आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

BACHELOR OF TECHNOLOGY
AGRICULTURAL ENGINEERING

[*w.e.f.* ACADEMIC SESSION 2021 – 22]

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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

CBCS Based Course Structure and Syllabi

of

Bachelor of Technology

Agricultural Engineering

[*w.e.f.* Academic Session 2021 – 22]

(As per CBCS guidelines given by UGC)

Summary

Programme	**: Bachelor of Technology Agricultural Engineering**
Programme Level	**: Degree (Under Graduation)**
Duration	**: Four Years (Eight semesters) Full time**
Medium of Instruction	**: English**
Minimum Required Attendance	**: 75%**
Maximum Credits	**: 241**

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Study & Evaluation Scheme

of

Bachelor of Technology

Agricultural Engineering

(IV Year Program)

Choice Based Credit System (CBCS)

(Applicable w.e.f Academic Session 2021-22)

Summary

Programme	Bachelor of Technology in Agricultural Engineering
Course Level	Degree (Under Graduation)
Duration	Four Years (Eight semesters) Full Time
Medium of Instructions	English
Minimum Required Attendance	75%
Maximum Credits	241

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Bachelor of Technology (Agricultural Engineering)

Preamble

Education is the first step for people to gain the knowledge, critical thinking, empowerment and skills that make the world a better place to live. Agricultural Engineering has the potential to combine the knowledge of basic Agricultural Engineering of the natural diversity and innovative technologies to create or evolve novel processes or novel products beneficial for human welfare. The need for qualified human resource for various Agricultural technology based industries is the driving force to design and implement B. Tech. program in Agricultural.

A sound knowledge of Agricultural is thought to play an important role in the upcoming years to encourage the modern Agricultural driven development efforts.

Generating trained human resource to work closely with the farmers in farm mechanization, soil conservation and water management, post-harvest technology, processing, new and renewable energy resources apart from developing of web based automation technologies for smart agriculture. The **School of Agricultural Sciences & Engineering, IFTM University** offers the B. Tech Agricultural Engineering course with an outcome based curriculum emphasizing the Critical, Analytical and Problem Solving skills to equip the students to pursue their academic, scientific and research career with better preparedness and matured professional outlook. The presence of other allied Faculties of the University provides additional exposure to students, the multidisciplinary approach which is emerging as a key differentiator in the success of modern quality education in the field of Agricultural engineering and to create trained Agriculturalist

Program Objectives: The program aims to achieve the following objectives:

- To develop strong student competencies in Agricultural Engineering and its applications in a technology-rich, interactive environment.
- To develop strong student skill in research, analysis and interpretation of problems and information relevant to modern Agricultural.
- To prepare the students to successfully compete for employment in agricultural technology based research and development sectors, industrial sectors and teaching, and

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to offer a wide range of experience in research methods. Data analysis to meet the industrial needs.

- Understand the role of agricultural Engineering in society and has the background to consider ethical problems.

Programme Outcomes (POs):`

Students completing this programme will be able to:

1. Apply the Knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Design solutions for complex engineering problems and design system components or process, and engineering sciences.
3. Design solutions for complex engineering problems and design 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
4. Analytical and critical thinking abilities for data- based decision making.
5. Ability to develop value based leadership ability.
6. Determine the entrepreneurial.
7. 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.
8. 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
9. Ability to understand, analyze and communicate global, economic, legal ethical aspects of Technology.
10. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

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Programme Specific Outcomes (PSOs):

PSO-1: Students will be able to take the role to serve the society by way of providing need-based solutions in the farm sector.

PSO-2: Students will be able to do smooth functions with high standards in private, public and government sectors with high competence.

PSO-3: Students will have ethical know-how and good communication skills and they will have enriched their knowledge and will be prepared for the public service commission examination.

PSO-4: Student will be able to draft and design advanced tools, implements and methods for sustainable agricultural production and service.

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Evaluation of Performance

1. **Programme:** Evaluation of performance of the students in a programme shall be a continuous process based on their performance in the class test, quizzes, assignments and the end semester examinations.

a.Theory papers in semester system (Maximum Marks: 100)

The evaluation will be done through two class test and one end semester examination. This will be in addition to quizzes, assignments, attendance, etc. Each class test will carry a weightage of 10 marks, and the end semester examination will carry a weightage of 70 marks. The remaining 10 marks will be awarded on the basis of attendance and performance in quizzes and assignments.

b. Practical in semester system (Maximum Marks: 100)

In each practical, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and understanding of the experiment done, which will carry a weightage of 30 marks. There shall be an end semester practical examination with or without an external examiner which will carry a weightage of 70 marks.

2. **Project, Dissertation, Colloquium etc.:** Project, Seminar, Dissertation, and other learning-oriented activities shall have associated maximum marks and credits, as stated in the syllabus.

3. **Examination:**

a. The minimum Grade required to pass in each Theory & Practical paper is 'GRADE D'.

b. A candidate, in order to pass, minimum CGPA of 4.50 is required in a particular academic year inclusive of both semesters of that academic and maximum number of carryover paper permissible for promotion to next academic year are 06 theory/ practical / project papers.

c. There shall be no minimum Grade required to pass in General Proficiency (GP). However, Grade obtained in General Proficiency (GP) shall be included in SGPA.

d. In case of audit paper, the minimum Grade required to pass is Grade D. However, the Grade obtained in audit paper shall not be included in SGPA.

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Groups of CBCS:

07 Groups of courses have been identified to provide students comprehensive exposure to a large number of areas, leading to the holistic development of an individual. These groups / clusters are as follows:

1. Humanities, Management courses, Language and literature (HML)
2. Elementary / Fundamental Science courses (FSC)
3. Engineering Core courses (ECC)
4. Engineering Laboratory Courses (ELC)
5. Engineering Departmental Elective(EDE)
6. MOOCs/NPTEL/Mandatory Courses/Value added Courses (VAC)
7. Project/Dissertation/Seminar/Industrial training/General proficiency (PDT)

1. Humanities, Management courses, Language and literature (HML): These courses are actually Ability Enhancement Course (AEC) which is designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. These courses are of 4 credits each.

2. Elementary / Fundamental Sciences courses (FSC): These courses include science courses from the disciplines of Physics Chemistry and Mathematics department, crafted for engineering students. These courses are of 4 credits each.

3. Engineering Core courses (ECC): Core courses of B. Tech. Program will provide a holistic approach to engineering education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.
The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding. Develop decision-making ability and contribute to the society at large. A wide range of core courses provides groundwork in the field of thermo-fluids, engineering. Designs, industrial and production engineering etc. We offer core courses in semester III, IV, V, VI, VII &VIII during the B. Tech. Agricultural Engineering program. There will be 3 or 4 credits for each core course offered depending upon the course content.

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4. Engineering Laboratory Courses (ELC): These courses includes various laboratories of Engineering designed to provide the student solid foundation to the domain of engineering. These courses are of 1 credit each.

5. Engineering Departmental Elective (EDE): The departmental elective course is chosen to make students specialist or having specialized knowledge of a specific domain like thermo-fluids, designing, industrial, production management etc. The student will have to choose any one out of the given list of specialization offered. These courses are of 4 credits each.

6. MOOCs/NPTEL/Mandatory Course/Value added courses (VAC): A Value-Added Course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability-required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day to day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and general reasoning ability for a better performance, as desired in corporate world.

This is recommended for every student to take at least one MOOC Course throughout the programme. Every student completing a MOOC course through only NPTEL

7. Project/Seminar/Industrial training/General proficiency (PST):

1. Project with a department faculty.

2. The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other than their regular classes.

3. Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance student's exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

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Summary of Credits

B. Tech Agricultural Engineering: Four-Year (8-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S.No.	**Type of Course**	**Credit**	**Total Credits**
1.	Humanities, Management courses, Language and Literature (HML)	4 Courses of 4 Credits each (Total Credit 4×4) 1 Course of 3 Credits (Total Credit 1×3)	19
2.	Elementary/Fundamental Science Courses (FSC)	22 Courses of 4 Credits each (Total Credit 20×3)	88
3.	Engineering Science Courses (ECC)	20 Courses of 3 Credits each (Total Credit 20×3)	60
4.	Engineering laboratory Courses (ELC)	30 Courses of 1 Credits each (Total Credit 30×1)	30
5.	Engineering Departmental Elective (EDE)/Engineering Open Elective (EOE)	3 Courses of 4 Credits each (Total Credit 3×3) 1 Course of 4 Credits each (Total Credit 1×4)	13
6.	MOOCs/NPTEL/SWAYAM/Value added courses/*Mandatory Courses (VAC)	1 Course of 4 Credits each (Total Credit 1×4) 2 Course of 0 Credits each (Total Credit 2×0) 1 Course of 3 Credits each (Total Credit 1×3)	7
7.	Project/ Seminar/Summer or Industrial Training (PST)/ General Proficiency	14 Courses of 1 Credits each (Total Credit 14×1) 1Courses of 10 Credits (Total Credit 1×10)	24
Total Credits **241**			

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School of Agricultural Engineering
CBCS Programme
Effective from Session 2021-2022

Course Code	CBCS BASKET	Credits			
Humanities, Management courses, Language and Literature		**L**	**T**	**P**	**C**
TPSD-101/ PSD-201	Professional Skill Development-I	3	1	0	4
TEAG802	Industrial Management	3	0	0	3
TEAG803	Entrepreneurship Development and Business Management	3	0	0	3
TEHU-501	Human Values & Professional Ethics	3	1	0	4
TEHU-801	Industrial Management	3	1	0	4
TPSD301	Professional Skill Development -II	3	1	0	4
Elementary/Fundamental Sciences Courses (FSC)					
TEMA-102/TEMA-202	Elementary Mathematics-I/ Elementary Mathematics-II	3	1	0	4
TEPH-101	Engineering Physics-I	3	1	0	4
TECH-101/201	Engineering Chemistry	3	1	0	4
TEEE-101/TEEE-201	Electrical Engineering	3	1	0	4
TEEC-101/ TEEC-201	Electronics Engineering	3	1	0	4
TECS-101/ TECS-201	Computer Fundamentals & Programming	3	1	0	4
TEME-101/TEME-201	Engineering Mechanics	3	1	0	4
TEME-102/ TEME-202	Materials & Manufacturing	3	1	0	4
TEPH-201	Engineering Physics-II	3	1	0	4
EMA-303	Analytical Mathematics	3	1	0	4
EBT-107T /EBT-209T	Elementary Biology-I /Elementary Biology-II	3	1	0	4

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TEAG302	Principle of Soil Science, Agronomy and Horticulture Crops	3	1	0	4
TEME308	Fluid Mechanics and Open Channel Hydraulics	3	1	0	4
TECE306	Surveying practices	3	1	0	4
TEME306	Heat & Mass Transfer	3	1	0	4
EMA303	Analytical Mathematics	3	1	0	4
TEEE306	Electrical Machines & Power Utilization	3	1	0	4
TEME405	Strength of Materials	3	1	0	4
TEME406	Thermal Engineering	3	1	0	4
TEEC408	Basic Electronics and Instrumentation	3	1	0	4
TEME407	Theory of Machines	3	1	0	4
TEME506	Machine Design	3	1	0	4
Agricultural Engineering Core Courses (ECC)					
Farm Machinery & Power Engineering					
TEAG404	Farm Machinery Equipments -I	3	0	0	3
TEAG506	Tractor System & Control	3	0	0	3
TEAG508	Tractor and Automotive Engines	3	0	0	3
TEAG510	Bio-Energy systems: Design and Applications	3	0	0	3
TEAG610	Farm Machinery and Equipments-II	3	0	0	3
TEAG713	Renewable Energy Sources and Management	3	0	0	3
TEAG806	Agri-Informatics	3	0	0	3
Soil & Water Conservation Engineering					
TEAG-405	Soil Mechanics	3	0	0	3
TEAG507	Soil & Water Conservation Engineering	3	0	0	3
TEAG607	Irrigation & Drainage Engineering	3	0	0	3
TEAG509	Watershed Hydrology, Planning and Management	3	0	0	3
TEAG608	Ground Water, Well & Pumps	3	0	0	3
TEAG709	Water Harvesting and Soil Conservation Structures	3	0	0	3
TEAG711	Sprinkler and Micro Irrigation Systems	3	0	0	3
TEAG804	Fundamentals of Remote Sensing & GIS Applications	3	0	0	3
Process & Food Engineering					
TEAG-406	Dairy & Food Engineering	3	0	0	3
TEAG611	Engineering Properties of Agricultural Produce	3	0	0	3

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TEAG708	Post Harvest Engineering of Cereals, Pulses and Oil Seeds	3	0	0	3
TEAG609	Post Harvest Engineering of Horticultural crops	3	0	0	3
TEAG710	Agricultural Structures & Environmental Control	3	0	0	3
Engineering Laboratory Courses (ELC)		**L**	**T**	**P**	**C**
TECH-151/ TECH-251	Engineering Chemistry Lab	0	0	2	1
TEEC-151	Electronics Engineering Lab	0	0	2	1
TECS-151	Computer Lab	0	0	2	1
TEME-151	Mechanical Engineering Lab	0	0	2	1
TEPH-151/TEPH-251	Physics Lab	0	0	2	1
TEEE-151/TEEE-251	Electrical Engineering Lab	0	0	2	1
TEME-253	Engineering Graphics Lab	0	0	2	1
TEME-152/ TEME-252	Materials & Manufacturing Lab	0	0	2	1
TEAG352	Soil Science, Agronomy and Horticulture Lab	0	0	2	1
TEME358	Fluid Mechanics Lab	0	0	2	1
TECE356	Surveying Lab	0	0	2	1
TECE357	Auto CAD Applications lab	0	0	2	1
TEEE356	Electrical Machines & Power utilization Lab	0	0	2	1
TEAG454	Farm Machinery & Equipment-I Lab	0	0	2	1
TEAG455	Soil Mechanics Lab	0	0	2	1
TEAG456	Dairy and Food Engineering Lab	0	0	2	1
TEME456	Thermal Engineering Lab	0	0	2	1
TEEC458	Electronics and Instrumentation Lab	0	0	2	1
TEAG556	Tractor System & Control Lab	0	0	2	1
TEAG557	Soil & Water Conservation Engg. Lab	0	0	2	1
TEAG558	Tractor and Automotive Engines Lab	0	0	2	1
TEAG559	Hydrology Lab	0	0	2	1
TEAG550	Bio-energy Lab	0	0	2	1
TEAG657	Irrigation & Drainage Engineering lab	0	0	2	1
TEAG658	Ground Water, Well & Pump Engineering Lab	0	0	2	1
TEAG659	Post Harvest Engineering of Horticultural crops Lab	0	0	2	1
TEAG660	Farm Machinery and Equipments-II lab	0	0	2	1
TEAG758	Post Harvest Engineering of Cereals, Pulses and Oil Seeds Lab	0	0	2	1
TEAG854	Remote Sensing Lab	0	0	2	1
TEAG856	Agri-Informatics Lab	0	0	2	1

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Agricultural Engineering Departmental Elective (EDE)/ Engineering Open Elective (EOE)			L	T	P	C
Elective-I	TEAG-612A	Wasteland Development	3	1	0	3
	TEAG-612B	Information Technology for Land and Water Management	3	1	0	3
	TEAG-612C	Precision farming Techniques for Protected Cultivation	3	1	0	3
Elective-II	TEAG-712A	Plastic Applications in Agriculture	3	1	0	3
	TEAG-712B	Human Engineering and Safety	3	1	0	3
	TEAG-712C	Waste and By-Product Utilization	3	1	0	3
Elective-III	TEAG-805A	Food Quality and Control	3	1	0	3
	TEAG-805B	Photovoltaic Technology and Systems	3	1	0	3
	TEAG-805C	Food Plant Design and Management	3	1	0	3
Open Elective	TEME-802 EBT506T NCC-01	Non-Conventional Energy Resources Engineering Principles and calculations NCC General	3	1	0	4
MOOCs/NPTEL/Mandatory Course/Value added courses (VAC)			**L**	**T**	**P**	**C**
TECE-101/ECE-201		Environmental Sciences	3	1	0	4
TEHU-601		Disaster Management (Audit Paper)	2	1	0	3
MOOC-01		MOOC Program-1 (Optional)	-	-	-	0
MOOC-02		MOOC Program-1I (Optional)	-	-	-	0
Project/ Seminar/Industrial Training/General Proficiency (PST)			**L**	**T**	**P**	**C**
TGP-101		General Proficiency	-	-	-	1
TGP-201		General Proficiency	-	-	-	1
TGP-301		General Proficiency	-	-	-	1
TGP-401		General Proficiency	-	-	-	1
TGP-501		General Proficiency	-	-	-	1
TGP-601		General Proficiency	-	-	-	1
TGP-701		General Proficiency	-	-	-	1
TGP-801		General Proficiency	-	-	-	1
TEAG560		Skill Development Training-I (Student READY)Registration only 5(0+5)/ Seminar based on industrial training	0	0	2	1
TEAG760		Experiential Learning I (Process & Food Engineering)	0	0	2	1
TEAG761		Experiential Learning II (Farm Machinery & equipments)	0	0	2	1
TEAG762		Experiential Learning III (Soil & Water	0	0	2	1

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	conservation Engineering and Irrigation)				
TEAG-763	Seminar	0	0	2	1
TEAG-764	Skill Development Training-II	0	0	2	1
TEAG-852	Project	0	0	20	10

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(Effective from 2021-22)

Programme: B. Tech. Agricultural Engineering

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4. Understand the role of agricultural Engineering in society and has the background to consider ethical problems.

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considerations.

3. Analytical and critical thinking abilities for data- based decision making.
4. Ability to develop value based leadership ability.
5. Determine the entrepreneurial.
6. 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.
7. 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
8. Ability to understand, analyze and communicate global, economic, legal ethical aspects of Technology.
9. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

Programme Specific Outcomes (PSOs)

On completion of four year B. Tech. Agricultural Engineering degree programme, the students will be able to:

PSO-1: Students will be able to take the role to serve the society by way of providing need-based solutions in the farm sector.

PSO-2: Students will be able to do smooth functions with high standards in private, public and government sectors with high competence.

PSO-3: Students will have ethical know-how and good communication skills and they will have enriched their knowledge and will be prepared for the public service commission examination.

PSO-4: Student will be able to draft and design advanced tools, implements and methods for sustainable agricultural production and service.

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Course Structure

&

Syllabus

Of

B. Tech

Agricultural Engineering

(Applicable w.e.f Academic Session-2021-22)

(As per CBCS guidelines given by UGC)

SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

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STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

Choice Based Credit System (CBCS)

YEAR I, SEMESTER- I

S.N	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
		THEORY										
1.	**FSC**	TEMA-102/ EBT-107T	Elementary Mathematics-I Elementary Biology-I	3	1	0	20	10	30	70	100	4
2.	**FCS**	TEPH-101	Engineering Physics-I	3	1	0	20	10	30	70	100	4
3.	**FSC**	TECH- 101/201	Engineering Chemistry	3	1	0	20	10	30	70	100	4
4.	**FSC/HML**	TEME-101/TEME201	Engineering Mechanics	3	1	0	20	10	30	70	100	4
5.	**FSC/FSC**	TEEC-101/TEEC201	Electronics Engineering	3	1	0	20	10	30	70	100	4
6.	**FSC/FSC**	TECS-101/TECS201	Computer Fundamentals & Programming	3	1	0	20	10	30	70	100	4
		PRACTICALS / PROJECT										
7.	**ELC**	TECH-151/ECH251	Engineering Chemistry Lab	0	0	2	20	10	30	70	100	1
8.	**ELC**	TEEC-151	Electronics Engineering Lab	0	0	2	20	10	30	70	100	1
9.	**ELC**	TECS-151	Computer Lab	0	0	2	20	10	30	70	100	1
10.	**ELC**	TEME-151	Mechanical Engineering Lab	0	0	2	20	10	30	70	100	1
11.	**PST**	GP-101	General Proficiency	-	-	-	-	-	100	-	100	1
			Total Credit	**18**	**06**	**08**	**-**	**-**	**480**	**620**	**1100**	**29**

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YEAR I, SEMESTER- II

STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

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S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	**FSC**	TEMA-202/ EBT-209T	Elementary Mathematics-II/Elementary Biology-II	3	1	0	20	10	30	70	100	4
2.	**FSC**	TEPH-201	Engineering Physics-II	3	1	0	20	10	30	70	100	4
3.	**VAC**	TECE-201/101	Environmental Science	3	1	0	20	10	30	70	100	4
4.	**HML**	TPSD-201	Professional Skill Development-I	3	1	0	20	10	30	70	100	4
5.	**FSC**	TEEE-201	Electrical Engineering	3	1	0	20	10	30	70	100	4
6.	**FSC**	TEME-202	Materials & Manufacturing	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	**ELC**	TEPH-251	Physics Lab	0	0	2	20	10	30	70	100	1
8.	**ELC**	TEME-252	Materials & Manufacturing Lab	0	0	2	20	10	30	70	100	1
9.	**ELC**	TEEE-251	Electrical Engineering Lab	0	0	2	20	10	30	70	100	1
10.	**ELC**	TEME-253	Engineering Graphics Lab	0	0	2	20	10	30	70	100	1
11.	**PST**	GP-201	General Proficiency	-	-	-	-	-	100	-	100	1
			Total Credit	**18**	**06**	**08**	**-**	**-**	**480**	**620**	**1100**	**29**

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Choice Based Credit System (CBCS)

YEAR II, SEMESTER-III

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	TEAG302	Principle of Soil Science, Agronomy and Horticulture Crops	3	0	0	20	10	30	70	100	3
2.	ECC	TEME308	Fluid Mechanics and Open Channel Hydraulics	3	1	0	20	10	30	70	100	4
3.	EDE	TECE306	Surveying practices	3	1	0	20	10	30	70	100	4
4.	ECC	TEME306	Heat & Mass Transfer	3	1	0	20	10	30	70	100	4
5.	FSC	EMA303	Analytical Mathematics	3	1	0	20	10	30	70	100	4
6.	HML	TPSD301	Professional Skill Development -II	3	1	0	20	10	30	70	100	4
7.	ECC	TEEE306	Electrical Machines & Power Utilization	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
							IA	AT				
8.	ELC	TEAG352	Soil Science, Agronomy and Horticulture Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TEME358	Fluid Mechanics Lab	0	0	2	20	10	30	70	100	1
10.	ELC	TECE356	Surveying Lab	0	0	2	20	10	30	70	100	1
11.	ELC	TECE357	Auto CAD Applications lab	0	0	2	20	10	30	70	100	1
12.	ELC	TEEE356	Electrical Machines & Power utilization Lab	0	0	2	20	10	30	70	100	1
13	PST	GP301	General Proficiency	-	-	--	-	-	-	-	100	1
TOTAL				**21**	**06**	**10**	-	-	-	-	**1300**	**33**

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YEAR II, SEMESTER-IV

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
			THEORY									
1.	ECC	TEAG404	Farm Machinery and Equipments-I	3	0	0	20	10	30	70	100	3
2.	ECC	TEAG405	Soil Mechanics	3	0	0	20	10	30	70	100	3
3.	ECC	TEAG406	Dairy & Food Engineering	3	0	0	20	10	30	70	100	3
4.	ECC	TEME405	Strength of Materials	3	1	0	20	10	30	70	100	4
5.	ECC	TEME406	Thermal Engineering	3	1	0	20	10	30	70	100	4
6.	ECC	TEEC408	Basic Electronics and Instrumentation	3	1	0	20	10	30	70	100	4
7.	ECC	TEME407	Theory of Machines	3	1	0	20	10	30	70	100	4
			PRACTICALS / PROJECT									
							IA	AT				
8.	ELC	TEAG454	Farm Machinery & Equipment-I Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TEAG455	Soil Mechanics Lab	0	0	2	20	10	30	70	100	1
10.	ELC	TEAG456	Dairy and Food Engineering Lab	0	0	2	20	10	30	70	100	1
11.	ELC	TEME456	Thermal Engineering Lab	0	0	2	20	10	30	70	100	1
12.	ELC	TEEC458	Electronics and Instrumentation Lab	0	0	2	20	10	30	70	100	1
13.	PST	GP401	General Proficiency	-	-	-	-	-	-		100	1
TOTAL				**21**	**04**	**10**	-	-	-	-	**1300**	**31**

Note: Skill Development Training-I during summer break June-July after 4th Semester

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Choice Based Credit System (CBCS)

YEAR III, SEMESTER-V

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	ECC	TEAG506	Tractor System & Control	3	0	0	20	10	30	70	100	3
2.	ECC	TEAG507	Soil & Water Conservation Engineering	3	0	0	20	10	30	70	100	3
3.	ECC	TEAG508	Tractor and Automotive Engines	3	0	0	20	10	30	70	100	3
4.	ECC	TEAG509	Watershed Hydrology, Planning and Management	3	0	0	20	10	30	70	100	3
5.	ECC	TEAG510	Bio-Energy systems: Design and Applications	3	0	0	20	10	30	70	100	3
6.	HML	TEHU501	Human values and professional ethics	3	1	0	20	10	30	70	100	4
7.	ECC	TEME506	Machine Design	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
							IA	AT				
8.	ELC	TEAG556	Tractor System & Control Lab	0	0	2	20	10	30	70	100	1
9.	ELC	TEAG557	Soil & Water Conservation Engg. Lab	0	0	2	20	10	30	70	100	1
10.	ELC	TEAG558	Tractor and Automotive Engines Lab	0	0	2	20	10	30	70	100	1
11.	ELC	TEAG559	Hydrology Lab	0	0	2	20	10	30	70	100	1
12.	ELC	TEAG550	Bio-energy Lab	0	0	2	20	10	30	70	100	1
13.	ELC	TEAG560	Skill Development Training-I (Student READY) Registration only 5(0+5) / Seminar based on industrial training	0	0	-	-	-	100	-	100	5
14.	PST	GP501	General Proficiency	-	-	-	-	-	-	-	100	1
TOTAL				**21**	**02**	**10**	-	-	-	-	**1400**	**34**

MOOC Course:

1.	VAC	MOOC-01	MOOC Program-I (Optional)	-	-	-	-	-	-	100	100	-
2.	VAC	MOOC-02	MOOC Program-II(Optional)	-	-	-	-	-	-	100	100	-

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YEAR III, SEMESTER-VI

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	**ECC**	TEAG607	Irrigation & Drainage Engineering	3	0	0	20	10	30	70	100	3
2.	**ECC**	TEAG608	Ground Water, Well & Pumps	3	0	0	20	10	30	70	100	3
3.	**ECC**	TEAG609	Post Harvest Engineering of Horticultural crops	3	0	0	20	10	30	70	100	3
4.	**ECC**	TEAG610	Farm Machinery and Equipments-II	3	0	0	20	10	30	70	100	3
5.	**ECC**	TEAG611	Engineering Properties of Agriculture Produce of	3	0	0	20	10	30	70	100	3
6.	**EDE**	TEAG612(A/B/C)	Elective I	3	0	0	20	10	30	70	100	3
7.	**VAC**	TEHU601	Disaster Management (Audit Paper)#	3	0	0	20	10	30	70*	100*	3
PRACTICALS / PROJECT												
							IA	**AT**				
8.	**ELC**	TEAG657	Irrigation & Drainage Engineering lab	0	0	2	20	10	30	70	100	1
9.	**ELC**	TEAG658	Ground Water, Well & Pump Engineering Lab	0	0	2	20	10	30	70	100	1
10.	**ELC**	TEAG659	Post Harvest Engineering of Horticultural crops Lab	0	0	2	20	10	30	70	100	1
11.	**ELC**	TEAG660	Farm Machinery and Equipments-II lab	0	0	2	20	10	30	70	100	1
12.	**PST**	GP601	General Proficiency	-	-	-	-	-	-	-	100	1
TOTAL				**21**	**00**	**08**	-	-	-	-	**1200**	**26**

Note: Industrial Training of 4 – 6 Weeks after VI Semester (during summer break June-July) which will be evaluated in VII Semester. (*Skill Development Training-II)*

 # The subject (THU601), Disaster Management will be offered as a compulsory audit course and each student has to pass the subject at the minimum by getting marks out of 100.

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YEAR IV, SEMESTER-VII

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	**ECC**	TEAG708	Post Harvest Engineering of Cereals, Pulses and Oil Seeds	3	0	0	20	10	30	70	100	3
2.	**ECC**	TEAG709	Water Harvesting and Soil Conservation Structures	3	0	0	20	10	30	70	100	3
3.	**ECC**	TEAG710	Agricultural Structures & Environmental Control	3	0	0	20	10	30	70	100	3
4.	**ECC**	TEAG711	Sprinkler and Micro Irrigation Systems	3	0	0	20	10	30	70	100	3
5.	**EDE**	TEAG712(A/B/C)	Elective II	3	0	0	20	10	30	70	100	3
6.	**ECC**	TEAG713	Renewable Energy Sources and Management	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT												
							IA	**AT**				
7.	**ELC**	TEAG758	Post Harvest Engineering of Cereals, Pulses and Oil Seeds Lab	0	0	2	20	10	30	70	100	1
8.	**ELC**	TEAG760	Experiential Learning I (Process & Food Engineering)	0	0	4	20	10	30	70	100	2
9.	**ELC**	TEAG761	Experiential Learning II (Farm Machinery & equipments)	0	0	4	20	10	30	70	100	2
10.	**ELC**	TEAG762	Experiential Learning III (Soil & Water conservation Engineering and Irrigation)	0	0	4	20	10	30	70	100	2
11.	**PDT**	TEAG763	Seminar (Project based special problem)	0	0	-	20	10	30	70	100	1
12.	**PDT**	TEAG764	Skill Development Training-II (Student READY) Registration	0	0	-	-	-	100	-	100	5
13.	**PDT**	GP701	**General Proficiency**	-	-	-	-	-	-	-	100	1
TOTAL				**18**	**00**	**14**	-			-	**1300**	**32**

***Educational tour during VII Semester**

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Choice Based Credit System (CBCS)

YEAR IV, SEMESTER-VIII

S.N.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	**HML**	TEHU801	Industrial Management	3	0	0	20	10	30	70	100	3
2.	**HML**	TEAG803	Entrepreneurship Development and Business Management	3	0	0	20	10	30	70	100	3
3.	**ECC**	TEAG804	Fundamentals of Remote Sensing & GIS Applications	3	0	0	20	10	30	70	100	3
4.	**EDE**	TEAG805(A/B/C)	Elective course III	3	0	0	20	10	30	70	100	3
5.	**EOE**	Engineering Open Electives	Only one paper to be chosen from the basket of Open Elective having 03 papers provided by the University*	3	1	0	20	10	30	70	100	4
6.	**ECC**	TEAG806	Agri-Informatics	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT												
7.	**ELC**	TEAG854	Remote Sensing Lab	0	0	2	20	10	30	70	100	1
8.	**ELC**	TEAG856	Agri-Informatics Lab	0	0	2	20	10	30	70	100	1
9.	**PDT**	TEAG852	Project	0	0	10	-	200	200	300	500	10
10.	**PST**	GP801	General Proficiency	-	-	-	-	-	-	-	100	1
TOTAL				**15**	**00**	**14**	-	-	-	-	**1300**	**32**

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Choice Based Credit System (CBCS)

Elective Courses

S.N.	Category	Course Code	Course Name
1.	**EDE**	Electives –I ,II & III **	Only one paper to be chosen from the basket of Departmental Elective- I ,II & III having 03 papers provided by the School**
Engineering Departmental Elective I			
1.	**EDE**	TEAG612A	Wasteland Development
2.	**EDE**	TEAG612B	Information Technology for Land and Water Management
3.	**EDE**	TEAG612C	Precision Farming Techniques for Protected Cultivation
Engineering Departmental Elective II			
4.	**EDE**	TEAG712A	Plastic Applications in Agriculture
5.	**EDE**	TEAG712B	Human Engineering and Safety
6.	**EDE**	TEAG712C	Waste and By-products Utilization
Engineering Departmental Elective III			
7.	**EDE**	TEAG805A	Food Quality and Control
8.	**EDE**	TEAG805B	Photovoltaic Technology and Systems
9.	**EDE**	TEAG805C	Food Plant Design and Management
Engineering Open Electives (EOE)			
-	**EOE**	Only one paper to be chosen from the basket of Open Elective having 03 papers provided by the University*	
1.	**EOE**	TEME-802	Non-Conventional Energy Resources
2.	**EOE**	EBT506T	Engineering Principles and calculations
3.	**EOE**	NCC-01	NCC General
Project Elective IV			
1.	**PDT**	**TEAG852**	**Project A. Soil Water & Conservation Engineering** **B. Farm Machinery & Power Engineering** **C. Process & Food Engineering**

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TEMA – 102 **Elementary Mathematics - I**

Objective: - The main aims of this course calculus are to find the instantaneous rate of change of a function with respect to an independent variable in calculus. Integrals are used to evaluate such quantities as area, volume, work and area of a curve. Coordinate geometry identify a shape within a shape, discriminate *geometric shapes* from one another based on the number of sides and corners

UNIT – 1 **(12 Sessions)**

Calculus: Limits and Derivatives: Derivative introduced as rate of change both as that of distance function and geometrically intuitive idea of limit, Definition of derivative, Relate it to slope of tangent of the curve, Derivative of sum, difference, Product and quotient of functions, Derivatives of polynomial and trigonometric functions **for better skilling of entrepreneurship**.

UNIT – 2 **(10 Sessions)**

Continuity and Differentiability : Continuity and Differentiability, Derivative of composite functions, Chain rule, Derivatives of inverse trigonometric functions, Derivative of implicit function, Concept of exponential, logarithmic functions and their derivative, Logarithmic differentiation, Derivative of functions expressed in a parametric forms, Second order derivatives, Rolle's and Lagrange's Mean Value theorems (without proof) and their geometric interpretations

Applications of derivatives: Applications of derivatives: Rate of change, Increasing /Decreasing functions, Tangents and normals, Approximation, Maxima and minima of one variable (first derivative test motivated geometrically and second derivatives test given as a provable tool),Simple problems (that illustrate basic principles and understanding of the subject as well as real –life situations) **for better employability in industry**.

UNIT – 3 **(10 Sessions)**

Integrals: Integration as inverse process of differentiation, Integration of a variety of functions by substitution by partial fraction and by parts, Only simple integrals of the type to be evaluated, Definite integrals as a limit of a sum, Fundamental Theorem of calculus (without proof), Basic properties of definite integral and evaluation of definite integrals, Applications of the integrals; Applications in finding the area under simple curves, Lines, rea of Circles/parabola/ellipse (Standard form only), Area between the two curves **for skill development and employability**.

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UNIT – 4 **(10 Sessions)**

Differential Equations : Definitions order and degree, General and particular solutions of differential equation, Formation of differential equation whose general solution is given, Solution of differential equations by method of separation of variables, Homogeneous differential equation of first order and first degree, Solution of linear differential equation of the type $\frac{dy}{dx} + Py = Q$, where P and Q are the function of x. **for skill development and employability**.

UNIT – 5 **(10 Sessions)**

Coordinate Geometry: Straight line : Brief recall of 2D from earlier classes; Slope of a line, angle between two lines and Various forms of equations of a line parallel to axes, Point slope form, Slope intercept form, Two point form, Intercept form and normal form, General equation of a line, Distance of a point from a line.

Conic Sections: Circle, Ellipse, Parabola, Hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section, Standard equations and simple properties of parabola, Ellipse and Hyperbola, Standard equation of a circle **for skill development and employability**.

Course Outcomes:

The student will be able to

CO 1: Remember terminologies and formulae of differential, integral Calculus and Coordinate Geometry. **for better skilling of entrepreneurship**.

CO 2: Understand and interpret the concepts of differential, integral Calculus and Coordinate Geometry **for better employability in industry**.

CO 3: Compare and analyze the methods in differential, integral Calculus and Coordinate Geometry **for skill development and employability**.

CO4: Predict and evaluate the problems in differential, integral Calculus and Coordinate Geometry **for skill development and employability**.

CO 5: Understand and interpret coordinate geometry, straight line, conic section, hyperbola, standards equation, ellipse, and hyperbola **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	**3**	1	**3**	1	1	2	**3**	1	**3**
CO:2	1	**3**	1	2	1	**3**	1	2	2	1
CO:3	2	2	**3**	2	1	**3**	**3**	**3**	2	**3**
CO:4	2	1	2	**3**	2	**3**	**3**	2	1	2
CO:5	1	2	**3**	2	**3**	**3**	2	2	1	**3**

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	**3**	**1**	**3**
CO:2	**1**	**3**	**2**
CO:3	3	2	1
CO:4	**3**	**3**	**1**
CO:5	3	3	2

References:

1. R.D. Sharma: Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. NewDelhi, India.
2. R.D. Sharma: Mathematics (I& II-XII): Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. NewDelhi, India.
3. Gorakh Prasad: Differential Calculus, Pothishala Private Limited, Allahabad.
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EBT-107: ELEMENTARY BIOLOGY-I

Objective: The main objective of this course:

- Emphasize the basic principles that are common to animals, plants and microorganisms as well as high lighting the relationship of Biology with other areas of knowledge.

UNIT I: **(10 Sessions)**

The Cell: Concept and Cell theory. Structure of prokaryotic cells, eukaryotic cells, plant cells and animal cells. Structure and function of cell membrane and cell wall. Brief introduction of cell organelles **for skill enhancement**.

UNIT II: **(10 Sessions)**

Structural Organization: Tissues in animals and plants. Morphology, anatomy and functions of different parts of plants- Root, stem, leaf, inflorescence, flower, fruit and seed. Concepts of botanical garden, herbaria, zoological park and museums **for better skilling of entrepreneurship**.

UNIT III: **(10 sessions)**

Classification of living organisms: Five kingdom classification, major groups and principles of classification in each kingdom. Systematic and binomial system of nomenclature. Concept of animal and plant classification **for better employability in industry**.

UNIT IV: **(5 Sessions)**

Concept of alleles and genes: Mendelian Experiments, Cell cycle (Elementary Idea), mitosis and meiosis **for skill development and employability**.

UNIT V: **(5 Sessions)**

Plant Physiology: Concept of diffusion, osmosis, imbibitions. Movement of water, food, nutrients and gases. Plant growth and development **for skill development and employability**.

Course Outcomes:

At the end of the course students will able to:

CO 1: Define cell biology and gain some basic concept of functioning of various specific systems of humans, plants and animals **for skill enhancement**.

CO 2: Learn the basic concepts of biology and its importance in analyzing the principles of human development **for better skilling of entrepreneurship**.

CO 3: Develop the knowledge of classification of living organisms, systematic and binomial system of nomenclature **for better employability in industry**.

CO 4: Demonstrate medical implications of developmental biology **for skill development and employability**.

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CO 5: Concept of alleles and genes and cell cycle **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	1	2	**3**	**3**	1	**3**	2	1	**3**
CO:2	**3**	**3**	2	1	2	**3**	1	2	**3**	**3**
CO:3	**3**	**3**	1	1	2	**3**	2	1	**3**	**3**
CO:4	**3**	2	1	**3**	1	**3**	1	**3**	2	1
CO:5	1	1	1	2	**3**	1	2	2	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**2**	**1**	**3**
CO:2	**1**	**3**	**2**
CO:3	3	2	3
CO:4	**3**	**3**	**1**
CO:5	3	3	2

Suggested Readings:

1. Biology - Textbook for Class XI, NCERT Publication.
2. Biology - Textbook for Class XII, NCERT Publication.
3. Biology by Peter H Raven, George B Johnson, Kenneth A. Mason, Jonathan Losos, Susan Singer(Macgraw Hill).
4. Concepts in Biology By E.D.Enger & F.C.Ross, 9th Ed Tata McGraw Hill.

Website Sources:

- https://www.britannica.com/science/fermentation
- https://nptel.ac.in/courses/102/105/102105064/
- https://www.khanacademy.org

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TEPH-101 **Engineering Physics-I**

Objective: The aim of this course is to impart knowledge of statistical mechanics, quantum mechanics, Laser system and their applications. The broad education is necessary to understand special theory of relativity.

UNIT- I **(8 sessions)**

Relativistic Mechanics: Frame of reference, Michelson-Morley Experiment, Lorentz transformation equation, Length contraction & Time dilation, Addition of velocities, Variation of mass with velocity and Mass energy relation. **for skill enhancement**.

UNIT- II **(10 sessions)**

Statistical Mechanics: Concept of phase space, Density of states as a function of energy, Maxwell- Boltzmann statistics, Distribution law and its application in case of ideal gas, Energy and velocity distribution. Bose -Einstein statistics Distribution Law and its application to Black body radiation to obtain Plank's law of radiation. Fermi –Dirac statistics, Distribution law and its application to electrons in metals, Calculation of Fermi energy and average energy of electrons in metals. **for better skilling of entrepreneurship**.

UNIT- III **(10 sessions)**

Quantum Mechanics: De-Broglie Hypothesis, Davisson -Germer Experiment, wave function and its properties, Uncertainty principle. Time Dependent & Time Independent Schrodinger Equation, Particle in one dimensional box, Eigen values and eigen function **for better employability in industry**.

UNIT- IV **(8 sessions)**

Laser: Principle of Laser, Stimulated and spontaneous emission, Population inversion, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers **for skill development and employability**.

UNIT- V **(8 sessions)**

Fibre Optics: Fundamental ideas of optical Fiber, Propagation Mechanism, Numerical aperture, Acceptance angle and Acceptance cone, Single and multi mode fibers, Applications of optical fibres **for skill development and employability**.

Course Outcomes:

The students completing this course will be able to:

CO 1: Learn Frame of reference, Lorentz transformation equation **for skill enhancement**.

CO 2: Understand Statistical Mechanics, Maxwell- Boltzmann statisticsand its applications **for better skilling of entrepreneurship**.

CO 3: Study Bose -Einstein statistics and Fermi –Dirac statistics Understand De-Broglie Hypothesis, Davisson -Germer Experiment **for better employability in industry**.

CO 4: Study Time Dependent & Time Independent Schrodinger Equation and applications of these equations **for skill development and employability**.

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CO 5: Attain basic knowledge on different types of LASERs and their applications **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	1	2	**3**	**3**	1	2	**3**	**3**	**3**
CO:2	1	**3**	2	1	2	**3**	**3**	1	2	1
CO:3	2	1	**3**	2	1	**3**	1	**3**	**3**	2
CO:4	1	2	1	**3**	1	2	**3**	1	1	**3**
CO:5	**3**	1	2	2	**3**	1	2	1	**3**	**3**

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**2**	**1**	**3**
CO:2	**1**	**3**	**2**
CO:3	2	1	3
CO:4	**3**	**3**	**1**
CO:5	2	3	2

References:

1. A. Beiser, "Concepts of Modern Physics
2. C. Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.
3. W.T. Silf vast, "Laser Fundamental" Cambridge University Press (1996).
4. G. Keiser "Optical Fiber Communication" New york.
5. K.M. khanna" Statistical Mechanics"
6. C.Kittel" Elementary Statistical Mechanics"

Website Sources:

- https://web.stanford.edu
- https://sites.google.com
- https://en.wikipedia.org
- https://www.khanacademy.org
- https://www.rp-photonics.com
- https://nptel.ac.in
- https://www.eatm.in

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TECH-101/201 **Engineering Chemistry**

OBJECTIVES:

1. To emphasize the relevance of fundamentals and applications of chemistry in the field of engineering.
2. To take into account appropriate combinations of old and new emerging concepts for the potential uses in engineering.
3. To address the principles of general chemistry and specific topics relevant to various engineering disciplines.
4. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
5. To bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT-I:

MATTER - CHEMICAL BONDING AND ITS STATES:

Types of bonds (Ionic, covalent and chemical bonds), valence bond theory, molecular orbital theory and its applications to homo and hetero (CO & NO) diatomic molecules. Solid state- Types of unit cells, space lattice (only cubes) calculation of density of the unit cell, two dimensional solids such as graphite and its conduction properties. Fullerenes and their applications **for skill enhancement**.

UNIT-II: CHEMICAL KINETICS AND ELECTROCHEMISTRY:

Molecularity and order of reactions, zero, first and second order reactions, theories of reaction rates, electrode potential, electrochemical cells (galvanic and concentration), Nernst equation, electrochemical and galvanic series, definition, significance and classification of corrosion, electrochemical corrosion. **for skill development and employability**.

UNIT-III: REACTION MECHANISM AND SPECTROSCOPY:

Electrophile, Nucleophile (SN^1 and SN^2reactions)

Mechanism of the following reactions:

(i) Aldol condensation (ii) Beckmann rearrangement (iii) Cannizaro reaction

(iv) Hoffmann rearrangement (v) Diels-Alder reaction and ((vi) Friedel craft reaction

Basic principle, instrumentation and general application of UV, Visible, IR/ FTIR & NMR spectroscopy (excluding specific applications) **for skill development and employability**.

UNIT-IV:

POLYMERS:

Polymers, classification and applications, polymerization (addition and condensation), Thermoplastic and

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Thermosetting polymers, preparation, properties and uses of PVC, Dacron, nylon66 and Bakelite. Elastomers (Natural rubber, buna-N, buna-S) vulcanization, conducting polymers (Intrinsic & Extrinsic), doping, ion exchange resins, biodegradable polymers. **for better employability in industry**.

UNIT-V:

WATER TREATMENT AND FUELS:

Hardness of water, calculation on hardness and its determination by EDTA method, sludge and scale formation, causes and prevention of scale formation (colloidal, phosphate, and calgon conditioning), removal of hardness (Soda lime process, zeolite process & ion- exchange process), calculations based on lime soda process.

Definition of fuels, classification of fuels, calorific value, determination by Dulong's formula, analysis of coal (Proximate and ultimate analysis), petroleum, important fractions of petroleum and their uses, gaseous fuels (CNG & LPG) **for better skilling of entrepreneurship**.

COURSE OUTCOMES:

CO: 1 Demonstrate knowledge of science behind common impurities in water and methods to treat them and also different methods to remove hardness of water **for skill enhancement**.

CO: 2 Students will also be able to understand and relate electrochemistry and corrosion **for skill development and employability**

CO: 3 To analyze the basic knowledge of various types of Fuels, their properties and Industrial Applications ALONG WITH THE determination OF the calorific value of fuels **for skill development and employability**.

CO: 4 Apply the science for understanding corrosion and its prevention **for better employability in industry**.

CO: 5 Demonstrate knowledge of superconducting and organic electronic materials **for better skilling of entrepreneurship**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	2	1	2	**3**	1	**3**	2	**3**	1
CO:2	1	**3**	2	**3**	**3**	1	**3**	2	1	**3**
CO:3	**3**	1	**3**	2	1	**3**	2	1	2	2
CO:4	**3**	1	1	**3**	**3**	2	**3**	2	**3**	**3**
CO:5	1	**3**	1	2	**3**	2	2	**3**	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

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	Skill Development	Employability	Entrepreneurship Development
CO:1	1	3	3
CO:2	3	2	2
CO:3	2	3	3
CO:4	3	1	2
CO:5	2	3	3

REFERENCES:

1. Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.

2. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.

3. Corrosion Engineering by M.G. Fontana McGraw Hill Publications

4. Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)

5. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org/

  https://uri.idm.oclc.org/login?url=https://www.engineeringvillage.com/search/quick.url?CID=quickSearch&database=1

  https://www.technicalsymposium.com/

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TECH 151/251 **ENGINEERING CHEMISTRY LAB**

List of Experiments:

1. Determination of alkalinity of the given sample of water.
2. Determination of temporary and permanent hardness of water sample by Versinate method
3. Determination of available chlorine in bleaching powder.
4. Determination of quantity of dissolve oxygen in given sample of water.
5. Determination of iron content in the given water sample by Mohr's methods.
6. Determination of ion exchange capacity of given sample of ion-exchange material.
7. Determination of Equivalent weight of iron by the chemical displacement method. The equivalent weight of copper is 63.5.
8. Determination of viscosity of polystyrene by Ostwald Viscometer.
9. Preparation of Bakelite resin.
10. Element detection and functional group identification in organic.

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TEME –101/201 **ENGINEERING MECHANICS** **L T P 3 1 0**

Objective: The primary purpose of the study of engineering mechanics is to develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering. This capacity requires more than a mere knowledge of the physical and mathematical principles of mechanics; also required is the ability to visualize physical configurations in terms of real materials, actual constraints ,and the practical limitations which govern the behavior of machines and structures.

Unit-1 **(10 Sessions)**

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and non-concurrent force systems, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications **for skill enhancement**.

Unit-2 **(08 Sessions)**

Trusses: Introduction, Simple Truss and solution of simple truss, Method of Joints and Method of Sections. **Friction**: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry- friction, Belt friction, Application. **for better skilling of entrepreneurship**.

Unit-3 **(08 Sessions)**

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorem, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry **for better employability in industry**.

Unit-4 **(06 Sessions)**

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams **for skill development and employability**.

Unit-5 **(08 Sessions)**

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion. Relative Velocity.

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium **for skill development and employability**.

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Course outcome:

Students completing this course will be able to:

CO: 1 Recognize different force systems, moments and couple **for skill enhancement**.

CO: 2 To draw Free Body Diagram and label the reactions on it **for better skilling of entrepreneurship**.

CO: 3 Apply equilibrium equations in statics **for better employability in industry**.

CO: 4 Understand Newton's law in motion, and recognize different kinds of particle motions **for skill development and employability**.

CO: 5 Introduction, Plane Motion of Rigid Body Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	2	**3**	2	**3**	2	**3**	2	**3**	2
CO:2	1	**3**	2	**3**	**3**	**3**	1	2	1	**3**
CO:3	**3**	1	**3**	2	2	1		2	**3**	1
CO:4	1	**3**	1	**3**	1	**3**	**3**	2	**3**	**3**
CO:5	**3**	1	2	1	**3**	2	1	2	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	**1**	**3**	**2**
CO:2	**2**	**2**	**3**
CO:3	**3**	**1**	**2**
CO:4	**2**	**3**	**1**
CO:5	**1**	**2**	**2**

References:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Engineering Mechanics by R.K. Bansal, Laxmi Publications, New Delhi.
4. Engineering Mechanics by SS Bhavi Katti, New age International Publisher, New Delhi.

Website Sources:

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- https://nptel.ac.in/courses/122/104/122104014/
- https://www.coursera.org/learn/engineering-mechanics-statics
- https://www.edx.org/course/engineering-mechanics-2
- https://www.youtube.com/watch?v=ADR04oYgpAM

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TEEC 101 / 201 ELECTRONICS ENGINEERING L T P 3 1 0

Objective: The objective of the course is to familiarize the students with concepts of semiconductor and its working along with t heir applications in real life.

UNIT – I **(08 Sessions)**

Theory of Semiconductor material: Energy band Theory of crystals, Insulators, Semiconductors and Metals, classification of semiconductors, Mobility and Conductivity, Donor and Acceptor Impurities, Mass-Action law, Variation in semiconductor parameters with Temperature, Hall – Effect **for better employability in industry**.

UNIT – II **(08 Sessions)**

Semiconductor Diodes and Applications: p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance, p-n junction as rectifiers, filter (Shunt capacitor filter), clipping circuits, clamping circuits, breakdown mechanism, breakdown characteristics, zener resistance, zener diode application as shunt regulator. Introduction of LED, and Photo diode **for skill enhancement**.

UNIT– III **(08 Sessions)**

Bipolar Junction Transistor (BJT): construction, transistor action, CB, CE and CC configurations, concept of voltage gain, current gain. Field Effect Transistor (FET): JFET: construction, principle of working, concept of pinch-off, drain saturation current, characteristics, characteristic equation, CG, CS and CD configurations, MOSFET: depletion and enhancement type, construction **for better skilling of entrepreneurship**.

UNIT – IV **(08 Sessions)**

Number system: conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, Boolean algebra, logic gates, concept of universal gates. Canonical forms, minimization using K-map (Upto four variable, don't care conditions also) **for skill development and employability**.

UNIT – V **(08 Sessions)**

Operational Amplifier (Op-Amp): concept of ideal operational amplifier, parameters. Inverting, non-inverting and unity gain configurations, Op-amp as adder, subtractor, Block diagram of Communication Systems, Introduction to Modulation, Need for modulation, Definition of AM and FM **for skill development and employability**.

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Course Outcomes:

Students completing this course will be able to

CO: 1 Understand the basic of semiconductor technology **for better employability in industry**.

CO: 2 Define the purpose of different diodes used in several applications **for skill enhancement**.

CO: 3 Develop understanding and impact of resistance regions **for better skilling of entrepreneurship**.

CO: 4 Discuss how basic communication occurs over wireless medium **for skill development and employability**.

CO: 5 Discuss the benefits of transistors over conventional vacuum tubes **for skill development and employability.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	1	2	1	**3**	2	**3**	1	**3**	**3**
CO:2	**3**	**3**	2	2	**3**	1	1	**3**	2	1
CO:3	**3**	1	**3**	1	1	**3**	2	1	**3**	2
CO:4	**3**	2	1	**3**	1	2	**3**	1	2	1
CO:5	**3**	2	1	2	**3**	1	**3**	**3**	2	**3**

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	**2**	**3**	**2**
CO:2	**2**	**1**	**3**
CO:3	**1**	**2**	**1**
CO:4	**2**	**3**	**3**
CO:5	**1**	**2**	**2**

References:

1. S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
2. Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education

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3. Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH

4. Morris Mano "Digital Computer Design", PHI 2003

5. Kennedy, Davis, "Electronics Communication System" 4th Edition, TMH.

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- www.sanfoundary.co.in
- Grade up online course on transistors (www.gradeup.org)
- www.nptel.ac.in
- https://en.wikipedia.org

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TEEC 151/251 ELECTRONICS ENGINEERING LAB

Objective: The objective of this lab is to familiarize the students with the basic working of diodes and also help them calculate voltage and currents through simple devices such as multimeter.

Experiments:

1. To study of Digital Multimeters (measurement of AC and DC voltage, measurement of current, measurement of resistance, capacitance), passive components (resistor, capacitor) and verify using colour code.
2. To Study Cathode Ray Oscilloscope (To study of controls of CRO, to measure amplitude, time period and frequency of time varying signals), function generator, power supply & Bread Board.
3. To study the Characteristics of a P-N Junction diode in forward & reverse bias connection.
4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier.
5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers.
6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance.
7. To Plot input / output characteristics for common base transistor.
8. To verify the truth table of basic logic gates (AND, OR, NOT)
9. To build and test the clipper circuit using diode.
10. To build and test the clamper circuit using diode

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TECS-101 / 201 Computer Fundamentals and Programming L T P 3 1 0
Objective:

- This course introduces the concepts of computer basics & programming with particular attention to Engineering examples.
- The C programming language is used but the course will stress on fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.
- C is the easiest language to understand so basic constructs of C will be cleared.

Unit-I **(08 Sessions)**

Introduction: Introduction to Computer Systems, Generation of Computers, BIOS, Various types of memories, CPU organization, ALU, registers. Introduction to various operating Systems. Number systems: Binary, hexadecimal, octal and their inter conversions. Computer Languages and Software & hardware: High Level Languages and Low Level Language, Various types of software. Firmware, Compiler, Interpreter and Assembler. File Allocation Table, Hardware. **for better employability in industry**.

Unit –II **(08 Sessions)**

Input, Output and storage Units: Introduction to various Input and output Devices Printers: Various type of Impact and Non- Impact Printers. Introduction to algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code. Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs. Use of high level programming languages for the development of programs **for skill enhancement**.

Unit-III **(08 Sessions)**

Standard I/O in "C", Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associatively **for better skilling of entrepreneurship**.

Unit-IV **(08 Sessions)**

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and

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Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue **for better employability in industry**.

Unit-V **(08 Sessions)**

Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules. Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structure, union, enumerated data types, Functions: Introduction, types of functions, functions with array, recursive functions, Introduction to pointers, Introduction to file handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler. **for skill development and employability**.

Course Outcomes:

On completion of the course students will be able to:

CO: 1 Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming **for better employability in industry**.

CO: 2 Write, compile and debug programs in C language and use different data types for writing the programs **for skill enhancement**.

CO: 3 Design programs connecting decision structures, loops and functions **for better skilling of entrepreneurship**.

CO: 4 Explain the difference between call by value and call by address **for better employability in industry**.

CO: 5 Understand the dynamic behavior of memory by the use of pointers **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	2	**3**	**3**	1	2	**3**	1	**3**	2
CO:2	1	**3**	2	**3**	1	2	1	2	1	**3**
CO:3	2	1	**3**	2	**3**	**3**	1	2	**3**	1
CO:4	**3**	1	2	**3**	1	2	**3**	**3**	**3**	**3**
CO:5	2	**3**	1	2	**3**	1	2	1	2	**3**

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	2	3

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CO:2	2	**3**	**2**
CO:3	**1**	**2**	**3**
CO:4	**3**	**2**	**1**
CO:5	**1**	**3**	**2**

References:

1. "Let us C", Yashvant Kanitkar.
2. "Programming with C", Byron Gottfried
3. "Computer Fundamentals", Anita Goel, Pearson Education
4. "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
5. "C programming", Kernighan and Ritchie, PHI
6. "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

Website Sources:

- www.nptel.ac.in
- www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus
- www.learn-c.org

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TECS-151/251 **Computer Lab**

Objective: The following student learning outcomes, goals, assessment methods and core competencies have been identified for the Learning Center computer lab:

- To provide students with an open access computer lab using up-to-date technology to complete their studies.
- To increase retention in reading, study skills, English, foreign language, nursing, psychology and other academic classes by providing a lab where students can make use of software products to supplement instruction.

List of Experiments: (Minimum 10 experiments are required to be performed)

(20 Sessions)

1. Object: Apply basic operations in windows on a folder.
2. Object: Design front page of your practical file
3. Object: Prepare a PERSONAL LETTER.
4. Object: Create your resume using given Templates.
5. Object: Create a report containing the pay details of the employee.
6. Object: Create a student result sheet
7. Object: create a pie chart for a sample data and give legends.
8. Object: Prepare a Time Table in MS-Excel.
9. Object: Prepare a presentation in MS-Power point about "Fundamentals of Computer".
10. Object: Create your E-Mail ID on Gmail
11. Object: Search any topic related to your syllabi using any search.
12. Object: Write a program in C to print "I am a student of IFTM University".
13. Object: Write a program in C to take input from user using scanf.
14. Object: Write a program to add, subtract, multiplication and division of two numbers.
15. Object: Write a program in C to calculate Factorial of a Number
16. Object: Write a program in C to print a Table.
17. Object: Program to compute the compute the average.
18. Object: Write a program to check whether a number is even or odd.
19. Object: Write a program to check whether a number is prime number or not.
20. Object: Write a program to check whether a year is leap year or not.
21. Object: Write a program to find largest of three numbers.
22. Object: Program to compute the factorial of a given number.

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TEME – 151 / 251: Mechanical Engineering Lab L T P 0 0 2

Objective: The objective of the course is to introduce students to different engineering material and create an understanding of different mechanical properties by using Destructive testing methods. Also the students will be familiar with the basic working of IC engines & boilers.

List of Experiments: (Minimum 08 experiments are required to be performed) (16 Sessions)

1. To conduct tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen using UTM Machine.
2. To conduct compression test and determine the ultimate compressive strength for a specimen using UTM Machine.
3. To conduct Impact-tests (Izod / Charpy) on Impact-testing machine to find the toughness.
4. To determine the hardness of the given specimen using Brinell/Rockwell hardness testing machine.
5. To study 2-stroke & 4-stroke I.C. Engine models.
6. To study Lancashire, Babcock Wilcox and Locomotive boiler models.
7. To study Steam Engine & Steam Turbine models.
8. To study vapor compression Refrigerator unit tutor / refrigerator.
9. To study window type Air conditioner.
10. To conduct torsion test on mild steel or cast iron specimens to find out modulus of rigidity.

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TEMA – 202 **Elementary Mathematics- II**

Objective: -The main aims of this course are to recall and remember basics of algebra, probability theory, vectors and three dimensional geometry. The focus of the subject to understand the concepts of basic mathematical methods to solve engineering problems analyze engineering problems and evaluate the solutions.

UNIT – 1 **(12 Sessions)**

ALGEBRA: Fundamental theorem of algebra , Solution of quadratic equations in the complex number system, Linear inequalities, Algebraic solutions of linear inequalities in one variable and their representation on the number line, Graphical solution of linear inequalities in two variables, Solution of system of linear inequalities in two variables graphically **for skill enhancement**.

UNIT – 2 **(08 Sessions)**

SEQUENCES, SERIES, PERMUTATION & COMBINATION: Sequence and series,

Arithmetic progression (A.P.), Arithmetic mean (A.M.), Geometric progression (G.P.), General term of a G.P., Sum of n terms of a G.P., Geometric mean (G.M), Relation between

A.M. and G.M., Fundamental principle of counting, Factorial n (n!), Permutation and combinations formulae and their connections, Simple applications, Sum of n terms of the special series n, n^2 and n^3 **for better skilling of entrepreneurship**.

UNIT – 3 **(10 Sessions)**

PROBABILITY THEORY: Random experiments, Outcomes, Sample spaces(set representation), Events , Occurrence of events, 'and' and 'or' events, Exhaustive events, Mutually exclusive events , Connections with the theories of earlier classes, Probability of an event , Multiplication theorem on probability , Bays theorem , Binomial distribution , Poisson distribution and Normal distribution **for skill development and employability**.

UNIT – 4 **(10 Sessions)**

VECTOR AND SCALARS: Vectors and Scalars, Magnitude and direction of a vector, Direction cosines / ratios of vectors, Type of vectors (equal , unit, zero, Parallel and collinear vectors), Position vector of a point , Negative of a vector , Components of a vector, Addition of a vectors, Multiplication of a vector by a scalar, Position vector of a point dividing a line segment in a given ratio, Scalar product of vectors, Projection of a vector on a line, Cross product of vectors **for skill development**

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UNIT – 5 **(12 Sessions)**

THREE-DIMENSIONAL GEOMETRY: Introduction to three- dimensional geometry coordinate axes and coordinate planes in three dimensions, Coordinates of a point, Distance between two points and section formula, Direction cosines / ratios of a line joining two points, Cartesian and vector equation of a line, Coplanar and skew lines, Shortest distance between two lines, Cartesian and vector equation of a plane, Angle between (i) two lines, (ii) two planes (iii) a line and a plane, Distance of a point from a plane **for employability**.

Course Outcomes:

The student is able to

CO: 1 Remember equations, inequalities, and systems of equations to represent situations and find solutions via symbolic, numeric and graphic methods **for skill enhancement**.

CO: 2 Understand and calculate probabilities by applying probability laws and theoretical results **for better skilling of entrepreneurship**.

CO: 3 Compare and analyze the methods by using coordinates to represent and work with ***vectors*** **for skill development and employability**.

CO: 4 Understand the concepts & advance topics related to *three dimensional geometry* and study the applications of conics **for skill development**

CO: 5 Understand the concepts Direction cosines / ratios of a line joining two points, Cartesian and vector equation of a line, Coplanar and skew lines, Shortest distance between two lines **for employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	1	**3**	2	**3**	1	2	**3**	2	1
CO:2	**3**	**3**	2	**3**	1	1	**3**	2	1	**3**
CO:3	**3**	1	**3**	2	2	**3**	2	**3**	1	2
CO:4	**3**	2	2	**3**	1	2	**3**	2	1	**3**
CO:5	**3**	**3**	2	1	**3**	2	1	**3**	2	**3**

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**1**	**2**	**3**
CO:2	**2**	**3**	**2**
CO:3	**3**	**2**	**3**

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CO:4	**1**	**3**	**1**
CO:5	**2**	**2**	**2**

References:

1. R.D. Sharma: Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. New Delhi, India.
2. R.D. Sharma: Mathematics (I& II-XII):Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. New Delhi, India.
3. Gorakh Prasad: Differential Calculus, Pothishala Private Limited, Allahabad.
4. Gorakh Prasad: Integral Calculus, Pothishala Private Limited, Allahabad.
5. B.S. Grewal: Engg. Mathematics, khanna publishers, New Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

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TEBT-209: ELEMENTARY BIOLOGY-II

Objective(s): The objectives of this course:

- Provide necessary knowledge of the microbial world, structure and functions of microbes and their relationship to environment and human health.
- Emphasizes on imparting basic construction of a living organism, its metabolism and relation to diseases.

UNIT I: **(8 Sessions)**

Microbiology: Brief history of microbiology, Types of microorganisms, Basic idea of domain bacteria, proteobacteria, non proteobacteria Gram –ve and Gram +ve bacteria, lichens, algae, protozoa, helminthes, viral structures, viral multiplication, Role of microorganisms in the production of industrial chemicals and pharmaceuticals **for skill enhancement**.

UNIT II: **(8 Sessions)**

Cells: Functional Anatomy of Prokaryotic and Eukaryotic Cells: Size, shape, and arrangement of bacterial cells. Structure and function of cells **for better skilling of entrepreneurship**. **for skill development and employability**.

UNIT III: **(8 Sessions)**

Metabolism: Catabolic &anabolic reactions: enzymes, energy production and carbohydrate metabolism. Lipid & protein catabolism, Energy production mechanism, metabolic diversity & amp; pathways of energy use. Integration of metabolism **for better skilling of entrepreneurship**.

UNIT IV: **(8 Sessions)**

Energy Utilization: Structure of mitochondria, cellular respiration, relationship of carbohydrate metabolism to other compounds, Glycolysis, formation of acetyl co-A, Krebs cycle, Electron Transport System and Oxidative Phosphorylation, ATP, factors affecting respiration **for skill development and employability**.

UNIT V: **(8 Sessions)**

Reproductive health and human welfare: Population and birth control, sexually transmitted diseases, infertility, Cancer and AIDS, Basic concepts of immunology, vaccines **for skill development and employability**.

Course Outcomes:

At the end of the course students will able to:

CO: 1 Define the science of microbiology, its development and importance in human welfare **for skill enhancement**.

CO: 2 Acquire knowledge about the organizational and functional aspects of cell and cell

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for skill development and employability.

CO: 3 Learn about the interactions of the cells with outside environment **for better skilling of entrepreneurship**.

CO: 4 Learn about the classical genetics and transmission of characters **for skill development and employability**.

CO: 5 Learn about cellular respiration Phosphorylation ATP Electron Transport System **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	1	2	1	2	2	**3**	2	1	2
CO:2	1	**3**	2	**3**	1	**3**	2	**3**	1	**3**
CO: 3	**3**	1	**3**	2	**3**	1	2	**3**	1	2
CO: 4	2	**3**	1	**3**	2	1	2	1	**3**	1
CO: 5	**3**	1	2	1	**3**	2	**3**	1	**3**	2

CO-Curriculum Enrichment Mapping (Please 3 wherever required)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**3**	**3**	**3**
CO:2	**1**	**2**	**1**
CO:3	**2**	**3**	**2**
CO:4	**1**	**2**	**3**
CO:5	**3**	**3**	**2**

Suggested Readings:

1. Biology-Textbook of Class XI, NCERT Publication
2. Biology-Textbook of Class XII, NCERT Publication
3. Microbiology- Pelzer, Tata Mcgraw- Hill Publishing Com. Ltd., 2002
4. An introduction to immunology by C.V. Rao, Narosa publishing house
5. Biology by Peter H Raven, George b Johnson, Kenneth A., Mason, Jonathan Losos, Susan
6. Singer (MacGraw Hill Publication)
7. General Microbiology: Stainer, Adelberg and Ingraham

Website Sources:

- https://routledgetextbooks.com/textbooks/9780815345138/lecture-notes.php
- https://www.slideshare.net

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- https://lecturenotes.in/
- https://www.shomusbiology.com/

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TEPH-201 **Engineering Physics-II** **L T P 3 1 0**

Objective: The goal of this course is to familiarize students about electromagnetic theory, magnetic materials, solid state Physics, superconductors and their applications.

UNIT- I **(10 Sessions)**

Electromagnetic Theory Gauss law, continuity equation, Ampere's Law, Maxwell's equations (differential and integral forms), Pointing vector and Pointing Theorem , propagation of plane electromagnetic waves in free space Non conducting and in conducting media, Skin depth **for skill enhancement**.

UNIT- II **(08 sessions)**

Dielectric and Magnetic Properties of Materials Dielectric Properties: Dielectric constants, Polarization of dielectric materials, Polarizability, Claussius- Mossotti Equation, Application of dielectric. Magnetic Properties: Magnetization, Magnetic moment, Dia, Para and Ferro magnetism, Langevin theory for diamagnetic material, Hysteresis Curve **for better skilling of entrepreneurship**.

UNIT - III **(08 Sessions)**

Solid State Physics Energy bands in metals, Semiconductors and insulators, Intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors, P-N junction, Tunnel diode, Zener diode **for skill development and employability**.

UNIT- IV **(08 Sessions)**

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), London's Equation, Properties of superconductors & applications of superconductors.

Nano Materials: Basic principle of nano science and technology, Structure, properties and uses of Fullerene and carbon nano tubes, Application of nano technology **for skill development and employability**.

Unit- V **(08 Sessions)**

I- Rays: Diffraction of X-rays, Production and properties, Bragg's Law, Bragg's spectrometer, Applications of X-rays.

Ultrasonics: Introduction, Production of Ultrasonics (Magneto striction and piezoelectric methods), properties & applications of Ultrasonic waves **for skill development and employability**.

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Course outcome: The students completing this course will be able to:

CO: 1 Understand Gauss law, Ampere's Law, Maxwell's equations and their applications **for skill enhancement**.

CO: 2 Study of Propagation of plane electromagnetic waves in free space **for better skilling of entrepreneurship**.

CO: 3 Understand Dielectric and magnetic properties of the materials **for skill development and employability**.

CO: 4 Explain Intrinsic and extrinsic semiconductors **for skill development and employability**.

CO: 5 Construction, Operation and characteristics of diodes **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	**3**	2	1	2	1	2	2	1	2	1
CO:2	1	2	**3**	1	2	**3**	1	**3**	1	2
CO:3	2	1	**3**	2	2	1	2	1	2	**3**
CO:4	**3**	2	1	**3**	1	**3**	1	**3**	1	1
CO:5	1	1	2	1	**3**	1	1	2	2	**3**

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**3**	**3**	**2**
CO:2	1	**2**	**3**
CO:3	3	**3**	**2**
CO:4	3	**3**	**1**
CO:5	3	**3**	**3**

References:

1. Concept of Modern Physics: A. BEISER
2. Atomic Physics: Rajam
3. Greiner : Quantum Physics
4. Griffth : Introduction to Electrodynamics
5. S. K. Gupta: Engineering Physics

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Website Sources:

- https://www2.ph.ed.ac.uk
- http://web.mit.edu
- http://pcwww.liv.ac.uk
- http://sites.science.oregonstate.edu
- https://eng.libretexts.org
- https://shodhganga.inflibnet.ac.in
- https://www.electrical4u.com
- https://vardhaman.org

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TEPH-151/251 **Physics Lab** **L T P 0 0 2**

Objective: To achieve perfectness in experimental skills. The study of practical applications will bring more confidence and to learn the usage of electrical and optical systems for various measurements.

List of Experiments: (Minimum 10 experiments are required to be performed)

(20 Sessions)

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and thento estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter.
10. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up.
11. To determine energy bank gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of thegiven specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

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TECE-201/101: Environmental Science

Objective(s): The objectives of this course:

- Provide every student with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment.
- Develop and reinforce new patterns of environmentally sensitive behavior among individuals, groups and society as a whole for a sustainable environment.
- Understand the trans-national character of environmental problems such as global warming, climate change, ozone layer depletion etc. and ways of addressing them, including interactions across local to global scales.

UNIT I: (12 Sessions)

Environment: Definition of environment. Environmental education. Need for the public awareness. : Concept of Ecology: Ecosystem, energy and nutrients flow in ecosystem food chain. Environmental segment: Atmospheric structure. Classification of air pollutants, sources of air pollution and their effect on human health and property **for skill enhancement**.

UNIT II: **(10 Sessions)**

Air quality and standard: Meteorological phenomenon and their influence on air quality, lapse rates, dispersion of pollutants. Air pollution control: Introduction to particulates and gaseous pollutants such as SOx, NOx & CO, and their effects **for better skilling of entrepreneurship**.

UNIT III: **(10 Sessions)**

Water quality: Physical. Chemical & biological parameters. Water quality standard, BOD. COD and BOD COD calculations. Environmental Analysis: pH, alkalinity, conductivity, ammonia, fluoride, sulphate, chloride. Analysis and measurement of gaseous pollutants **for skill development and employability**.

UNIT IV: **(8 Sessions)**

Pollution: Pollution from industry and agriculture. Polymers and plastic, food additives, fertilizers, insecticides, fungicides and herbicides. Heavy metal and energy their environmental implications. Solid waste and its managements. Pollution and public health aspect Environmental Protection- Role of government, initiatives by non-governmental organizations (NGO) **for skill development and employability**.

Course Outcomes:

At the end of the course students will able to:

CO: 1 Understand the issues and challenges related to environmental and ecosystem due to some human activities **for skill enhancement**.

CO: 2 Understand key concepts from economic, political, and social analysis as they pertain to

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the design and evaluation of environmental policies and institutions **for better skilling of entrepreneurship**.

CO: 3 Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving **for skill development and employability**.

CO: 4 Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems **for skill development and employability**.

CO: 5 Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	1	2	3	2	3	2	3
CO:2	1	3	1	1	2	1	1	1	1	2
CO:3	2	1	3	2	1	3	2	2	3	1
CO:4	3	2	2	3	2	1	3	1	2	2
CO:5	1	3	1	2	3	2	1	2	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**3**	**2**	**1**
CO:2	**1**	**1**	**3**
CO:3	**3**	**3**	**1**
CO:4	**3**	**3**	**2**
CO:5	**1**	**2**	**3**

Suggested Readings:

- "Environmental studies" Benny Joseph, Tata McgrawHill-2005.
- "Environmental studies"-Dr D.L. Manjunath, Pearson Education-2006.
- "Environmental studies" R. Rajagopalan, Oxford Publication-2005.
- "Text book of environment science & Technology", M. Anji Reddy, BS Publication.

Website Sources:

- https://www.india.gov.in/official-website-ministry-environment-and-forests-0
- https://www.earthshare.org/environews/

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TPSD-201: PROFESSIONAL SKILL DEVELOPMENT-I

Objective(s): The objective of this course:

- Develop knowledge and understanding of grammar.
- Develop abilities to make use of the grammar in own writing English.
- Increase understanding and recall of what read and listen is including facts and main idea.
- Enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resume, bio-data, letters and applications of different kinds.
- Develop all the four skills of English language.

UNIT I: **(8 Sessions)**

Basic Applied Grammar and Usage: The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. Noun: Kinds; Gender; Case; Number; Usage. Pronouns: Definition; Kinds; Usage. Adjectives: Kinds, Degrees of Comparison, Transformation of Degrees. Determiners: Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. Articles: Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. Verbs: Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage **for skill enhancement**.

UNIT II: **(8 Sessions)**

Basic Applied Grammar Continued: Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. Adverbs: Kinds and Usage. Prepositions: Kinds and Usage. Conjunctions: Kinds; Usage. Interjections: Definition; Usage **for better skilling of entrepreneurship**.

UNIT III: **(10 Sessions)**

Clauses and Phrases: Tenses, Active and Passive Voice, Direct and Indirect Speech **for skill development and employability**.

UNIT IV: **(6 Sessions)**

Précis Writing: Techniques of Précis Writing; examples. Paragraph Writing: Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. Reading Comprehension. Listening Comprehension **for skill development**

UNIT V: **(8 Sessions)**

Writing of Resume: Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment **for and employability**.

Course Outcomes:

At the end of the course students will able to:

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CO: 1 Write paragraph, gist or abstract/précis of the passage in own words/ language and resume, bio-data, letters and applications of different kinds **for skill enhancement**.

CO: 2 Use targeted grammatical structures meaningfully and appropriately in oral and written production **for better skilling of entrepreneurship**.

CO: 3 Enhance competences in the four modes of literacy: writing, speaking, reading & listening **for skill development and employability**.

CO: 4 Understand and recall of what read and listen is including facts and main idea **for skill development**

CO: 5 Understand Bio-Data. Writing of Letters and Applications Letters of Claims and Complaints, Letters of Adjustment **for and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	2	3	1	2	3	1	3	2	3
CO:2	2	3	1	3	1	2	3	1	3	1
CO:3	3	1	3	2	1	1	2	1	1	2
CO:4	3	2	2	3	3	1	3	2	3	1
CO:5	1	3	1	1	3	2	1	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**3**	**2**	**1**
CO:2	**1**	**1**	**3**
CO:3	**3**	**3**	**2**
CO:4	**3**	**1**	**1**
CO:5	**1**	**3**	**2**

Suggested Readings:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
3. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources:

- www.wikipedia.com
- www.englishgrammar.org

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- www.usingenglish.com
- www.grammarly.com

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TEEE-101 / 201 **ELECTRICAL ENGINEERING** **L T P 3 1 0**

Objective:

- To provide comprehensive idea about AC and DC circuits and its analysis
- To provide the working principles and applications of basic machines in electrical engineering.

UNIT-I **(08 Sessions)**

D.C. Circuit Analysis: Network, Active And Passive Elements, Concept of Linearity And Linear Network, Unilateral And Bilateral Elements, Sources, Source Transformation, Kirchhoff's Laws, Star-Delta Transformation, **Network Theorems:** Thevenin's Theorem, Superposition Theorem, Norton's Theorem, Maximum Power Transfer Theorem **for skill enhancement**.

UNIT-II **(08 Sessions)**

Single Phase AC Circuits: AC Waveforms, Average and Effective Values, Form and Peak Factors, Analysis of Series, Parallel and Series-Parallel RLC Circuits, Active, Reactive and Apparent Powers, Power Factor, Causes of Low Power Factor, Resonance in Series and Parallel Circuits. **for better skilling of entrepreneurship**.

UNIT-III **(08 Sessions)**

Three Phase AC Circuits: Three Phase System, Advantages, Phase Sequence, Star and Delta Connections, Balanced Supply and Balanced Load, Three-phase Power and its Measurement, **Measuring Instruments:** Types of Instruments, PMMC and Moving Iron Instrument, Single-Phase Dynamometer Wattmeter, Induction Type Energy Meter **for better skilling of entrepreneurship**.

UNIT-IV **(08 Sessions)**

Magnetic Circuits: Magnetic Circuit Concepts, Analogy between Electric & Magnetic Circuits, Magnetic Circuits with DC and AC Excitations, B-H Curve, Hysteresis and Eddy Current Losses,

Single Phase Transformer: Principle, Working, Construction, E.M.F. Equation, Power Losses, Efficiency, Introduction to Auto-Transformer (Excluding Numericals) **for better skilling of entrepreneurship**.

UNIT-V **(08 Sessions)**

Principles of Electro-Mechanical Energy Conversion,

DC Generator: Construction & Working, E.M.F. Equation of Generator, Types of D.C. Generator, Applications, **D.C. Motor:** Principle of operation, Torque Equation of a Motor, Types of D.C. Motor, Applications (Excluding Numericals)

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Three Phase Induction Motor: Construction-(Squirrel cage and slip-ring motor), Principle of Operation, Applications (Excluding Numericals) **for skill enhancement**.

Course Outcome: On completion of the course students will be able to:

CO: 1 Predict the behavior of any electrical and magnetic circuits **for skill enhancement**.

CO: 2 Formulate and solve complex AC, DC circuits **for better skilling of entrepreneurship**.

CO: 3 Identify the type of electrical machine used for that particular application **for better skilling of entrepreneurship**.

CO: 4 Realize the requirement of transformers in transmission and distribution of electric power and other applications **for better skilling of entrepreneurship**.

CO: 5 Function on multi-disciplinary teams.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	2	3	1	2	1	3	2
CO:2	3	3	1	2	1	1	2	2	1	3
CO:3	2	1	3	1	2	3	1	3	2	1
CO:4	3	1	1	3	1	2	2	2	3	1
CO:5	1	3	1	2	3	1	3	1	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**3**	**2**	**1**
CO:2	**2**	**1**	**3**
CO:3	**1**	**2**	**3**
CO:4	**3**	**1**	**1**
CO:5	**2**	**1**	**2**

References:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc-Graw Hill
4. T.K. Nagsarkar & M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press

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5. W.H. HaytP, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.lecturenotes.in
- www.examupdates.in
- www.iare.ac.in
- www.notes.specworld.in
- www.ocw.mit.edu
- www.nptel.ac.in
- www.vlab.co.in

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TEEE-151/ 251 ELECTRICAL ENGINEERING LAB L T P 0 0 2

List of Experiments: (Minimum 08 experiments are required to be performed)

(16 Sessions)

1. Verification of Kirchhoff's current law.
2. Verification of Kirchhoff's voltage law
3. Verification of Superposition theorem.
4. Verification of Thevenin's Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. To study a Single phase induction motor and its various methods of starting.
7. To study running and speed reversal of a Three Phase Induction Motor and determine the slip.
8. To determine the transformation ratio and turns ratio and current ratio of a single-phase transformer.
9. To study the construction of a dc machine.
10. To study a single phase Induction type Energy meter.

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TEBT-102/ TEBT-202: INTRODUCTION TO BIOTECHNOLOGY

Objective(s): The objectives of this course:

- Introduce students to the global significance of biotechnology, the categories of biotechnology processes and products, and in the context of "traditional" Vs "modern" biotechnology processes and its applications.
- Introduce the developments in the field of biotechnology, genomics and proteomics.
- Introduce to the bioinformatics which is one of the emerging fields in biotechnology.

UNIT I: **(8 Sessions)**

Introduction to Biotechnology: Fundamentals of Biochemical Engineering, Biotechnology and Society-Principles and Processes; Application in Health, food, medicine and Agriculture; genetically modified organisms (GMO); biosafety issues. **For skill enhancement**.

UNIT II: **(8 Sessions)**

Biomolecules: Building Blocks of Biomolecules-Structure and dynamics. Structure and function of Macromolecules (Carbohydrates, Proteins, Lipids). Classification of Enzymes-Purification and characterization of enzymes from natural sources. Comparison of chemical and enzyme catalysis. **for better skilling of entrepreneurship**.

UNIT III: **(8 Sessions)**

Cell as a basic unit of life: Introduction: Definition, Study of Microbes, Types of microbes, Classification of microbes. Origin of microbiology. Application of microbes in fermentation Biotechnology. Cellular Techniques including chromatography **for skill development and employability**.

UNIT IV: **(8 Sessions)**

History of Bioinformatics: Introduction and application. Biological databases (nucleotide and protein data bases, Structure databases) and their retrieval. Sequence file formats. Information Sources Analysis using Bioinformatics tools **for skill enhancement**.

UNIT V: **(8 Sessions)**

Genomics: Introduction Genome Sequencing Projects, Gene Prediction and counting, Genome similarity, SNP's and comparative genomics **for skill employability.**

Course Outcomes:

At the end of the course students will able to:

CO: 1 Understand basic concepts in components of cell, structure and biochemical functions. **For skill enhancement**.

CO: 2 Acquire basic concepts of nucleic acids and its structures. **for better skilling of entrepreneurship**.

CO: 3 Search and retrieve information from genomic and proteomic databases (e.g. Gen Bank,

CO:3 Swiss-Prot), and to analyze their search results using software available on the internet

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(e.g. BLAST, ClustalW). **for skill development and employability**.

CO: 4 Learn the theory of genome sequencing and other predictions **for skill enhancement**.

CO: 5 Introduction Genome Sequencing Projects SNP's and comparative genomics **for skill employability.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	1	2	1	3	2	3	1
CO:2	1	3	1	3	3	2	2	1	2	3
CO:3	3	1	3	2	1	3	1	2	1	2
CO:4	3	1	1	3	2	1	3	3	1	3
CO:5	2	2	1	1	3	1	1	1	2	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	**3**	**2**	**2**
CO:2	**1**	**1**	**3**
CO:3	**3**	**3**	**1**
CO:4	3	1	2
CO:5	1	3	1

Suggested Readings:

- Introduction to Biotechnology by William J. Thieman, Michael A. Palladino, Publisher: Benjamin Cummings.
- Basic Biotechnology by Colin Ratledge Publisher: Cambridge University Press.
- Text book of Biotechnology by H.K. Dass (Wiley India publication).
- Biotechnology by B.D. Singh (Kalyani Publishers).
- Text book of Biotechnology by R.C.Dubey (S.Chand and company).

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://www.ncbi.nlm.nih.gov/books

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TEBT-252: Introduction to Biotechnology Lab

1. Introduction of Laboratory Practices
2. Safety Measures
3. Do and Don't
4. About Equipments and Accessories: Principle and Working
5. Introduction to Laboratory Instruments — Experiment 1
6. To learn the Preparation of media — Experiment 2
7. Isolation of microbes from the given sample by spread plate technique — Experiment 3
8. To characterize bacterial colony using gram staining — Experiment 4
9. Preparation of buffers and measurement of pH — Experiment 5
10. Identification of carbohydrates by Molisch's test — Experiment 6
11. Estimation of reducing sugars by Benedict test — Experiment 7
12. To distinguish between polysaccharides and other carbohydrates (Iodine test) — Experiment 8

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TEME 153/253 **Engineering Graphics Lab** **L T P 0 0 2**

1. Introduction **(03 Sessions)**

Introduction, Drawing Instruments and their uses, BIS conventions, Lines & Lettering, Dimensioning and free hand practicing. Coordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale.

2. Orthographic Projections **(05 Sessions)**

Introduction, Definitions- Planes of projection, reference line and conventions employed. Principle of Orthographic projections, First and Third Angle projections.
Projection of Points, Pictorial view.

Terms used in Projection of lines. Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems. **(First Angle Projection Only)**

3. Projections of Solids (First Angle Projection Only) **(06 Sessions)**

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. Sections and Development of Lateral Surfaces of Solids, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. Development of lateral surface of above solids, their frustums and truncations.

4. Isometric Projection (Using Isometric Scale Only) **(06 Sessions)**

Introduction, Principle of isometric projection, Terminology, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids.

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TEAG302 Principles of Soil Science, Agronomy & Horticulture Crops L: T: P 3:0:0

Objective: This course enables the Graduates to gain knowledge of basics of agriculture to improve the efficacy and sustainability of agricultural practices.

UNIT-I

Soils: Nature and origin of soil; soil forming rocks and minerals, their classification and composition, soil forming processes, classification of soils – soil taxonomy orders; soil physical properties; and their importance; soil particle distribution; soil inorganic colloids – their composition, properties and origin of charge; ion exchange in soil and nutrient availability **for better skilling of entrepreneurship**.

UNIT- II

Soil Organic Matter: Composition and decomposition of soil organic matter, effect on soil fertility; soil reaction – acid, saline and sodic soils; quality of irrigation water; essential plants nutrients – their functions and deficiency symptoms in plants; important inorganic fertilizers and their reactions in soils **for skill enhancement**.

UNIT- III

Agronomy: Definition and scope of agronomy, classification of crop and the effect of different weather parameters on the growth and development of crop. Principles of tillage, tilth and it's characteristics. Soil water plant relationship and water requirement of crops, weeds and their control, crop rotation, cropping systems, Relay cropping and mixed crop **for skill enhancement**.

UNIT- IV

Horticulture: Scope of horticultural and vegetable crops. Soil and climatic requirements for fruits, vegetables and floriculture crops, improved varieties, **for skill development and employability**.

UNIT- V

Criteria for site selection: layout and planting methods, nursery raising, macro and micro propagation methods, plant growing structures, pruning and training, fertilizer application, fertigation, irrigation methods. Harvesting, grading and packaging, Post harvest practices, Garden tools, management of orchard, Extraction and storage of vegetables seeds **for skill development**

Course Outcomes:

The Students will understand the different types of soils, rocks, characteristics and Identifications.

CO: 1. the layout and planting methods of horticultural crops **for better skilling of entrepreneurship**.

CO: 2 the different types of soil and organic matters **for skill enhancement**.

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CO: 3 the different types of equipment for tillage operations **for skill enhancement**.

CO: 4 about the essential plants nutrients **for skill development and employability**.

CO: 5 about the Harvesting, grading and packaging Extraction and storage of vegetables seeds **for skill development**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	2	3	1	2	1	3	2
CO:2	1	3	2	1	3	1	3	2	2	3
CO:3	3	1	3	1	1	2	1	1	1	1
CO:4	1	1	2	3	1	2	2	2	2	1
CO:5	3	1	2	1	3	1	1	1	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	**2**	**1**	**2**
CO:2	**1**	**2**	**3**
CO:3	**3**	**3**	**1**
CO:4	**3**	**3**	**2**
CO:5	**3**	**3**	**3**

References:

1. Nyle C. Brady, The Nature and Properties of Soils, Pearson Prentice Hall, 2007
2. T.D. Biswas, Text Book of Soil Science, TMH, 2006
3. P. Balasubramaniyan, Principles and Practices of Agronomy, 2004
4. T. Yellamandra Reddy, Principles of Agronomy, Kalyani Publications, 2007

Website Source:

- www.onlineecourses.nptel.ac.in
- http://ecoursesonline.iasri.res.in/
- www.agrimoon.com

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TEAG352 Soil Science, Agronomy and Horticulture Lab L:T:P 0:0:2

List of Experiments: Minimum 08 experiments out of the following:

1. Identification of rocks and minerals.
2. Examination of soil profile in the field.
3. Determination of bulk density.
4. Determination particle density and porosity of soil.
5. Identification of crops and their varieties seeds and weeds.
6. Different weed control methods.
7. Judging maturity time for harvesting of crop.
8. Study of seed viability and germination test.
9. Identification and description of important fruit; flowers and vegetables crops,
10. Study of different garden tools.
11. Preparation of nursery bed.
12. Practices of pruning and training in some important fruit crops.

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TEME 308 Fluid Mechanics and Open Channel Hydraulics L:T:P 3:0:0

Course Objective: The objective of this course is to familiarize the students with the properties of fluids and the applications of fluid mechanics. To formulate and analyze the problems related to fluid flow. To understand the concept of flow measurement, types of flows and dimensional analysis.

UNIT I: (8 Sessions)

Properties of fluids, ideal and real fluid, pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces. Buoyancy and Floatation: Centre of pressure, buoyancy, meta centre and meta centric height, condition of floatation and stability of submerged and floating bodies **for better skilling of entrepreneurship**.

UNIT II: (8 Sessions)

Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function and velocity potential. Types of fluid flow, translation, rotation, circulation and vorticity **for better skilling of entrepreneurship**.

UNIT III: (8 Sessions)

Dynamics of fluid flow: Bernoulli's theorem, venturimeter, orifice meter and pitot tube. Flow through orifices and mouthpieces, flow over notches and weirs, flow through open channels **for better skilling of entrepreneurship**.

UNIT IV: (8 Sessions)

Flow through pipes: Chezy's formula for loss of head in pipes, flow through simple and compound pipes, minor and major hydraulic losses through pipes and fittings, flow through siphon. **for skill enhancement**.

UNIT V: (8 Sessions)

Dimensional analysis and similitude: Rayleigh's method and Buckingham's 'Pi' theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery, Hydraulic pumps. **for skill development and employability**.

Course Outcomes:

Students completing this course will be able to:

CO: 1 Understand stress-strain relationship in fluids, classify their behavior and also establish force balance in static systems **for better skilling of entrepreneurship**.

CO: 2 To apply Bernoulli principle and compute pressure drop in flow systems of different

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configurations **for better skilling of entrepreneurship**.

CO: 3 To describe function of flow measuring devices and apply Bernoulli equation to determine the performance of these devices **for better skilling of entrepreneurship**.

CO: 4 To measure the fluid pressure using various types of pressure measuring devices **for skill enhancement**.

CO: 5 To understand the Rayleigh's method and Buckingham's `Pi' theorem dimensional analysis, dimensionless numbers Hydraulic pumps **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	1	2	3	1	3	3
CO:2	1	3	2	3	1	3	1	3	1	2
CO:3	3	1	3	2	1	3	1	3	3	2
CO:4	2	1	2	3	1	2	1	2	1	1
CO:5	3	1	1	2	3	3	2	3	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	1	**1**	**3**
CO:2	2	**2**	**3**
CO:3	1	**1**	**3**
CO:4	3	**2**	**1**
CO:5	3	**3**	**2**

References:

1. Som, S K & Biswas, G: Introduction of fluid mechanics and fluid machines, TMH, 2000.
2. Das, M M: Fluid mechanics & turbo machines , Oxford University Press.
3. Agarwal, S K: Fluid mechanics and machinery, TMH.
4. Rouse, H: Elementary mechanics of fluids, John Wiley & Sons, 1946.
5. Gupta, V and Gupta, S K: Fluid Mechanics and its Applications, Wiley Eastern Ltd, 1984.

Website Sources:

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- www.nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

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TEME358 **Fluid Mechanics Lab** **L:T:P 0:0:2**

List of Experiments: Minimum 08 experiments out of the following:

1. Study of manometers and pressure gauges.
2. Verification of Bernoulli's theorem.
3. Determination of coefficient of discharge of Venturi-meter.
4. Determination of coefficient of discharge of orifice meter.
5. Determination of coefficient of friction in pipeline.
6. Determination of coefficient of discharge for triangular notch.
7. Determination of coefficient of discharge, coefficient of velocity and coefficient of contraction for flow through orifice.
8. Determination of coefficient of discharge for mouth piece.
9. Measurement of force exerted by water jets on flat.
10. Determination of meta-centric height.
11. Determination of efficiency of hydraulic ram.
12. Performance evaluation of Pelton and Francis turbine.
13. Study of current meter.

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TECE306 **Surveying Practices** **L:T:P 3:1:0**

Objective: The objective of this course is to introduce the students about the basic concept of measurement such as distance, direction and elevation and to explore the knowledge of instruments used for measurement such as Auto level, theodolite, compass, total station. The objectives of surveying may vary depending on the type of project such as roads, public transit systems, bridges, power plants, dams, pipelines and waste management systems.

UNIT - I

Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys. Linear measurement, compass survey, bearing, meridian, survey station and survey line. **for skill**

UNIT – II

Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction, automatic levels, Contouring-methods and uses **for better skilling of entrepreneurship.**

UNIT – III

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves. Principles, plane table equipments, methods, resection by three point problem **for skill development and employability.**

UNIT – IV

Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, inter-visibility of stations, triangulation field work **for skill development and employability.**

UNIT – V

Global Positioning Systems: GPS Overview, Satellite Constellation, Equipment Segment, Principle of Position Determination via Satellite Generated Ranging Signals, GPS Surveying Techniques, GPS Accuracy, Uses and Applications of GPS

Total Station: Introduction and application **for skill development.**

Course Outcomes:

Students completing this course will be able to:

CO: 1 Apply the principle and knowledge of surveying for civil Engineering Applications Calculation of areas, **for skill enhancement.**

CO:2 Drawing plans and contour maps using different measuring equipment **for better skilling of entrepreneurship.**

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CO:3 Use and operate measurement related traditional and modern instruments **for skill development and employability**.

CO: 4 To understand Principles of traversing by compass and theodolite, computations of traverse coordinates **for skill development and employability**.

CO: 5 To understand GPS Overview Satellite Constellation Equipment Segment Principle of Position Determination via Satellite Generated Ranging Signals **for skill development.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	2	1	2	1	1	2	1	3	3
CO:2	1	3	1	1	3	1	3	3	2	1
CO:3	2	1	3	1	3	3	3	2	3	1
CO:4	3	1	1	3	1	1	1	2	1	2
CO:5	2	3	2	1	3	1	2	1	3	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**2**	**2**
CO:2	2	**1**	**3**
CO:3	3	**3**	**1**
CO:4	3	**2**	**2**
CO:5	3	**1**	**3**

Reference Books:

1. "Surveying Vol 1 & 2", S K Duggal; TMH
2. "Surveying & Leveling"; R Subramanian; Oxford University Press
3. "Surveying & Leveling"; B C Punamia
4. "Text Book of Surveying"; C Venkatramaih University Press

Website resources:

- https://nptel.ac.in/courses/105/107/105107122/
- http://ecoursesonline.iasri.res.in/course/view.php?id=523
- https://freevideolectures.com/course/98/surveying

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TECE356 Surveying Practices Lab L: T:P 0:0:2

1. To find out the angle with the help of Compass.
2. Study of different types of topographical maps and to prepare conventional symbols chart
3. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
4. To find out reduced levels of given points using dumpy/Auto level
5. To study parts of a vernier / Electronic theodolite and practice for taking angle measurements.
6. To measure vertical and horizontal angle of given points by Electronic theodolite.
7. To determine the height of wall using theodolite.
8. To carry out the general study of GPS
9. Demonstration & Study of Total Station

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TEME306 **Heat & Mass Transfer** **L:T:P 3:1:0**

Objective: This course is designed to introduce a basic study of the phenomena of heat transfer such as conduction convection and radiation, and to provide useful information concerning the performance and design of particular heat exchanger systems and processes. A knowledge-based design problem requiring the formulations of solid conduction and fluid convection and the technique of numerical computation progressively elucidated in different chapters will be assigned and studied in detail.

UNIT – I

Concept, modes of heat transfer, thermal conductivity of materials, measurement. General differential equation of conduction. One dimensional steady state conduction through plane and composite walls, tubes and spheres with and without heat generation. Electrical analogy. **Insulation materials for skill enhancement**.

UNIT-II

Free and forced convection. Newton's law of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection. Useful non dimensional numbers. Equation of laminar boundary layer on flat plate and in a tube. Laminar forced convection on a flat plate and in a tube. Combined free and forced convection **for better skilling of entrepreneurship**.

UNIT-III

Introduction Absorptivity, reflectivity and transmissivity of radiation. Black body and monochromatic radiation, Planck's law, Stefan-Boltzman law, Kirchoff's law, grey bodies and emissive power, solid angle, intensity of radiation. Radiation exchange between black surfaces, geometric configuration factor. Heat transfer analysis involving conduction, convection and radiation by networks **for skill development**

UNIT-IV

Types of heat exchangers, fouling factor, log mean temperature difference, heat exchanger performance, transfer units. Heat exchanger analysis restricted to parallel and counter flow heat exchangers **For employability.**

UNIT-V

Steady state molecular diffusion in fluids at rest and in laminar flow, Flick's law, mass transfer coefficients. Reynolds's analogy **for employability**.

Course outcomes: Students completing this course will be able to

CO: 1 Understand the basic laws of heat transfer.

CO: 2 Analyze problems involving steady state heat conduction in simple geometries.

CO: 3 Understand the fundamentals of convective heat transfer process.

CO: 4 Evaluate heat transfer coefficients for natural convection and forced convection inside ducts.

CO: 5 Calculate radiation heat transfer between black body surfaces &heat exchange between gray body surfaces

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	1	1	2	1	2	3
CO:2	1	3	1	2	3	3	3	1	3	3
CO:3	3	2	3	1	3	2	1	1	3	2
CO:4	3	2	1	3	1	2	2	2	1	3
CO:5	3	3	1	2	3	1	1	3	3	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	1	**2**	**2**
CO:2	2	**3**	**1**
CO:3	2	**3**	**3**
CO:4	3	**2**	**2**
CO:5	1	**3**	**2**

References:

1. Heat Transfer, by J.P. Holman, McGraw-Hill International edition.
2. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
3. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt). Ltd.
4. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers

Suggested Readings:

- https://www.brighthubengineering.com/hvac/5231-what-is-heat-transfer/
- https://www.researchgate.net/profile/Md_Washim_Akram/post/Good_books_on_Fluid_mechanics_and_Heat_Transfer/attachment/5ab22ae44cde266d5892d50a/AS%3A606556357918729%401521625713296/download/heat-transfer-a-practical-approach-by-_y-a-cengel.pdf
- https://scholars.unh.edu/day20/33/
- https://nptel.ac.in/courses/112/107/112107211/

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TEMA – 303 **ANALYTICAL MATHEMATICS**

Objective: -The main aims of this course are to provide suitable and effective methods by numerical analysis, for obtaining approximate representative numerical results of the problems. To have a proper understanding of Laplace transforms for solve engineering problems and its applications in the field of Agricultural engineering.

UNIT – 1 **(12 Sessions)**

Finite difference: Various difference operators and their relationships factorial notation. **Interpolation with Equal Intervals**: Newton's forward and Newton's backward interpolation formulae, Bessel's and Stirling's Central difference interpolation formulae.

Interpolation with Unequal Intervals: Introduction, Divided differences, divided difference table, Newton's divided difference formula, Lagrange's interpolation formula, Lagrange's inverse formula, Hermite interpolation formula. **for skill enhancement**.

UNIT – 2 **(10 Sessions)**

Numerical Differentiation: Numerical differentiation based on equal interval interpolation, First and Second order derivatives by using Newton's forward , Backward interpolation formulae, Bessel's and Stirling's formulae. Numerical Integration by using Trapezoidal rule, Simpson's one-third and three-eighth rules, Weddle's rule **for better skilling of entrepreneurship**.

UNIT – 3 **(10 Sessions)**

Numerical Solution of Ordinary Differential Equations by Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge–Kutta's method **for skill development**.

UNIT – 4 **(10 Sessions)**

Laplace Transforms: Definition of Laplace transform, Laplace transforms of elementary functions, Properties of Laplace transform, Inverse Laplace transforms, Transforms of derivatives, Integrals, Transform of function multiplied by t^n, Transform of function divided by t, Convolution theorem, Laplace transforms of unit step function, Unit impulse function, Periodic function **for skill development and employability**.

UNIT – 5 **(10 Sessions)**

Applications of Laplace transform to solve ordinary differential equations and simultaneous differential equations **for skill and employability**.

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Course Outcomes:

The student is able to

CO: 1 Apply Numerical analysis which has enormous applications in the field of Science and engineering **for skill enhancement**.

CO: 2 Understand numerical integration and differentiation, numerical solution of ordinary differential equations **for better skilling of entrepreneurship**.

CO: 3 Know the use of Laplace transform solving Boundary Value problems.

CO: 4 Evaluate the problems of Laplace transform and its applications in engineering **for skill development and employability**.

CO: 5 Understand simultaneous differential equations. Laplace transform **for skill and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	1	1	2	1	2	3
CO:2	1	2	2	2	3	2	3	2	3	3
CO:3	3	1	3	1	1	1	2	2	3	1
CO:4	1	1	2	3	2	1	1	1	1	3
CO:5	3	2	2	1	3	1	1	1	3	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**2**	**3**
CO:2	2	**1**	**2**
CO:3	3	**3**	**3**
CO:4	1	**2**	**3**
CO:5	3	**3**	**3**

References:

1. V. Raja Raman: Computer Oriented Numerical Methods, PHI.
2. Gupta & Malik: Numerical Analysis. Krishna Prakashan media, Meerut.
3. B. S. Grewal: Numerical methods in Engineering and Science, Khanna Publishers, Delhi.
4. Pradip Niyogi : Numerical Analysis and Algorithms, TMH.

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5. R.K. Jain,Iyenger: Numerical Analysis. New Age International Publisher, New Delhi.

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- www.onlinecourses.nptel.ac.in
- en.wikipedia.org

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PROFESSIONAL SKILL DEVELOPMENT-II (ECR-301/ECR-401/MCA-301)

Followed in B. Tech. & MCA II Year, III/IV Semester w.e.f. July, 2018 Credit: 04

Objectives: The objectives of Professional Skill Development-IIare:

- To develop critical thinking, creativity and effective communication.
- To provide the essential foundational elements for leadership skill-building and student success.
- To explore self-awareness that involves identification and articulation of various facets – cultural, social, and familial that contribute to the formation of one'sidentity.
- To develop mutually beneficial relationships through communication and cooperation with others, collaborate to achieve group goals, practice living and leading with integrity, and learn about issues of local and global significance in order to become active members of their communities.

Unit I: Communicative Skills (Session-05) Communication: Concept, Classification, Purpose, Process, Importance, Flow & Level of Communication, Barriers & Gateways in Communication, 7 C's of Communication, Types of Communication & communication without words **for skill enhancement**.

(Session-07)

Personality: Characteristics of Healthy & Sick Personality

Self Awareness

Self Esteem

Self Confidence

Assertiveness V/S Aggressiveness Values: Types & Importance **for better skilling of entrepreneurship**.

Unit III: Interpersonal Relationship Skills **(Session-08)**

Group: Concepts, Types, Stages

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Team: Concepts, Elements, Types, Stages

Presentation Skills& strategies

Interview: Concepts, Types, Process, Interview Preparation Checklist, Interview Handling Skills, Common Interview mistakes **for skill enhancement**.

Unit IV: Argumentative Skills **(Session-10)**

Debate

Role Play

Speeches

Elocution

Group Discussion **for skill enhancement**.

Unit V: Campus to Company Skills **(Session-08)**

The corporate Fit: Dressing and Grooming Basic Etiquette: Office (Do's and Don'ts for men and women), Telephone, Email Dealing with People in Corporate **for better skilling of entrepreneurship**.

Course Outcomes:

Students completing this course will be able to:

CO: 1 Apply the comprehensive set of skills and knowledge for life success **for skill enhancement**.

CO: 2 understand the communication process, its benefits and challenges **for better skilling of entrepreneurship**.

CO: 3 Learn to effectively lead others on a project or in an organization **for skill enhancement**.

CO: 4 Develop and articulate respect for the diversity of talents, ways of knowing and learning **for skill enhancement**.

CO: 5 Understand the corporate Fit: Dressing and Grooming Basic Etiquette **for better skilling of entrepreneurship**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	1	3	2	3	1	2	2	3
CO:2	1	3	1	2	3	2	3	2	3	3
CO:3	3	3	3	1	1	3	3	1	3	1
CO:4	2	3	2	3	2	1	2	1	2	3
CO:5	3	2	1	2	3	3	3	2	3	2

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
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	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**3**	**1**
CO:2	2	**2**	**3**
CO:3	3	**3**	**1**
CO:4	3	**1**	**2**
CO:5	3	**3**	**3**

References:

1. M.K. Sehgal & V. Khetrapal's Business Communication published by Excel Books.
2. Rajendra Pal's Business Communication published by Sultan Chand & Sons Publication.
3. P. D. Chaturvedi's Busines Communication published by Pearson Education, Delhi.
4. Elizabeth B. Hurlock's Personality Development by Tata McGraw Hills, Delhi.

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- www.fluentu.com
- www.mindstool.com
- www.digitalcommons.pace.edu

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TEEE306 **Electrical Machines & Power Utilization**

Objective:

1. The educational objective of Electrical Machines & Power Utilization course is to provide in-depth understanding of Alternating Current & Magnetic Circuit and utilization of Electrical Energy.
2. In this course the different types of Transformer, DC motors & Induction Motor which are widely used in industry are covered and their performance aspects will be studied.
3. Fundamental Concept of Single Phase and Polyphaser Induction motor and working of DC generator along with basic knowledge of Alternating and Direct current are acquired.

UNIT-I **(08Sessions)**

Transformer: Principle of working, construction of single phase transformer, types of transformers, ratio of transformation, EMF equation, phase diagram on load, leakage reactance, voltage regulation, losses and efficiency, open circuit and short circuit tests, Back to Back test, method of cooling transformers. **for skill development and employability**.

UNIT-II **(08Sessions)**

Polyphase Induction Motor: Synchronous speed & slip, construction, operation, phase diagram, effect of rotor resistance, torque equation, starting and speed control methods. **Single Phase Induction Motor:** Double field revolving theory, equivalent circuit, characteristics, various methods of starting, phase split, shaded pole motors **for skill enhancement**.

UNIT-III **(08Sessions)**

DC Machine: Principles, operation and performance of DC machine (generator and motor), types of D.C. machine, EMF and torque equations, armature reaction, commutation, excitation of DC generator and their characteristics, condition for self excitation, DC motor characteristics, starting of shunt and series motor, starters, speed control methods-field and armature control **for skill development and employability**.

UNIT-IV **(08Sessions)**

A.C. Circuit: Various methods of three phase power measurement, power factor, reactive and apparent power, concept and analysis of balanced poly-phase circuits, series and parallel resonance **for skill development**

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UNIT-V **(08Sessions)**

Magnetic Circuit: Electro motive force, reluctance, laws of magnetic circuits, analogy between electric & magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, B-H Curve, hysteresis and eddy current losses **for skill development**

Course Outcomes:

On completion of the course, student will be able to

CO: 1 Acquire knowledge about the fundamental principles and classification of alternating current, magnetic circuit & electromagnetic machines **for skill development and employability**.

CO: 2 Acquire knowledge about the constructional details and principle of operation of transformer DC & AC machines **for skill enhancement**.

CO: 3 Acquire knowledge about the working of DC machines, induction machine and generators **for skill development and employability**

CO: 4 Acquire knowledge about testing and applications of Single phase & polyphaser induction motor **for skill development**

CO: 5 Acquire knowledge about the constructional details, principle of operation, testing and applications of transformers **for skill development**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	1	2	3	1	2	3
CO:2	1	3	1	1	2	3	3	1	3	1
CO:3	3	2	3	3	2	3	2	3	1	2
CO:4	3	1	1	3	1	2	3	1	3	3
CO:5	2	3	1	2	3	3	2	3	2	3

CO-Curriculum Enrichment Mapping (Please 3 wherever required)

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**3**	**2**
CO:2	3	**3**	**1**
CO:3	3	**2**	**2**
CO:4	3	**1**	**1**
CO:5	3	**3**	**2**

References:

1. D. P. Kothari & I. J. Nagrath, "Electric Machines", Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans "Electric Machinery", MC Graw Hill.

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3. P. S. Bhimbhra, "Electrical Machinery", Khanna Publisher
4. M. G. Say, "Alternating Current Machines", Pitman & Sons
5. B. L. Thareja & A. K. Theraja "A text book of Electrical Technology" Vol. I S.Chand & Company LTD., New Delhi.
6. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International.

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- www.academia.edu
- www.electrical-engineering-portal.com
- www.nptel.ac.in
- www.newtondesk.com

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TEEE-356 Electrical Machines and Power Utilization Lab L:T:P 3:1:0

Minimum 08 experiments out of the following:

1. To determine the transformation ratio, turns ratio and current ratio of a transformer & prove that they are equal.
2. To determine efficiency and voltage regulation of a single phase transformer by load test.
3. To determine efficiency and voltage regulation of a single phase transformer by open circuit and short circuit test.
4. To perform load-test on three phase induction motor & to plot torque-speed characteristics.
5. To perform no-load & blocked-rotor tests on 3 ph. Induction motor to obtain equivalent circuit parameters.
6. To start a 3-phase slip-ring induction motor by inserting different levels of resistance in the rotor circuit and to plot torque-speed characteristics.
7. To perform load-test on single phase induction motor & plot torque–speed characteristics.
8. To control the speed of a D.C. shunt motor using (a) armature control method (b) field control method.
9. To plot load characteristics of a D.C. shunt generator.
10. To plot load characteristics of a D.C. series generator.

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TECE357 **Auto CAD Applications lab** **L:T:P 0:0:2**

List of experiments

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing
2. Practice on setting up of drawing- SNAP, GRID, LIMITS, UNITS, etc.
3. Practice on drawing basic entities- Line, Circle, Arc, Rectangle, Ellipse, etc.
4. Practice on various edit / modify commands- COPY, MOVE, MIRROR, ROTATE, etc.
5. Layout drawing of a building using different layer and line colors indicating all Building details.
6. Draw 3D models by extruding simple 2D objects, dimension and name the objects
7. Draw a spiral by extruding a circle
8. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion

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TEAG404 Farm Machinery and Equipment-I L:T:P 3:1:0

Objective: To identify the need of farm mechanization in India. Also equip the students with technical knowledge and skills required for the operation, maintenance and evaluation of Tillage, Sowing and intercultural operational machinery needed for agricultural farms.

UNIT-I

Introduction to farm mechanization. Classification of farm machines. Unit operations in crop production. Identification and selection of machines for various operations on the farm. Hitching systems and controls of farm machinery. **for skill enhancement**.

UNIT-II

Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines. Introduction to seed-bed preparation and its classification. Familiarization with land reclamation and earth moving equipment **for skill development and employability**.

UNIT-III

Introduction to machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage. Measurement of draft of tillage tools and calculations for power requirement for the tillage machines. Introduction to tillage machines like mould-board plough, disc plough, chisel plough, sub-soiler, harrows, cultivators, Identification of major functional components. Attachments with tillage machinery **for skill development and employability**.

UNIT-IV

Introduction to sowing, planting & transplanting equipment. Introduction to seed drills, no-till drills, and strip till drills. Introduction to planters, bed-planters and other planting equipment. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation. **for skill enhancement**.

UNIT-V

Introduction to materials used in construction of farm machines. Heat treatment processes and their requirement in farm machines. Properties of materials used for critical and functional components of agricultural machines. Introduction to steels and alloys for agricultural application. Identification of heat treatment processes specially for the agricultural machinery components **for skill development and employability**.

Course Outcomes:

Students completing this course will be able to:

CO: 1 The students will be able to understand the mechanization and various equipment used in the farm for different field operations. **for skill enhancement**.

CO: 2 Familiar with farm mechanization, and able to identify the major functional components and forces acting on various tillage implements. Hitching systems **for skill development and**

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employability.

CO: 3 Understand and evaluate the Calibration of seed-drills and planters. Familiar with plant protection equipments. Evaluate the calibration of sprayers **for skill development and employability**.

CO: 4 Understand steels and alloys for agricultural application, Heat treatment processes, Properties of materials **for skill enhancement**.

CO: 5 Understand Properties of materials used for critical and functional components of agricultural machines. Introduction to steels and alloys for agricultural application **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	2	1	1	2	3	1	2
CO:2	3	3	2	3	1	2	3	1	1	3
CO:3	3	3	3	2	2	3	3	2	3	2
CO:4	3	1	2	3	1	2	1	2	1	3
CO:5	2	3	1	2	3	2	3	1		3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	1	**2**	3
CO:2	3	**3**	3
CO:3	3	**3**	2
CO:4	1	**2**	3
CO:5	3	**3**	2

References:

1. Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.
2. Smith HP and LH Wilkey. Farm Machinery and Equipment.
3. Culpin Claude. Farm Machinery.
4. Srivastava AC. Elements of Farm Machinery.
5. Lal Radhey and AC Datta. Agricultural Engineering.

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- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in

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TEAG454 **Farm Machinery and Equipment Lab** **L:T:P 0:0:2**

Minimum 08 experiments out of the following:

1. Familiarization with different farm implements and tools.
2. Identification of materials of construction in agricultural machinery and study of material properties.
3. Study of hitching systems, Problems on machinery management.
4. Study of primary and secondary tillage machinery
5. Calculations of power and draft requirements.
6. Study of sowing equipments.
7. Study of planting equipments.
8. Calibration of seed drill.
9. Study of Transplanters – paddy, vegetable, etc.
10. Study of heat treatment processes subjected to critical components of agricultural machinery.

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TEAG405 **Soil Mechanics** **L:T:P 3:0:0**

Objectives: To impart the knowledge of basic properties of soil, analysis of stresses, bearing capacity of soil etc.

UNIT- I

Introduction of soil mechanics, field of soil mechanics, phase diagram, physical and index properties of soil, classification of soils, elementary concept of Boussinesq and Western guards analysis, new mark influence chart **for skill development and employability**.

UNIT- II

Seepage Analysis. Velocity potential and stream function, Flow net construction. Shear strength, Mohr stress circle, theoretical relationship between principle stress circle, theoretical relationship between principal stress, Mohr coulomb failure theory, and effective stress principle. **for skill enhancement**.

UNIT- III

Determination of shear parameters by direct shear test. Numerical exercise based on various types of tests. Compaction, composition of soils standard and modified protector test, abbot compaction and Jodhpur mini compaction test field compaction method and control **for skill development and employability**.

UNIT- IV

Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory, Laboratory consolidation test, calculation of void ratio and coefficient of volume change, Taylor's and Casagrande's method, determination of coefficient of consolidation. **for skill development and employability**.

UNIT- V

Earth pressure: plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure, active and passive earth pressure for cohesive soils, simple numerical exercises. Stability of slopes: introduction to stability analysis of infinite and fnite slopes friction circle method, Taylor's stability number. **For employability**

Course Outcomes:

The student will be able to-

CO: 1 At the end of the course, the students will be able to: Compute various engineering properties of different types of soil **for skill development and employability**.

CO: 2 Apply the knowledge of soil mechanics to design various types of structures **for skill**

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enhancement.

CO: 3 Select a particular type of soil for utilization under specific conditions in nature **for skill development and employability**.

CO: 4 Develop a plan for suitability of soil conservation structures at a location **for skill development and employability**.

CO: 5 Understand Earth pressure active and passive states simple numerical exercises. Introduction to stability analysis of infinite and fnite slopes **for employability**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	3	1	3	2	3	1
CO:2	3	3	1	3	2	1	2	1	2	3
CO:3	1	2	3	1	1	3	1	1	3	1
CO:4	3	2	2	3	2	1	1	1	1	2
CO:5	2	1	3	1	3	2	3	2	1	3

CO-Curriculum Enrichment Mapping (Please 3 wherever required)

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**1**	**1**
CO:2	1	**3**	**2**
CO:3	3	**3**	**2**
CO:4	3	**3**	**1**
CO:5	3	**3**	**2**

References:

1. Punmia B C, Jain A K and Jain A K. 2005. Soil Mechanics and Foundations. Laxmi Publications (P) Ltd. New Delhi.
2. Ranjan Gopal and Rao A S R. 1993. Basic and Applied Soil Mechanics. Welley Easters Ltd., New Delhi.
3. Singh Alam. 1994. Soil Engineering Vol. I. CBS Publishers and Distributions, Delhi.

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TEAG455 **Soil Mechanics Lab** **L:T:P 0:0:2**

Minimum 08 experiments out of the following:

1. Determination of water content of soil;
2. Determination of specific gravity of soil.
3. Determination of field density of soil by core cutter method;
4. Determination of field density by sand replacement method;
5. Grain size analysis by sieving (Dry sieve analysis);
6. Determination of liquid limit by Casagrande's method;
7. Determination of liquid limit by cone penetrometer and plastic limit;
8. Determination of shrinkage limit;
9. Determination of permeability by constant head method;
10. Determination of permeability by variable head method;
11. Determination of compaction properties by standard proctor test;
12. Determination of shear parameters by Direct shear test;
13. Determination of unconfined compressive strength of soil;

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TEAG406 **Dairy and Food Engineering** **L:T:P 3:0:0**

Objectives: To acquaint the students with various dairy engineering operations such as homogenization, pasteurization, thermal processing, evaporation, freezing and drying of milk.

UNIT- I

Deterioration in food products and their controls, Physical, chemical and biological methods of food preservation. Nanotechnology: History, fundamental concepts, tools and techniques nonmaterial's, applications in food packaging and products, implications, environmental impact of nanomaterials and their potential effects on global economics, regulation of nanotechnology. Dairy development in India. **for skill enhancement**.

UNIT- II

Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Unit operation of various dairy and food processing systems. Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation. **for skill development and employability**.

UNIT- III

Preparation methods and equipment for manufacture of cheese, paneer, butter and ice cream, Filling and packaging of milk and milk products; Dairy plant design and layout, Plant utilities; Principles of operation and equipment for thermal processing, Canning, Aseptic processing.

for skill development

UNIT- IV

Evaporation: principle, types of evaporators, steam economy, multiple effect evaporation, vapour recompression, Drying of liquid and perishable foods: principles of drying, spray drying, drum drying, freeze drying **for skill development and employability**.

UNIT- V

Filtration: principle, types of filters; Membrane separation, RO, Nano-filtration, Ultra filtration and Macro-filtration, equipment and applications, Non-thermal and other alternate thermal processing in Food processing. **For employability**

Course Outcomes:

CO: 1 The students will gain knowledge about Dairy and Food process engineering **for skill enhancement**.

CO: 2 Understand the process of manufacturing of dairy products and thermal processing of food **for skill development and employability**.

CO: 3 The Students will understand the importance of quality control and food preservation and packaging **for skill development**

CO: 4 The students gain a good knowledge on the various processes and equipments used in the processing of milk and milk products **for skill development and employability**.

CO: 5 The student will discover the biotechnological approaches in the field of dairy **For**

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employability

PO-CO Mapping (Please write 3, 2, 1 wherever required)
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	1	3	3	3	1	3
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CO:3	1	2	3	1	2	3	3	1	2	1
CO:4	3	1	2	3	1	3	1	3	1	3
CO:5	2	2	1	2	3	1	3	2	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**3**	**2**
CO:2	3	**2**	**3**
CO:3	3	**3**	**3**
CO:4	2	**3**	**2**
CO:5	1	**3**	**1**

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5. Ranjan Gopal and Rao A S R. 1993. Basic and Applied Soil Mechanics. Welley Easters Ltd., New Delhi.
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1. Brennan, J.G., Butters,J.r. Cowell, N.D. and Lilly, A.E.V. 1976. Food Engineering Operations Applied Science Publihers
2. Farrall, A.W. 1967. Engineering for Dairy and Food Products Wiley Eastern Pvt. Ltd. New Delhi.

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3. Kessler, H.G. 1981. Food Engineering and Dairy Technology Verlag A. Kessler, Freising, F.R. Germany
4. Earle, R.L. Unit Operations in Food Processing. Pergamon Press, Oxford
5. McCabe, W.L., Smith, J.C. and Harriott, P. 1993. Unit Operations of Chemical Engineering McGraw Hill, Inc. New York.

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TEAG456 **Dairy and Food Engineering Lab** **L:T:P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Determination of the composition of milk and its properties (fat content, total solids, specific gravity, acidity, pH, viscosity etc)
2. Study of milk plant.
3. Study of plate heat exchanger and tubular heat exchanger.
4. HTST pasteurization of milk.
5. Centrifugal separation of milk.
6. Study of vacuum pan and rising film evaporators
7. Visit to milk food factory.
8. Spray drying of milk
9. Study of drum dryer
10. Study of soya milk process and related equipments
11. Design of food processing plant and preparation of layout

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TEME405 **Strength of Materials** **L: T: P 3:0:0**

Objectives: To give the fundamental knowledge of deflection and bending of beam, column and struts under various type of loading. To understand the effect of combined (direct and bending) stresses on different members. To study welding joint and riveted joints and their failure. To understand how the analysis of statically indeterminate beams and stability of dams can be done.

UNIT –I

Deflection of Beams, Slope and deflection of beams using integration techniques, moment area theorems and conjugate beam method **for skill enhancement**.

UNIT – II

Columns and Struts, Struts with different end conditions. Euler's theory and experimental results, Ranking Gardon Formula. **for better skilling of entrepreneurship**.

UNIT – III

Combined Direct and Bending Stresses, Load acting eccentrically to one axis, Condition for no Tension in the Section, Effect of Wind Pressure **for skill development and employability**.

UNIT – IV

Riveted and welded connections, Type of riveted joints, Failure of riveted joints, Types of welds, Strength of butt welds **for skill development**

UNIT – V

Stability of masonry dams. Analysis of statically intermediate beams. Propped beams. Fixed and continuous beam analysis using superposition, three moment equation and moment distribution methods **for skill development and employability**.

Course Outcomes: The outcomes of this course for the students are as follows

CO: 1 Will be able to design beams in respect deflection and slope in structures **for skill enhancement**.

CO: 2 Will be able to analyze the beams, column and strut used in various structures **for better skilling of entrepreneurship**.

CO: 3 Will understand the role of joining of solid members by welding and rivets and cause of failure **for skill development and employability**.

CO: 4 Will be able to understand Riveted and welded connections Types of welds, Strength of butt welds **for skill development**

CO: 5 Will be able to understand Stability of masonry dams Fixed and continuous beam analysis using superposition **for skill development and employability**.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	1	3	2	3	1	2	3
CO:2	2	3	1	2	1	2	1	2	1	2
CO:3	3	1	3	1	2	3	1	2	3	1
CO:4	2	1	2	3	2	2	3	2	1	2
CO:5	3	2	1	2	3	2	2	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	1	**2**	**1**
CO:2	2	**3**	**3**
CO:3	3	**3**	**2**
CO:4	3	**1**	**2**
CO:5	3	**3**	**1**

References:

1. Strength of Materials by Ryder.
2. Strength of Materials by Dr. R.K. Bansal.
3. Strength of Materials by Timoshenko &Yσungs.
4. Strength of Materials by S. Ramamrutham.
5. Strength of Materials by R. K. Rajput.
6. Strength of Materials by Khurmi R.S., S. Chand & Co., Ltd., New Delhi.
7. Mechanics of Structures (Vo-I), by Junarkar S.B., Choratar Publishing House, Anand.

Website Resources:

- www.nptel.ac.in
- https://orioncbse.kces.in/pdf/tutorials/1547024773course_strength%20of%20materials.pdf
- https://drive.google.com/file/d/1OqMj6d-Uxbv1nWwQqth15YoctRYqq8S_/view

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TEME -406 **Thermal Engineering** **L: T: P 3:0:0**

Objective: The objective of this course is the study of energy and its transformation. Most studies of thermodynamics are primarily concerned with two forms of energy – heat and work. Thermodynamics study includes quantitative analysis of machine and processes for transformation of energy and between work and heat. In classical thermodynamics a macroscopic viewpoint is taken regarding such matters. The term thermodynamics was first introduced by Lord Kelvin in 1849. The term comes from the Greek words ***therme*** (heat) and **dynamics** (power).

Unit – I

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow processes. **(06 Session) for skill enhancement**.

Unit-II

Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamics process. Principles of refrigeration, - units, terminology, production of low temperatures, air refrigerators working on reverse Carnot cycle and Bell Coleman cycle **for better skilling of entrepreneurship**.` **(10 Session)**

Unit – III

Vapour refrigeration-mechanism, P-V, P-S, P-H diagrams, vapour compression cycles, dry and wet compression, super cooling and sub cooling. Vapour absorption refrigeration system. Common refrigerants and their properties. **for skill development and employability. (10 Session)**

Unit – IV

Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process **for skill development** **(07 Session)**

Unit – V

Air conditioning – principles –Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers. **For skill enhancement. (07 Session)**

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Course Outcomes:

Students completing this course will be able to:

CO: 1 Identify and use units and notations in Thermodynamics **for skill enhancement**

CO: 2 State and illustrate first and second laws of Thermodynamics **for better skilling of entrepreneurship**.

CO: 3 Explain the concepts of entropy, enthalpy, reversibility and irreversibility **for skill development and employability**

CO: 4 Apply the first and second laws of Thermodynamics to various gas processes and cycles. **for skill development**

CO: 5 To get conversant with properties of steam, dryness fraction measurement, vapor processes and Thermodynamic vapor cyc les, perform ance estimation. **for skill enhancement**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	1	3	2	3	1	2	3
CO:2	3	3	2	3	1	1	2	3	1	1
CO:3	2	1	3	1	2	3	1	2	3	3
CO:4	3	1	2	3	1	2	3	1	2	1
CO:5	2	3	1	2	3	1	2	2	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	1	**3**	**2**
CO:2	3	**3**	**3**
CO:3	2	**3**	**3**
CO:4	3	**2**	**1**
CO:5	3	**1**	**1**

Suggest Readings:

1. Kothandaraman C P Khajuria P R and Arora S C. 1992. A Course in Thermodynamics and Heat Engines. Dhanpet Rai and Sons, 1682 Nai Sarak, New Delhi.
2. Khurmi R S. 1992. Engineering Thermodynamics. S Chand and Co. Ltd., Ram Nagar, New Delhi.
3. Mathur M L and Mehta F S. 1992. Thermodynamics and Heat Power Engineering.

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5. Nag P K. 1995. Engineering Thermodynamics. Tata McGraw Hill Publishing Co.Ltd., 12/4 Asaf Ali Raod, New Delhi.

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- https://www.ohio.edu/mechanical/thermo/
- https://freevideolectures.com/course/2681/basic-thermodynamics
- https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/video-lectures/

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TEME456 **Thermal Engineering Lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Tutorials on thermodynamic air cycles,
2. Study and application of P V and T S chart in refrigeration, P H chart (or) Mollier diagram in refrigeration,
3. Numerical on air refrigeration cycle systems,
4. Numerical on vapour compression cycle refrigeration system,
5. Study of domestic water cooler,
6. Study of domestic household refrigerator,
7. Study of absorption type solar refrigeration system,
8. Study of cold storage for fruit and vegetables, Freezing load and time calculations for food materials,
9. Determination of refrigeration parameters using refrigeration tutor – II,
10. Numerical on design of air conditioning systems,
11. Study of window air conditioner,
12. Study on repair and maintenance of refrigeration and air-conditioning systems.
13. Visit to chilling or ice making and cold storage plants.

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TEEC408 **Basic Electronics and Instrumentation**

(For B. Tech. AG 2nd Year IV Semester)

Course Objective:

- Agriculture Graduates will have the fundamental knowledge in Basic electronics and instrumentation.
- Understand the equipment used in temperature, pressure, and velocity measurement

Unit-I **(8 Sessions)**

Semiconductors, p-n junction, V-I characteristics of p-n junction, diode as a circuit element, rectifier, capacitive filter clipper, clamper circuit voltage multiplier, diode circuits for OR & AND (both positive and negative logic), Zener diode, Zener diode as a voltage regulator. **for skill enhancement.**

Unit-II **(8 Sessions)**

DC biasing of BJT: operating point, fixed-bias circuit, emitter-stabilized bias circuit, voltage-divider bias, hybrid equivalent model of BJT, graphical determination of the *h*-parameters; small signal analysis of BJT: CE fixed-bias configuration, CE emitter-bias configuration, emitter-follower configuration, power amplifiers: introduction, series-fed class A amplifier, class B, class C, class D amplifiers **for better skilling of entrepreneurship.**

Unit-III **(8 Sessions)**

Operational amplifiers: Differential and common-mode operation, basic Op-AMP parameters, ideal OP-AMP characteristics differential; linear and non-linear applications of OP-AMP (adder, subtractor, integrator, active rectifier, comparator, differentiator) **for skill development and employability.**

Unit-IV **(8 Sessions)**

Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures. Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters. **for skill development**

Unit-V **(8 Sessions)**

Binary ladder D/A converter, Successive approximation A/D converter, generalized instrumentation, measurement of displacement, temperature, velocity, force and pressure using potentiometer, Resistance thermometer, Thermocouples, Thermistor, Bourdon tube, LVDT, Strain gauge and tachogenerator. **For skill development**

Course Outcomes:

Students completing this course will be able to:

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CO: 1 To understand important and fundamental parameters of electronics engineering. **for skill enhancement**.

CO: 2 To learn the basic concepts of measuring instruments such as: ammeter, voltmeter, galvanometer, multimeter etc. **for better skilling of entrepreneurship**.

CO: 3 To develop the basic skills necessary for measuring various parameters such as current, voltage, temperature etc. **for skill development and employability**.

CO: 4 To address the underlying concepts and methods behind Electronics measurements **for skill development**

CO: 5 To understand Binary ladder D/A converter, Successive approximation A/D converter Bourdon tube, LVDT, Strain gauge and tachogenerator. **for skill development**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	2	1	3	1	3	2	3	2	1
CO:2	1	3	2	1	3	1	1	2	3	2
CO:3	3	1	3	2	3	2	3	1	1	3
CO:4	2	2	1	3	2	1	2	1	3	1
CO:5	3	3	2	1	3	2	1	3	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**1**	**3**
CO:2	3	**3**	**3**
CO:3	3	**3**	**2**
CO:4	3	**2**	**3**
CO:5	3	**1**	**1**

References:

1. R.L Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Pvt. Ltd, 9th Edition, 2008.
2. S. Salivahanan and N Suresh Kumar, "Electronic Devices and Circuit", TMH (India) Private Ltd, 3rd Edition, 2013
3. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons. 19th Edition, 2007.

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- en.wikipedia.org
- www.tutorialspoint.com

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TEEC458 **Electronics and Instrumentation lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. To study the application of PN Junction Diode:-full wave rectifier-Measurement of Vrms, Vdc, ripple factor-use of filter-ripple reduction.
2. To study characteristics of BJT: BJT in CE configuration-Graphical measurement of h parameters from input and output Characteristics.
3. To study the operation of single-stage and multi-stage RC–Coupled Amplifier.
4. To calculate Av , AI , Ro and Ri of CE RC-Coupled amplifier with potential divider biasing.
5. To study an inverting and non-inverting amplifier using Op-Amp IC 741 Kit.
6. To study Op-Amp as adder and subtractor using Op-Amp IC 741 Kit.
7. To study Op-Amp as a differentiator and integrator using Op-Amp IC 741 Kit.
8. Study of Resistance Temperature Detector (RTD) and calculating various parameters.
9. To Study of Thermocouple and calculating its various parameters.
10. To Study of Thermistor and calculating its various parameters.

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TEME407 **Theory of Machines** **L: T: P 3:1:0**

Objective: The study of kinematics is an applied field of mechanical engineering that is concerned with understanding the relationship between the geometry and the motions of the parts of a machine and the forces that produce this motion. We have to learn how to analyze the motions of mechanisms, design mechanisms to have given motions, and analyze forces in machines. This includes relative motion analysis and design of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces.

UNIT – I

Introduction: Elements, links, kinematics pairs-classification, Kinematics chain and mechanisms, Inversions of Four bar mechanism, slider crank chain.

Velocity Analysis Velocity of point in mechanism, Relative velocity method, Instantaneous centers method.

Acceleration Analysis Acceleration diagram (Graphical method), Coriolis component of acceleration. **for skill enhancement**.

UNIT – II Gears

Classification & terminology of gear, Law of gearing, Velocity of sliding, Form of tooth (Involute and cycloidal), Spur gear, Interference and Undercutting, Introduction to helical, spiral, bevel and worm gear, Simple, compound, reverted, and epicyclic trains, Determining velocity ratio by tabular method. **for skill enhancement**.

UNIT – III

Turning moment diagrams, Coefficient of fluctuation of speed and energy, Weight of flywheel, Flywheel applications.

Belt drives, types of drives, belt materials. Length of belt, power transmitted, velocity ratio, belt size for flat and V belts. Effect of centrifugal tension, creep and slip on power transmission, Chain drives. **for better skilling of entrepreneurship**.

UNIT – IV

Friction Types of friction, laws of dry friction, Friction of pivots and collars. **Clutches** Introduction to friction clutch, Single disc, multiple disc, and cone clutches. **Bearings** Rolling friction bearing, Anti friction bearings. **for skill development and employability**

UNIT – V

Types of governors, Constructional details and analysis of Watt, Porter, Proell governors, Effect of friction, controlling force curves, Sensitiveness, stability, hunting, iso-chronism, power and effort of a governor. Static and dynamic balancing, Balancing of rotating masses in one and different planes. **for skill development**

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Course outcomes:

Students completing this course will be able to

CO: 1 Distinguish kinematic and kinetic motion **for skill enhancement**.

CO: 2 Identify the basic relations between distance, time, velocity, and acceleration **for skill enhancement**.

CO: 3 Drawing velocity and acceleration diagrams for different mechanisms **for better skilling of entrepreneurship**.

CO: 4 Selecting gear and gear train depending on application. **for skill development and employability**

CO: 5 Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers, **for skill development**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	3	2	1	3	2	3	2
CO:2	1	3	2	2	3	2	1	2	1	3
CO:3	2	1	3	1	2	3	1	2	2	2
CO:4	3	1	2	3	1	2	1	2	1	3
CO:5	1	2	1	2	3	1	3	2	2	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**2**	**3**
CO:2	3	**1**	**1**
CO:3	1	**2**	**3**
CO:4	3	**3**	**1**
CO:5	3	**3**	**2**

Books and References:

1. Theory of machines - Thomas Bevan
2. Theory of machines and mechanisms- Shigley
3. Theory of machines and mechanisms- Ghosh &Mallik
4. Theory of machines and mechanisms- Rao&Dukkipati
5. Theory of Machines – R. K. Bansal

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Suggested Readings:

- https://www.youtube.com/watch?v=pTJWuvDlTNU
- https://www.youtube.com/watch?v=MJeRFzs4oRU
- https://www.springer.com/gp/book/9789400711556
- https://www.nature.com/articles/014213a0
- https://www.coursera.org/lecture/dynamics/module-1-course-introduction-v9YXC

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TEAG506 **Tractor System & Control** **L: T: P 3:0:0**

Objective: Gaining knowledge about various tractor systems, their construction and working.

UNIT-I

Study of need for transmission system in a tractor. Transmission system – types, major functional systems. Study of clutch – need, types, functional requirements, construction and principle of operation. **for skill enhancement**.

UNIT-II

Familiarization with single plate, multi-plate, centrifugal and dual clutch systems. Study of Gear Box – Gearing theory, principle of operation, gear box types, functional requirements, and calculation for speed ratio. Study of differential system – need, functional components, construction, calculation for speed reduction. Study of need for a final drive. Study of Brake system – types, principle of operation, construction, calculation for braking torque. **for better skilling of entrepreneurship**.

UNIT-III

Study of steering system – requirements, steering geometry characteristics, functional components, calculation for turning radius. Familiarization with Ackerman steering. Steering systems in track type tractors. Study of Hydraulic system in a tractor – Principle of operation, types, main functional components, functional requirements. **for skill development and employability**.

UNIT-IV

Familiarization with the Hydraulic system adjustments and ADDC. Study of tractor power outlets – PTO. PTO standards, types and functional requirements. Introduction to traction. Traction terminology. Theoretical calculation of shear force and rolling resistance on traction device. Study of wheels and tyres – Solid tyres and pneumatic tyres, tyre construction and tyre specifications. **for skill development and employability**.

UNIT-V

Study of traction aids. Study of tractor mechanics – forces acting on the tractor. Determination of CG of a tractor. Determination and importance of moment of inertia of a tractor. Study of tractor static equilibrium, tractor stability especially at turns. Determination of maximum drawbar pulls. Familiarization with tractor as aspring-mass system. Ergonomic considerations and operational safety. Introduction to tractor testing. Deciphering the engine test codes. **for skill development**

Course Outcomes:

Students completing this course will be able to:

CO: 1 Familiarization with different makes and models of tractors. And Identify the different tractor

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systems including fuel system, cooling system, transmission system, steering and hydraulic systems **for skill enhancement**.

CO: 2 Understand hitching & de-hitching to the tractor and Introduction to trouble shooting in tractors. . **for better skilling of entrepreneurship**.

CO: 3 Replacement of broken components in tillage implements, Maintenance of cutter bar in a reaper. **for skill development and employability**.

CO: 4 Adjustments in a thresher for different crops. Setting of agricultural machinery workshop. **for skill development and employability**.

CO: 5 Understand engine test codes. tractor testing, determination of maximum drawbar pulls **for skill development**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	1	3	3	1	2	3
CO:2	1	3	1	3	2	1	2	3	1	2
CO:3	3	1	3		1	3	1	1	1	3
CO:4	1	1	2	3	1	2	3	3	1	2
CO:5	3	1	2	1	3	2	1	2	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**2**	**2**
CO:2	1	**1**	**3**
CO:3	3	**3**	**2**
CO:4	3	**3**	**1**
CO:5	3	**2**	**3**

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1. Liljedahl J B and Others. Tractors and Their Power Units.
2. Rodichev V and G Rodicheva. Tractors and Automobiles.
3. Singh Kirpal. Automobile Engineering – Vol I.
4. Heitner Joseph. Automotive Mechanics: Principles and Practices.

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TEAG556 **Tractor Systems and Controls Lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Introduction to transmission systems and components;
2. Study of clutch functioning.
3. Design problem on clutch system.
4. Study of different types of gear box, calculation of speed ratios, design problems on gear box;
5. Study on differential and final drive and planetary gears.
6. Study of brake systems and some design problems;
7. Steering geometry and adjustments;
8. Study of hydraulic systems in a tractor, hydraulic trainer and some design problems;
9. Appraisal of various controls in different makes tractors in relation to anthropometric measurements.
10. Determination of location of CG of a tractor, Moment of Inertia of a tractor.
11. Traction performance of a traction wheel.

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TEAG507 Soil and Water Conservation Engineering L: T: P 3:0:0

Objectives: To have understanding about the degradation of productive soil globally and its effect thereon, also to know about the causes about water scarcity and their solution to fight against the evil effects through soil and water conservation technologies.

UNIT- I

Soil erosion - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion. Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion.

UNIT- II

Gullies - Classification, stages of development. Soil loss estimation – Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity - estimation by KE>25 and EI30 methods. Soil erodibility - topography, crop management and conservation practice factors. Measurement of soil erosion - Runoff plots, soil samplers. **for skill enhancement**.

UNIT- III

Water erosion control measures - agronomical measures - contour farming, strip cropping, conservation tillage and mulching. Engineering measures– Bunds and terraces. Bunds - contour and graded bunds - design and surplus sing arrangements. **for better skilling of entrepreneurship**.

UNIT- IV

Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour, stonewall and trenching. Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains. **for skill enhancement**.

UNIT- V

Grassed waterways and design. Wind erosion- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures, wind breaks and shelter belts and stabilization of sand dunes. Land capability classification. Rate of sedimentation, silt monitoring and storage loss in tanks. **for skill development and employability**.

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Course Outcomes:

The student will be able to-

CO1: Understand the erosion concept and its types. **for skill enhancement**.

CO2: understand the concept of gully formation and USLE equation Determination.

for skill development and employability.

CO3: Analyze the Water erosion control measures that can be undertaken

for skill development and employability.

CO4: Understand the concept of terraces and gully and ravine reclamation processes. **for skill enhancement**.

CO5: Understand the concept of Grassed waterways and Wind erosion.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	3	1	3	1	2	3	2	2	3
CO:2	1	3	1	1	3	2	1	3	3	1
CO:3	3	1	3	2	3	1	3	2	1	3
CO:4	1	2	1	3	2	1	2	3	1	1
CO:5	3	3	2	1	3	1	3	2	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	3	**1**	**3**
CO:2	3	**3**	**1**
CO:3	3	**3**	**2**
CO:4	3	**3**	**3**
CO:5	1	**1**	**2**

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1. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water.
2. Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Mal, B.C. 2014. Introduction to Soil and Water Conservation Engineering. 2014. Kalyani Publishers.
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TEAG557 Soil and Water Conservation Engineering Lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Study of different types and forms of water erosion.
2. Exercises on computation of rainfall erosivity index.
3. Computation of soil erodibility index in soil loss estimation.
4. Exercises on soil loss estimation/measuring techniques.
5. Study of rainfall simulator for erosion assessment.
6. Estimation of sediment rate using Coshocton wheel sampler and multislot devisor.
7. Determination of sediment concentration through oven dry method.
8. Design and layout of contour bunds.
9. Design and layout of broad base terraces and
10. Design of vegetative waterways.
11. Exercises on rate of sedimentation and storage loss in tanks
12. Design of shelterbelts and wind breaks for wind erosion control.

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TEAG508 **Tractor and Automotive Engines** **L: T: P 3:0:0**

Objectives: Gaining knowledge about various tractor systems, their construction and working.

UNIT- I

Study of sources of farm power –conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI)engines and deviation from ideal cycle. General energy equation and heat balance sheet. **for skill enhancement**.

UNIT- II

Study of mechanical, thermal and volumetric efficiencies. Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and4-stroke engine cycles and CI and SI engines. Study of Engine Valve systems, valve mechanism, Valve timing diagram, and valve clearance adjustment Study of Cam profile, valve lift and valve opening area. **for better skilling of entrepreneurship**.

UNIT- III

Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners. Study of fuel supply system. Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines. Study of detonation and knocking in IC engines carburetors and their main functional components. **for skill development**.

UNIT- IV

Study of fuel injection system – Injection pump, their types, working principles. Fuel injector nozzles – their types and working principle. Engine governing– need of governors, governor types and governor characteristics. Study of lubrication system –need, types, functional components. Study of lubricants – physical properties, additives and their application. Engine cooling system – need, cooling methods and main functional components. **for employability**.

UNIT- V

Study of need and type of thermostat valves. Additives in the coolant. Study of radiator efficiency. Study of ignition system of SI engines. Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing. **for employability**.

Course Outcomes:

Students completing this course will be able to:

CO: 1 Identify the conventional & non-conventional energy sources for farm power. And understand thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle **for skill enhancement**.

CO: 2 Understand the ignition, cooling electrical system of IC engines. **for better skilling of entrepreneurship.**

CO: 3 Familiar with the basics of engine testing with reference to BIS code. Understand about

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tractors various systems, mechanism and power outlets **for skill development**.

CO: 4 To illustrate traction, its mechanics, basic Ergonomics and basic knowledge of tractor system testing. **for employability**.

CO: 5 Understand radiator efficiency ignition system of SI engines comparison of dynamo and alternator **for employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	3	1	3	1	3	2
CO:2	2	3	3	3	1	2	1	2	2	1
CO:3	3	1	3	2	3	1	3	2	1	3
CO:4	3	1	2	3	1	2	2	1	1	3
CO:5		3	1	2	3	1	2	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**3**	**2**
CO:2	3	**1**	**3**
CO:3	3	**2**	**1**
CO:4	1	**3**	**2**
CO:5	3	**3**	**2**

References:

1. Liljedahl J B and Others. Tractors and Teir Power Units.
2. Rodichev V and G Rodicheva. Tractors and Automobiles.
3. Mathur ML and RP Sharma. A course in Internal Combustion Engines.
4. Singh Kirpal. Automobile Engineering – Vol II.

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TEAG558 **Tractor and Automotive Engines Lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Introduction to different systems of CI engines; Engine partsand functions, working principles etc.
2. Valve system – study, construction and adjustments;
3. Oil & Fuel – determination of physical properties;
4. Air cleaning system;
5. Fuel supply system of SI engine;
6. Diesel injection system & timing;
7. Cooling system, and fan performance,
8. thermostat and radiator performance evaluation;
   Part load efficiencies & governing;
9. Lubricating system & adjustments;
10. Starting and electrical system; Ignition system;
11. Tractor engine heat balance and engine performance curves.
12. Visit to engine manufacturer/ assembler/ spare parts agency.

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TEAG509 Watershed Hydrology, Planning and Management L: T: P 3:0:0

Objectives: To acquaint the students about the preparation of the detail report of the problems and causes related to the water, land, vegetation and social aspects of specific area and their remedies through watershed planning and management.

UNIT- I

Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves and intensity-duration-frequency relationship. **for skill enhancement**.

UNIT- II

Hydrologic processes-Interception, infiltration –factors affecting, measurement and indices. Evaporation - Estimation and measurement. Runoff - Factors affecting, measurement, stage - discharge rating curve, estimation of peak runoff rate and volume, Rational method, Cook's method and SCS curve number method. **for better skilling of entrepreneurship**.

UNIT- III

Geomorphology of watersheds – Linear, aerial and relief aspects of watersheds- stream order, drainage density and stream frequency. Hydrograph - Components, base flow separation methods, Unit hydrograph theory, S-curve, synthetic hydrograph, applications and limitations. Stream gauging - discharge rating curves, flood peak, design flood and computation of probable flood. Flood routing – channel and reservoir routing. Drought – classification, causes and impacts, drought management strategy **for skill development and employability**.

UNIT- IV

Watershed - introduction and characteristics. Watershed development - problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio-economic factors. Watershed management - concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologic data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index. **for skill employability**.

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UNIT- V

Water budgeting in a watershed. Management measures - rainwater conservation technologies - *in-situ* and *ex-situ* storage, water harvesting and recycling. Dry farming techniques- inter-terrace and inter-bund land management. Integrated watershed management concept, components, arable lands - agriculture and horticulture, non-arable lands - forestry, fishery and animal husbandry **for skill employability**.

Outcomes:

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

CO1: Understand different components of hydrologic cycle and Precipitation. **for skill enhancement**.

CO2: Understand the different hydrologic processes. **for better skilling of entrepreneurship**.

CO3: Understand the geomorphology of watersheds, hydrograph, flood routing and drought. **for skill development and employability**.

CO4: Understand the concept of watersheds, its development and management **for skill employability**.

CO5: Understand the Water budgeting in watershed and dry farming **for skill employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	3	1	3	2	3	2
CO:2	1	3	2	3	2	1	3	2	1	3
CO:3	3	2	3	1	1	3	2	2	1	2
CO:4	2	1	2	3	1	1	2	3	1	3
CO:5	3	3	1	1	3	1	3	1	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**1**	**1**
CO:2	2	**2**	**3**
CO:3	3	**3**	**2**
CO:4	3	**3**	**1**
CO:5	3	**3**	**1**

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2. Mutreja, K.N. 1990. Applied Hydrology. Tata McGraw-Hill Publishing Co., New Delhi.
3. Subramanya, K. 2008. Engineering Hydrology. 3rd Edition, Tata McGraw-Hill Publishing Co. New Delhi.
4. Suresh, R. 2005. Watershed Hydrology. Standard Publishers Distributors, Delhi.
5. Ghanshyam Das. 2008. Hydrology and Soil Conservation Engineering: Including Watershed
6. Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.

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TEAG559 **Hydrology Lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Visit to meteorological observatory.
2. Analysis of rainfall data and estimation of mean rainfall by different methods.
3. Exercise on frequency analysis of hydrologic data and estimation of missing data
4. Computation of runoff volume by SCS curve number method.
5. Study of stream gauging instruments.
6. Exercise on morphological parameters of watershed.
7. Exercise on unit hydrograph.
8. Quantitative analysis of watershed characteristics.
9. Watershed investigations for planning and development.
10. Analysis of hydrologic data for planning watershed management.
11. Techno-economic viability analysis of watershed projects.
12. Visit to watershed development project areas.

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TEAG510 Bio-Energy Systems: Design and Applications L: T: P 3:0:0

Objectives: The course is designed to generate awareness on recycling and energy recovery from different wastes. The student will incline towards conservation of energy through application of efficient devices and practices.

UNIT-I

Fermentation processes and its general requirements, an overview of aerobic and anaerobic fermentation processes and their industrial application. Heat transfer processes in anaerobic digestion systems, land fill gas technology and potential. **for better skilling of entrepreneurship**.

UNIT-II

Biomass Production: Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting. **for skill development and employability**.

UNIT-III

Harvesting of biomass and coppicing characteristics. Biomass preparation techniques for harnessing (size reduction, densification and drying). Thermo- chemical degradation. **for skill enhancement**.

UNIT-IV

History of small gas producer engine system. Chemistry of gasification. Gas producer – type, operating principle. Gasifier fuels, properties, preparation, conditioning of producer gas. Application, shaft power generation, thermal application and economics. **for skill enhancement**.

UNIT-V

Trans-esterification for biodiesel production. A range of bio-hydrogen production routes. Environmental aspect of bio-energy, assessment of greenhouse gas mitigation potential. **for skill enhancement**.

Course Outcomes:

Students completing this course will be able to:

CO: 1 Identify the non conventional resources and understand solar cell material, array, power plant and its limitations. **for skill development and employability**.

CO: 2 Understand about Geothermal Energy, Principle of working of MHD Power plant and Fuel Cells. **for skill development and employability**.

CO: 3 Familiar with Wind energy and energy conversion system.

For skill enhancement.

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CO: 4 Understand about solar thermal energy, collectors and analyze solar thermal power **for skill enhancement**.

CO: 5 Plant for power generation, energy storage for heating and cooling purposes **for skill enhancement**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	3	2	1	3	2	1	3	3	3
CO:2	3	3	1	2	3	1	3	3	1	2
CO:3	2	1	3	2	3	3	3	2	1	3
CO:4	3	2	1	3	1	2	1	2	1	2
CO:5	2	3	2	2	3	1	3	2	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**3**	**1**
CO:2	3	**3**	**2**
CO:3	3	**2**	**3**
CO:4	3	**1**	**1**
CO:5	3	**1**	**2**

References:

1. British BioGen. 1997, Anaerobic digestion of farm and food processing practices-Good
2. practice guidelines, London, available on www.britishbiogen.co.UK.
3. Butler, S.2005. Renewable EnergyAcademy:Trainingwoodenergy professionals.
4. Centre for biomass energy. 1998. Straw for energy production; Technology-Environment Ecology. Available: www.ens.dk.

Website Source:

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TEAG550 **Bio-Energy Systems Lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Study of anaerobic fermentation system for industrial application, Study of gasification for industrial process heat
2. Study of biodiesel production
3. Study of biomass densification technique (briquetting, pelletization, and cubing).
4. Integral bio energy system for industrial application,
5. Study of bio energy efficiency in industry and commercial buildings.
6. Study and demonstration of energy efficiency in building.
7. Measuring efficiency of different insulation technique.
8. Study of Brayton, Striling and Rankine cycles.
9. Study of modern greenhouse technologies.

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TEHU501 **Human values and professional ethics** **L: T: P**

3:1:0 Objectives:

- To create awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I

HUMAN VALUES: Morals, Values and Ethics – Integrity – Work Ethic – Service – Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing - Honesty – Courage – Valuing Time – Co-operation – Commitment - Empathy – Self-Confidence – Character - Spirituality. **for skill enhancement**.

UNIT II

ENGINEERING ETHICS: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - custom and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment. **for skill enhancement**.

UNIT III

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study. **for better skilling of entrepreneurship**.

UNIT IV

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination. **for better skilling of entrepreneurship**.

UNIT V

GLOBAL ISSUES: Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers and engineers as expert witness and advisors -moral leadership – Sample code of Ethics like ASME, ASCE, IEEE, IETE etc. **for skill development and employability**.

Course Outcomes:

Students completing this course will be able to:

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CO: 1 understands human values. **for skill enhancement**.

CO: 2 Inculcate ethics in professional life. **for skill enhancement**.

CO: 3 Understand codes of ethics balanced outlook on law Engineering as experimentation - engineers as responsible experimenter **for better skilling of entrepreneurship**.

CO: 4 Understand Safety and risk assessment of safety respect for authority professional rights discrimination **for better skilling of entrepreneurship**.

CO: 5 4 Understand Multinational corporations computer ethics Sample code of Ethics like ASME, ASCE, IEEE **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	3	1	3	2	1	3
CO:2	2	3	2	1	2	1	1	3	2	3
CO:3	3	1	3	2	3	1	2	2	3	2
CO:4	3	1	2	3	2	1	2	3	1	2
CO:5	3	1	2	2	3	2	1	1	2	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**1**	**1**
CO:2	3	**2**	**1**
CO:3	3	**1**	**3**
CO:4	3	**1**	**3**
CO:5	3	**3**	**1**

References:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
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TEME506 **Machine Design** **L: T: P 3:0:0**

Objectives: To familiarize the students how to apply the concepts of stress analysis, Data book techniques in the analysis, theories of failure and material science to analyze, design and/or select commonly used machine components.

Unit- I

Meaning of design, Phases of design, design considerations. Common engineering materials and their mechanical properties. Types of loads and stresses, theories of failure, factor of safety, selection of allowable stress. Stress concentration. Elementary fatigue and creep aspects. **For better skilling of entrepreneurship**.

Unit- II

Cotter joints, knuckle joint and pinned joints, turnbuckle. Design of welded subjected to static loads. Design of threaded fasteners subjected to direct static loads, bolted joints loaded in shear and bolted joints subjected to eccentric loading. **for skill development**

Unit- III

Design of shafts under torsion and combined bending and torsion. Design of keys. Design of muff, sleeve, and rigid flange couplings. Design of helical and leaf springs. **For employability.**

Unit- IV

Design of flat belt and V-belt drives and pulleys.Design of gears. **for skill enhancement**.

Unit- V

Design of screw motion mechanisms like screw jack, lead screw, etc. Selection of anti-friction bearings. **for skill enhancement**.

Course Outcomes:

CO: 1 The students will demonstrate the ability to apply the fundamentals of stress analysis, theories of failure and material science in the design of machine components. . **for better skilling of entrepreneurship**.

CO: 2 The students will demonstrate the ability to make proper assumptions, perform correct analysis while drawing upon various mechanical engineering subject areas. **for skill development**

CO: 3 Specifically, the students will demonstrate the preceding abilities by performing correctly: The design, analysis and sizing of shafts, Keys and Coupling. **For employability.**

CO: 4 Student will Learn how to design a power screw, rivet joint and welded joint. **for skill enhancement**.

CO: 5The selection, sizing and analysis of springs and other mechanical components/systems. Students will learn the use of data book. **for skill enhancement**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	3	3	3	1	1	3	3
CO:2	2	3	1	2	2	2	1	2	2	1
CO:3	3	1	3	1	1	2	3	3	3	2
CO:4	3	2	1	3	1	2	1	2	1	2
CO:5	1	3	1	1	3	1	1	3	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO:1	2	**1**	**3**
CO:2	3	**2**	**2**
CO:3	1	**3**	**3**
CO:4	3	**1**	**1**
CO:5	3	**1**	**2**

Suggested Readings

- Jain R K. 2013. Machine Design. Khanna Publishers, 2-B Nath Market, NaiSarak, New Delhi.
- Khurmi R S and Gupta J K. 2014. A Text Book of Machine Design. S. Chand & Company Ltd., New Delhi.
- Design of machine element (B.V.Bhandri)
- Machine Design (R.S.khurmi)
- Machine Design (Sharma &Agrawal)
- Machine Design (Sadhu Singh)

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TEAG607 **Irrigation & Drainage Engineering** **L: T: P 3:0:0**

Objectives: To train the students about the reclamation of the agricultural lands suffering from excessive water application and problematic soils.

UNIT- I

Major and medium irrigation schemes of India, purpose of irrigation, environmental impact of irrigation projects, source of irrigation water, present status of development and utilization of deferent water resources of the country; measurement of irrigation water: weir, flume and orifice. **for skill enhancement**.

UNIT- II

Design and lining of irrigation field channels, land grading: criteria for land levelling, land levelling design methods, estimation of earth work; soil water plant relationship: soil properties, irrigation management practices, soil water movement, infiltration, soil water potential. **for better skilling of entrepreneurship**.

UNIT- III

Measurement of soil moisture, concept of evapotranspiration (ET), measurement and estimation of ET, water and irrigation requirement of crops, depth of irrigation, frequency of irrigation, irrigation efficiencies, surface methods of water application: border, check basin and furrow irrigation-adaptability, specification and design considerations.

for better skilling of entrepreneurship.

UNIT- IV

Water logging- causes and impacts; drainage, objectives of drainage, types of drainage system, drainage coefficient, design of surface drains: purpose and benefits, hydraulic conductivity, drainable porosity, water table; derivation of Hooghoudt's equation. **for better skilling of entrepreneurship**.

UNIT- V

Layout, construction and installation of drains; vertical drainage; bio-drainage; mole drains; reclamation of saline and alkaline soils, leaching requirements, conjunctive use of fresh and saline water **for skill enhancement**.

Course Outcomes:

At the end of this course, the student will be able to-

CO1: Understand the irrigations projects and its relevance. **for skill enhancement**.

CO2: Design and lining of irrigation field channels **for better skilling of entrepreneurship**.

CO3: Analyze the soil moisture measurement techniques, Evapotranspiration and water

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application methods. **for better skilling of entrepreneurship.**

CO4: understand waterlogging and drainage concept. **for better skilling of entrepreneurship.**

CO5: understand the drain layout and drainage methods. **for skill enhancement.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	1	2	3	3	2	1	3	3
CO:2	1	3	1	3	2	2	1	1	2	2
CO:3	3	2	3	1	2	3	3	1	3	3
CO:4	2	3	1	3	1	3	2	3	3	2
CO:5	1	2	2	1	3	2	1	2	3	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**1**	**1**
CO:2	1	**2**	**3**
CO:3	2	**1**	**3**
CO:4	1	**2**	**3**
CO:5	3	**2**	**3**

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1. Michael A.M. 2012. Irrigation: Teory and Practice. Vikas Publishing House New Delhi. Majumdar D. K. 2013. Irrigation Water Management Principles. PHI learning Private Limited New Delhi 2nd Edition.

2. Allen R. G., L. S. Pereira, D. Raes, M. Smith. 1998. Crop Evapotranspiration guidelines for computing crop water requirement. Irrigation and drainage Paper 56, FAO of United Nations, Rome.

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TEAG657 **Irrigation & Drainage Engineering** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Measurement of soil moisture.
2. Measurement of irrigation water.
3. Measurement of soil infiltration.
4. Determination of bulk density and field capacity of soil.
5. Estimation of irrigation efficiencies.
6. *In-situ* measurement of hydraulic conductivity.
7. Estimation of drainage coefficients.
8. Design of surface drainage systems.
9. Design of subsurface drainage systems.
10. Study of drainage tiles and pipes.
11. Installation of sub-surface drainage system.
12. Cost analysis of surface and sub-surface drainage system.

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TEAG608 **Groundwater, Wells and Pumps** **L: T: P 3:0:0**

Objectives: To enable the students to know about the ground water potential, its dynamic behaviour and exploration manual and mechanically.

UNIT- I

Occurrence and movement of ground water; aquifer and its types; classification of wells, tube-wells and open wells, familiarization of various types of bore wells; design of open wells; groundwater exploration techniques. **for skill enhancement**.

UNIT- II

Methods of drilling of wells: percussion, rotary, reverserotary; design of tubewell and gravel pack, installation of well screen, development of well; groundwater hydraulics-determination of aquifer parameters by di□erent method suchas Theis, Jacob and Chow's, Theis recovery method. **for better skilling of entrepreneurship**.

UNIT- III

Well interference, multiple well systems, estimation of ground water potential, artificial groundwater recharge techniques; pumping systems and water lifting devices.
for skill development and employability.

UNIT- IV

Classification of pumps, components of centrifugal pump, priming, pump selection, installation and troubleshooting, pump performance curves. **for skill enhancement**.

UNIT- V

Effect of change of impeller dimensions on performance characteristics; hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; turbine pump and submersible pump. **for skill enhancement**.

Course Outcomes:

The student will be able to-

CO1: Understand the concept of ground water, wells and aquifer. **for skill enhancement**.

CO2: know the Methods of drilling of wells and groundwater hydraulics. **for better skilling of entrepreneurship**.

CO3: know the concept of Well interference and pumping systems
for skill development and employability.

CO4: study the Classification of pumps **for skill enhancement**.

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CO5: Understand the impeller dimensions effect and other pump systems **for skill enhancement.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	3	3	2	3	3	1	3	1	3
CO:2	1	3	1	3	1	1	3	1	3	1
CO:3	3	2	3	2	1	3	3	3	2	3
CO:4	3	1	1	3	2	3	1	3	3	3
CO:5	2	3	2	1	3	1	2	1	2	1

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**2**	**2**
CO:2	1	**1**	**3**
CO:3	3	**3**	**3**
CO:4	3	**1**	**3**
CO:5	3	**1**	**1**

References:

1. Michael AM, Khepar SD. and SK Sondhi. 2008. Water Well and Pumps, 2nd Edition, TataMc-Graw Hill.
2. Todd David Keith and Larry W. Mays. 2004. Groundwater Hydrology, 3rd Edition, John Wiley & Sons, New York (International Book Distributing Company Lucknow).
3. Michael AM. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-II, 5th Edition.Jain Brothers Publication, New Delhi.

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TEAG658 **Groundwater, Wells and Pumps Lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Verification of Darcy's Law
2. Study of different drilling equipments.
3. Sieve analysis for gravel and well screens design.
4. Estimation of aquifer parameters by Theis method.
5. Estimation of aquifer parameters by Coopers-Jacob method.
6. Estimation of aquifer parameters by Chow method.
7. Estimation of aquifer parameters by Theis Recovery method.
8. Well design under confined and unconfined conditions.
9. Study of artificial ground water recharge structures.
10. Study of centrifugal pumps.
11. Study of turbine, propeller pumps.
12. Study of submersible pump.

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TEAG609 Post Harvest Engineering of Horticultural Crops L: T: P 3:0:0

Objectives: To acquaint the students with various post harvest operations of horticultural crops to reduce post harvest losses and value addition.

UNIT-I

Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing, Peeling: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling), Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc., Blanching: Importance and objectives; blanching methods, effects on food (nutrition, colour, pigment, texture). **for better skilling of entrepreneurship**.

UNIT-II

Chilling and freezing: Application of refrigeration in different perishable food products, Thermophilic, mesophilic & Psychrophilic micro-organisms, Chilling requirements of different fruits and vegetables, Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic), Effect on food during chilling and freezing, Cold storage heat load calculations and cold storage design, refrigerated vehicle and cold chain system, Dryers for fruits and vegetables, Osmo-dehydration. **for skill development and employability**.

UNIT-III

Packaging of horticultural commodities, Packaging requirements (in terms of light transmittance, heat, moisture and gas proof, micro organisms, mechanical strength), Different types of packaging materials commonly used for raw and processed fruits and vegetables products, bulk and retail packages and packaging machines, handling and transportation of fruits and vegetables, Pack house technology. **for skill enhancement**.

UNIT-IV

Minimal processing, Common methods of storage, Low temperature storage, evaporative cooled storage, Controlled atmospheric storage, Modified atmospheric packaging, Preservation Technology, General methods of preservation of fruits and vegetables, Brief description and advantages and disadvantages of different physical/ chemical and other methods of preservation. **for skill enhancement**.

UNIT-V

Flowcharts for preparation of different finished products, Important parameters and equipment used for different Unit Operations, Post harvest management and equipment for spices and flowers, Quality control in fruit and vegetable processing industry. Food supply chain. **for skill enhancement**.

Course Outcomes:

The students will be able to:

CO: 1 Understand the physical, chemical, and mechanical properties of food and their handling and storage. **for better skilling of entrepreneurship**.

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CO: 2 Determine the porosity and roundness of fruits and vegetables. **for skill development and employability**.

CO: 3 Understand maturity indices of fruits and vegetables. . **for skill enhancement**.

CO: 4 Understand the concept of quality in relation to fruit and vegetable based products. **for skill enhancement**.

CO:5 Understand the processing and preservation of fruits and vegetables using various techniques. **for skill enhancement**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	2	3	3	3	1	2	3	3
CO:2	1	3	2	1	2	2	3	3	2	3
CO:3	3	2	3	1	2	3	3	1	2	1
CO:4	3	1	1	3	1	1	1	3	3	1
CO:5	2	1	1	1	3	3	1	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	1	**1**	**3**
CO:2	3	**3**	**1**
CO:3	1	**3**	**3**
CO:4	3	**1**	**1**
CO:5	3	**2**	**2**

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1. Arthey, D. and Ashurst, P. R. 1966. Fruit Processing. Chapman and Hall, New York.
2. Pantastico, E.C.B. 1975. Postharvest physiology, handling and utilization of tropical and
3. Subtropical fruits and vegetables AVI Pub. Co., New Delhi.

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TEAG659 Post Harvest Engineering of Horticultural Crops Lab L:T:P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Performance evaluation of peeler and slicer
2. Performance evaluation of juicer and pulper
3. Performance evaluation of blanching equipment
4. Testing adequacy of blanching
5. Freezing of food, freezing time calculations,
6. Study of cold storage and its design
7. Study of CAP and MAP storage
8. Study of different types of packaging materials commonly used for raw and processed fruits and vegetables products
9. Minimal processing of vegetables
10. Preparation of value added products
11. Visit to fruit and vegetable processing industry
12. Visit to spice processing plant.

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TEAG610 Farm Machinery and Equipment-II 3(2+1) L: T: P 3:0:0

Objectives: To develop skills in the students required to develop and modification of indigenous harvesting machines/methods as per the need of the area and farmers

UNIT- I

Introduction to plant protection equipment – sprayers and dusters. Classifcation of sprayers. Types of nozzles. Calculations for calibration of sprayers. Introduction to intercultural equipments. Use of weeders – manual and powered. Study of functional requirements of weeders and main components. **for better skilling of entrepreneurship**.

UNIT-II

Familiarization of fertilizer application equipment. Study of harvesting operation – harvesting methods, harvesting terminology. Mower – types, constructional details, working and adjustments. Study of shear type harvesting devices – cutter bar, inertial forces, counter balancing, terminology, cutting pattern. Study of reapers, binders and windrowers – principle of operation and constructional details. **for skill development.**

UNIT- III

Importance of hay conditioning, methods of hay conditioning, and calculation of moisture content of hay. Introduction to threshing systems – manual and mechanical systems. Types of threshing drums and their applications. Types of threshers- tangential and axial, their constructional details and cleaning systems. **for skill enhancement**.

UNIT- IV

Factors affecting thresher performance. Combine and their terminology, classification of combines, Computation of combine losses, study of combine troubles and troubleshooting. Study of chaff cutters and capacity calculations. **for better skilling of entrepreneurship**.

UNIT- V

Study of straw combines – working principle and constructional details. Study of root crop diggers – principle of operation, blade adjustment and approach angle, and calculation of material handled. Study of potato and groundnut diggers. Study of Cotton harvesting – Cotton harvesting mechanisms, study of cotton pickers and strippers, functional components. Study of maize harvesting combines. Introduction to vegetables and fruit harvesting equipment and tools. **for skill development and employability**.

Course Outcomes:

Students completing this course will be able to:

CO: 1 Familiar with combines, cotton harvester, and chaff cutter. **for better skilling of entrepreneurship**.

CO: 2 The students will be able to understand the mechanization and various equipment used in the farm for different field operations **for skill development.**

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CO: 3 Familiar with potato and groundnut diggers **for skill enhancement**.

CO: 4 Understand Factors affecting thresher performance, combine and their terminology cutters and capacity calculations **for better skilling of entrepreneurship**.

CO: 5 Understand straw combines of root crop functional components of cotton pickers vegetables and fruit harvesting equipment **for skill development and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	3	3	1	1	3	3	2
CO:2	2	3	3	1	3	2	3	1	3	1
CO:3	1	2	3	3	1	3	3	3	2	3
CO:4	3	3	1	3	2	1	2	2	1	3
CO:5	3	2	3	1	3	3	1	3	2	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	1	**1**	**3**
CO:2	3	**2**	**1**
CO:3	3	**1**	**2**
CO:4	1	**1**	**3**
CO:5	3	**3**	**1**

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1. Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.
2. Smith HP and LH Wilkey. Farm Machinery and Equipment.
3. Culpin Claude. Farm Machinery.
4. Srivastava AC. Elements of Farm Machinery.
5. Lal Radhey and AC Datta. Agricultural Engineering Principles of Farm Machinery.

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TEAG660 Farm Machinery and Equipment-II Lab L: T: P 3:0:0

List of Experiment: Minimum 08 experiments out of the following:

1. Study of types of dusters and functional components.
2. Familiarization with plant protection and interculture equipments.
3. Study of types of sprayers and functional components.
4. Study of nozzle types and spread pattern using patternator.
5. Study of fertilizer application equipments.
6. Study of various types of mowers and reaper.
7. Study of power threshers.
8. Study of functional units of combines.
9. Study of root crop diggers.
10. Familiarization with the working of cotton and maize harvesters.
11. Familiarization with vegetable and fruit harvesters.

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TEAG611 Engineering Properties of Agricultural Produce L: T: P 3:0:0

Objectives: To acquaint the students with various aspects of engineering properties such as size, shape, mass, energy balance, fluid flow, heat transfer and psychrometry required for food processing.

UNIT- I

Classification and importance of engineering properties of Agricultural Produce, shape, size, roundness, sphericity, volume, density, porosity, specific gravity, surface area of grains, fruits and vegetables, Thermal properties, Heat capacity, Specific heat, Thermal conductivity, Thermal diusivity, Heat of respiration; **for skill enhancement**.

UNIT- II

Co-efficient of thermal expansion, Friction in agricultural materials; Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, Flow of bulk granular materials, Aero dynamics of agricultural products, drag coefficients, terminal velocity. **for better skilling of entrepreneurship**.

UNIT- III

Rheological properties; force, deformation, stress, strain, elastic, plastic and viscous behavior, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non-Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves. **for better skilling of entrepreneurship**.

UNIT- IV

Electrical properties; dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination. **for skill development**

UNIT- V

Application of engineering properties in handling processing machines and storage structures **for employability.**

Course Outcomes:

The student will be able to understand:

CO: 1 Engineering properties of food and biomaterials. **for skill enhancement**.

CO: 2 Structure and chemical composition of foods, Physical properties. **for better skilling of entrepreneurship**.

CO: 3 Water activity, food stability sorption and desorption isotherm of food materials. **for better skilling of entrepreneurship**.

CO: 4 Newtonian and non-Newtonian fluid. **for skill development**

CO: 5 Thermal properties and Electrical and magnetic properties of food. **For employability**.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	3	1	3	1	2	3	1
CO:2	2	3	2	1	2	1	1	1	2	2
CO:3	1	2	3	1	3	1	3	1	2	3
CO:4	2	1	1	3	2	1	2	1	2	1
CO:5	3	2	1	2	3	1	2	3	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**2**	**1**
CO:2	1	**1**	**3**
CO:3	2	**1**	**3**
CO:4	3	**2**	**1**
CO:5	1	**3**	**3**

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2. Mohesin, N.N. 1980. Termal Properties of Foods and Agricultural Materials. Gordon &
3. Breach Science Publishers, New York.
4. Prentice, J.H. 1984. Measurement in Rheological Properties of Food Stu□s. Elsevier Appliedscience Pub. Co. Inc. New York.
5. Rao, M.A. and Rizvi, S.H., 1995. Engineering Properties of Foods. Marcel Dekker Inc. NewYork.
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TEAG612A **Wasteland Development** **L:T:P 3:0:0**

Objectives: To study causes of watershed formation, assessment and methods to reclaim.

UNIT- I

Land degradation – concept, classification - arid, semiarid, humid and sub-humid regions, denuded range land and marginal lands. **for skill enhancement**.

UNIT- II

Wastelands – factors affecting, classification and mapping of wastelands, planning of wastelands development - constraints, agro-climatic zones, Soil conservation structures- gully stabilization, ravine rehabilitation, sand dune stabilization, water harvesting methods. **for better skilling of entrepreneurship**.

UNIT- III

Afforestation - agro-horti-forestry-silvipasture methods, forage and fuel crops- socioeconomic constraints. Shifting cultivation, optimal land use options. Wasteland development – hills, semi-arid, coastal areas, water scarce areas, reclamation of waterlogged and salt-affected lands **for better skilling of entrepreneurship**.

UNIT- IV

Mine spoils- impact, land degradation and reclamation and rehabilitation, Micro-irrigation in wastelands development. Sustainable wasteland development under drought situations, socio-economic perspectives. **for skill development and employability**

UNIT- V

Government policies. Participatory approach. Preparation of proposal for wasteland development and benefit-cost analysis. **for employability**

Course Outcomes:

The students will able to:

CO1: Have theoretical knowledge of land degradation. **for skill enhancement**.

CO2: Understand the concept of wastelands. **for better skilling of entrepreneurship**.

CO3: Understand the need of afforestation and wasteland management and development. **for better skilling of entrepreneurship**.

CO4: to know about Mine spoils and Sustainable wasteland development under different conditions. **for skill development and employability**

CO5: Know about Government policies and approach for wasteland development. **for employability**

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	3	1	2	3	2	3	3	1
CO:2	1	3	2	1	3	2	1	2	3	3
CO:3	3	1	3	1	1	3	3	2	3	1
CO:4	1	2	2	3	1	2	1	2	1	3
CO:5	3	2	1	2	3	3	3	1	3	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**1**	**1**
CO:2	1	**1**	**3**
CO:3	1	**2**	**3**
CO:4	3	**3**	**3**
CO:5	2	**3**	**1**

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TEAG612B Information Technology for Land and Water Management L:T:P 3:0:0

Objectives: To acquaint the students with the application of IT in assessment of Land and Water resources and their management.

UNIT- I

Concept of Information Technology (IT) and its application potential. Role of IT in natural resources management. **for skill enhancement**.

UNIT- II

Existing system of information generation and organizations involved in the field of land and water management. Application and production of multimedia. Internet application tools and web technology. **for better skilling of entrepreneurship**.

UNIT- III

Networking system of information. Problems and prospects of new information and communication technology. Development of database concept for effective natural resources management. **for better skilling**.

UNIT- IV

Application of remote sensing, geographic information system (GIS) and GPS. Rational data base management system. Object oriented approaches. Information system, decision support systems and expert systems. **for better skilling of entrepreneurship**.

UNIT- V

Agricultural information management systems - use of mathematical models and programmes. Application of decision support systems, multi sensor data loggers and overview of software packages in natural resource management. Video-conferencing of scientific information. **for better entrepreneurship**.

Course Outcomes:

At the end of this course, the student will be able to-

CO1: Understand about Concept of Information Technology (IT) and its application.

CO2: Understand the present system of information generation and Application and production of multimedia. **for better skilling of entrepreneurship**.

CO3: Understand the network system of information and database system. **for better skilling**.

CO4: Analyze the concept of remote sensing, geographic information system (GIS) and GPS. **for better skilling of entrepreneurship**.

CO5: Know about agricultural information management systems. **for better entrepreneurship**.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	2	3	1	2	3	1	3	3	2
CO:2	1	3	1	1	3	2	1	2	3	3
CO:3	3	2	3	2	1	3	3	1	3	1
CO:4	1	2	1	3	2	2	1	1	2	3
CO:5	3	1	2	1	3	3	3	1	3	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	2	**1**	**1**
CO:2	1	**2**	**3**
CO:3	3	**1**	**1**
CO:4	1	**2**	**3**
CO:5	1	**1**	**3**

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TEAG612C Precision Farming Techniques for Protected Cultivation L: T: P 3:0:0

Objectives: Student will gain the knowledge of recent farming techniques to increase the accuracy and efficiency of agricultural input applications.

UNIT- I

Protected cultivation: Introduction, History, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment. **for skill enhancement**.

UNIT- II

Design and construction of green houses – site selection, orientation, design, construction, Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, different shading material fogging, combined fogging and fan pad cooling system, design of cooling system, maintenance of cooling and ventilation systems. **for better skilling**

UNIT- III

Greenhouse heating – necessity, components, methods, design of heating system. Root mediatypes – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Planting techniques in green house cultivation. Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design, and installation and material requirement. **for better skilling of entrepreneurship**.

UNIT- IV

Greenhouses and net houses – introduction, benefits, design, installation and material requirement. Management of irrigation. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers. **for skill development and employability**.

UNIT- V

Greenhouse climate measurement, control and management. Insect and disease management in greenhouse and net houses, Selection of crops for greenhouse cultivation, major crops in greenhouse- cultivation, harvesting and post harvest techniques, Economic analysis. **for skill and employability**.

Course outcomes

At the end of this course, the student will be able to

CO: 1 Knowledge about protected cultivation and precision farming. **for skill enhancement**.

CO: 2 Design and construction of green houses. **for better skilling**

CO: 3 Types of irrigation systems used in Protected cultication. **for better skilling of entrepreneurship**.

CO: 4 Knowledge about fertilization. **for skill development and employability**.

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CO: 5 Greenhouse climate measurement. **for skill and employability**.

PO-CO Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO:1	3	1	1	3	3	3	1	3	1	3
CO:2	1	3	1	3	3	1	2	1	3	2
CO:3	3	3	3	2	1	2	3	2	3	1
CO:4	3	1	1	3	2	3	1	3	2	3
CO:5	2	3	2	1	3	2	1	3	3	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	**Employability**	**Entrepreneurship Development**
CO:1	3	**3**	**2**
CO:2	3	**1**	**3**
CO:3	1	**1**	**3**
CO:4	3	**3**	**2**
CO:5	3	**3**	**1**

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TEHU601 **Disaster Management** **L: T: P 3:0:0**

Objectives:

- To provide students an understanding to the concepts and aspects of disaster and its relationship with development.
- To ensure awareness of Disaster Risk Reduction (DRR) approaches among students.
- To assist students develop ability to respond to their environment with potential response to disaster.

UNIT I: Introduction to Disasters **(12 Sessions)**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks

Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.

Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.

Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters. **for skill development and employability**.

UNIT II: Approaches To Disaster Risk Reduction **(10 Sessions)**

Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures, Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders **for skill enhancement**.

UNIT III: Inter-Relationship Between Disasters And Development **(08 Sessions)**

Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.

Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

Role of international cooperations in Disaster Management **for better skilling of entrepreneurship**.

UNIT IV: Disaster Risk Management In India **(08 Sessions)**

- Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management
- Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation

Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment. **for skill development**

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and employability.

UNIT V: Disaster Management: Applications, Case Studies and Field Works (07 Sessions)

The project /fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below. Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations. Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs. Students could conduct mock drills in schools, colleges or hospitals. They could also work of school safety, safety of college buildings, training in first aid. Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work. **for skill development and employability**.

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The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Any field works related to disaster management.

Learning Outcomes:

CO: 1 The students will be able to identify the nature and causes of disaster. **for skill development and employability**.

CO: 2 Also the students will be able to apply the disaster risk reduction mechanism. **for skill enhancement**.

CO: 3 Understand Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources. **for better skilling of entrepreneurship**.

CO: 4 Hazard and Vulnerability profile of India. . **for skill development and employability**.

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CO: 5 The project /fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. **for skill development and employability**.

Teaching Resources

Emphasis will be on interactive teaching learning methods. Tools could be Range of Films-documentaries and feature films related to disasters and their impacts and on vulnerabilities of people are available which a teacher could choose with care and screen. This could form a basis for classroom discussion.

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TEAG708 Post Harvest Engineering of Cereals, Pulses and Oil Seeds L:T:P 3:0:0

Objectives- To acquaint with the appropriate post harvest technologies of cereals, pulses and oil seeds.

UNIT-I

Cleaning and grading, aspiration, scalping; size separators, screens, sieve analysis, capacity and effectiveness of screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, shape graders. Size reduction: principle, Bond's law, Kick's law, Rittinger's law, procedure (crushing, impact, cutting and shearing), Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill. **for skill enhancement**.

UNIT-II

Material handling equipment. Types of conveyors: Belt, roller, chain and screw. Elevators: bucket, Cranes & hoists. Trucks (refrigerated/ unrefrigerated), Pneumatic conveying. Drying: moisture content and water activity; Free, bound and equilibrium moisture content, isotherm, hysteresis effect, EMC determination, Psychrometric chart and its use in drying, Drying principles and theory, Thin layer and deep bed drying analysis, Falling rate and constant rate drying periods, maximum and decreasing drying rate period, drying equations **for better skilling of entrepreneurship**.

UNIT-III

Mass and energy balance, Shedd's equation, Dryer performance, Different methods of drying, batch-continuous; mixing-non-mixing, Sun- mechanical, conduction, convection, radiation, superheated steam, tempering during drying, Different types of grain dryers: bin, flat bed, LSU, columnar, RPEC, fluidized, rotary and tray **for skill development and employability**.

UNIT-IV

Mixing: Theory of mixing of solids and pastes, Mixing index, types of mixers for solids, liquid foods and pastes. Milling of rice: Conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment. Milling of wheat, unit operations and equipment **for skill development**.

UNIT-V

Milling of pulses: traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods: CFTRI and Pantnagar methods. Pulse milling machines, Milling of corn and its products. Dry and wet milling. Milling of oilseeds: mechanical

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