMES:

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

CO1:	Outline the earth's energy, environment and the processes leading to climate change
CO2:	Infer the atmospheric issues related to the chemistry, green house gases
CO3:	Summarize the role of the terrestrial energy-environment-climate system
CO4:	Interpret the Possible effects of Global Warming and climate change.
CO5:	Outline the Natural and Anthropogenic and Green House Gas theory

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	2	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	2	-	-	-	-	2	-	-	-
CO3	3	3	-	-	-	2	-	-	-	-	2	-	-	-
CO4	3	3	-	-	-	2	-	-	-	-	2	-	-	-
CO5	3	3	1	-	-	2	-	-	-	-	2	-	-	-
Avg.	3	3	1	-	-	2	-	-	-	-	2	-	-	-

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Department	CIVIL	Programme Code & Name	Open to all Departments
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Course Code	Course Name	Hours/Week				Credit	Maximum Marks
UCEOE2405	GLOBAL WARMING AND CLIMATE CHANGE	L	T	P	C		
		3	0	0	3		100
Course Objectives	- To explain the causes and effects of global warming and climate change. - To promote awareness of mitigation strategies and sustainable solutions.						

Unit-I	EARTH'S CLIMATE SYSTEM	(9)
Role of ozone in environment – Ozone layer – Ozone depleting gases – Greenhouse gases and its sources – Green House Effect, Radiative Effects of Greenhouse Gases -The Hydrological Cycle – Green House Gases and Global Warming – Effects and causes of Global Warming, Carbon Cycle.		
Unit-II	ATMOSPHERE AND ITS COMPONENTS	(9)
Importance of Atmosphere – Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere - Composition of the atmosphere - Atmospheric stability -Temperature profile of the atmosphere - Lapse rates- Temperature inversion - effects of inversion on pollution dispersion.		
Unit-III	OBSERVED CHANGES AND ITS CAUSES	(9)
Causes of Climate change – Change of Temperature in the environment - Melting of ice Pole-sea level rise - Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions – Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.		
Unit-IV	OBSERVED CHANGES AND ITS CAUSES	(9)
Climate change and Carbon credits – CDM- Initiatives in India - Kyoto Protocol - Intergovernmental Panel on Climate change - Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Evidences of Changes in Climate and Environment – on a Global Scale and in India		
Unit-V	CLIMATE CHANGE AND MITIGATION MEASURES	(9)
Clean Development Mechanism – Carbon Trading – Examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding - Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry - Carbon sequestration – Carbon capture and storage (CCS) - Waste(MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation.		
Total No of Periods to be Taught		45 periods



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TEXT BOOK:

1	Kandarp Tarkeshprasad Vaishnav., Climate Change Solutions, Global Warming Solutions & Innovative Ideas For Construction of World Development, Notion Press, Chennai, First Edition, 2018
2	Vivian Moritz., Climate Change and Global Warming, Syrawood Publishing House, New York, First Edition, 2017

REFERENCES:

1	Marie Antonette and Chloe Marechal., Climate Change Past, Present & Future, Wiley-Blackwell, New Jersey, First Edition, 2015.
2	Empereur Raymond., Global Warming and Climate Change, Litfire Publishing, Atlanta, First Edition, 2017.
3	Agarwal S.K., Global Warming and Climate Change Past, Present & Future, Ashish Publishing House, New Delhi, First Edition, 2004.
4	https://onlinecourses.swayam2.ac.in/arp19_ap55/preview

COURSE OUTCOMES:

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

CO1:	Outline the concept of the causes and effects of global warming
CO2:	Summarize about physical and chemical characteristics of atmosphere
CO3:	Identify the causes and effects of climate change
CO4:	Infer the agreements took place among the countries regarding climate change
CO5:	Summarize about the concept of mitigation measures against climate change

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	3	-	-	-	2	2	-	-	-
CO3	3	-	-	2	-	3	-	-	-	2	3	-	-	-
CO4	3	2	-	2	-	3	-	2	-	-	2	-	-	-
CO5	3	2	-	-	-	3	-	3	-	2	3	-	-	-
Avg.	3	2	2	2	-	3	-	3	-	2	3	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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Department	CIVIL	Programme Code & Name	Open to all Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCEOE2406	INTRODUCTION TO DISASTER MANAGEMENT AND MITIGATION	L	T	P	C	100
		3	0	0	3	
Course Objectives	● Provide adequate knowledge about disaster mitigation, preparedness, response, and recovery to face disaster among government bodies, institutions, N O's, etc. ● Obtain the knowledge different disaster and its preparedness and mitigation methods. ● Provide adequate knowledge about applications of space technology in disaster monitoring and information dissemination					

Unit-I	INTRODUCTION TO DISASTER	(9)
Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change		
Unit-II	NATURAL DISASTER AND MANMADE DISASTERS	(9)
Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion. Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.		
Unit-III	DISASTER MANAGEMENT CYCLE AND FRAMEWORK	(9)
Disaster Management Cycle, Paradigm Shift in Disaster Management Pre-Disaster Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development, Awareness During Disaster Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation, Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment, IDNDR, Yokohama Strategy, Hyogo Framework of Action.		
Unit-IV	DISASTER MANAGEMENT IN INDIA DISASTER PROFILE OF INDIA	(9)
Mega Disasters of India and Lessons Learnt, Disaster Management Act 2005, Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management, Role of Government, Non-Government and Inter-Governmental Agencies.		
Unit-V	APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT & MITIGATION	(9)
Geo-informatics in Disaster Management, Disaster Communication System, Land Use Planning and Development Regulations, Structural and Non Structural Mitigation of Disasters, S&T Institutions for Disaster Management in India.		
Total No of Periods to be Taught		45 periods



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TEXT BOOK:

1	R B Singh., Disaster Management and Mitigation, World focus Publisher, New Delhi, First Edition, 2016.
2	Satish Modh, Introduction to disaster management, Macmillan publishers India Ltd, New Delhi, Second Edition, 2019.

REFERENCES:

1	R B Singh., Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi, Reprint Edition, 2006.
2	Pardeep Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, Fourth Edition, 2018.
3	M. Saravanakumar, Disaster Management, Himalaya Publishing House, Bangalore, First Edition, 2017
4	Singh, Disaster Management: Future Challenges, IK International, New Delhi, First Edition, 2017.

COURSE OUTCOMES:

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

CO1:	Explain the concepts of disaster and its effect in Indian scenario.
CO2:	Elaborate the difference between natural and manmade disasters.
CO3:	Outline the disaster management cycle and its operation.
CO4:	Outline the disaster management in India and its profile
CO5:	Propose the application of geo-informatics for disaster management and mitigation.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	2	-	-	-	-	3	-	-	-
CO2	3	3	1	-	-	3	-	-	-	-	3	-	-	-
CO3	3	3	-	-	-	2	-	-	-	-	3	-	-	-
CO4	3	3	1	-	-	3	-	-	-	-	3	-	-	-
CO5	3	3	3	-	2	3	-	-	-	-	3	-	-	-
Avg.	3	3	1	-	2	3	-	-	-	-	3	-	-	-

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy



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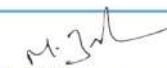
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Department	CSE	Programme Code & Name				OPEN TO ALL DEPARTMENTS
Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCSOE2401	Introduction to C Programming	L 2	T 0	P 2	C 3	100
Course Objectives	- Understand the basic structure and syntax of C programming language. - Develop logical thinking and problem-solving skills. - Apply control structures, functions, and arrays. - Understand pointers, structures, and file handling. - Gain practical experience through lab exercises.					

Unit-I	INTRODUCTION TO C PROGRAMMING	(6)
History and Features of C-Structure of C Program-Character Set, Tokens, Keywords, -Identifiers- Constants and Variables-Data Types (int, float, char, double)-Operators: Arithmetic, Relational, Logical, Assignment-Expressions and Precedence-Input and Output Functions (printf, scanf).		
Unit-II	CONTROL STATEMENTS	(6)
Decision Making: if, if-else, nested if, switch-case -Looping: for, while, do-while-Nested loops Jump Statements: break, continue, goto-Applications of loops.		
Unit-III	FUNCTIONS	(6)
Function Definition and Declaration-Types of Functions-Recursion-Storage Classes: auto, static, extern, register-Parameter Passing: Call by Value, Call by Reference.		
Unit-IV	ARRAYS AND STRINGS	(6)
One Dimensional Arrays - Two Dimensional Arrays - Matrix Operations-String Declaration and Initialization-String Functions: strlen, strcpy, strcat, strcmp-Applications of Arrays and Strings.		
Unit-V	POINTERS, STRUCTURES AND FILE HANDLING	(6)
Pointers and Pointer Arithmetic-Pointers with Arrays and Functions-Structures and Unions-File Handling: fopen, fclose, fprintf, fscanf, fgets, fputs-File Modes and Applications.		
Total No of Periods to be Taught		30 Periods


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TEXT BOOK:

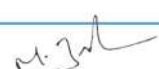
1	E. Balagurusamy, Programming in ANSI C, McGraw Hill, 9th Edition, 2024.
2	Kernighan & Ritchie, The C Programming Language, 2nd Edition, 1988.

REFERENCES:

1	Yashavant Kanetkar, Let Us C, BPB, 20th Edition, 2024.
2	Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition, 2000.
3	Byron Gottfried, Programming with C, McGraw Hill, 1996.

List of Exercises/Experiments

1. Implement a C program to display Hello World.	
2. Implement programs using input and output operations.	
3. Implement programs using arithmetic and logical operators.	
4. Implement decision making programs (if, switch).	
5. Implement looping programs (for, while, do-while).	
6. Implement functions and recursive programs.	
7. Implement array operations (1D and 2D arrays).	
8. Implement string handling programs.	
9. Implement pointer-based programs.	
10. Implement structure and file handling programs.	
Total No of Periods to be Taught	30 Periods


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COURSE OUTCOMES:

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

CO1:	Explain C fundamentals.
CO2:	Apply control structures.
CO3:	Develop programs using arrays and functions.
CO4:	Implement pointers and structures.
CO5:	Design file-based applications neural networks for various tasks.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	Windows 11 requires a modern 64-bit processor (1 GHz or faster, 4 GB RAM, 64 GB+ storage)	30
2.	Turbo C Compiler	

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	0	0	1	0	0	0	0	0	1	3	2	1
CO2	3	3	2	0	1	0	0	0	0	0	1	3	3	2
CO3	3	3	3	2	2	0	0	0	0	0	1	3	3	2
CO4	3	3	3	2	2	0	0	0	0	0	1	3	3	2
CO5	3	3	3	2	3	0	0	0	0	0	2	3	3	3
Avg.	3	2.8	2.2	1.2	1.8	0	0	0	0	0	1.2	3	2.8	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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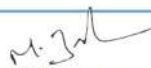
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Department	CSE	Programme Code & Name				OPEN TO ALL DEPARTMENTS
Course Code	Course Name	Hours/Week		Credit	Maximum Marks	
UCSOE2402	Introduction to Data Structures	L 2	T 0	P 2	C 3	100
Course Objectives	- To understand fundamental data structures. - To analyze and design algorithms. - To implement linear and non-linear data structures. - To evaluate performance of algorithms. - To apply data structures in problem solving.					

Unit-I	Introduction to Data Structures	(6)
Definition and Classification of Data Structures-Abstract Data Types (ADT)-Algorithm -Analysis: Time and Space Complexity-Asymptotic Notations: Big-O, Theta, Omega-Recursion and its applications.		
Unit-II	Linear Data Structures	(6)
Arrays and their operations-Linked Lists: Singly, Doubly, Circular-Stack ADT: Operations and Applications-Queue ADT: Linear Queue, Circular Queue, Deque-Applications of Stacks and Queues.		
Unit-III	Searching and Sorting	(6)
Linear Search and Binary Search-Sorting Techniques: Bubble, Selection, Insertion-Divide and Conquer: Merge Sort, Quick Sort-Hashing: Hash Functions, Collision Handling-Performance Analysis of Searching and Sorting.		
Unit-IV	Trees	(6)
Tree ADT and Terminologies-Binary Trees and Traversals (Inorder, Preorder, Postorder)-Binary Search Trees-AVL Trees-Heaps and Priority Queues.		
Unit-V	Graphs	(6)
Graph ADT and Representations-Graph Traversals: BFS and DFS-Directed Acyclic Graphs (DAG)-Shortest Path Algorithms-Minimum Spanning Trees.		
Total No of Periods to be Taught		30 Periods


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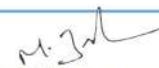
1	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson, 2nd Edition, 1997.
2	Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures, Galgotia, 1976.

REFERENCES:

1	Seymour Lipschutz, Data Structures, Schaum's Outline, McGraw Hill, 2011.
2	Reema Thareja, Data Structures Using C, Oxford University Press, 2014.
3	YedidyahLangsam, Moshe Augenstein, Data Structures Using C and C++, Pearson.

List of Exercises/Experiments

1. Implement array operations.	
2. Implement singly linked list operations.	
3. Implement doubly and circular linked lists.	
4. Implement stack operations using array/linked list.	
5. Implement queue operations (linear and circular)	
6. Implement searching algorithms (linear, binary).	
7. Implement sorting algorithms (bubble, selection, insertion).	
8. Implement divide and conquer sorting (merge, quick sort).	
9. Implement tree traversals.	
10.Implement graph traversals (BFS, DFS).	
Total No of Periods to be Taught	30 Periods


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COURSE OUTCOMES:

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

CO1:	Explain basic data structures concepts.
CO2:	Apply linear data structures.
CO3:	Implement searching and sorting techniques.
CO4:	Analyze trees and graphs.
CO5:	Design efficient algorithms using data structures.

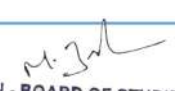
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	Windows 11 requires a modern 64-bit processor (1 GHz or faster, 4 GB RAM, 64 GB+ storage)	30
2.	Turbo C Compiler	

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	0	0	1	0	0	0	0	0	1	3	2	1
CO2	3	3	2	0	2	0	0	0	0	0	1	3	3	2
CO3	3	3	3	2	2	0	0	0	0	0	1	3	3	2
CO4	3	3	3	3	2	0	0	0	0	0	1	3	3	3
CO5	3	3	3	3	3	0	0	0	0	0	2	3	3	3
Avg.	3	2.8	2.2	1.6	2	0	0	0	0	0	1.2	3	2.8	2.2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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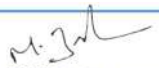
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Department	CSE	Programme Code & Name				OPEN TO ALL DEPARTMENTS	
Course Code	Course Name		Hours/Week			Credit	Maximum Marks
UCSOE2403	Data Science Fundamentals	L	T	P	C	100	
		2	0	2	3		
Course Objectives	- Familiarize students with the data science process. - Understand the data manipulation functions in Numpy and Pandas. - Explore different types of machine learning approaches. - Understand and practice visualization techniques using tools. - Learn to handle large volumes of data with case studies.						

Unit-I	INTRODUCTION	(6)
Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – data preparation - Exploratory Data analysis – build the model – presenting findings and building applications - Data Mining - Data Warehousing – Basic statistical descriptions of Data.		
Unit-II	DATA MANIPULATION	(9)
Python Shell - Jupyter Notebook - IPython Magic Commands - NumPy Arrays-Universal Functions – Aggregations – Computation on Arrays – Fancy Indexing – Sorting arrays – Structured data – Data manipulation with Pandas – Data Indexing and Selection – Handling missing data – Hierarchical indexing – Combining datasets – Aggregation and Grouping – String operations – Working with time series – High performance.		
Unit-III	MACHINE LEARNING	(5)
The modeling process - Types of machine learning - Supervised learning - Unsupervised learning - Semi-supervised learning- Classification, regression - Clustering – Outliers and Outlier Analysis.		
Unit-IV	DATA VISUALIZATION	(5)
Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.		
Unit-V	HANDLING LARGE DATA	(5)
Problems - techniques for handling large volumes of data - programming tips for dealing with large data sets- Case studies: Predicting malicious URLs, Building a recommender system - Tools and techniques needed - Research question - Data preparation - Model building – Presentation and automation.		


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Total No of Periods to be Taught	30 Periods
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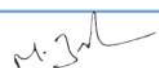
1	David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
2	Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCES:

1	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
2	Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

List of Exercises/Experiments

1. Download, install and explore the features of Python for data analytics	
2. Working with Numpy arrays.	
3. Working with Pandas data frames.	
4. Basic plots using Matplotlib.	
5. Statistical and Probability measures a) Frequency distributions b) Mean, Mode, Standard Deviation c) Variability d) Normal curves e) Correlation and scatter plots f) Correlation coefficient g) Regression.	
6. Use the standard benchmark data set for performing the following: a) Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis. b) Bivariate Analysis: Linear and logistic regression modelling.	
7. Apply supervised learning algorithms and unsupervised learning algorithms on any data set.	
8. Apply and explore various plotting functions on any data set.	
Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.	
Total No of Periods to be Taught	30 Periods


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COURSE OUTCOMES:

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

CO1:	Gain knowledge on data science process.
CO2:	Perform data manipulation functions using Numpy and Pandas.
CO3:	Understand different types of machine learning approaches.
CO4:	Perform data visualization using tools.
CO5:	Handle large volumes of data in practical scenarios.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	Windows 11 requires a modern 64-bit processor (1 GHz or faster, 4 GB RAM, 64 GB+ storage)	30
2.	Idle Python (latest version)	
3.	Jupyter Notebook	

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	0	1	0	0	0	0	0	1	3	2	1
CO2	3	3	2	1	3	0	0	0	0	0	1	3	3	2
CO3	3	3	3	2	2	0	0	0	0	0	1	3	3	2
CO4	3	2	2	1	3	0	0	0	0	0	1	3	3	2
CO5	3	3	3	3	3	0	0	0	0	0	2	3	3	3
Avg.	3	2.6	2.2	1.4	2.4	0	0	0	0	0	1.2	3	2.8	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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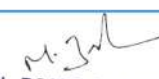
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Department	CSE	Programme Code & Name				OPEN TO ALL DEPARTMENTS
Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UCSOE2404	Introduction of Data Analytics	L	T	P	C	100
		2	0	2	3	
Course Objectives	- Understand the fundamental concepts of Data analytics. - Learn about various types of data formats and its manipulations. - It helps students to learn exploratory data analysis and visualization techniques in addition to R/Python/Tableau programming language.					

Unit-I	INTRODUCTION TO DATA SCIENCE	(5)
Introduction to Data Science, Need for Data Science, the 5 V's, Evolution of Data Science, Data Science Lifecycle, types of Data Analysis, Data Science Tools and technologies, Applications of Data Science in various fields.		
Unit-II	DATA HANDLING	(7)
Types of Data: structured, semi-structured, unstructured data, Numeric, Categorical, Graphical, High Dimensional Data, Transactional Data, Spatial Data, Social Network Data, standard datasets, Data Classification, Sources of Data, Data manipulation in various formats, import and export data in R/Python.		
Unit-III	DATA PRE-PROCESSING	(6)
Data Cleaning: - missing values, noisy data; Data Transformation: -Normalization, Attribute Selection, Discretization, Hierarchy Generation; Data Reduction: - Attribute Subset Selection, Numerosity and Dimensional Reduction, Exploratory Data Analysis techniques, Concept of data munging and data wrangling, Feature generation and Feature selection algorithms.		
Unit-IV	DATA VISUALIZATION	(6)
Introduction and importance of Data Visualization, Benefits, Idea and tools; Types of Data visualization, Libraries for Data visualization, Data visualization using Python/R, Creating Dashboards & Stories Tableau: Getting started with Tableau Software, Using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps).		
Unit-V	APPLICATION	(5)
Application of Data Science, Data Science and Ethical Issues-Discussion on privacy, security, Ethics-A look back at data science-next generation data scientists. Case Study of Data science-Facebook, uber and Amazon.		


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Total No of Periods to be Taught	30 Periods
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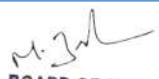
1	Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.
2	Data Analysis and Data Mining, 2nd Edition, John Wiley & Sons Publication, 2014.

REFERENCES:

1	Open Data for Sustainable Community: Glocalised Sustainable Development Goals, Neha Sharma, Santanu Ghosh, MonodeepSaha, Springer, 2021.
2	The Data Science Handbook, Field Cady, John Wiley & Sons, Inc, 2017.
3	Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann, 2012.

List of Exercises/Experiments

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.	
2. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files.	
3. Implement of Matrix Multiplication with Hadoop Map Reduce.	
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.	
5. Installation of Hive along with practice examples.	
6. Installation of HBase, Installing thrift along with Practice examples.	
7. Practice importing and exporting data from various databases.	
Total No of Periods to be Taught	30 Periods


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COURSE OUTCOMES:

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

CO1:	Understand the fundamental concepts of data analytics in the areas that plays major role within the realm of data science.
CO2:	Explain and exemplify the most common forms of data and its representations.
CO3:	Understand and apply data pre-processing techniques.
CO4:	Illustrate various visualization methods for different types of data sets and application scenarios.
CO5:	Understand application and ethics of Data Science.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	Windows 11 requires a modern 64-bit processor (1 GHz or faster, 4 GB RAM, 64 GB+ storage)	30
2.	Idle Python (latest version)	
3.	Jupyter Notebook	

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	0	1	0	0	0	0	0	1	3	2	1
CO2	3	3	2	1	2	0	0	0	0	0	1	3	3	2
CO3	3	3	3	2	2	0	0	0	0	0	1	3	3	2
CO4	3	2	2	1	3	0	0	0	0	0	1	3	3	2
CO5	3	3	2	2	2	1	1	1	0	0	2	3	3	3
Avg.	3	2.6	2	1.2	2	0.2	0.2	0.2	0	0	1.2	3	2.8	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														


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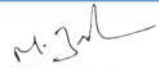
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Department		CSE		Programme Code & Name			OPEN TO ALL DEPARTMENTS	
Course Code	Course Name			Hours/Week			Credit	Maximum Marks
UCSOE2405	Artificial Intelligence and Machine Learning Fundamentals			L	T	P	C	100
				2	0	2	3	
Course Objectives	- Understand the importance, principles, and search methods of AI - Provide knowledge on predicate logic and Prolog. - Introduce machine learning fundamentals. - Study of supervised learning algorithms. - Study about unsupervised learning algorithms.							

Unit-I	INTELLIGENT AGENT AND UNINFORMED SEARCH	(6)
Introduction - Foundations of AI - History of AI - The state of the art - Risks and Benefits of AI - Intelligent Agents - Nature of Environment - Structure of Agent - Problem Solving Agents - Formulating Problems - Uninformed Search - Breadth First Search - Dijkstra's algorithm or uniformcost search - Depth First Search - Depth Limited Search.		
Unit-II	PROBLEM SOLVING WITH SEARCH TECHNIQUES	(7)
Informed Search - Greedy Best First - A* algorithm - Adversarial Game and Search - Game theory - Optimal decisions in game - Min Max Search algorithm - Alpha-beta pruning - Constraint Satisfaction Problems (CSP) - Examples - Map Coloring - Job Scheduling - Backtracking Search for CSP.		
Unit-III	LEARNING	(6)
Machine Learning: Definitions – Classification - Regression - approaches of machine learning models - Types of learning - Probability - Basics - Linear Algebra – Hypothesis space and inductive bias, Evaluation. Training and test sets, cross validation, Concept of over fitting, under fitting, Bias and Variance - Regression: Linear Regression - Logistic Regression.		
Unit-IV	SUPERVISED LEARNING	(6)
Neural Network: Introduction, Perceptron Networks – Adaline - Back propagation networks - Decision Tree: Entropy – Information gain - Gini Impurity - classification algorithm - Rule based Classification - Naïve Bayesian classification - Support Vector Machines (SVM).		
Unit-V	UNSUPERVISED LEARNING	(6)


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Unsupervised Learning – Principle Component Analysis - Neural Network: Fixed Weight Competitive Nets
- Kohonen Self-Organizing Feature Maps – Clustering: Definition - Types of Clustering – Hierarchical clustering algorithms – k-means algorithm.

Total No of Periods to be Taught

30 Periods

TEXT BOOK:

1	S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, Fourth Edition, 2021.
2	S.N.Sivanandam and S.N.Deepa, Principles of soft computing-Wiley India.3 rd ed.

REFERENCES:

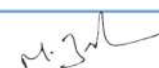
1	Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2	I. Bratko, “Prolog: Programming for Artificial Intelligencel, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3	C. Muller & Sarah Alpaydin, Ethem. Introduction to machine learning. MIT press, 2020.

List of Exercises/Experiments

1. Implement breadth first search.
2. Implement depth first search.
3. Analysis of breadth first and depth first search in terms of time and space.
4. Implement and compare Greedy and A* algorithms.

Supervised learning

5. Implement the non-parametric locally weighted regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
6. Write a program to demonstrate the working of the decision tree based algorithm.
7. Build an artificial neural network by implementing the back propagation algorithm and test the same using appropriate data sets.


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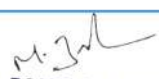


8. Write a program to implement the naïve Bayesian classifier.
Unsupervised learning
9. Implementing neural network using self-organizing maps.
10. Implementing k-Means algorithm to cluster a set of data.
11. Implementing hierarchical clustering algorithm.
Total No of Periods to be Taught
30 Periods

COURSE OUTCOMES:	
On completion of the course, the students will be able to	
CO1:	Understand the foundations of AI and the structure of Intelligent Agents.
CO2:	Use appropriate search algorithms for any AI problem.
CO3:	Study of learning methods.
CO4:	Solving problem using Supervised Learning.
CO5:	Solving problem using Unsupervised Learning.

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	0	1	0	0	0	0	0	1	3	2	1
CO2	3	3	2	1	2	0	0	0	0	0	1	3	3	2
CO3	3	3	2	2	2	0	0	0	0	0	1	3	3	2
CO4	3	3	3	2	3	0	0	0	0	0	1	3	3	3
CO5	3	3	3	3	3	0	0	0	0	0	2	3	3	3
Avg.	3	2.8	2.2	1.6	2.2	0	0	0	0	0	1.2	3	2.8	2.2
1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy														

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS		
S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	Windows 11 requires a modern 64-bit processor (1 GHz or faster, 4 GB RAM, 64 GB+ storage)	30
2.	Idle Python (latest version)	
3.	Anaconda	


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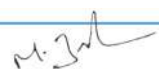
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Department		CSE		Programme Code & Name			OPEN TO ALL DEPARTMENTS	
Course Code	Course Name			Hours/Week			Credit	Maximum Marks
UCSOE2406	IOT CONCEPTS AND APPLICATIONS			L	T	P	C	100
				2	0	2	3	
Course Objectives	- To apprise students with basic knowledge of IoT that paves a platform to understand physical and logical design of IOT. - To teach a student how to analyse requirements of various communication models and protocols for cost-effective design of IoT applications on different IoT platforms. - To introduce the technologies behind Internet of Things(IoT). - To explain the students how to code for an IoT application using Arduino/Raspberry Pi open platform. - To apply the concept of Internet of Things in real world scenario.							

Unit-I	INTRODUCTION TO INTERNET OF THINGS	(5)
Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT Models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT .		
Unit-II	COMPONENTS IN INTERNET OF THINGS	(5)
Functional Blocks of an IoT Ecosystem – Sensors, Actuators, and Smart Objects – Control Units - Communication modules (Bluetooth, Zigbee,Wifi, GPS, GSM Modules).		
Unit-III	PROTOCOLS AND TECHNOLOGIES BEHIND IOT	(6)
IOT Protocols - IPv6, 6LoWPAN, MQTT, CoAP - RFID, Wireless Sensor Networks, BigData Analytics, Cloud Computing, Embedded Systems.		
Unit-IV	OPEN PLATFORMS AND PROGRAMMING	(7)
IOT deployment for Raspberry Pi /Arduino platform-Architecture –Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.		
Unit-V	IOT APPLICATIONS	(7)
Business models for the internet of things, Smart city, Smart mobility and transport, Industrial IoT, Smart health, Environment monitoring and surveillance – Home Automation – Smart Agriculture.		
Total No of Periods to be Taught		30 Periods


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TEXT BOOK:

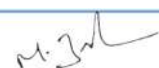
1	Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.
2	Samuel Greengard, The Internet of Things, The MIT Press, 2015.

REFERENCES:

1	Perry Lea, “Internet of things for architects”, Packt, 2018.
2	. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.
3	IOT (Internet of Things) Programming: A Simple and Fast Way of Learning, IOT Kindle Edition.
4	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.

List of Exercises/Experiments

1. Introduction to Arduino platform and programming.	
2. Interfacing Arduino to Zigbee module.	
3. Interfacing Arduino to GSM module.	
4. Interfacing Arduino to Bluetooth Module.	
5. Introduction to Raspberry PI platform and python programming.	
6. Interfacing sensors to Raspberry PI.	
7. Communicate between Arduino and Raspberry PI using any wireless medium.	
8. Setup a cloud platform to log the data.	
9. Log Data using Raspberry PI and upload to the cloud platform.	
10. Design an IOT based system.	
Total No of Periods to be Taught	30 Periods


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COURSE OUTCOMES:

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

CO1:	Explain the concept of IoT.
CO2:	Understand the communication models and various protocols for IoT.
CO3:	Design portable IoT using Arduino/Raspberry Pi /open platform.
CO4:	Apply data analytics and use cloud offerings related to IoT.
CO5:	Analyze applications of IoT in real time scenario..

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	0	1	0	0	0	0	0	1	3	2	1
CO2	3	3	2	1	2	0	0	0	0	0	1	3	3	2
CO3	3	3	3	2	3	0	0	0	0	0	1	3	3	3
CO4	3	3	2	2	3	0	0	0	0	0	1	3	3	3
CO5	3	3	3	3	3	1	1	1	0	0	2	3	3	3
Avg.	3	2.8	2.2	1.6	2.4	0.2	0.2	0.2	0	0	1.2	3	2.8	2.4

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.NO	DESCRIPTION OF EQUIPMENT	REQUIRED NUMBERS
1.	Windows 11 requires a modern 64-bit processor (1 GHz or faster, 4 GB RAM, 64 GB+ storage)	30
2.	https://www.arduino.cc/en/software/	
3.	https://www.raspberrypi.com/software/operating-systems/	

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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week				Credit	Maximum Marks
		L	T	P	C		
UEEOE2401	ELECTRICAL SAFETY	3	0	0	3		100
Course Objectives	- To provide an overview of electrical safety, shocks and their prevention. - To Understand the electrical safety in residential, commercial and agricultural installations - To familiarise with electrical safety during installation, testing and commissioning, operation and maintenance - To provide an overview of electrical hazardous areas						

Unit-I	INTRODUCTION TO ELECTRICAL SAFETY, SHOCKS AND THEIR PREVENTION	(9)
Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shop.		
Unit-II	ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS	(9)
Wiring and fitting –Domestic appliances –water tap giving shock –shock from wet wall –fan firing shock –multi-storied building –Temporary installations – Agricultural pump installation Do's and Don'ts for safety in the use of domestic electrical appliances.		
Unit-III	ELECTRICAL SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE	(9)
Preliminary preparations –safe sequence –risk of plant and equipment –safety documentation –field quality and safety –personal protective equipment –safety clearance notice –safety precautions –safeguards for operators – safety..		
Unit-IV	ELECTRICAL SAFETY IN HAZARDOUS AREAS	(9)
Hazardous zones –class 0,1 and 2 spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipment's for hazardous locations –Classification of equipment enclosure for various hazardous gases and vapours –classification of equipment/enclosure for hazardous locations		
Unit-V	FIRE EXTINGUISHERS	(9)
Fundamentals of fire-initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system; CO2 and Halogen gas schemes; foam schemes.		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988
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REFERENCES:

1	Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth Company, 1978.
2	John Codick, "Electrical safety hand book", McGraw Hill Inc., New Delhi, 2000.
3	Nagrath, I.J. and Kothari, D.P., "Power System Engineering", Tata McGraw Hill, 1998.
4	Wadhwa, C.L., "Electric Power Systems", New Age International, 2004.

COURSE OUTCOMES:

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

CO1:	Understand the Indian power sector organization and Electricity rules, electrical safety in residential, commercial, agriculture, hazardous areas and use of fire extinguishers.
CO2:	Apply various fire extinguishers and the Electrical Safety to prevent the Electric Shocks in residential, commercial, agriculture and hazardous areas;.
CO3:	Apply the Electrical Safety to prevent the Electric Shocks during installation, testing, commissioning, Operation and Maintenance
CO4:	Analyse the Electrical Safety, Electric Shocks and Their Prevention.
CO5:	Examine the Electrical Safety in hazardous areas and the use of various fire extinguishers.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2402	INTRODUCTION TO ELECTRICAL MACHINES	3	0	0	3	100
Course Objectives	- To introduce the principles of operations of DC machines as motor and generator - To introduce the principles of operations of Transformers - To introduce the principles of operations of Induction machines. - To introduce the principles of operations of Synchronous machines. - To introduce other special machines					

Unit-I	D.C. MACHINES	(9)
D.C. Machines – Principle of operation and construction of motor and generator – torque and EMF equation — Characteristics of Motor and Generator – Starting, Speed control and braking of D.C. Motor		
Unit-II	TRANSFORMERS	(9)
Principle , Construction and Types of Transformer - EMF equation - Equivalent circuits - Phasor diagrams - Regulation and efficiency of a transformer-three phase transformer Connection.		
Unit-III	SYNCHRONOUS MACHINES	(9)
Principle of Operation, type - EMF Equation and Phasor diagrams - Synchronous motor-Rotating Magnetic field Starting Methods , Torque V-Curves, inverted – V curves		
Unit-IV	THREE PHASE INDUCTION MOTORS	(9)
Constructional details – Types of rotors — Principle of operation – Slip - Equivalent circuit – Torque-Slip characteristics - Starting, Speed control and induction motor.		
Unit-V	SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES	(9)
Types of single phase induction motors – Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor – Universal motor – Hysteresis motor - Permanent magnet synchronous motor – Switched reluctance motor – Brushless D.C motor.		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	B.S.Guru and H.R.Hiziroglu, "Electric Machinery and Transformer", Oxford university Press 2007
2	M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009
3	Deshpande M. V., "Electrical Machines" PHI Learning Pvt. Ltd., New Delhi, 2011.

REFERENCES:

1	Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.
2	Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGraw- Hill, Singapore, 2000.
3	Nagrath I. J and Kothari D. P. 'Electric Machines', Fourth Edition, Tata McGraw Hill. Publishing Company Ltd, 2010
4	M.S. Sarma and M.K.Pathak, "Electric Machines", Cengage Learning, 2012. 5. C.A.Gross, "Electric Machines", CRC Press 2010

COURSE OUTCOMES:

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

CO1:	Explain the construction and working principle of DC machines.
CO2:	Describe the working principle of auto transformer, three phase transformer with different types of connections.
CO3:	Ability to understand the construction and working principle of Synchronous Machines
CO4:	Ability to understand the construction and working principle of Three Phase Induction Motor and knowledge about the starting and speed control of induction motors.
CO5:	To gain knowledge about the basic principles and working of Single phase induction motors and Special Electrical Machines.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2403	ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION	3	0	0	3	100
Course Objectives	- To study the generation, conservation of electrical power and energy efficient equipments. - To understand the principle, design Of Illumination Systems and energy Efficiency lamps. - To study the methods of industrial heating and welding. - To understand the electric traction systems and their performance.					

Unit-I	GENERATION OF ELECTRIC POWER CONVENTIONAL SOURCES	(9)
Hydro station, Thermal Power Plant, Nuclear Power Plant and Gas Turbine Plant. Non-Conventional Sources (Qualitative): Ocean Energy, Tidal Energy, wind Energy, and Solar Energy.		
Unit-II	ILLUMINATION	(9)
Importance of lighting – properties of good lighting scheme – laws of illumination – photometry types of lamps– lighting calculations–basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.		
Unit-III	TRACTION	(9)
Merits of electric traction–requirements of electric traction system–supply systems - mechanics of train movement – traction motors and control – braking – recent trends in electric traction		
Unit-IV	HEATING AND WELDING	(9)
Role of electric heating for industrial applications–resistance heating–induction heating– dielectric heating - electric arc furnaces. Brief introduction to electric welding–welding generator, welding transformer and the characteristics		
Unit-V	DOMESTIC UTILIZATION OF ELECTRICAL ENERGY	(9)
Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing.		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	Wadhwa, C.L. "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2003.
2	Dr.Uppal S.L. and Prof.S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3	Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

REFERENCES:

1	Partab.H, "Art and Science of Utilisation of Electrical Energy", Dhanpat Rai and Co, New Delhi, 2004.
2	Openshaw Taylor.E, "Utilization of Electrical Energy in SI Units", Orient Longman Pvt. Ltd, 2003.
3	Gupta.J.B, "Utilization of Electric Power and Electric Traction", S.K. Kataria and Sons, 2002.
4	Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

COURSE OUTCOMES:

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

CO1:	To understand them a in aspects of generation, utilization and conservation.
CO2:	To understand them a in aspects of illuminations
CO3:	To realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit.
CO4:	To understand the main aspects of Traction and method of heating
CO5:	To evaluate domestic wiring connection and debug any faults occurred

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2404	POWER ELECTRONICS AND DRIVES	3	0	0	3	100
Course Objectives	- Comprehensive introduction to various power electronic devices, their structure, operating principle and characteristics - Give exposure to Various topologies, working principle and analysis of controlled rectifiers and ac controllers - Detailed knowledge on Classifications, structure, operating principle of dc choppers. - Introduction to different types of Inverters , their principle of operation and waveform control - Overview on dc and ac drives and their control using power electronic circuits.					

Unit-I	POWER SEMICONDUCTOR DEVICES AND CHARACTERISTICS	(9)
Operating principle and switching Characteristics: Power diodes, Power BJT, Power MOSFET, IGBT, SCR, TRIAC, GTO, MCT, Power integrated circuits (PIC) – Drive and Protection circuits.		
Unit-II	CONTROLLED RECTIFIERS AND AC CONTROLLERS	(9)
Single phase – Three phase – Half controlled – Fully controlled rectifiers – Dual converters -Effect of source and load inductance - AC voltage controllers –Introduction to Cyclo converters, Matrix converters		
Unit-III	DC TO DC CONVERTERS	(9)
Step up and Step down Chopper – Chopper classification - quadrant of operation – Switching mode Regulators – Buck, Boost, Buck-Boost, and Cuk Regulators		
Unit-IV	INVERTERS	(9)
Voltage source Inverters – Half bridge – Full bridge – Three Phase Bridge Inverters – Voltage control– PWM Techniques – Current Source Inverters: Capacitor Commutated Inverter- Resonant inverters: Series, Parallel, ZVS, ZCS – Introduction to multilevel Inverters		
Unit-V	DRIVES AND CONTROL	(9)
Static and Dynamic equations of dc and ac machines – Electrical breaking – Rectifier and chopper control of DC drives – Principles of v/f control of AC drives – Open loop and Closed loop schemes for DC and AC drives(Block diagram approach only)– Introduction to vector control of AC drives..		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	Rashid, M.H., "Power Electronics – Circuits, Devices and Applications", PHI, 3rd Edition, 2004.
2	Mohan, Udeland and Robbins., "Power Electronics", John Wiley and Sons, New York, 1995.

REFERENCES:

1	Singh, M.D., and Khanchandani, K.B., "Power Electronics", 2nd Edition., Tata McGraw-Hill, 2011.
2	2. Bose, B.K., "Modern Power Electronics and AC Drives", Pearson Education, 2002.
3	Bimbira, P.S., "Power Electronics", Khanna Publishers, 2006.
4	Moorthi, V.R., "Power Electronics - Devices, Circuits and Industrial Applications", Oxford University Press, 2005
5	NPTTEL Lecture Series on "Power Electronics" by Dr.B.G.Fernandes, IIT Bombay.

COURSE OUTCOMES:

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

CO1:	Ability to explain various devices and their structure, operating characteristics in the field of electronics.
CO2:	Ability to classify, analyze and design, Control rectifiers and AC controllers
CO3:	Ability to classify, analyze and design, DC to DC convertors,
CO4:	Ability to classify, analyze and design, inverters
CO5:	Will have ability to apply power electronic circuits for the control of popular applications.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2405	ELECTRICAL ESTIMATION AND COSTING	3	0	0	3	100
Course Objectives	- Emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost availability. - Exposure to design and estimation of wiring, design of overhead and underground distribution lines, substations and illuminations design. - These techniques should help the students to successfully estimate costing of the products/projects that are part of our everyday usage. - A basic knowledge on methods and types of estimation and its merits and demerits. - To prepare the schedule of materials with specifications and estimates for different types of electrical installations.					

Unit-I	DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS	(9)
Electric Supply System, Three phase four wire distribution system, General requirements of Electrical Installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub- Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution Board		
Unit-II	ELECTRICAL INSTALLATION OF BUILDINGS AND SMALL INDUSTRIES	(9)
Electrical installations for residential buildings – estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.		
Unit-III	OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES	(9)
Introduction, Supports for Transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.		
Unit-IV	SUBSTATIONS:	(9)
Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substation, Floor mounted type.		
Unit-V	DESIGN OF ILLUMINATION SCHEMES:	(9)
Introduction, Terminology in Illumination, laws of illumination, various types of light sources, Practical lighting schemes		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	Electrical Design Estimating and Costing, K.B. Raina, S.K. Bhattacharya, New Age International Publisher
2	Design of Electrical Installations, Dr. V.K. Jain, Dr. Amitabh Bajaj, University Science Press.
3	Electricity pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P.E., CRC Press.

REFERENCES:

1	Guide for Electrical Layout in residential buildings, Indian Standard Institution, IS:4648- 1968
2	Electrical Installation buildings Indian Standard Institution, IS:2032

COURSE OUTCOMES:

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

CO1:	The estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost viability.
CO2:	Exposure to design and estimation of wiring,
CO3:	Design of overhead and underground distribution lines, substations and illuminations design.
CO4:	Understand types of substations and their ratings
CO5:	To design illumination systems.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy

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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
UEEOE2406	BASICS OF ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	L	T	P	C	100
		3	0	0	3	
Course Objectives	• To educate the fundamental concepts and characteristics of measurement and errors • To impart the knowledge on the functional aspects of measuring instruments • To infer the importance of various bridge circuits used with measuring instruments. • To educate the fundamental working of sensors and transducers and their applications • To summarize the overall measurement and instrumentation with the knowledge on digital instrumentation principles.					

Unit-I	CONCEPTS OF MEASUREMENTS	(9)
Instruments: classification, working and applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement -Statistical evaluation of measurement data.		
Unit-II	MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS	(9)
Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type watt meters – Energy meter – Megger – Instrument transformers (CT & PT).		
Unit-III	AC/DC BRIDGES AND INSTRUMENTATION AMPLIFIERS	(9)
Wheatstone bridge, Kelvin double bridge - Maxwell, Hay, Wien and Schering bridges – Errors and compensation in A.C. bridges - Instrumentation Amplifiers.		
Unit-IV	TRANSDUCERS FOR MEASUREMENT OF NON- ELECTRICAL PARAMETERS	(9)
Classification of transducers – Measurement of pressure, temperature, displacement, flow, angular velocity – Digital transducers – Smart Sensors.		
Unit-V	OTHER ENERGY SOURCES	(9)
A/D converters: types and characteristics – Sampling, Errors- Measurement of voltage, Current, frequency and phase - D/A converters: types and characteristics- DSO- Data Loggers – Basics of PLC programming and Introduction to Virtual Instrumentation - Instrument standards		
Total No of Periods to be Taught	45	


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TEXT BOOK:

1	A.K. Sawhney, PuneetSawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', DhanpatRai and Co, New Delhi, Edition 2011.
2	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010
3	Scott Grinnell, "Renewable Energy & Sustainable Design", CENGAGE Learning, USA, 2016.

REFERENCES:

1	M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India, New Delhi, 2009
2	J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India, New Delhi, 2011
3	W.Bolton, Programmable Logic Controllers, 6th Edition, Elsevier, 2015.
4	R.B. Northrop, 'Introduction to Instrumentation and Measurements', Taylor & Francis, New Delhi, 3rd Edition 2014.
5	E. O. Doebelin and D. N. Manik, "Measurement Systems – Application and Design", Tata McGraw-Hill, New Delhi, 6th Edition 2017.
6	R. K. Rajput, "Electrical and Electronics Measurements and Instrumentation", Chand Pub, 2016

COURSE OUTCOMES:

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

CO1:	Ability to understand the fundamental art of measurement in engineering.
CO2:	Ability to understand the structural elements of various instruments.
CO3:	Ability to understand the importance of bridge circuits.
CO4:	Ability to understand about various transducers and their characteristics by experiments.
CO5:	Ability to understand the concept of digital instrumentation and virtual instrumentation by log/antilog amplifier, analog multiplier /divider, active filters, comparators, waveform generators, A/D and D/A converters

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	-	3	2	-	2	-	-	3	3	3	3
CO2	3	2	3	2	-	-	-	-	-	3	3	3	3	3
CO3	3	2	3	-	3	2	-	-	-	-	3	3	3	3
CO4	3	2	3	-	-	-	-	2	-	-	-	3	3	3
CO5	3	2	3	2	3	-	-	-	-	3	3	3	3	3
Avg.	3	2	3	2	3	2	-	2	-	3	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy


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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2407	INTRODUCTION TO CONTROL ENGINEERING	3	0	0	3	100
Course Objectives	To introduce the control system components and transfer function model with their graphical representation To understand the analysis of system in time domain along with steady state error. To introduce frequency response analysis of systems To accord basic knowledge in design of compensators To introduce the state space models.					

Unit-I	MATHEMATICAL MODELLING	(9)
Introduction – transfer function – simple electrical, mechanical, ,pneumatic , hydraulic and thermal systems– analogies		
Unit-II	FEEDBACK CONTROL SYSTEMS	(9)
Control system components - Block diagram representation of control systems, Reduction of block diagrams, Signal flow graphs, Output to input ratios		
Unit-III	STABILITY ANALYSIS	(9)
Response of systems to different inputs viz., Step impulse, pulse, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit		
Unit-IV	STATE SPACE TECHNIQUE	(9)
Necessary and sufficient conditions, Routh-Hurwitz criteria of stability, Root locus and Bode techniques, Concept and construction frequency response.		
Unit-V	OTHER ENERGY SOURCES	(9)
State vectors–state space models-Digital Controllers–design aspects		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2017
2	Benjamin C. Kuo, "Automatic Control Systems", Wiley, 2014

REFERENCES:

1	Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
2	Richard C. Dorf and Bishop, R.H., "Modern Control Systems", Pearson Education, 2009
3	John J.D., Azzo Constantine, H. and Houpis Stuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor & Francis Reprint 2009.
4	Ramesh C. Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.
5	M. Gopal, "Control System: Principle and design", McGraw Hill Education, 2012.
6	NPTEL Video Lecture Notes on "Control Engineering" by Prof. S. D. Agashe, IIT Bombay.

COURSE OUTCOMES:

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

CO1:	To represent and develop systems in different forms using the knowledge gained
CO2:	To analyse the system in time and frequency domain
CO3:	Ability to Derive Transfer function Model of Electrical and Mechanical Systems.
CO4:	Ability to Obtain the transfer Function by the Reduction of Block diagram & Signal flow graph
CO5:	To analyse the stability of physical systems

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	2	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	2.8	3	3	2.8	2	2	1	-	-	-	3	3	3	3

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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2408	FUNDAMENTALS OF ELECTRICAL DRIVES AND CONTROL	3	0	0	3	100
Course Objectives	- To study the conventional and solid-state drives - To study the different methods of starting D.C motors and induction motors. - To understand the basic concepts of different types of electrical machines and their performance					

Unit-I	INTRODUCTION	(9)
Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors		
Unit-II	DRIVE MOTOR CHARACTERISTICS	(9)
Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.		
Unit-III	STARTING METHODS	(9)
Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors		
Unit-IV	CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C DRIVES	(9)
Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications.		
Unit-V	CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES	(9)
Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications..		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	VedamSubrahmaniam, "Electric Drives (Concepts and Applications", Tata McGraw-Hill, 2001
2	Nagrath .I.J. & Kothari .D.P, "Electrical Machines", Tata McGraw-Hill, 1998

REFERENCES:

1	Pillai.S.K "A First Course on Electric Drives", Wiley Eastern Limited, 1998
2	Singh. M.D., K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, 1998
3	Partab. H., "Art and Science and Utilisation of Electrical Energy", DhanpatRai and Sons, 1994.

COURSE OUTCOMES:

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

CO1:	Derive the heating and cooling curve and study the various classes of duty and Selection of power rating
CO2:	Understand the working principle of DC &AC motors and their characteristics and its braking methods
CO3:	Understand the Starting methods of DC &AC motors
CO4:	Understand the Concepts of speed control in DC motors
CO5:	Understand the Concepts of speed control in AC motors

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	-	3	2	2	-	-	-	3	3	3
CO2	3	2	3	2	-	-	-	-	3	-	3	3	3
CO3	3	2	3	-	3	2	-	-	-	-	3	3	3
CO4	3	2	3	-	-	-	2	-	-	-	-	3	3
CO5	3	2	3	2	3	-	-	-	3	-	3	3	3
Avg.	3	2	3	2	3	2	2	-	3	-	3	3	3

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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2409	ENERGY CONSERVATION AND MANAGEMENT	3	0	0	3	100
Course Objectives	- Understand and analyses the energy data of industries - Carryout energy accounting and balancing - Conduct energy audit and suggest methodologies for energy savings. - Utilize the available resources in optimal ways					

Unit-I	INTRODUCTION	(9)
Energy-Power-Past & Present scenario of World; National Energy consumption Data Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.		
Unit-II	ELECTRICAL SYSTEMS	(9)
Power system structure, Electrical tariff and types- Illumination–Lux, Lumens, law of illumination -Types of lighting, LED Lighting and. Energy Efficient Lighting.		
Unit-III	THERMAL SYSTEMS	(9)
Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters–Efficiency computation and encon measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators& Refractories		
Unit-IV	ENERGY CONSERVATION IN MAJOR UTILITIES	(9)
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems –Cooling Towers – D.G. sets.		
Unit-V	ECONOMICS	(9)
Energy Economics–Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing–ESCO concept		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004. Power, Government of India, 2004
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REFERENCES:

1	Witte.L.C.,P.S.Schmidt,D.R.Brown,“IndustrialEnergyManagementandUtilisation” Hemisphere Publ, Washington, 1988.
2	Callaghn,P.W.“Design and Management for Energy Conservation”,Pergamon Press, Oxford, 1981.
3	Dryden.I.G.C.,“TheEfficientUseofEnergy”Butterworths,London,1982
4	Turner.W.C.,“EnergyManagementHandbook”,Wiley,NewYork,1982.
5	Murphy. W.R.andG.McKAY,“EnergyManagement”,Butterworths,London1987

COURSE OUTCOMES:

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

CO1:	Remember the knowledge for Basic combustion and furnace design and selection of thermal and mechanical energy equipment.
CO2:	Study the Importance of Stoichiometry relations, Theoretical air required for complete combustion.
CO3:	Skills on combustion thermodynamics and kinetics.
CO4:	Apply calculation and design tube still heaters.
CO5:	Studied different heat treatment furnace.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	2	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2	2	2	1	-	-	-	3	3	3	3

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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2410	AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING	3	0	0	3	100
Course Objectives	The objective of this course is to prepare the students to become familiar with the basic concepts and applications of different sensor and actuators used for electronic control, different communication protocols and networking in vehicles					

Unit-I	INTRODUCTION AND AUTOMOTIVE BATTERIES	(9)
Introduction Overview of vehicle electrical systems Electrical circuits Electrical power supply in conventional vehicle Dimensioning of wires Circuit diagrams and symbols. Batteries – Battery design – Method of operation – Lead acid battery construction – Battery ratings and testing Maintenance free batteries – Battery		
Unit-II	STARTING AND CHARGING SYSTEM	(9)
Starter Motors – Development and Starting requirements in the IC engines starter motor design – Starter motor design variations – starter motor control and power circuits		
Unit-III	IGNITION, LIGHTING AND AUXILLARY SYSTEM	(9)
Ignitions System Ignition fundamentals Electronic ignition Programmed ignition Distributor less ignition Direct ignition Spark plugs. Automotive lighting Technology –Technical demands Development of lighting technology Light sources – physical principles – Front and rear lighting system Interior lighting system – Special purpose lamps – Adaptive Lighting system Instrument clusters Wiper and Washer systems electric horns		
Unit-IV	AUTOMOTIVE ELECTRONICS AND SENSORS AND ACTUATORS	(9)
Automotive Electronics overview and Basic principles of semiconductor technology Electronic Components semiconductor components. Automotive Sensors – Basic Sensors : Position, speed, Force/Torque, Flow meters, Automotive Actuators Electromechanical actuators Fluid mechanical actuators		
Unit-V	VEHICLE NETWORKING	(9)
Data transfer between automotive Electronics systems Basic principles of networking- Network topology- Network organization OSI reference model Control mechanisms communication protocols in embedded systems Vehicle Communication Protocols		
Total No of Periods to be Taught	45	


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TEXT BOOK:

1	Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, 5th Edition, 2007, ISBN No: 978- 3- 658- 01783- 5
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REFERENCES:

1	Barry Hole beak, "Automotive Electrical and Electronics" , Delmar Publishers, Clifton Park,USA,2010
2	James D Halderman, "Automotive Electrical and Electronics", Prentice Hall, USA, 2013
3	Tom Denton, "Automotive Electrical and Electronics Systems," Third Edition, 2004, SAE International
4	William Ribbens, "Understanding Automotive Electronics - An Engineering Perspective," 7th Edition, Elsevier Butterworth- Heinemann Publishers, 2012.

COURSE OUTCOMES:

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

CO1:	Define the glossary related to vehicle electrical and electronic system
CO2:	Explain the need for starter batteries, starter motor and alternator in the vehicle.
CO3:	Differentiate the conventional and modern vehicle architecture and the data transfer among the different electronic control unit using different communication protocols
CO4:	List common types of sensor and actuators used in vehicles
CO5:	Understand networking in vehicles.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	2	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	2.8	3	3	2.8	2	2	1	-	-	-	3	3	3	3
1 – Slight, 2 – Moderate, 3 – Substantial , BT – Bloom's Taxonomy														


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Department	EEE	Programme Code & Name	Open to All Departments
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Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
UEEOE2411	INTRODUCTION TO EMBEDDED SYSTEMS	3	0	0	3	100
Course Objectives	To familiarize students with the fundamental concepts of embedded systems, including their architecture, hardware, and software components, and to provide experience in designing and implementing simple embedded systems					

Unit-I	BASICS OF COMPUTER ARCHITECTURE AND THE BINARY NUMBER SYSTEM	(9)
Basics of computer architecture, computer languages, RISC and CISC architectures, number systems, number format conversions, computer arithmetic, units of memory capacity.		
Unit-II	INTRODUCTION TO EMBEDDED SYSTEMS	(9)
Application domain of embedded systems, desirable features and general characteristics of embedded systems, model of an embedded system, microprocessor Vs microcontroller, example of a simple embedded system, merit for an embedded system, classification of MCUs: 4/8/16/32 bits, history of embedded systems		
Unit-III	EMBEDDED SYSTEMS-THE HARDWARE POINT OF VIEW	(9)
Microcontroller unit(MCU), a popular 8-bit MCU, memory for embedded systems, low power design, pull up and pull down resistors		
Unit-IV	SENSORS, ADCs AND ACTUATORS	(9)
Sensors: Temperature Sensor, Light Sensor, Proximity/range Sensor; Analog to digital converters: ADC Interfacing; Actuators Displays, Motors, Opto couplers / Opto isolators, relays.		
Unit-V	EXAMPLES OF EMBEDDED SYSTEMS	(9)
Mobile phone, automotive electronics, radio frequency identification (RFID), wireless sensor networks(WISENET), robotics, biomedical applications, brain machine interface		
Total No of Periods to be Taught		45


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TEXT BOOK:

1	Lyla B Das, Embedded systems: An Integrated Approach, 1st Ed., Pearson, 2013
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REFERENCES:

1	Shibu, K.V., Introduction to Embedded Systems, 1st Ed., TMH, 2009
2	KantaRao B, Embedded Systems, 1st Ed., PHI
3	Frank Vahid & Tony Givargis, Embedded System Design, 2nd Edition, John Wiley,

COURSE OUTCOMES:

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

CO1:	learn about the general principles of computer architecture
CO2:	learn about the working of a simple embedded system and embedded system applications
CO3:	learn the hardware aspects of embedded systems
CO4:	Understand the sensors, ADCs and actuators used in embedded systems
CO5:	Understand the real world examples of embedded systems

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	-	3	2	2	-	-	-	3	3	3
CO2	3	2	3	2	-	-	-	-	3	-	3	3	3
CO3	3	2	3	-	3	2	-	-	-	-	3	3	3
CO4	3	2	3	-	-	-	2	-	-	-	-	3	3
CO5	3	2	3	2	3	-	-	-	3	-	3	3	3
Avg.	3	2	3	2	3	2	2	-	3	-	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy

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Department		AGRI		Programme Code & Name				Open to All Departments	
Course Code	Course Name			Hours/Week		Credit	Maximum Marks		
UAIOE2401	INTRODUCTION TO FOOD PROCESSING			L	T	P	C	100	
				3	0	0	3		
Course Objectives									
The course aims to introduce the students to the area of Food Processing. This is necessary for effective understanding of a detailed study of food processing and technology subjects. This course will enable students to appreciate the importance of food processing with respect to the producer, manufacturer and consumer.									
UNIT I		PROCESSING OF FOOD AND ITS IMPORTANCE						9	
Source of food - plant, animal and microbial origin; different foods and groups of foods as raw materials for processing – cereals, pulses, grains, vegetables and fruits, milk and animal foods, sea weeds, algae, oil seeds & fats, sugars, tea, coffee, cocoa, spices and condiments, additives; need and significance of processing these foods.									
UNIT II		METHODS OF FOOD HANDLING AND STORAGE						9	
Nature of harvested crop, plant and animal; storage of raw materials and products using low temperature, refrigerated gas storage of foods, gas packed refrigerated foods, sub atmospheric storage, Gas atmospheric storage of meat, grains, seeds and flour, roots and tubers; freezing of raw and processed foods.									
UNIT III		LARGE-SCALE FOOD PROCESSING						9	
Milling of grains and pulses; edible oil extraction; Pasteurization of milk and yoghurt; canning and bottling of foods; drying – Traditional and modern methods of drying, Dehydration of fruits, vegetables, milk, animal products etc; preservation by use of acid, sugar and salt; Pickling and curing with microorganisms, use of salt, and microbial fermentation; frying, baking, extrusion cooking, snack foods.									
UNIT IV		FOOD WASTES IN VARIOUS PROCESSES						9	
Waste disposal-solid and liquid waste; rodent and insect control; use of pesticides; ETP; selecting and installing necessary equipment.									
UNIT V		FOOD HYGIENE						9	
Food related hazards – Biological hazards – physical hazards – microbiological considerations in foods. Food adulteration – definition, common food adulterants, contamination with toxic metals, pesticides and insecticides; Safety in food procurement, storage handling and preparation; Relationship of microbes to sanitation, Public health hazards due to contaminated water and food; Personnel hygiene; Training& Education for safe methods of handling and processing food; sterilization and disinfection of manufacturing plant; use of sanitizers, detergents, heat, chemicals, Cleaning of equipment and premises.									
Total								45 Periods	



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TEXT BOOK:

1 Karnal, Marcus and D.B. Lund “Physical Principles of Food Preservation”. Rutledge, 2003.

REFERENCES:

1 VanGarde, S.J. and Woodburn. M “Food Preservation and Safety Principles and Practice”.Surbhi Publications, 2001.

2 Sivasankar, B. “Food Processing & Preservation”, Prentice Hall of India, 2002.

3 Khetarpaul, Neelam, “Food Processing and Preservation”, Daya Publications, 2005.

COURSE OUTCOMES:

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

CO1: Be aware of the different methods applied to processing foods.

CO2: Be able to understand the significance of food processing and the role of food and beverage industries in the supply of foods.

CO3: Describe about large-scale food processing methods.

CO4: Distinguish Food Wastes in Various Processes techniques.

CO5: Understand the concepts of Food process methods, Storage techniques, food handling methods, reduces food waste and food hygiene process.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom’s Taxonomy



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Department		AGRI		Programme Code & Name				Open to All Departments	
Course Code	Course Name			Hours/Week		Credit	Maximum Marks		
UAIOE2402	TRADITIONAL INDIAN FOODS	L	T	P	C	100			
		3	0	0	3				
Course Objectives									
To help students acquire a sound knowledge on diversities of foods, food habits and patterns in India with focus on traditional foods.									
UNIT – I		HISTORICAL AND CULTURAL PERSPECTIVES						9	
Food production and accessibility - subsistence foraging, horticulture, agriculture and pastoralization, origin of agriculture, earliest crops grown. Food as source of physical sustenance, food as religious and cultural symbols; importance of food in understanding human culture - variability, diversity, from basic ingredients to food preparation; impact of customs and traditionson food habits, heterogeneity within cultures (social groups) and specific social contexts - festive occasions, specific religious festivals, mourning etc. Kosher, Halal foods; foods for religious and other fasts.									
UNIT II		TRADITIONAL METHODS OF FOOD PROCESSING						9	
Traditional methods of milling grains –rice, wheat and corn –equipments and processes as compared to modern methods. Equipments and processes for edible oil extraction, paneer, butter and ghee manufacture – comparison of traditional and modern methods. Energy costs, efficiency, yield,nshelf life and nutrient content comparisons. Traditional methods of food preservation – sun drying, osmotic drying, brining, pickling and smoking.									
UNIT III		TRADITIONAL FOOD PATTERNS						9	
Typical breakfast, meal and snack foods of different regions of India. Regional foods that have gone Pan Indian / Global. Popular regional foods; Traditional fermented foods, pickles and preserves,beverages, snacks, desserts and sweets, street foods; IPR issues in traditional foods									
UNIT IV		COMMERCIAL PRODUCTION OF TRADITIONAL FOODS						9	
Commercial production of traditional breads, snacks, ready-to-eat foods and instant mixes, frozen foods – types marketed, turnover; role of SHGs, SMES industries, national and multinational companies; commercial production and packaging of traditional beverages such as tender coconut water, neera, lassi, butter milk, dahi. Commercial production of intermediate foods –ginger and garlic pastes, tamarind pastes, masalas (spicemixes), idli and dosa batters.									
UNIT V		HEALTH ASPECTS OF TRADIONAL FOODS						9	
Comparison of traditional foods with typical fast foods / junk foods – cost, food safety, nutrient composition, bioactive components; energy and environmental cost soft raditional foods; traditional foods used for specific ailments /illnesses.									
Total								45 Periods	



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TEXT BOOK:

1	Sen, Colleen Taylor“ Food Culture in India” Green wood Press, 2005.
2	Davidar, Ruth N.“Indian Food Science: A Health and Nutrition Guide to Traditional Recipes: East West Books, 2001

COURSE OUTCOMES:

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

CO1:	Provide a comprehensive understanding of the origins, evolution, and regional diversity of Indian cuisine.
CO2:	Highlight the traditional ingredients, cooking methods, and food preparation techniques used across various parts of India.
CO3:	Explore the cultural, religious, and seasonal influences on traditional Indian dietary practices.
CO4:	Analyze the nutritional and therapeutic value of traditional Indian foods and their relevance in modern diets.
CO5:	Introduce traditional food preservation methods like fermentation, pickling, drying, and smoking.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2	PSO 3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

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Department		AGRI		Programme Code & Name				Open to All Departments	
Course Code	Course Name			Hours/Week		Credit		Maximum Marks	
UAIOE2403	FUNDAMENTALS OF FOOD ENGINEERING			L	T	P	C	100	
				3	0	0	3		
Course Objectives									
- Acquaint and equip the students with different techniques of measurement of engineering properties. - Make the students understand the nature of food constituents in the design of processing equipment									
UNIT – I		ENGINEERING PROPERTIES OF FOOD MATERIALS							9
Engineering properties of food materials: physical, thermal, aerodynamic, mechanical, optical and electromagnetic properties.									
UNIT II		DRYING AND DEHYDRATION IN FOOD PROCESSING							9
Drying and dehydration: Basic drying theory, heat and mass transfer in drying, drying rate curves, calculation of drying times, dryer efficiencies; classification and selection of dryers; tray, vacuum, osmotic, fluidized bed, pneumatic, rotary, tunnel, trough, bin, belt, microwave, IR, heat pump and freeze dryers; dryers for liquid: Drum or roller dryer, spray dryer and foammat dryers.									
UNIT III		SIZE REDUCTION IN FOOD PROCESSING: PRINCIPLES, BENEFITS, ANALYSIS & EQUIPMENT							9
Size reduction: Benefits, classification, determination and designation of the fineness of ground material, sieve/screen analysis, principle and mechanisms of comminution of food, Rittinger’s, Kick’s and Bond’s equations, work index, energy utilization; Size reduction equipment: Principal types, crushers (jaw crushers, gyratory, smooth roll), hammer mills and impactors, attrition mills, buhr mill, tumbling mills, tumbling mills, ultra fine grinders, fluid jet pulverizer, colloid mill, cutting machines (slicing, dicing, shredding, pulping).									
UNIT IV		MIXING IN FOOD AND CHEMICAL PROCESSING							9
Mixing: theory of solids mixing, criteria of mixer effectiveness and mixing indices, rate of mixing, theory of liquid mixing, power requirement for liquids mixing; Mixing equipment: Mixers for low- or medium-viscosity liquids (paddle agitators, impeller agitators, powder- liquid contacting devices, other mixers), mixers for high viscosity liquids and pastes, mixers for dry powders and particulate solids.									
UNIT V		DOMESTIC UTILIZATION OF ELECTRICAL ENERGY							9
Mechanical Separations: Theory, centrifugation, liquid-liquid centrifugation, liquid-solid centrifugation, clarifiers, desludging and decanting machine, Filtration: Theory of filtration, rate of filtration, pressure drop during filtration, applications, constant-rate filtration and constant-pressure filtration, derivation of equation; Filtration equipment; plate and frame filter press, rotary filters, centrifugal filters and air filters, filter aids, Membrane separation : General considerations, materials for membrane construction, ultra-filtration, microfiltration, concentration, polarization, processing variables, membrane fouling, applications of ultra-filtration in food processing, reverse osmosis, mode of operation, and applications; Membrane separation methods, demineralization by electro-dialysis, gel filtration, ion exchange, per-evaporation and osmotic dehydration.									
Total								45 Periods	



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TEXT BOOK:

1	R.L. Earle. 2004. Unit Operations in Food Processing. The New Zealand Institute of Food Science & Technology, Nz. Warren L. McCabe, Julian Smith, Peter Harriott. 2004.
2	Unit Operations of Chemical Engineering, 7 th Ed. McGraw-Hill, Inc., NY, USA. Christie John Geankoplis. 2003.
	Transport Processes and Separation Process Principles (Includes Unit Operations), 4th Ed. Prentice-Hall, NY, USA.

COURSE OUTCOMES:

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

CO1:	To understand the importance of food polymers
CO2:	To understand the effect of various methods of processing on the structure and texture of food materials
CO3:	To evaluate domestic wiring connection and debug any faults occurred.
CO4:	To understand the interaction of food constituents with respect to thermal, electrical properties to develop new technologies for processing and preservation.
CO5:	Promote awareness of the role of food engineering in ensuring food quality, safety, and sustainability.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

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Department		AGRI		Programme Code & Name				Open to All Departments	
Course Code	Course Name			Hours/Week		Credit	Maximum Marks		
UAIOE2404	REMOTE SENSING CONCEPTS			L	T	P	C	100	
				3	0	0	3		
Course Objectives									
- To introduce the concepts of remote sensing processes and its components. - To expose the various remote sensing platforms and sensors and to introduce the elements of data interpretation									
UNIT – I		REMOTE SENSING AND ELECTROMAGNETIC RADIATION						9	
Definition–components of RS – History of Remote Sensing –Merits and demerits of data collation between conventional and remote sensing methods Electromagnetic Spectrum– Radiation principles - Wave theory, Planck’s law, Wien’s Displacement Law, Stefan’s Boltzmann law, Kirchoff’s law – Radiation sources : active & passive - Radiation Quantities.									
UNIT II		EMRINTERACTION WITH ATMOSPHERE AND EARTH MATERIAL						9	
Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere – Scattering, absorption and refraction – Atmospheric windows - Energy balance equation – Specular and diffuse reflectors – Spectral reflectance & emittance – Spectro radio meter–Spectral Signature concepts –Typical spectral reflectance curves for vegetation, soil and water – solid surface scattering in microwave region.									
UNIT III		ORBITS AND PLATFORMS						9	
Motions of planets and satellites – Newton’s law of gravitation - Gravitational field and potential - Escape velocity - Kepler ‘s law of planetary motion - Orbit elements and types – Orbital per turbations and maneuvers–Types of remote sensing platforms- Ground based, Airborne platforms and Space borne platforms –Classification of satellites –Sun synchronous and Geosynchronous satellites – Lagrange Orbit.									
UNIT IV		SENSING TECHNIQUES						9	
Classification of remote sensors – Resolution concept : spatial, spectral, radiometric and temporal resolutions - Scanners - Along and across track scanners – Optical-infrared sensors – Thermal sensors – microwave sensors – Calibration of sensors - High Resolution Sensors - LIDAR , UAV – Orbital and sensor characteristics of live Indian earth observation satellites									
UNIT V		DATA PRODUCTS AND INTERPRETATION						9	
Photographic and digital products –Types, levels and open source satellite data products – selection and procurement of data– Visual interpretation: basic elements and interpretation keys - Digital interpretation – Concepts of Image rectification, Image enhancement and Image classification									
Total								45 Periods	



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TEXT BOOK:

1	Thomas M. Lilles and, Ralph W. Kiefer and Jonathan W. Chipman, Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York,2015.
2	George Joseph and C Jeganathan, Fundamentals of Remote Sensing, Third Edition Universities Press (India) Private limited, Hyderabad, 2018

COURSE OUTCOMES:

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

CO1:	Understand the concepts and laws related to remote sensing
CO2:	Understand the interaction of electromagnetic radiation with atmosphere and earth material.
CO3:	Acquire knowledge about satellite or bits and different types of satellites.
CO4:	Understand the different types of remote sensors.
CO5:	Gain knowledge about the concepts of interpretation of satellite imagery

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

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Department		AGRI		Programme Code & Name				Open to All Departments	
Course Code	Course Name			Hours/Week		Credit	Maximum Marks		
UAIOE2405	BASICS OF INTEGRATED WATER RESOURCES MANAGEMENT			L	T	P	C	100	
				3	0	0	3		
Course Objectives									
- To introduce the inter disciplinary approach of water management. - To develop knowledge base and capacity building on IWRM.									
UNIT – I		OVER VIEW OF INTEGRATED WATER RESOURCES MANAGEMENT						9	
Facts about water – Definition – Key challenges – Paradigm shift – Water management Principles – Social equity – Ecological sustainability – Economic efficiency - SDGs- World Water Forums.									
UNIT II		WATER USE SECTORS : IMPACTS AND SOLUTION						9	
Water users : People, Agriculture, ecosystem and others - Impacts of the water use sectors on water resources -Securing water for people, food production, ecosystems and other uses - IWRM relevance in water resources management.									
UNIT III		WATER ECONOMICS						9	
Economic characteristics of water good and services –Economic instruments –Private sector involvement in water resources management - PPP experiences through case studies.									
UNIT IV		RECENTRE AND SIN WATER MANAGEMENT						9	
Riverbasin management - Ecosystem Regeneration –5 Rs - WASH – Sustainable livelihood – Water management in the context of climate change.									
UNIT V		IMPLEMENTATION OF IWRM						9	
Barriers to implementing IWRM - Policy and legal framework - Bureaucratic reforms and inclusive development - Institutional Transformation - Capacity building - Case studies on conceptual framework of IWRM.									
Total								45 Periods	

TEXT BOOK:

1	Cech Thomas V., Principles of water resources: history, development, management and policy. John Wiley and Sons Inc., New York. 2003.
2	Mollinga P. <i>et al.</i> “Integrated Water Resources Management”, Water in South Asia Volume I, Sage Publications, 2006.

REFERENCES:

1	Technical Advisory Committee, Background Papers No:1, 4 and 7, Stockholm, Sweden.2002.
2	IWRM Guidelines at River Basin Level (UNESCO, 2008).

COURSE OUTCOMES:

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

CO1:	Describe the context and principles of IWRM; Compare the conventional and integrated ways of water management.
CO2:	Discuss on the different water uses; how it is impacted and ways to tackle the seimpacts.



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CO3:	Explain the economic aspects of water and choose the best economic option among the alternatives; illustrate the pros and cons of PPP through case studies.
CO4:	Illustrate the recent trend in water management.
CO5:	Understand the implementation hitches and the institutional framework.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	-	-	3	3	3	3
CO2	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO3	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO4	3	3	3	3	2	2	1	-	-	-	3	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	3	3	3	3
Avg.	3	3	3	2.8	2	2	1	-	-	-	3	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT – Bloom's Taxonomy