B.Tech. Agricultural Engineering

CURRICULUM AND SYLLABI

I to IV Semesters

Regulation - 2023

EXCÊL

ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Accredited by NBA and NAAC with "A+"and Recognized by UGC (2f&12B)

KOMARAPALAYAM – 637303

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KOMARAPALAYAM - 637303

B.Tech., AGRICULTURAL ENGINEERING
REGULATION - 2023
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM
AND SYLLABI

I SEMESTER

Sub Code	Course	Category	L	T	P	C	CA	FE	Total
			Periods/Week				Maximum Marks		
Theory Course (s)									
23MA102	Matrices and Calculus	BS	3	1	0	4	40	60	100
23LET07	Heritage of Tamils (தமிழர் மரபு)	HSS	1	0	0	1	40	60	100
Theory with Practical Course (s)									
23ENE01	Communicative English	HSS	2	0	2	3	50	50	100
23CH102	Chemistry for Material Sciences	BS	3	0	2	4	50	50	100
23EE105	Fundamentals of Measurements, Electrical and Electronics Engineering	ES	3	0	2	4	50	50	100
23ME101	Engineering Graphics	ES	1	0	4	3	50	50	100
Mandatory Course (s)									
23MC001	Induction Programme	MC	2	0	0	0	100	0	100
		Total	15	1	10	19	380	320	700

II SEMESTER

Sub Code	Course	Category	L	T	P	C	CA	FE	Total
			Periods/Week				Maximum Marks		
Theory Course (s)									
23MA202	Mathematical Foundations for Engineering	BS	3	1	0	4	40	60	100
23ME201	Engineering Mechanics	ES	3	1	0	4	40	60	100
23LET08	Tamils and Technology (தமிழரும் தொழில்நுட்பமும்)	HSS	1	0	0	1	40	60	100
Theory with Practical Course (s)									
23LEEXX	Language Elective*	HSS	2	0	2	3	50	50	100

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Sub Code	Course	Category	L	T	P	C	CA	FE	Total
23PH202	Materials Physics	BS	3	0	2	4	50	50	100
23CS203	Problem Solving using Python Programming	ES	3	0	2	4	50	50	100
23AG201	Principles of Crop Production	PC	2	0	2	3	50	50	100
Mandatory Course (s)									
23MC002	Mandatory Course-II	MC	2	0	0	0	100	0	100
Total			19	2	8	23	420	380	800

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Language Electives									
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100
23LEH03	Hindi	HSS	2	0	2	3	50	50	100
23LEF04	French	HSS	2	0	2	3	50	50	100
23LEG05	German	HSS	2	0	2	3	50	50	100
23LEJ06	Japanese	HSS	2	0	2	3	50	50	100

III SEMESTER

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23AG301	Applied Thermodynamics for Agriculture Engineering	ES	3	0	0	3	40	60	100
23AG302	Theory of Machines	ES	3	0	0	3	40	60	100
23HS301	Universal Human Values	HSS	3	0	0	3	100	0	100
Theory with Practical Course (s)									
23MA301	Transforms and Boundary Value Problems	BS	3	0	2	4	50	50	100
23AG303	Fluid Mechanics and Machineries for Agriculture Engineering	PC	3	0	2	4	50	50	100
23AG304	Soil Science and Engineering	PC	3	0	2	4	50	50	100
Practical Course (s)									
23AG305	Computer Aided Design of Agricultural Equipments Drawing Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course (s)									
23MCXXX	Mandatory Course-III	MC	0	0	2	0	100	0	100
Total			18	1	10	22	490	310	800

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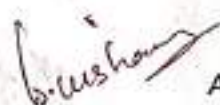
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IV SEMESTER

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23AG401	Heat and Mass Transferfor Agriculture Engineering	PC	3	1	0	4	40	60	100
23AG402	Tractor and Farm Engines	PC	3	0	0	3	40	60	100
23AG403	Hydrology and Water Resources Engineering	PC	3	0	0	3	40	60	100
23AG404	Strength of Materials for Agriculture Engineering	PC	3	0	0	3	40	60	100
Theory with Practical Course (s)									
23MA402	Statistical and Numerical Methods	BS	3	0	2	4	50	50	100
23AG405	Surveying and Levelling	PC	3	0	2	4	50	50	100
Practical Course (s)									
23AG406	Strength of Materials for Agriculture Engineering Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course (s)									
23MCXXX	Mandatory Course-IV	MC	2	0	0	0	100	0	100
		Total	20	1	6	22	420	380	800

V SEMESTER

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23AG501	Farm Structures and Precision Framing	PC	3	0	0	3	40	60	100
23AG502	Farm Implements and Equipments	PC	3	0	0	3	40	60	100
23AG503	Renewable Energy Resources Technology	PC	3	0	0	3	40	60	100
23AGE0XX	Professional Electives - I	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective-I	OE	3	0	0	3	40	60	100
Theory with Practical Course (s)									
23AG504	Irrigation and Drainage Engineering	PC	3	0	2	4	50	50	100
Practical Course (s)									
23AG505	Farm Machinery Laboratory	PC	0	0	2	1	60	40	100
23MCXXX	Mandatory Course-V	MC	2	0	0	0	100	0	100
		Total	20	0	4	20	410	390	800

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VI SEMESTER

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23AG601	Entrepreneurship in Agricultural Engineering	HSS	3	0	0	3	40	60	100
23AG602	Groundwater and Well Engineering	PC	3	0	0	3	40	60	100
23AG603	Unit Operations in Agricultural Processing	PC	3	0	0	3	40	60	100
23AGEXX	Professional Elective-II	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective-II	OE	3	0	0	3	40	60	100
Theory with Practical Course (s)									
23AG604	Post Harvest Technology	PC	3	0	2	4	50	50	100
Practical Course (s)									
23AG605	Design of Agricultural Machineries and Implements	PC	0	0	2	1	60	40	100
Employment Enhancement Course (s)									
23AG611	Design Thinking & Mini Project	EEC	0	0	2	2	50	50	100
23AG612	Internship	EEC	2 weeks			1	100	0	100
		Total	18	0	6	23	460	440	900

VII SEMESTER

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23AG701	Soil and Water Conservation Engineering	PC	3	0	0	3	40	60	100
23AGEXX	Professional Elective-III	PE	3	0	0	3	40	60	100
23AGEXX	Professional Elective-IV	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective-III	OE	3	0	0	3	40	60	100
Theory with Practical Course (s)									
23AG702	Dairy and Food Engineering - Principles & Products	PC	3	0	2	4	50	50	100
23AG703	IoT in AgriculturalSystems	PC	3	0	2	4	50	50	100

Employment Enhancement Course (s)

23AG711	Design Project	EEC	0	0	2	2	50	50	100
23AG712	Study Tour	EEC	1 Week			0	100	0	100
		Total	18	0	6	22	410	390	800

VIII SEMESTER									
Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course (s)									
23AGEXX	Professional Elective- V	PE	3	0	0	3	40	60	100
23AGEXX	Professional Elective-VI	PE	3	0	0	3	40	60	100
Employment Enhancement Course (s)									
23AG811	Major Project	EEC	0	0	20	8	60	40	100
		Total	6	0	20	14	140	160	300

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PROFESSIONAL ELECTIVE COURSES (PE)

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
STREAM-I AGRICULTURAL PROCESS ENGINEERING									
23AGE01	Agricultural By Products and Management	PE	3	0	0	3	40	60	100
23AGE02	Sustainable Agriculture and Food Security	PE	3	0	0	3	40	60	100
23AGE03	Refrigeration and Air Conditioning for Agricultural Engineering	PE	3	0	0	3	40	60	100
23AGE04	Storage Engineering	PE	3	0	0	3	40	60	100
23AGE05	Seed Processing Technology	PE	3	0	0	3	40	60	100
23AGE06	Process Engineering of Horticultural crops	PE	3	0	0	3	40	60	100
23AGE07	Fundamentals of Nano Science	PE	3	0	0	3	40	60	100
23AGE08	Agricultural Structures and Environmental Control	PE	3	0	0	3	40	60	100
23AGE09	Food Plant Design and Management	PE	3	0	0	3	40	60	100
23AGE10	Waste and By-products Utilization	PE	3	0	0	3	40	60	100
23AGE11	Processing of Fats and Oils	PE	3	0	0	3	40	60	100
23AGE12	Food Safety Regulations and Standards	PE	3	0	0	3	40	60	100
23AGE13	Emerging Technologies in Food Processing	PE	3	0	0	3	40	60	100
23AGE14	Food Process Equipment and Design	PE	3	0	0	3	40	60	100
23AGE15	Sugarcane Process Techniques	PE	3	0	0	3	40	60	100
STREAM-II SOIL AND WATER CONSERVATION ENGINEERING									
23AGE21	Watershed Management	PE	3	0	0	3	40	60	100
23AGE22	Micro Irrigation	PE	3	0	0	3	40	60	100
23AGE23	On Farm Water Management	PE	3	0	0	3	40	60	100
23AGE24	Automation in Irrigation	PE	3	0	0	3	40	60	100

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23AGE25	Agricultural Waste Management	PE	3	0	0	3	40	60	100
23AGE26	Protected Cultivation	PE	3	0	0	3	40	60	100
23AGE27	Disaster Management	PE	3	0	0	3	40	60	100
23AGE28	Water Harvesting and Soil Conservation Structures	PE	3	0	0	3	40	60	100
23AGE29	Landscape Irrigation Design and Management	PE	3	0	0	3	40	60	100
23AGE30	Remote Sensing and GIS Applications	PE	3	0	0	3	40	60	100
23AGE31	Command Area Development	PE	3	0	0	3	40	60	100
23AGE32	Land Reclemation Techniques	PE	3	0	0	3	40	60	100
23AGE33	Advanced Drainage Engineering	PE	3	0	0	3	40	60	100
23AGE34	Design of Micro-irrigation system	PE	3	0	0	3	40	60	100
23AGE35	Landscape architecture	PE	3	0	0	3	40	60	100
23AGE36	Waste Land Development	PE	3	0	0	3	40	60	100

STREAM-III : FARM MACHINERY AND POWER

23AGE41	Agricultural Economics and Farm Management	PE	3	0	0	3	40	60	100
23AGE42	Mechanics of Tillage and Traction	PE	3	0	0	3	40	60	100
23AGE43	Special Farm Equipment	PE	3	0	0	3	40	60	100
23AGE44	Ergonomics and Safetyin Agricultural Engineering	PE	3	0	0	3	40	60	100
23AGE45	Energy Auditing and Management	PE	3	0	0	3	40	60	100
23AGE46	Bio-energy Systems: Design and Applications	PE	3	0	0	3	40	60	100
23AGE47	Tractor Design and Testing	PE	3	0	0	3	40	60	100
23AGE48	Thermal Power Engineering	PE	3	0	0	3	40	60	100
23AGE49	Human Engineering and Safety	PE	3	0	0	3	40	60	100
23AGE50	Farm Machinery	PE	3	0	0	3	40	60	100

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	Design and Production								
23AGE51	Testing of Farm Machineries	PE	3	0	0	3	40	60	100
23AGE52	Blue Print of Machines	PE	3	0	0	3	40	60	100
23AGE53	Modern Applications of Sensors	PE	3	0	0	3	40	60	100
23AGE54	Integrated Farming System	PE	3	0	0	3	40	60	100
23AGE55	Systems Analysis in Agricultural Engineering	PE	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES (For Other Branches)

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23AGO01	Principles of Food Preservation	OE	3	0	0	3	40	60	100
23AGO02	Introduction to Bio Energy and Bio Fuels	OE	3	0	0	3	40	60	100
23AGO03	Energy Technology	OE	3	0	0	3	40	60	100
23AGO04	Low Cost Automation	OE	3	0	0	3	40	60	100
23AGO05	Supply Chain Management	OE	3	0	0	3	40	60	100
23AGO06	Food Safety and Quality Regulations	OE	3	0	0	3	40	60	100
23AGO07	Basics of Integrated Water Resources Management	OE	3	0	0	3	40	60	100
23AGO08	Operation and maintenance of Micro Irrigation System	OE	3	0	0	3	40	60	100
23AGO09	Pumps and Hydraulic Machineries	OE	3	0	0	3	40	60	100
23AGO10	Crop Production techniques	OE	3	0	0	3	40	60	100
23AGO11	Roof Top Gardening Techniques	OE	3	0	0	3	40	60	100
23AGO12	Entrepreneurship in Agricultural Engineering	OE	3	0	0	3	40	60	100

ONE CREDIT COURSES

Sub Code	Course	Category	Periods/Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23AGA01	Mushroom Cultivation Techniques	EEC	0	0	2	1	100	0	100
23AGA02	Honey Bee Keeping Techniques	EEC	0	0	2	1	100	0	100
23AGA03	Value Addition in Agricultural Products	EEC	0	0	2	1	100	0	100
23AGA04	Sericulture Technology	EEC	0	0	2	1	100	0	100
23AGA05	Production Technology of Vermicomposting	EEC	0	0	2	1	100	0	100
23AGA06	Poultry Farming Techniques	EEC	0	0	2	1	100	0	100
23AGA07	Millet processing and Cookies	EEC	0	0	2	1	100	0	100
23AGA08	Tractor and Farm Machineries Operation and Maintenance	EEC	0	0	2	1	100	0	100
23AGA09	Operation and Maintenance of Micro irrigation	EEC	0	0	2	1	100	0	100
23AGA10	Staad Pro.Software course	EEC	0	0	2	1	100	0	100

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MANDATORY COURSES (MC)

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23MC001	Induction Programme	MC	2 Weeks			0	100	0	100
23MC002	Environmental Sciences	MC	2	0	0	0	100	0	100
23MC003	Interpersonal Skill	MC	2	0	0	0	100	0	100
23MC004	Indian Constitution	MC	2	0	0	0	100	0	100
23MC005	Yoga and Value for Holistic Development	MC	2	0	0	0	100	0	100
23MC006	Soft Skills	MC	0	0	2	0	100	0	100
23UH001	Universal Human Values	MC	3	0	0	3	100	0	100

SUMMARY

Sl. No.	Category	Credits per Semester								Total Credits (AICTE)	Credits in %
		I	II	III	IV	V	VI	VII	VIII		
1	HSS	4	4	3			3			14 (10-14)	8.48%
2	BS	8	8	4	4					24 (22-28)	14.54%
3	ES	7	8	6						21 (24)	12.72%
4	PC		3	9	18	14	11	11		66 (48)	40.00%
5	PE					3	3	6	6	18 (18)	10.91%
6	OE					3	3	3		9 (9)	5.45%
7	EEC						3	2	8	13 (12-16)	7.87%
8	MC	0	0	0	0	0				0	0.00%
	Total	19	23	22	22	20	23	22	14	165	100%

HSS   - Humanities and Social Sciences

BS   - Basic Sciences

ES   - Engineering Sciences

PC   - Professional Core

PE   - Professional Electives

OE   - Open Electives

EEC   - Employability Enhancement Courses

MC   - Mandatory Courses (Non-Credit Courses)

CA   - Continuous Assessment

FE   - Final Examination

Passed in Board of Studies Meeting   CHAIRMAN-BOARD OF STUDIES   Approved in Academic Council Meeting

23MA102	MATRICES AND CALCULUS (Common to all B.E/B.Tech Programmes)	L	T	P	C
		3	1	0	4

Nature of Course	Basic Sciences
Pre requisites	Nil

Course Objectives

The course is intended to

1. Introduce the concept of orthogonal transformation to convert the square matrix into diagonal form.
2. Acquaint the student with mathematical tools needed in evaluating derivatives and differentiation of one variable.
3. Familiarize the functions of two variables, Taylor series and Jacobian techniques
4. Impart knowledge of double integral techniques in evaluating volume of the solid.
5. Learn the Green's theorem, Stoke's theorem and the Divergence theorem to compute integrals

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Apply the concept of orthogonal reduction for diagonalization of the given matrix	Apply
CO 2	Execute the rules of differentiation to differentiate the functions.	Apply
CO 3	Demonstrate the maxima and minima for a given function with two variables	Apply
CO 4	Apply integration to compute area and volume using multiple integrals	Apply
CO 5	Interpret the Green's theorem, Stokes' theorem and Divergence theorem to evaluate integrals.	Apply

Course Contents

Module – I   MATRICES   **9+3**

Eigen values and Eigenvectors of a real matrix – Characteristic Equation- Properties - Cayley Hamilton Theorem - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic Forms.

Module – II   DIFFERENTIAL CALCULUS   **9+3**

Functions of single Variable -Limits and Continuity - Derivatives - Differentiation rules(sum, product, quotient, chain rule) – Implicit differentiation-Logarithmic differentiation-Maxima and Minima of function of one variable –Taylors series.

Module – III   FUNCTIONS OF TWO VARIABLES   **9+3**

Limits and Continuity –Partial differentiation–Homogeneous functions and Euler's theorem–Jacobians –Partial differentiation of implicit functions–Taylor's series– Maxima and minima – Lagrange's method of multipliers.

Module – IV   MULTIPLE INTEGRALS   9+3

Double integrals – Change of order of Integrations- Double integrals in polar coordinates – Areaenclosed by plane curves – Triple integrals – Volume of solids.

Module – V   VECTOR CALCULUS   9+3

Gradient and directional derivative — Divergence and curl — Green's, Gauss divergence and Stoke's theorems — Verification andapplicationinevaluatingline, surfaceandvolumeIntegrals (cube, rectangular parallelepiped).

Total : 60 Periods

Text Books

1. B.K.Pal and K.Das , "Engineering Mathematics", Volume-1, 10th Edition, U.N.Dhur and Sons private limited,2020
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 44th Edition, 2019.

Reference Books

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 1st Edition, 2018
2. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics Semester II", Laxmi Publications, 6th Edition 2015.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References

1. **NPTEL-**https://nptel.ac.in/courses/111105035
2. **NPTEL-**https://nptel.ac.in/courses/111104144
3. **NPTEL-** https://nptel.ac.in/courses/111105122

	Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)													
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO 1	3	2	2										1	
CO 2	3	3	2										1	
CO 3	3	1	1										1	
CO 4	3	2	1										1	
CO 5	3	2	2										1	
	3-High				**2-Medium**				**1-Low**					

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Passed in Board of Studies Meeting 17.03.23   *Passed in Academic Council Meeting 27.04.23*

23CH102	CHEMISTRY FOR MATERIALS SCIENCE	L	T	P	C
	(Common to AERO, AGRI, CIVIL, MECH, PCT and SF)	3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Impart knowledge and understanding about the constituents present in water and the need for purification of water.
2. Provide knowledge about the basic principles, preparatory methods and applications of nanomaterials.
3. Understand the causes and control measures of corrosion.
4. Learn about the nature, types of the soil and suitable fertilizers for different types of soil.
5. Gain knowledge about fuels and calorific value of solid fuel, liquid fuel and gaseous fuel.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Develop innovative and eco-friendly method for water purification to meet the growing industrial demand.	Apply
CO 2	Discuss the basic principles, synthesis and applications of nanomaterials	Understand
CO 3	Demonstrate the importance of protection of metals from corrosion.	Understand
CO 4	Identify the nature of the soil and to decide fertilizer for a particular soil depending on its nature	Understand
CO 5	Classify fuels based on their efficiency of combustion.	Apply

Course Contents

Module – I   WATER ANALYSIS AND WATER TREATMENT   9

Water analysis: Sources of water, hard water and soft water, Hardness of water, acidity, alkalinity, pH value. Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD). Water treatment: Definition, Zeolite process, Conditioning methods: internal conditioning (Phosphate, Calgon) and external conditioning (Demineralization), Desalination, Reverse-osmosis (RO).

Module – II   NANOCHEMISTRY   9

Basics: Distinction between molecules, nanomaterials and bulk materials, Size-dependent properties, Types of nanomaterials: Definition, properties, and uses of nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis: Sol-Gel and laser ablation methods. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

Module – III   CORROSION AND ITS CONTROL   9

Corrosion: Classification, Types: Chemical corrosion and Electrochemical corrosion. Corrosion control: Corrosion inhibitors, cathodic protection (sacrificial anodic protection, impressed current cathodic protection), Protective coating, Paint and Electroplating.

Passed in Board of Studies Meeting on 17.03.2023 Passed in Academic Council Meeting on 27.04.2023

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Module – IV   SOIL CHEMISTRY& FERTILIZER   9

Types of soil: saline soil, acidic soil and alkaline soil, submerged soil, salt affected and calcareous soil. Characteristics and Reclamation. Effect of N, P, K, Secondary nutrients and micronutrients on plant growth and development. Importance of nitrogenous fertilizers. Green manuring: definition and examples.

Module – V   FUELS AND COMBUSTION   9

Solid fuel: Coaland its varieties, analysis of coal: proximate and ultimate with their significance. Manufacture of metallurgical coke (Otto-Hoffmann method).Liquid fuel: petroleum oil. Knocking: octane number. Diesel: cetane number. Gaseous fuels - Water gas and Liquefied Petroleum Gas. Combustion: Introduction, Calorific value: Gross and net calorific value, Dulong's formula and problems..

Total : 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of hardness of water.	3	Apply
2	Determination of chloride content in water sample.	3	Apply
3	Conductometric titration of strong acid versus strong base.	3	Apply
4	Determination of strength of HCl by pH metry.	3	Apply
5	Estimation of copper in brass by EDTA method.	3	Apply
6	Determination of rate of corrosion by weight loss method	3	Apply
7	Estimation of strength of iron by potentiometric titration	3	Apply
8	Determination of strength of acids in a mixture of acids using conductivity meter	3	Apply

Total Periods: 30

Text Books

1. Dr. A. Ravikrishnan, "Engineering Chemistry" Sri Krishna Hitech Publishing Company, Chemistry, 2021.
2. N. Krishnamurthy, "Engineering Chemistry" PHI Learning, 4th Edition, 2020.
3. Dr.Sunita Rattan. Publisher, S.K. Kataria& Sons. Edition, Reprint, 2020

Reference Books

1. S. S. Dara, "A Text Book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018
2. B.S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
3. Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2017

Additional References

1. https://nptel.ac.in/downloads/122101001
2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf
3. https://nptel.ac.in/courses/102103044/3
4. https://www.youtube.com/watch?v=jFQeDef6bug

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Passed in Board of Studies Meeting on 17.03.2023   Passed in Academic Council Meeting on 27.04.2023

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2									1			
CO 2	3	2									1			
CO 3	3	1									1			
CO 4	3	2									1			
CO 5	3	2									1			
	3-High				2-Medium				1-Low					

Bloom's Level	Summative Assessment					Final Examination (Theory) [50]
	Continuous Assessment					
	Theory				Practicals	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20]	
Remember	20	20	20		-	30
Understand	25	25	25		40	60
Apply	5	5	5		60	10
Analyze	-	-	-		-	
Evaluate	-	-	-		-	
Create	-	-	-		-	

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23ENE01	COMMUNICATIVE ENGLISH	L	T	P	C
	Common to all B.E./B.Tech Programmes	2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to
1. Improve lexical, grammatical and semantic competence.
2. Enhance communicative skills in real life situations.
3. Augment thinking in all forms of communication.
4. Equip with oral and written communication skills.
5. Gain employability skills.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1.	Use effectively the lexical, grammatical and semantic knowledge	Understand
CO2.	Communicate with clarity using intentional vocabulary in English	Apply
CO3.	Articulate perfectly and express their opinions confidently	Apply
CO4.	Accomplish listening and reading skills for life long learning	Apply
CO5.	Comprehend, interpret and present data	Understand

Course Contents:

MODULE I   BASIC GRAMMAR AND USAGE   9
Grammar: Parts of Speech – Verb (Primary & Modal Auxiliary) – Prefixes and Suffixes **Listening:** Listening Skills: Importance and Types of Listening – Barriers of Listening - Listening to short monologues **Speaking:** Introducing oneself – Role play **Reading:** Types of Reading – Intensive reading – Extensive Reading – Reading Comprehension **Writing:** Permission letter (Industrial Visit) – Informal letter – Dialogue writing

MODULE II   APPLICATIONS OF LANGUAGE SKILLS   9.
Grammar: Tenses (Present, Past and Future) – Different Forms of a word – Types of Questions **Listening:** Listening strategies – Listening to Announcements **Speaking:** Likes and dislikes- Movie Reviews – **Reading:** Skimming - Scanning - Reading Newspaper and Articles **Writing:** Inviting Dignitaries – Accepting Invitation – Declining Invitation.

MODULE III   CONVERSATIONAL SKILLS   9
Grammar: If conditionals – Numerical Adjectives **Listening:** - Listening to Telephone calls and taking notes – Listening Lectures **Speaking:** Technical Presentation – Group Discussion **Reading:** Reading Magazines - Cloze Test **Writing:** Calling for Quotation – Complaint Letter – Process Description

MODULE IV   GRAMMATICAL ACCURACY COMPETENCE   9
Grammar: Subject verb agreement – Discourse markers - One word substitution **Listening:** Listening and gap filling – Listening and Match the answers **Speaking:** Narrating Story - Asking and giving directions **Reading:** Rearranging Jumbled sentence - Note making **Writing:** Instructions – Hints Developing – Report Writing (Fire and Accident Report)

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MODULE V   TECHNICAL WRITING SKILLS
Grammar: Homophones and Homonyms - Abbreviation and Acronyms **Listening:** Listening announcements – Listening and Summing up **Speaking:** Impromptu speech – Presentation at a business meeting **Reading:** Reading and summarizing articles **Writing:** Paragraph Writing – Checklist – Story writing.

Total: 45 Periods

Laboratory Components

S.No.	List of Exercises	CO Mapping	RBT
1	Self Introduction	1	Understand
2	Movie Review	2	Apply
3	Group Discussion	3	Apply
4	Asking and Giving Directions	4	Apply
5	Impromptu Speech	5	Apply
6	Listening to short monologues	1	Understand
7	Listening to Announcement	2	Understand
8	Listening Telephone calls	3	Understand
9	Listening and Gap Filling	4	Apply
10	Listening and Match the answers	4	Apply

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication",Tata McGraw Hill Publishing company Limited,New Delhi, 2nd Edition, 2018.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books:

1. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press,USA,13thEdition,2018.
2. Norman Whitby, Business Benchmark – "Pre-Intermediate to Intermediate, Students Book", Cambridge University Press, 1st Edition, 2006.
3. Dhanavel S. P., "English and Soft Skills", 1stEdition, Orient Black Swan Private Limited, Hyderabad, 1st Edition, 2010.

Web References:

1. https://www.englishclub.com/grammar/
2. https://learnenglish.britishcouncil.org
3. https://www.indiabix.com/verbal-ability/questions-and-answers/
4. https://www.elllo.org
5. https://englishforeveryone.org/Topics/Reading-Comprehension.html

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Mapping of Course Outcomes (CO) with Programming Outcomes (PO) Programme Specific Outcomes (PSO)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1										3	1	2	2		
CO2										3	1	2	2		
CO3										3	1	2	2		
CO4										3	1	2	2		
CO5										3	1	2	2		
	3	High		2		Medium			1		Low				

Bloom's Level	Summative assessment					Final Examination (Theory) [50 marks]
	Continuous Assessment					
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	-	-	-		-	-
Understand	40	40	40		40	40
Apply	60	60	60		60	60
Analyse	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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20LEJ06	Japanese	L	T	P	C
		2	0	2	3

Nature of Course	HSS
Pre requisites	Nil

Course Objectives

The course is intended to

1. Read & Write Hiragana and Katakana (Japanese Alphabets) letters.
2. Use words and phrases of greeting in Japanese, identify names of objects and do a self-introduction using short and simple sentences.
3. Demonstrate the use of time-related words, verb conjunctions and make light conversation asking for directions and answering questions.
4. Express their likes and dislikes, hobbies, describe the locations of different things and demonstrate counting in Japanese.
5. Demonstrate the minimum day to day conversation and describe their ability and experiences.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1.	Read and write Hiragana and Katakana (Japanese Alphabets) letters	Understand
CO2.	Identify names of objects and do self-introduction using short and simple sentences	Apply
CO3.	Demonstrate the use of time-related words	Apply
CO4.	Articulate their likes and dislikes, hobbies and describe the locations of different things	Apply
CO5.	Able to communicate effectively in day to day life	Understand

Course Contents

S. No.	Topic	Periods
1.	INTRODUCTION- はじめまして,ALPHABET-Hiragana	5.0
2.	NUMBERS- すうじ	1.5
3.	Classroom Words- きょうしつのことば	1.5
4.	ALPHABET-Katakana	1.5
5.	BASIC SENTENCE- じぶんのなまえ	1.5
6.	COUNTRY NAMES- くにのなまえ	1.5
7.	SAYING AGE- なんさいですか	1.5
8.	SAYING MONTH- なにつき	1.5
9.	SAYING BIRTHDAY- たんじょうび	1.5
10.	KAZOKU- かぞく	1.5
11.	KNOWING THINGS- あ/こ/そ	1.5
12.	PRONOUNS	1.5
13.	ADJECTIVES	1.5

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14.	SAYING TIME SHOPPING	1.5
15.	SELF INTRODUCTION	1.5
16.	MY TOWN-Watashino machi	1.5
17.	GO,COME,RETURN	1.5
18.	BASIC VERBS	1.5
19.	TRANSPORT	1.5
20.	LISTENING	4.0
21.	REVISION	4.0
22.	ORAL & WRITTEN EXAMS	5.0
	Total Periods	45.0

Text Books

1. Minna no Nihongo – Elementary Japanese 1
2. Minna no Nihongo- Translation & Grammar Notes 1
3. Gateway to Japan Japanese Language school e-handouts / e-course materials.

	Summative assessment					
	Continuous Assessment					**Final Examination (Theory) [50 marks]**
Bloom's Level	**Theory Marks**				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE -III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	-	-	-		-	-
Understand	40	40	40		40	40
Apply	60	60	60		60	60
Analyse	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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23LET07   தமிழர் மரபு   **L T P C**
                                                                             1 0 0 1

                                                                                      3
அலகு I   மொழி மற்றும் இலக்கியம்:
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி –
தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க
இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் –
தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி
இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில்
நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும்
பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II   மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை –
                                                                                      3
**   சிற்பக் கலை:**
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர்
மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர்
செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் –
குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை,
வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில்
கோவில்களின் பங்கு.

                                                                                      3
அலகு III   நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம்,
தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்
விளையாட்டுகள்.

                                                                                      3
அலகு IV   தமிழர்களின் திணைக் கோட்பாடுகள்:
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க
இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய
அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் –
சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும்
இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V   இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்
**   தமிழர்களின் பங்களிப்பு:**
                                                                                      3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில்
தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில்,
சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப்
புத்தகங்களின் அச்சு வரலாறு.

                                                          TOTAL : 15 PERIODS

TEXT BOOKS
1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:
    தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை
    வெளியீடு)

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REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23LET07   **HERITAGE OF TAMILS**   **L T P C**
1 0 0 1

UNIT I   LANGUAGE AND LITERATURE   **3**
Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II   HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE   **3**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III   FOLK AND MARTIAL ARTS   **3**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV   THINAI CONCEPT OF TAMILS   **3**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V   CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE   **3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TEXT BOOKS   **TOTAL : 15 PERIODS**
1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23EE105	FUNDAMENTALS OF MEASUREMENTS, ELECTRICAL AND ELECTRONICS ENGINEERING (Agriculture Engineering)	L	T	P	C
		3	0	0	3

Nature of Course	Professional Core
Pre requisites	Engineering Science

Course Objectives

The course is intended to

1. Learn the basic concepts of electrical elements and measuring instruments.

2. Introduce the basics of electric circuits and analysis

3. Identify the analog devices and their characteristics

4. Educate on the fundamental concepts of digital electronics.

5. Impart knowledge in the basics of working principles and application of electrical machines.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Express the operating principles of electrical elements and measuring instruments	Understand
CO 2	Compute the electric circuit parameters for simple problems.	Apply
CO 3	Explain the characteristics of analog electronic devices	Understand
CO 4	Discuss the basic concepts of digital electronics	Understand
CO 5	Examine the working principle and applications of electrical machines	Understand

Course Contents

Module – I	ELECTRICAL ELEMENTS AND MEASURING INSTRUMENTS	9
Resistance, Inductance, Capacitance, Wires and Cables Ammeter, Voltmeter, Wattmeter, Energymeter, Thermistor and Anemometer	

Module – II	ELECTRICAL CIRCUITS	9
Ohm's Law, Kirchhoff's Laws, Mesh and Nodal analysis, Introduction to AC Circuits, Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor.	

Module-III	ANALOG ELECTRONICS	9
Semiconductor Materials: Silicon &Germanium ,Construction and operating characteristics of PN Junction Diodes, Zener Diode , Half wave and Full wave Rectifiers , Bipolar Junction Transistor ,CB, CE, CC Configurations and Characteristics.	

Module – IV	DIGITAL ELECTRONICS	9
Number System ,Logic Gates ,Boolean algebra ,Adders, Subtractors, SOP and POS forms, K-map representations, minimization using K maps (Simple Problems only)	

Module – V	ELECTRICAL MACHINES	9
Construction and operating characteristics: DC Motor, DC Generator, Single Phase Transformer, Three phase Induction motor, Three phase Alternator, Synchronous Motor.		
	Total : 45 Periods	

Text Books

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2. S.K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

Reference Books

1. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
3. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

Additional References

1. **NPTEL** - https://nptel.ac.in/courses/108105017
2. **NPTEL** -https://onlinecourses.nptel.ac.in/noc21_ee55/preview

S.No	List of Experiments	CO Mapping	Revised Blooms Taxonomy
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	CO1	Understand
2	Soldering practice – Components Devices and Circuits – Using general purpose PCB	CO1	Understand
3	Fluorescent Lamp Wiring	CO2	Understand
4	Staircase Wiring	CO2	Understand
5	Measurement of energy using single phase energy meter	CO2	Analyze
6	Characteristics of PN junction Diode	CO3	Analyze
7	Characteristics of BJT	CO3	Analyze
8	Half wave and Full Wave rectifiers	CO4	Analyze
9	Study of CRO.	CO4	Understand
10	Verification of Logic Gates	CO5	Understand

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	1	1										1	1
CO 2	3	2	1										1	1
CO 3	2	1	1										2	1
CO 4	2	1	1										2	1
CO 5	2	1	1										2	1
	3-High				2-Medium				1-Low					

Formative Assessment

Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations (IAE)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	60
Remember	10	10	10	20
Understand	40	20	30	60
Apply		20	10	20
Analyse				
Evaluate				
Create				

23ME101	**Engineering Graphics** **(Common to Aeronautical, Agriculture, Civil, Mechanical, Safety and Fire Engineering & Food Technology)**	**L**	**T**	**P**	**C**
		1	0	4	3
Nature of Course	Engineering Sciences				
Prerequisites	Nil				

Course Objectives:

The course is intended to

1. Understand technical drawings in various fields of engineering
2. Imagine and visualize the geometric details of engineering objects.
3. Translate the geometric information of engineering objects into engineering drawings.
4. Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings.
5. Visualize and draw isometric and perspective views

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Develop the conic sections, special curves, and draw orthographic views from pictorial views.	Apply
CO 2	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.	Apply
CO 3	Construct the projections of simple solids like prisms, pyramids, cylinder and cone.	Apply
CO 4	Build the sectional views of solids like cube, prisms, pyramids, cylinders & cones and development of its lateral surfaces.	Apply
CO 5	Organize and draw isometric view of simple solids.	Apply

Course Contents

Concepts and Conventions (Not for Examination)   **1**

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

UNIT -I   Plane Curves and Free Hand Sketching   (3+12)

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

UNIT –II   Projection of Lines and Plane Surface   (3+12)

Orthographic projection- principles-Principal Planes-First angle projection- Projection of points - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes

(polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT –III   Projection of Solids   (3+12)

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

UNIT- IV   Projection of Sectioned Solids and Development of Surface   (3+12)

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

UNIT -V   Isometric Projections   (3+12)

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems.

TOTAL: (15+60) Periods

TEXT BOOKS
1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011
2. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.

REFERENCE BOOKS
1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Parthasarathy N S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

Web References
1. http://nptel.ac.in/courses/112103019/Engineering drawing
2. http://pioneer.netserv.chula.ac.th/~kjirapon/self-practice.html

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

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

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2										1	2		
CO2	3	2										1	2		
CO3	3	2										1	2		
CO4	3	3										1	2		
CO5	3	2										1	2		
	3	High		2		Medium			1		Low				

Summative assessment					
	Continuous Assessment				**Final Examination (Theory) [50 marks]**
Bloom's Level	**Theory**			**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	10	10	10		20	20
Understand	20	20	20		40	40
Apply	20	20	20		40	40
Analyse						
Evaluate						
Create						

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23PH202	MATERIALS PHYSICS	L	T	P	C
	(Common to Aero, Agri, Civil, FT, Mech, PCT & SF)	3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Basic Physics				

Course Objectives
The course is intended to

1. Impart knowledge in production of laser and their applications in engineering and medical field.
2. Understand on the concept and properties of matter like elasticity and its applications.
3. Provide a valuable theoretical introduction and an overview of the fundamental structures of the crystal physics.
4. Apply the concepts of thermal conductivity to solve the thermal coefficients.
5. Give an idea on new engineering materials like shape memory alloys, metallic glasses and nanomaterials.

Course Outcomes
On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Compare the types of lasers for various industrial applications.	Understand
CO 2	Study the elastic behavior and working of torsional pendulum.	Understand
CO 3	Account for how crystalline materials are studied using miller indices, including concepts like coordination number and packing factor.	Understand
CO 4	Demonstrate the thermal conductivity of good and bad conductors.	Apply
CO 5	Explain a conceptual understanding about the properties of new engineering materials like shape memory alloys, metallic glasses and nanomaterials.	Apply

Course Contents

Module – I	**LASER PHYSICS**	9

Lasers: Introduction- characteristics of laser - population of energy levels, Einstein's A and B coefficients derivation - resonant cavity - semiconductor lasers: homojunction and heterojunction - Applications of lasers - particle size determination and holography.

Module – II	**PROPERTIES OF MATTER**	9

Elasticity - stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever - uniform and non-uniform bending - I-shaped girders.

Module – III	**CRYSTAL PHYSICS**	9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures.

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Module – IV	THERMAL PHYSICS	9
Transfer of heat energy - thermal expansion of solids and liquids - expansion joints - bimetallic strips - thermal conductivity - Forbe's and Lee's disc method: theory and experiment – thermal insulation - applications: heat exchangers in refrigerators, ovens and solar water heaters.		

Module – V	MODERN ENGINEERING MATERIALS	9
Metallic glasses – preparation, properties and applications – Shape memory alloys – Types, characteristics and applications – Nanomaterials – preparation– Physical Vapour Deposition (PVD) - sol gel method, properties and applications. Carbon Nano Tube (CNT) –properties and applications.		

Total : 45 Periods

Laboratory Components (Any Five)

S.No	List of Experiments	CO Mapping	RBT
1	Determination of wavelength and particle size of the given Laser beam.	CO1	Apply
2	Determination of numerical aperture and acceptance angle of an optical fiber.	CO1	Apply
3	Determination of the rigidity modulus of a given wire by using Torsion pendulum.	CO2	Apply
4	Determination of Young's modulus of a material by non-uniform bending method.	CO2	Apply
5	Determination of Young's modulus of a material by uniform bending method.	CO2	Apply
6	Determination of thermal conductivity of a bad conductor by Lee's Disc method.	CO4	Apply
		Total	15 Periods

Text Books

1. Bhattacharya, D.K and Poonam, T, "Engineering Physics", Oxford University Press, 2nd edition, 2015.
2. M.N. Avadhanulu, M.N. &Kshirsagar PG, "A Text book of Engineering Physics", S.Chand and company, Ltd., New Delhi, 10th edition, 2014.
3. Singh Dheeraj Kumar, "Nanomaterials", Springer International Publishing, 1st Edition, 2023.

Reference Books

1. David Halliday, Robert Resnick and Jearl Walker., "Principles of Physics", Wiley, 10th Edition, 2014.
2. Raymond A Serway and John W Jewett., "Physics for Scientists and Engineers", Cengage Learning, 9th Edition, 2019.

Web References:

1. https://nptel.ac.in/courses/115/107/115107095/
2. https://spaceplace.nasa.gov/laser/en/
3. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniform-bending-6aMRx

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4. https://nptel.ac.in/courses/113106093

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	1												
CO 2	3	1												
CO 3	3	2	2											
CO 4	3	2	2											
CO 5	3													
	3-High			2-Medium			1-Low							

	Summative Assessment					
	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
Bloom's Level	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	10	10	10			20
Understand	35	35	35		40	60
Apply	5	5	5		60	10
Analyse						10
Evaluate						
Create						

23MA202	MATHEMATICAL FOUNDATIONS FOR ENGINEERING	L	T	P	C
	(Common to all B.E. / B.Tech Programme)	3	1	0	4

Nature of Course	Basic Sciences
Pre requisites	Fundamentals of Basic Mathematics

Course Objectives

The course is intended to

1. Understand the curvature and calculate the radius of curvature, centre, evolutes, involutes.
2. Acquire the mathematical skills required to solve ordinary differential equations.
3. Familiarizethe concepts of Laplace transform and its inverse.
4. Gain knowledge of analytic approach to analyse the conformal mapping.
5. Obtainthe knowledge of evaluating contour integrals using residue theorem.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the circle of curvature, evolutes and involutes of the curves.	Apply
CO2	Demonstrate various techniques to solve ordinary differential equations.	Apply
CO3	Select Laplace transform to standard functions and solve initial value problems / differential equations .	Apply
CO4	Find an analytic function ,when its real or imaginary part is known	Apply
CO5	Classify the Singularities and its corresponding Residues for the given function	Apply

Course Contents:

Module – I	APPLICATION OF DIFFERENTIAL CALCULUS	12

Curvature – Curvature in Cartesian co-ordinates - Centre and Radius of curvature- Circle of curvature- Evolutes and Involutes.

Module – II	ORDINARY DIFFERENTIAL EQUATION	12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – non-Homogenous equation - Euler and Legendre Equations.

Module – III	LAPLACE TRANSFORMS	12

Laplace transform –Transform of elementary functions –Properties –Transforms of derivatives and integrals -Transform of periodic functions. Inverse Laplace transform –Statement and applications of Convolution theorem - Method of solving second order ordinary differential equations with constant coefficients by using Laplace transform technique.

Module – IV	ANALYTIC FUNCTIONS	12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping : w = a+z, az, 1/z – Bilinear transformation.

Module – V	COMPLEX INTEGRATION	12

Line integral - Cauchy's integral theorem –Cauchy's integral formula – Taylor's and Laurent's series — Singularities — Residues — Residue theorem — Application of residue theorem for evaluation of real integrals.

Total: 60 Periods

Text Books:
1. Grewal B.S, 'Higher Engineering Mathematics', Khanna Publishers, New Delhi, 44th Edition, 2019.
2. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons (Asia) Limited, 10th Edition, 2016.

Reference Books:
1. Bali.N.P and ManishGoyal N.P, "A text book of Engineering Mathematics", Laxmi Publications, 6th Edition, 2015.
2. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, 1st Edition, 2018.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References:
1. https://onlinecourses.nptel.ac.in/noc24_ma12/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma10/preview
3. https://onlinecourses.nptel.ac.in/noc24_ma37/preview

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3												
CO2	3	3	2												
CO3	3	2	2												
CO4	3	3	3												
CO5	3	3	3												
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class /Assignment	5	15
	Attendance	5	

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| Bloom's Category | Summative Assessment | | | |
| | Internal Assessment Exam | | | Final Examination (60) |
	IAE I (5)	IAE II (10)	IAE III (10)	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

23LEE02	ADVANCED COMMUNICATIVE ENGLISH	L	T	P	C
	(Common to all B.E. / B.Tech Programme)	2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Communicative English				

Course Objectives
The course is intended to
1. Hone professional communication skills, including email etiquette and formal presentation.
2. Develop advanced vocabulary and collocation for official communication.
3. Communicate effectively and actively in social interactions.
4. Improve writing skills such as project and report writing for various purposes.
5. Foster collaborative communication abilities through group discussion in diverse contexts.

Course Outcomes
On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Communicate professionally in various contexts.	Understand
CO 2	Make use of common English phrases and vocabulary.	Understand
CO 3	Integrate basic English communication skills at a personal and a professional level in day-to-day interaction.	Apply
CO 4	Implement listening, reading and writing skills in real-life situations	Apply
CO 5	Decipher collaborative communication skills through diversified contexts.	Understand

Course Contents

Module – I	TECHNICAL VOCABULARY AND USAGE	9

Grammar: Technical Vocabulary (Synonyms and antonyms) - Articles - Reported Speech - **Listening**: Listening to video lectures (TED / INK Talks) **Speaking**: Describing pictures, places – Speaking practice to improve pronunciation **Reading**: Critical reading from the given text **Writing**: Job Application with Resume - E mail writing.

Module – II	EFFECTIVE OFFICIAL COMMUNICATION	9

Grammar: Collocation – Question tags – Prepositions **Listening**: Listening to telephonic conversation **Speaking**: Role plays – Telephonic Etiquette and telephonic phrases **Reading**: Company profile - Advertisement (job / product) **Writing**: – Preparing Memo – Prepare Circular, Agenda and Minutes – Placing Order – Prepare Advertisement.

Module – III	TECHNICAL LANGUAGE SKILLS FOR CONVERSATION	9

Grammar: Degrees of Comparison – Conjunctions **Listening**: Sports commentaries – Animated short stories **Speaking**: Asking for and giving directions – Describing simple process **Reading**: Reading and understand technical vocabulary **Writing**: Letter to the Editor – Review of Favourite Movie / Book – Recommendations.

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Module – IV	LANGUAGE FOR BUSINESS CORRESPONDENCE	9

Grammar: Idioms and Phrases – Single line definitions Phrasal verbs **Listening:** Listening to informal communication **Speaking:** Narrating personal experience **Reading:** Speed reading – reading passage within the time limit **Writing:** Project writing – Report writing (Accident and Survey) – Preparing welcome address and vote of thanks.

Module – V	VERBAL ABILITY FOR WRITING	9

Grammar: Verbal Analogy – Cause and effect expressions **Listening:** Listening to Iconic Speeches - debate and reviewing the performance **Speaking:** Group communication skills – Discussing social issues and current affairs **Reading:** Short story – critical reading **Writing:** Itinerary –Interpretation of charts (Flow chart and Pie chart) - Essay Writing and Paragraph.

Total : 45 Periods

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Describing Picture / Place	1	Understand
2	Listening	1	Understand
3	Role Play	2	Understand
4	Prepare Circular, Agenda & Minutes	2	Understand
5	Asking and Giving Directions	3	Apply
6	Narrate a Favourite Movie / Book	3	Apply
7	Welcome Address	4	Apply
8	Vote of Thanks	4	Apply
9	Discussing Social Issues	5	Understand
10	Interpretation of Charts	5	Understand
		Total	15 Periods

Text Books
1. Rizvi, Ashraf.M, "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 8th Edition, 2020.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books
1. Dr. Krishnakumar TP, "Rudiments of Communication Skills", Buddha Publication,1st Edition, 2023.
2. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press, USA, 13th Edition, 2018.
3. Dhanavel S. P., "English and Soft Skills", 1st Edition, Orient Black Swan Private Limited, Hyderabad, 2010.

Passed in Board of Studies Meeting on 28.12.2023   Passed in Academic Council Meeting on 11.01.2024

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Web References:
1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1									1	3	1		2	
CO 2									1	3	1		2	
CO 3									1	3	1		2	
CO 4									1	3	1		2	
CO 5									1	3	1		2	
	3-High			2-Medium			1-Low							

	Summative assessment					
Bloom's Level	**Continuous Assessment (IAE)**					**Final Examination (FE) [50marks]**
	Theory Marks				**Practical**	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	25				4	10
Understand	25	25	25		8	20
Apply		25	25		8	20
Analyse						
Evaluate						
Create						

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23LEJ06	JAPANESE	L	T	P	C
		2	0	2	3
Nature of Course	HSS				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Read & Write Hiragana and Katakana (Japanese Alphabets) letters.
2. Use words and phrases of greeting in Japanese, identify names of objects and do a self-introduction using short and simple sentences.
3. Demonstrate the use of time-related words, verb conjunctions and make light conversation asking for directions and answering questions.
4. Express their likes and dislikes, hobbies, describe the locations of different things and demonstrate counting in Japanese.
5. Demonstrate the minimum day to day conversation and describe their ability and experiences.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1.	Read & Write Hiragana and Katakana (Japanese Alphabets) letters	Understand
CO2.	Identify names of objects and do self-introduction using short and simple sentences	Apply
CO3.	Demonstrate the use of time-related words	Apply
CO4.	Articulate their likes and dislikes, hobbies and describe the locations of different things	Apply
CO5.	Express day to day conversation and describe their ability to share their experiences	Understand

Course Contents

Module – I		9
INTRODUCTION- はじめまして – ALPHABET - Hiragana - NUMBERS- すうじ- Classroom Words- きょうしつのことば –LISTENING		
Module – II		9
ALPHABET-Katakana - BASIC SENTENCE- じぶんのなまえ – COUNTRY NAMES- くにのなまえ- SAYING AGE- なんさいですか - LISTENING		
Module – III		9
SAYING MONTH- なにつき – SAYING BIRTHDAY- たんじょうび – KAZOKU- かぞく - KNOWINGTHINGS-あ/こ/そ – LISTENING		

Module – IV		9
PRONOUNS - ADJECTIVES - SAYING TIME, SHOPPING – LISTENING		
Module – V		9
SELF INTRODUCTION - MY TOWN - Watashino machi - GO, COME, RETURN - BASIC VERBS – TRANSPORT – LISTENING		
	Total : 45 Periods	

Text Books

1. Minna no Nihongo – Elementary Japanese 1
2. Minna no Nihongo- Translation & Grammar Notes 1
3. Gateway to Japan Japanese Language school e-handouts / e-course materials.

	Summative Assessment					
	Continuous Assessment					Final Examination (Theory) [50 marks]
Bloom's Level	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	50				4	10
Understand		20	20		8	20
Apply		30	30		8	20
Analyse						
Evaluate						
Create						

Passed in Board of Studies Meeting on 28.12.2023   Passed in Academic Council Meeting on 11.01.2024

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23LET08	தமிழரும் தொழில்நுட்பமும் **TAMILS AND TECHNOLOGY** (Common to all B.E. / B.Tech Programme)	L	T	P	C
		1	0	0	1
Nature of Course	Humanities and Sciences				
Pre requisites	Tamil				

Course Objectives
The course is intended to

1. Introduce students to the great technology of ancient Tamil society.
2. Realize the contribution of various technologies for the development of governing area.
3. Highlighting the different manufacturing technology to make the coins, jewels, stones, art etc.
4. Know the role of agriculture, water management system and food processing.
5. Learn about the Scientific Tamil and Tamil computing of the past and how it has evolved over the generations.

Course Outcomes
On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Remember the life style and technology of the Sangam people.	Remember
CO 2	Get an updated knowledge of ancient designing and construction of House, Temple, hero stones etc.	Understand
CO 3	Learnt the speciality of manufacturing technology types and usages.	Understand
CO 4	Gain the knowledge on production of agricultural products based on the ancient technologies.	Understand
CO 5	Understand the evaluation of Tamil language through the digital system.	Understand

Course Contents (in Tamil)

அலகு - I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	2
	சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில் நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.	
அலகு - II	**வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**	**2**
	சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு கட்டிடக் கலை - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.	

அலகு - III	உற்பத்தித் தொழில் நுட்பம்	2

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சன்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் -நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	2

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குழுமிகள் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார்.

அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	2

அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

Total : 10 Periods

Course Contents (in English)

Module – I	WEAVING AND CERAMIC TECHNOLOGY	2

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

Module – II	DESIGN AND CONSTRUCTION TECHNOLOGY	2

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Module – III	MANUFACTURING TECHNOLOGY	2

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads –Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

Module – IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	2

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea – Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

Module – V	SCIENTIFIC TAMIL & TAMIL COMPUTING	2

Passed in Board of Studies Meeting on 28.12.2023   *Passed in Academic Council Meeting on 11.01.2024*

CHAIRMAN - BOARD OF STUDIES

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total : 10 Periods

பார்வை நூல்கள் (TEXT-CUM-REFERENCE BOOKS)

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நகரிகம் (தொல்லியல் துறைவெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

23MC202	ENVIRONMENTAL SCIENCES (Common for all branches)	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Understand the concept of eco system and environment.
2. Become conversant with ecological balance and values of biodiversity.
3. Know the role of human in prevention of pollution and making a clean environment.
4. Get knowledge about conservation of non-conventional energy resources.
5. Study about the nature and management of e-waste and solid waste.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Explain the knowledge about ecosystem and environment	Understand
CO 2	Interpret the ecological balance and preservation of bio diversity	Understand
CO 3	Demonstrate various types of pollution in order to control pollution	Apply
CO 4	Classify the energy sources for the conservation of non conventional energy sources	Understand
CO 5	Identify the nature and management of e-waste and solid waste	Apply

Course Contents

Module – I	ECOSYSTEM	6

Eco system - Food chains, Food webs and Ecological pyramids. Ecosystem (a) Forest eco system, (b) Aquatic eco system (pond ecosystem and marine ecosystem).

Module – II	BIODIVERSITY	6

Introduction to Bio diversity, Values of Bio diversity, Threads to Bio diversity, Endangered and Endemic species of India, Hotspots of biodiversity. Conservation of Biodiversity: In-Situ and Ex-Situ conservation of biodiversity.

Module – III	ENVIRONMENTAL POLLUTION	6

Definition, Causes, Effects and Control of (a) Air pollution (b) Water pollution (c) Soil pollution. Electrostatic Precipitator for controlling air pollution.

Module – IV	NON-CONVENTIONAL ENERGY RESOURCES	6

Introduction, Types, Working and Applications of: Solar Energy- Photovoltaic (PV) solar energy, Wind Energy-Onshore wind power- and Geo Thermal Energy-Geo thermal power plant.

Module – V	ENVIRONMENTAL MANAGEMENT	6
Sustainable Development, Waste Management: Types, sources and disposal of municipal, industrial solid Waste, Role of Information technology in Environment and Human. COVID-19 and JN-1 Virus.		

		Total : 30 Periods

Activity Components

S.No	List of Experiments	CO Mapping	RBT
1	Field study of simple eco system: pond, river and hill slopes	CO1	Understand
2	Case study regarding environmental management	CO5	Apply

Text Books

1. AnubhaKaushik and C.P. Kaushik, "Environmental Science and Engineering, New Age International Publishers, New Delhi, 2nd Edition, 2019.
2. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition, 2020.

Reference Books

1. Santosh Kumar Garg and Rajeshwari Garg "Ecological and Environmental Studies", Khanna Publishers, Nai Sarak, Delhi, 2nd Edition, 2019.
2. Masters, Gilbert M, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2nd Edition, 2020.

Web References:

1. https://nptel.ac.in/courses/122103039/38
2. https://bch.cbd.int/cms/ui/collaboration/download/download.aspx?id=909
3. https://nptel.ac.in/courses/105102089/air%20pollution%20(Civil)/Module-3/3a.htm
4. www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
5. nptel.ac.in/courses/120108004/module7/lecture8.pdf

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1		3					1					3		
CO 2		3					3					1		
CO 3		3					2					3		
CO 4		2					3					2		
CO 5		3					3					2		
	3-High				2-Medium				1-Low					

Bloom's Level	Summative Assessment				
	Continuous Assessment				
	IAE-I [20]	IAE-II [20]	IAE-III [20]	Attendance [20]	Activity [20]
Remember	20	20	15		
Understand	30	25	25		
Apply		5	10		
Analyze					
Evaluate					
Create					

23CS203	PROBLEM SOLVING USING PYTHON PROGRAMMING (Common to Aero,Agri,Civil,Mech,SF,PCT,FT)	L	T	P	C
		3	0	2	4

Nature of Course	Engineering Sciences
Prerequisites	Mathematical and Logical Knowledge

Course Objectives

The course is intended

1. Understand the basics of algorithmic problem solving.
2. Discuss the basics of simple python programs.
3. Develop python programs with conditionals and loops.
4. Explain python functions and call them.
5. Test the Python data structures—lists, tuples, dictionaries and files.

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO1	Develop algorithmic solutions to simple computational problems and read, write, execute by simple python programs	Understand
CO2	Read, Write, Execute by hand simple python programs.	Understand
CO3	Write simple Python programs using conditionals and loops for Solving problems	Apply
CO4	Develop python string functions and lists	Apply
CO5	Illustrate the compound data using python Tuples, Dictionaries, Files and Packages.	Apply

Course Contents

Module–I	Basics of Computers & Problem solving	9
Computer Basics – Components-Computer organization - Computer Software- Types of software-Software Development steps –Need for logical analysis and thinking-Algorithms – Flowchart - Number system.		
Module– II	Introduction of Python Programming	9
Introduction-PythonIDLEInstallation-PythonInterpreter-Interactiveandscriptmode-Valuesand types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, Input and Output Statements.		
Module– III	Control statements and Functions	9

Conditional(if),alternative(if-else),chainedconditional(if-elif-else)-Iteration-while,for,break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Illustrative Programs: Students Mark Statement.

Module–IV	Strings, Lists	9

Strings-String slices, immutability, string methods and operations -Lists-creating lists, list operations, list methods, mutability,aliasing,cloninglists,listand strings, list and functions-list processing-list comprehension, Sorting: Merge Sort, Insertion Sort. Illustrative Programs: Reverse String, Adding Elements to a List, Adding List to a List.

Module–V	Tuples , Dictionaries ,Files and Packages	9

Tuples- Tuple assignment, lists and tuples, Tuple as return value- Dictionaries-operations and methods,FilesandException-Textfiles,readingandwritingfiles,Exception handling, Modules and Packages.

Total:45 Periods

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Write a algorithm & draw flowchart for simple Computational problems.	CO1	Apply
2	Write a program to perform different arithmetic operations on numbers in python.	CO1	Apply
3	Write a python program to implement the various control structures.	CO2	Apply
4	Write a python program for computational problems using recursive function.	CO2	Apply
5	Demonstrate use of list for data validation.	CO3	Apply
6	Develop a python program to explore string functions.	CO3	Apply
7	Implement linear search and binary search.	CO4	Apply
8	Develop a python program to implement sorting methods.	CO4	Apply
9	Develop python programs to perform operations ondictionaries.	CO5	Apply
10	Write a python program to read and write into a file.	CO5	Apply
11	Create a game activity using Pygame like bouncing ball, car race etc.	CO5	Create

Text Books

1. Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 1st Edition 2021.
2. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 1st Edition 2019.

Reference Books

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2nd Edition 2021.
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 1st Edition 2020.
3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2nd Edition 2019.
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 1st Edition 2015.

Additional References

1. Python Research Association of India - https://www.araiindia.com/services/technology-and-products
2. NPTEL - https://nptel.ac.in/courses/107/106/107106088/
3. MOOC Courses - https://www.mooc-list.com/tags/automotive-engineering

Mapping of Course Outcomes(COs) with Programme Outcomes(POs) Programme Specific Outcomes(PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1		1										
												2	3	1	
CO2	3	2	1		1										
												2	3	1	
CO3	3	2	2		1										
												2	3	1	
CO4	3	2	2		1										
												2	3	1	
CO5	3	2	2		1										
												2	3	1	
	3	High				2				Medium			1	Low	

Summative Assessment

Bloom's Level	Continuous Assessment				Practicals	Final Examination (Theory) [50]
	Theory					
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20]	
Remember	10	10	10		20	20
Understand	20	20	20		20	40
Apply	20	20	20		10	40
Analyze						
Evaluate						
Create						

Passed in Board of Studies Meeting 29.03.2023   Approved in Academic Council Meeting 27.04.2023

CHAIRMAN-BOARD OF STUDIES

23AG201	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	L	T	P	C
		2	0	2	3
Nature of Course	Professional Core					
Pre requisites	Nil					

Course Objectives

The course is intended to

1. To impart knowledge in the basics of agriculture principles and practices.
2. To acquire knowledge in seasonal selection of crops its establishments
3. To study the cultivation practices of major field crops
4. To introduce the students to principles of Agricultural and Horticultural crop production and to introduce the production practices of crops.
5. To delineate the role of Agricultural and Irrigation engineers in relation to various crop production practices.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Acquire knowledge in factors affecting growth and production of crops	Understand
CO 2	Memorizing the choice of crops to be selected for different regions and seasons	Remember
CO 3	Understand the crop management practices of agricultural field crops.	Understand
CO 4	Expressing the best cultivation practices to be followed for higher yield of field crops.	Understand
CO 5	Preparing an idea about the cultivation of cash crops.	Applying

Course Contents

MODULE –I AGRICULTURE AND CROP PRODUCTION
9

Agriculture- Definition- Importance and Scope- Branches of Agriculture- Agronomy and Meteorology- Definition, National and International Agricultural Research Institutes, Seasons of India and Tamil Nadu, Crops and major soils - Classification – Economic and agricultural importance in India and Tamil Nadu, Factors Affecting crop production.

MODULE –II BASIC AGRICULTURAL OPERATIONS
9

Passed in Board of Studies
Approved in Academic Council

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Tillage –Definition and its types, Seed-Definition, Seed rate, Seed Treatments and Seed certification, Sowing methods- Weeds-Definition- Classification of Weeds, harmful and beneficial effects of weeds- Integrated Weed Management, Herbicides – advantages and limitation of herbicide usage in India. Irrigation and its Role on Plant Growth. Manures and Fertilizers- Time and Method of Application- Integrated Nutrient Management concepts and its advantages.

MODULE -III PRODUCTION PRACTICES OF AGRICULTURAL CROPS 9

Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereals, millets, pulses, oilseeds, fiber crops, Special purpose crops such as those grown for green manure and fodder.

MODULE –IV PRODUCTION PRACTICES OF HORTICULTRAL CROPS 9

Important groups of Horticultural crops in Tamil Nadu such as Fruit crops, vegetables, flower crops: cultivation practices of respective of each group; special features of production of cultural crops. Green house Technology.

MODULE -V CROP MANAGEMENT 9

Cropping pattern and cropping system - Intensive cropping- Sustainable agriculture – IFS: Water Management, Crop Protection : Pest- definition, Crop pests and stored grain pests and their management, Integrated pest Management, Diseases of Field Crops and horticultural crops & their Management. Types and Methods of Harvesting

Total:45 Periods

TEXTBOOKS

1. Reddy T. Sankara G.H. YellamandaReddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 1995. 2. Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication, KrishiAnusandhanBhavan, Pusa, New Delhi, 2005.
3. Handbook of Agriculture. ICAR Publications, New Delhi.

REFERENCES

1. Balasubramaniyan, P and SP. Palaniappan. 2002. Principles and practices of Agronomy. Agrobios (India), Jodhpur.
2. Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore. 2005
3. Chatterjee, B.N. and K.K.Bhattacharyya.1986. Principles and Practices of Grain legume production. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Passed in Board of Studies

Approved in Academic Council

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4. Chatterjee, B.N. and P.K.Das.1989. Forage crop production - Principles and Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

5. Chidda Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

CO/PO Mapping

COs	*CO-PO & PSO Matrix Correlation :: Put if, Strong :3, Moderate : 2, Weak : 1, Nil : -													
	Programmes Outcomes(POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO2
CO1	2	3	1	-	-	-	-	2	3	-	-	-	3	2
CO2	-	3	2	-	-	-	-	2	1	-	-	3	3	2
CO3	2	3	-	2	-	2	-	1	2	2	-	-	3	2
CO4	-	3	2	-	-	2	-	-	3	2	-	3	3	2
CO5	2	-	-	1	-	-	-	2	-	1	-	2	3	2

CROP HUSBANDRY LABORATORY
List of Exercises

S.No	List of Exercises	Co Mapping	RBT
1	Field preparation studies	2	Understand
2	Seed selection and seed treatment procedures	1	Understand
3	Seed bed and Nursery preparation	1	Understand
4	Sowing/ Transplanting	4	Understand
5	Nutrient management studies	4	Understand
6	Water management and irrigation scheduling	4	Applying
7	Weed management studies	4	Understand
8	Integrated Pest Management studies	4	Applying
9	Harvesting and Post Harvesting Techniques	4	Understand
10	Visit to Nursery and Agriculture Crop Field	5	Understand

Passed in Board of Studies   **Approved in Academic Council**

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Formative assessment

Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations			Final Examination (60)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	
Remember	20	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyze				
Evaluate				
Create				

Passed in Board of Studies   Approved in Academic Council

CHAIRMAN-BOARD OF STUDIES

23ME201	**Engineering Mechanics** **(Common to Mechanical, Aeronautical, Agriculture, Civil, Safety and Fire Engineering)**	**L**	**T**	**P**	**C**
		3	**2**	**0**	**4**
Nature of course	Engineering Science				
Pre requisites	Fundamentals of Physics and Mathematics				

Course Objectives
The course is intended to

1. Develop the capacity among students to predict the effect of forces and motion.
2. Make the students to understand the vector and scalar representation of forces and moment and the static equilibrium of particles.
3. Understand the effect of friction on equilibrium, laws of motion, motion kinematics and the interrelationship.
4. Make the students to understand the properties of surfaces and solids, prediction of behavior of particles and rigid bodies under the motion.
5. Make the students to familiar in laws of friction and applications of friction.

Course Outcomes
On successful completion of the course, students will be able to

COs. No.	Course Outcome	Bloom's Level
CO 1	Illustrate the Scalar and Vector representation of forces and moments.	Understanding
CO 2	Identify the Equilibrium of rigid bodies.	Apply
CO 3	Determination of properties of Surfaces and solids.	Apply
CO 4	Calculate dynamic effect of forces exerted in rigid bodies.	Apply
CO 5	Examine the laws of friction and its effects.	Apply

Course Contents
Unit –I   Statics of Particles   **12**

Introduction - Units and Dimensions - Laws of Mechanics - Lami's theorem, Parallelogram and triangular Law of forces-Vectorial representation of forces - Vector operations of forces - additions, subtraction, dot product, cross product - Coplanar Forces - rectangular components - Equilibrium of a particle - Forces in space- Equilibrium of particle in a space - principle of transmissibility.

Unit –II   Equilibrium of Rigid Bodies   **12**

Free body diagram - Types of supports -action and reaction forces - stable equilibrium – Moments and Couples - Moment of force about a point and an axis - Varigon's theorem - Equilibrium of Rigid bodies in two and three dimensions.

Unit–III   Properties of Surfaces and Solids   **12**

Centroid and centre of gravity of masses - Centroid of lines and areas - Rectangular, circular, triangular areas by integration - T section, I section, - Angle section, Hollow section by using standard formula - Pappus Theorem - Parallel axis and perpendicular axis theorem -Principal moment of inertia.

Unit– IV Dynamics of Particles
12

Displacement, Velocity and acceleration and their relationship - Relative motion - Curvilinear motion Newton's laws of motion - Work Energy Equation- Impulse and Momentum - Impact of elastic bodies.

Unit –V Friction and Elements of Rigid Body Dynamics
12

Friction force - Laws of sliding friction - equilibrium analysis of simple systems with sliding friction wedge friction- Rolling resistance -Translation and Rotation of Rigid Bodies - General Plane motion of simple rigid bodies - cylinder and fly wheel dynamics.

Total : 60 Periods

Text Books
1. Rajasekaran, S. and Sankarasubramanian. G, 'Fundamentals of Engineering 17 Mechanics",Vikas Publishing House Pvl. Ltd., New Delhi, 2009.
2. Kumar, K.L., 'Engineering Mechanics", Tata McGraw-Hill Publishing Company, New Delhj, 3rd Revised Edition, 2008.

Reference Books
1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition 2004.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", Pearson Education. 11th Edition. 2010.

Online Resources
1. http://nptel.ac.in/courses/122104015/
2. http://nptel.ac in/courses/112103109/

<table>
<tr><th colspan="16">Mapping of Course Outcomes (COs) with Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)</th></tr>
<tr><th rowspan="2">COs</th><th colspan="12">POs</th><th colspan="3">PSOs</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>CO 1</td><td>3</td><td>2</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td><td></td></tr>
<tr><td>CO 2</td><td>3</td><td>2</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td><td></td></tr>
<tr><td>CO 3</td><td>3</td><td>2</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td><td></td></tr>
<tr><td>CO 4</td><td>3</td><td>2</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td><td></td></tr>
<tr><td>CO 5</td><td>3</td><td>2</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td><td></td></tr>
<tr><td></td><td colspan="5">3-High</td><td colspan="5">2- Medium</td><td colspan="5">1-Low</td></tr>
</table>

<table>
<tr><th colspan="4">Formative assessment</th></tr>
<tr><th>Bloom's Level</th><th>Assessment Component</th><th>Marks</th><th>Total marks</th></tr>
<tr><td>Understand</td><td>Quiz</td><td>5</td><td rowspan="3">15</td></tr>
<tr><td>Apply</td><td>Tutorial Class / Assignment</td><td>5</td></tr>
<tr><td></td><td>Attendance</td><td>5</td></tr>
</table>

Passed in Board of Studies Meeting   *Approved in Academic Council Meeting*

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	10	10	10	30
Understand	20	10	10	30
Apply	20	30	30	40
Analyze				
Evaluate				
Create				

23AG301	Applied Thermodynamics for Agricultural Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Engineering Sciences				
Pre requisites	Engineering Chemistry				

Course Objectives

The course is intended to

1. Understand the basic concepts of thermodynamic processes and the first law of thermodynamics.
2. Gain knowledge on second law of thermodynamics.
3. Estimate the performance of agricultural engines by using thermodynamic and Morse test.
4. Distinguish the behaviour of real & ideal gases and find the properties of gas mixtures.
5. Apply the psychrometric concepts in various processes.

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Recognize the basic concepts of thermodynamic processes and first law of thermodynamics	Understand
CO 2	Apply the thermodynamic laws and processes in various agricultural equipments.	Apply
CO 3	Solve the problems by applying the second law of thermodynamics	Apply
CO 4	Analyze the I.C engines power and efficiency and Morse test	Apply
CO 5	Distinguish the behaviour of real & ideal gases and find the properties of gas mixtures	Apply
CO 6	Apply the psychrometric concepts in various processes	Apply

Course Contents

Module – I   **Basics Concepts and First Law of Thermodynamics**   9

Microscopic and macroscopic approach - Path and point functions, Intensive and extensive properties. System and their types. Thermodynamic equilibrium state, path and processes – Heat and work transfer - Forms of energy – Temperature and zeroth law of thermodynamics. First law of thermodynamics – Application to closed systems and steady flow systems.

Module – II   **Second Law of Thermodynamics and Pure Substances**   9

Concept of heat engine, refrigerator and heat pump. Second law of thermodynamics – Carnot and reversed Carnot cycle – Concept of entropy – Entropy change for pure substances and ideal gases. Pure substances, Phase change processes of pure substances – Property diagrams – Use of steam tables and Mollier chart - Energy transfer by heat, work and mass and applications.

Module – III   **I.C. Engines and Performance**   9

I.C. engines - Engine components - C.I and S.I Engines – Four stroke and two stroke engines - Fuels and combustion - Different systems – fuel, cooling, lubrication, ignition. Performance of I.C. engines – Measurement of IHP and BHP - Calculation of power, torque, fuel consumption – Heat

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CHAIRMAN-BOARD OF STUDIES

balance sheet and Morse test.

Module – IV   Ideal, Real gases and Gas Mixtures   9

Ideal and Real gases – Vander Waals equations – Reduced property – Compressibility chart – Mole and mass fraction - Dalton's law and Amagat's law. Properties of gas mixtures – Internal energy, enthalpy, entropy and specific heats of gas mixtures.

Module – V   Psychrometry   9

Psychrometric properties, psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric processes – adiabatic saturation, sensible heating and cooling, humidification and dehumidification, adiabatic mixing. Simple applications.

Total : 45 Periods

Text Books

1. Yunus A. Cengel and Michael A Boles, 'Thermodynamics: An Engineering Approach", McGraw Hill Publishers, New Delhi, 9th Edition 2021.
2. Michael J.Moran, Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", John Wiley & Sons, 9th Edition 2018.

Reference Books

1. Nag.P.K, "Engineering Thermodynamics", Tata McGraw Hill Publishers, New Delhi, 6th Edition 2020.
2. Domkundwar.S. and C.P.Kothandaraman, "A course in Thermal engineering",, Dhanpatrai & Co (P) Ltd, Sixth Edition, 2019.
3. K.Rajput, "A Text book of Engineering Thermodynamics", Laxmi Publications (P) Ltd., Fifth Edition 2020.

Additional References

1. NPTEL - https://archive.nptel.ac.in/courses/101/104/101104063/

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	3	2			2			3	1	2	2	3
CO 2	3	3	3	2			2			3	1	2	2	3
CO 3	3	3	3	2			2			3	1	2	2	3
CO 4	3	3	3	2			2			3	1	2	2	3
CO 5	3	2	3	2			2			3	1	2	2	3
CO 6	3	2	3	2			2			3	1	2	2	3

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

3- High	2- Medium	1- Low

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CHAIRMAN-BOARD OF STUDIES

Formative Assessment			
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Examinations (IAE)			Final Examination (FE) (60)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

Passed in Board of Studies Meeting

Approved in Academic Council Meeting

CHAIRMAN-BOARD OF STUDIES

23AG302	THEORY OF MACHINES	L	T	P	C
		3	0	0	3
Nature of Course	Engineering Sciences				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to

1. Acquire the basic knowledge on mechanism
2. Understand the role of friction in drives.
3. Understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
4. Determine gear ratio for simple, compound, reverted and epicyclic gear train.
5. Understand the function of flywheel and its operations

Course Outcomes

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

CO.No	Course Outcomes	Bloom's Level
CO 1	Assess the characteristics of a given planar mechanism	Analyze
CO 2	Choose friction drives in various mechanical components under different situation	Apply
CO 3	Construct different cam profiles for given conditions using graphical & theoretical methods	Apply
CO 4	Estimate basic terminologies of gears and gear trains	Evaluate
CO 5	Justify the concept of balancing of masses in rotating shafts	Apply
CO 6	Discuss the basic mechanisms and solved problems	Apply

Course Contents

Module – I   Basic of Mechanisms   9

Definitions – Element – links – Paris – kinematics chain and mechanisms – classification of pairs and mechanisms – Lower and higher Paris,– Kinematic inversion of four bar chain and slider crank mechanism.

Module – II   Friction in Machine Elements   9

Surface contact - Sliding and rolling friction –friction in screw threads-Bearing and lubrication- Friction clutches- Belt and rope drives.

Module – III   Kinematics of Cam Mechanisms   9

Cam and follower - types - application – displacement diagrams - profile layout for uniform velocity - Uniform acceleration and retardation - simple harmonic and cycloidal motion.

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9

Module – IV   Gears and Gear Trains

Law of toothed gearing involutes and cylodical tooth profiles- Spur gear terminology and definitions – Gear tooth action – Interference and undercutting – problems- helical, worm, rack and pinion gears- Gear trains- Introduction – gears trains – Speed ratio- train value – types of gears trains: Parallel axis gear trains – epicyclic gear trains – Determination of gear speeds and torque using tabular method.

9

Module – V   Flywheel and Balancing

Inertia - turning moment - flywheel - fluctuation of speed and energy. Balancing of single rotating mass by a single mass rotating in the same plane and two masses rotating in different planes – Several Masses rotating in the same plane and different planes.

Total : 45 Periods

Text Books

1.	Uicker, J.J Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms" Oxford University Press, 2017.
2.	Rattan, S.S, Theory of Machines, 5th Edition, Tata McGraw-Hill, 2019.
3.	Khurmi, R.S. and Gupta, J.K, Theory of Machines, 14th Edition S.Chand Publishing, 2020.

Reference Books

1.	Rattan,S.S., "Theroy of Machines", McGraw-Hill Education Pvt.Ltd.,, 2014.
2.	Robert L.Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill, 2009.
3.	Cleghorn W.L. Mechanisms of Machines, Oxford University Press, 2014.

Additional References

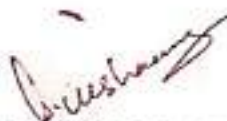| 1. | http://ecoursesonline.iasri.res.in/course/view.php?id=522 |
| 2. | NPTEL - https://onlinecourses.nptel.ac.in/noc24_me44/preview |
| 3. | MOOC Courses - ttps://www.classcentral.com/course/swayam-kinematics-of-mechanisms-and-machines-13022 |

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1	1	2			1				1	2	
CO 2	3	2	2	1	2			1				1	2	
CO 3	3	2	3	1	2			1				1	2	
CO 4	3	2	2	1	2			1				1	2	
CO 5	3	2	2	1	2			1				1	2	
CO 6	3	2	2	1	2			1				1	2	
	3-High			2-Medium				1- Low						

Passed in Board of Studies   CHAIRMAN-BOARD OF STUDIES   Approved in Academic Council

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Examinations (IAE) (40)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	(60)
Remember	10	10	10	20
Understand	20	10	10	20
Apply	20	30	30	60
Analyse				
Evaluate				
Create				

Passed in Board of Studies   *Approved in Academic Council*

CHAIRMAN-BOARD OF STUDIES

23AG303	Fluid Mechanics and Machineries for Agriculture Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to

1. To impart knowledge on the fluid properties and fluid statics principles
2. To introduce the basic concept of fluid flow analysis and principles of the conservation laws.
3. To calculate the rate of flow and energy losses in flow through pipes.
4. To calculate the most economic section and flow measurement in open channels
5. To develop the knowledge on dimensional analysis and types of pumps

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Understand the properties and behaviours of fluids under static condition	Understand
CO 2	Apply the dynamics of fluids through control volume approach	Apply
CO 3	Apply principles of conservation laws and Bernoulli's theorem	Apply
CO 4	Compute the various hydraulic engineering problems and calculating the flow through notches	Apply
CO 5	Develop the dimensional analysis in fluid mechanics and characteristic analysis of pumps	Apply
CO 6	Understandbasic Pump terminology and types	Understand

Course Contents

Module – I   **Properties of Fluids**   9

Definition, units of measurement - Properties of fluids: Mass density, specific weight, specific volume, specific gravity, Viscosity, vapour pressure, compressibility and elasticity, surface tension and capillarity. Fluid pressure and measurement – simple and differential manometers - Hydrostatic forces on Horizontal, vertical surfaces – total pressure and center of pressure. Archimedes principles, buoyancy, meta centre and metacentric height.
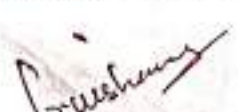
Module – II   **Fluid Flow Analysis**   9

Types of fluid flow – velocity and acceleration of a fluid particle - Rotational – irrotational -circulation and vorticity- Flow pattern – stream line – equipotential line – flow net – velocity potential – stream function. Principles of conservation of mass – energy – momentum – continuity equation in Cartesian co-ordinates - Euler's equation of motion.

Module – III   **Flow Measurement**   9

Bernoulli's equation – Applications: Venturimeter, Orifice meter, rotameter, and pitot tube – Time of emptying a tank with and without inflow. Flow through pipes – Reynold's experiment – Darcy-Weisbach equation for friction head loss, Chezy's formula, Manning's formula - Major and minor losses in pipes. Siphon – water hammer in pipes – gradual and sudden closure of valves.

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Module – IV   Open Channel Flow

9

Types of flow in open channel – most economical section of channel: Rectangular and trapezoidal section. Specific energy, specific force, critical depth and critical flow - momentum in open channel flow computation. Flow measurement in channels: notches (rectangular, Cipolletti and triangular) – float method - Parshall flume.

Module – V   Dimensional Analysis & Pumps

9

Dimensional analysis – Fundamental dimensions – dimensional homogeneity –Buckingham Pi-Theorem - concept of geometric, kinematic and dynamic similarity. Important non dimensional numbers: Reynolds, Froude, Euler, Mach and Weber - Pump terminology: suction lift, suction head, delivery head, discharge, Priming, cavitation, specific speed and water horse power -. Types of Pumps - Centrifugal pumps: components, working, types of pumps and impellers and Vane Pump.

Total : 45 Periods

Laboratory Components

S.No.	ListofExperiments	CO Mapping	RBT
1.	Determination of mean velocity by Pitot tube	CO1	Apply
2.	Determination of friction coefficient in pipes	CO2	Apply
3.	Determination of losses due to bends, fittings and elbows	CO2	Apply
4.	Calibration of Rotameter	CO3	Apply
5.	Flow through Venturimeter and circular Orifice	CO3	Apply
6.	Flow through a Triangular	CO4	Apply
7.	Notch Flow through a Rectangular Notch	CO4	Apply
8.	Characteristics of Centrifugal pump	CO5	Apply
9.	Characteristics of Submersible pump	CO5	Apply
10.	Characteristics of Reciprocating pump	CO5	Apply

Total : 30 Periods

TEXT BOOKS

1. Bansal, R.K., A text book of Fluid Mechanics and Hydraulic Machines, Tenth Edition, Laxmi Publications (P) Ltd., New Delhi, 2019.
2. Modi, P.N. and Seth S.M.,Hydraulics and Fluid Mechanics. Standard Publishers Distributors, New Delhi, 2019.

REFERENCE BOOKS

1. Jain, A.K., "Fluid Mechanics" (Including Hydraulic Machines), Twelfth Edition, Khanna Publishers, 2016.
2. Garde, R.J., Fluid Mechanics through problems. New Age International Publishers (P) Ltd., New Delhi, 2011.
3. Yunus A. Cengel, and John M. Cimbala, Fluid Mechanics, Third edition, McGraw Hill Education (India) Pvt. Ltd, 2014.

Passed in Board of Studies

CHAIRMAN-BOARD OF STUDIES

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Additional References

1. INSTITUTE OF FLUID MECHANICS - https://tu-dresden.de/ing/maschinenwesen/ism?set_language=en
2. NPTEL - https://archive.nptel.ac.in/courses/112/105/112105269/

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	1		2		1		1		3				3	2
2.	3	2	2		2		1		3				3	2
3.	3	2	2		2		1		3				3	2
4.	3	2	2		2		1		3				3	2
5.	3	2	2		2		1		3				3	2
6.	3	2	2		1		1		3				3	2

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

3-High   2-Medium   1- Low

Bloom's Level	Summativeassessment					FinalExamination (Theory) [50marks]
	ContinuousAssessment					
	Theory				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20Marks]	
Remember	10	10	10		20	20
Understand	20	10	10		40	40
Apply	20	30	30		40	40
Analyse						
Evaluate						
Create						

Passed in Board of Studies   *Approved in Academic Council*

CHAIRMAN-BOARD OF STUDIES

23AG304	Soil Science and Engineering	L	T	P	C
		3	0	2	4
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Acquire thefundamental knowledge on soil properties.
2. Gain knowledge on soil classification and their survey.
3. Impart knowledge on phase relationship and soil compaction methods.
4. Know about different engineering properties of soil.
5. Acquire knowledge on bearing capacity and slope stability.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO1	Assess the basic soil physical and chemical parameters	Remember
CO2	Classify the different soil and their survey methods	Understand
CO3	Assess suitable procedure for soil conservation measures	Understand
CO4	Assess the engineering properties of soil through standard tests	Understand
CO5	Apply the concepts of strength parameters in soil media	Apply
CO6	Compare the methods for estimating bearing capacity and slope stability	Apply

Course Contents

Module – I   Introduction and Properties of Soils   9

Soil - definition - major components –Soil forming minerals and processes- soil profile -Physical properties - texture –density-porosity-consistence-colour- specific gravity - capillary and non-capillary -plasticity. Soil air - soil temperature - soil water - classification of soil water- Movement soil water. Soil colloid – organic and inorganic matter-pH – Plant nutrient availability.

Module – II   Soil Classification and Survey   9

Soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping- mapping units - base maps -preparation of survey reports - concepts and uses - land capability classes and subclasses -Problem soils.

Module – III   Phase Relationship and Soil Compaction   9

Phase relations- Gradation Analysis- Atterberg Limits and Indices- Engineering Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.

Module – IV   Engineering Properties of Soil   9

Shear strength of cohesive and cohesionless - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test- -Permeability- Coefficient of Permeability- Darcy's law-field and lab methods.

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Module – V   Bearing Capacity and Slope stability   9

Bearing capacity of soils – Types - Factors affecting Bearing Capacity- method of improving the bearing capacity of soils-Terzaghi's formula- BIS standards - Slope stability-Analysis of infinite and finite slopes- friction circle method-slope protection measures.

Total : 45 Periods

List of Experiments:

S.No	List of Exercises	COMapping	RBT
1	Identification of rocks and minerals	CO1	Understand
2	Determination of Specific Gravity of Soil samples	CO1	Analyze
3	Determination of soil moisture	CO1	Analyze
4	Determination of EC and pH	CO1	Analyze
5	Determination of Organic carbon	CO1	Analyze
6	Collection and processing of soil samples	CO2	Apply
7	Grain size analysis by using Mechanical shaker	CO3	Analyze
8	Field density determination by Core Cutter method	CO3	Analyze
9	Field density determination by Sand Replacement method	CO3	Analyze
10	Determination of Shear strength of soil by Direct shear Test	CO4	Analyze
		Total : 30 Periods	

Text Books

1. Modi, P.N., "Soil Mechanics and Foundation Engineering", Standard Book House, 5th Edition, New Delhi, 2019.
2. Punmia, B.C., "Soil Mechanics and Foundation "Laxmi Publishers, New Delhi, 16th Edition, 2017.

Reference Books

1. Alam Singh, Soil Engineering in Theory and Practice, Vol-II, CBS Publishers and Distributors, 2nd Edition, 2019.

2. Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Reprint 2019.

3. Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2018.

Additional References

1. **Journal of the Indian Society of Soil Science-** https://epubs.icar.org.in/index.php/JISSS
2. **NPTEL -** https://nptel.ac.in/courses/105103097, https://nptel.ac.in/courses/105105168

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CHAIRMAN - BOARD OF STUDIES

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	-	-	-	-	-	1	-	-	-	-	2	2	1
CO 2	2	-	-	-	-	-	1	-	-	-	-	2	2	1
CO 3	3	2	2	2	-	-	1	-	-	-	-	2	2	1
CO 4	3	2	2	2	-	-	1	-	-	-	-	2	2	1
CO 5	3	2	2	2	-	-	1	-	-	-	-	2	2	1
CO 6	3	2	2	2	-	-	1	-	-	-	-	2	2	1

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

3-High	2-Medium	1- Low

Bloom's Level	Internal Assessment Examinations				Practical	Final Examination (50)
	Theory				Rubrics Based CIA (20)	
	IAE – I (5)	IAE – II (10)	IAE – III (10)	Attendance (5)		
Remember	20	20	10		10	30
Understand	30	20	20		10	40
Apply		10	20		10	30
Analyse					20	
Evaluate						
Create						

Summative Assessment

Passed in Board of Studies Meeting   Approved in Academic Council Meeting

CHAIRMAN-BOARD OF STUDIES

23AG307	Computer Aided Design of Agricultural Equipments	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core				
Pre requisites	Engineering Graphics				

Course Objectives

The course is intended to draft the agricultural engineering related equipments by computer aided design software.

1. Acquire the knowledge of CAD software and its features.
2. Develop the skills to use software to create 2D and 3D models.
3. Gain knowledge on design of check dam & underground pipeline systems.
4. Draw and design of KVIC floating drum biogas plant.
5. Draw and design of tractor components like connecting rod and knuckle joint.
6. Draw and design of post harvest technology units.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Familiarize to use of CAD software tools.	Understand
CO2	Design of given 2D and 3D models.	Create
CO3	Draw and design of check dam, underground pipeline systems.	Create
CO4	Emphasis the drawing additional objects of Biogas plant.	Create
CO5	Develop the tractor components	Create
CO6	Describe the dimensioning of post harvest technology units.	Create

List of Exercises

S.No	List of Exercises	CO Mapping	RBT
1	Introduction to AutoCAD.	1	Understand
2	Draw 2D and 3D models using AutoCAD software.	2	Create
3	Draw and design of check dam.	3	Create
4	Draw and design of underground pipeline systems.	3	Create
5	Draw and design of KVIC biogas plant.	4	Create
6	Draw and design of connecting rod in engine.	5	Create
7	Draw and design of knuckle joint.	5	Create
8	Draw and design of threshers.	6	Create
9	Draw and design of winnowers.	6	Create

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3		3	2	1				3	2	2	2
CO2	3	2	3		3	2	1				3	2	2	2
CO3	3	2	3		3	2	1				3	2	2	2
CO4	3	2	3		3	2	1				3	2	2	2
CO5	3	2	3		3	2	1				3	2	2	2
CO6	3	2	3		3	2	1				3	2	2	2

3- High	2- Medium	1- Low

Passed in Board of Studies Meeting

CHAIRMAN-BOARD OF STUDIES Approved in Academic Council Meeting

Formative Assessment Based on Continuous and End Semester Examination					
Assessment	Marks	Weightage	Marks		
			CA	FE	Total
Rubrics Based Continuous Assessment	100	30	60	40	100
Preparatory /Model Examination	100	25			
Attendance	5	5			

Summative Assessment Based on Continuous and End Semester Examination			
Bloom's Level	Rubrics Based Continuous Assessment [30 marks]	Preparatory / Model Examination [25 marks]	Final Examination [40 marks]
Remember	10	10	10
Understand	10	10	10
Apply	10	10	10
Analyze	10	10	10
Evaluate			
Create	60	60	60

Passed in Board of Studies Meeting

CHAIRMAN-BOARD OF STUDIES

Approved in Academic Council Meeting

23AG401	Heat and Mass Transfer for Agricultural Engineering	L	T	P	C
		3	2	0	4
Nature of Course	Engineering Sciences				
Pre requisites	Applied Thermodynamics for Agricultural Engineering				

Course Objectives

The course is intended to

1. Learn the principal mechanism of heat transfer under steady state and transient conditions.
2. Learn the fundamental concept and principles in convective heat transfer.
3. Learn the theory of phase change heat transfer and design of heat exchangers.
4. Study the fundamental concept and principles in radiation heat transfer.
5. Develop the basic concept and diffusion, convective di mass transfer.

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems.	Apply
CO 2	Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems.	Apply
CO 3	Explain the phenomena of boiling and condensation.	Understand
CO 4	Apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems.	Apply
CO 5	Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems.	Apply
CO 6	Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications.	Apply

Course Contents

Module – I   Conduction Heat Transfer   12

General Differential equation – Cartesian, Cylindrical and Spherical Coordinates – One Dimensional Steady State Heat Conduction — plane and Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Semi Infinite and Infinite Solids –Use of Heisler's charts – Methods of enhanced thermal conduction.

Module – II   Convection Heat Transfer   12

Conservation Equations, Boundary Layer Concept – Forced Convection: External Flow – Flow over Plates, Cylinders Spheres and Bank of tubes. Internal Flow – Entrance effects. Free Convection – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres. Mixed Convection.

Module – III   Phase Change Heat Transfer and Heat Exchangers   12

Nusselt's theory of condensation- Regimes of Pool boiling and Flow boiling - Correlations in boiling and condensation. Heat Exchanger Types – Overall Heat Transfer Coefficient – Fouling Factors. LMTD and NTU methods. Fundamentals of Heat Pipes and its applications.

Module – IV   Radiation Heat Transfer   12

Introduction to Thermal Radiation - Radiation laws and Radiative properties - Black Body and Gray body Radiation - Radiosity - View Factor Relations. Electrical Analogy. Radiation Shields.

Passed in Board of Studies Meeting   *Approved in Academic Council Meeting*

CHAIRMAN-BOARD OF STUDIES

Module – V   Mass Transfer

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state and Transient Diffusion - Stefan flow –Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations.

Total : 60 Periods

Text Books

1. R.C. Sachdeva, "Fundamentals of Engineering Heat & Mass transfer", New Age International Publishers, 2020.
2. Yunus A. Cengel, "Heat Transfer A Practical Approach" – Tata McGraw Hill, 5thEdition – 2017

Reference Books

1. Kothandaraman, C.P., "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 2020.
2. Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons, 7th Edition, 2019.
3. S.P. Venkateshan, "Heat Transfer", Ane Books, New Delhi, 2021.

Additional References

1. NPTEL - https://nptel.ac.in/courses/112101097

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)														
COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	3	2			2		1			2	3	2
CO 2	3	3	3	2			2		1			2	3	2
CO 3	3	3	3	2			2		1			2	3	2
CO 4	3	3	3	2			2		1			2	3	2
CO 5	3	3	3	2			2		1			2	3	2
CO 6	3	3	3	2			2		1			2	3	2
3- High				2- Medium				1- Low						

Formative Assessment			
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

| Bloom's Category | Summative Assessment | | | |
| | Internal Assessment Examinations (IAE) (40) | | | Final Examinations (FE) |
	IAE – I (5)	IAE – II (10)	IAE – III (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

Passed in Board of Studies Meeting

CHAIRMAN-BOARD OF STUDIES

Approved in Academic Council Meeting

23AG402	TRACTOR AND FARM ENGINES	L	T	P	C
		3	0	0	3

Nature of Course	Professional Core
Pre requisites	Nil

Course Objectives.

The course is intended to

1. Learn the fundamentals of IC engine operation and component understanding
2. Recognized the different IC engine systems
3. Understand the various function of transmission system
4. Develop an understanding of the tractor's hydraulic system
5. Learn the testing protocol to assess tractors' performance.

Course Outcomes

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

CO.No	Course Outcomes	Bloom's Level
CO 1	Acquire an in-depth knowledge on farm tractor and engine systems	Understand
CO 2	Analyze the engine systems	Remember
CO 3	Assess the functional components and their role in power transmission	Remember
CO 4	Understand the hydraulic system in a tractor and estimate the traction.	Understand
CO 5	Gain knowledge on power tillers, different tractor testing procedures	Understand
CO 6	To develop skills on safe and efficient use of tractors	Remember

Course Contents

Module – I   Tractors   9

Classification of tractors - IC engines – functional components and their construction, working principle – comparison between two stroke and four stroke engine – firing order - turbocharger, supercharger, emission characteristics of IC Engine, bio-fuels in IC engine.

Module – II   Engine Systems   9

Valves-inlet and outlet valves – valve timing diagram. Air cleaner- exhaust – silencer. Cooling systems - lubricating systems - fuel system – governor- electrical system – cranking of engine, battery and starting motor.

Module – III   Transmissions   9

Clutch – need types, functional requirements - gear box - sliding mesh - constant mesh - synchro mesh – Differential system, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system.

Passed in Board of Studies

CHAIRMAN-BOARD OF STUDIES

Approved in Academic Council

Module – IV   Hydraulic systems and Tractor Mechanics   9

Hydraulic system - working principles, three point linkages - draft control and position control- weight transfer, theory of traction - tractive efficiency – tractor chassis mechanics - stability - longitudinal and lateral. Controls- - visibility - operators seat; Wheels and tyres – solid tyres and pneumatic tyres

Module – V   Power Tiller , Automated Guided Vehicle and Tractor testing   9

Power tiller – types, application, functional components and attachments, AGVs – types – application – Vehicle guidance Technology – Vehicle Management & Safety- types of tests – test procedure – need for testing and evaluation of farm tractor and power tiller, code for performance testing of tractors and power tillers.

Total : 45 Periods

Text Books

1. Jain, S.C. and C.R.Rai. Farm Tractor Maintenance and repair, Standard Publishers and Distributors, New Dlehi, 2017.
2. Jagadeeshwar Sahay, Elements of agricultural Engineering, Standard Publishers Co., New Delhi, 3rd Edition 2020.

Reference Books

1. Baeger, E.L. J.B. Liljedahal and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt.Ltd., New Delhi, 1997.
2. Basavaraj and Srigiri, Farm Machinery and Power. New India Publishing Agency, Nipa, 2019.
3. Haynes Manuals, Cummins Diesel Engine Manual, Haynes Manuals N.America, 2020.

Additional References

1. http://ecoursesonline.iasri.res.in/course/view.php?id=39
2. NPTEL - https://archive.nptel.ac.in/courses/126/105/126105009

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	3	1		3			2				2	3	
CO 2	2	3	2		3			1				2	3	
CO 3	2	3	2		3			1				2	3	
CO 4	2	3	2		3			2				2	3	
CO 5	2	3	1		3			1				2	3	
CO 6	2	3	2		3			2				2	3	
	3-High				2-Medium				1- Low					

Passed in Board of Studies   **CHAIRMAN-BOARD OF STUDIES**   *Approved in Academic Council*

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Bloom's Category	Summative Assessment			
	Internal Assessment Examinations (IAE) (40)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	(60)
Remember	20	30	30	40
Understand	30	20	20	60
Apply				
Analyse				
Evaluate				
Create				

Passed in Board of Studies   Approved in Academic Council

CHAIRMAN-BOARD OF STUDIES

23AG403	Hydrology and Water Resources Engineering	L	T	P	C
		3	0	0	3

Nature of Course	Professional Core
Pre requisites	Fluid Mechanics and Machineries for Agriculture Engineering

Course Objectives

The course is intended to

1. To impart knowledge on concepts of hydrologic cycle and precipitation and its applications.
2. To estimate the runoff using hydrograph.
3. To analyze the hydrologic aspect of flood and drought.
4. To understand the general design principles and storage estimation of reservoir.
5. To quantify, regulate and manage ground water resources.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Understand the importance of hydrologic cycle, types and forms of precipitation.	Understand
CO 2	Calculating the spatial analysis of rainfall data using different methods, evaporation and infiltration.	Apply
CO 3	An ability to manipulate hydrological data and undertake widely-used data analysis.	Apply
CO 4	Apply knowledge to predict the flood and drought through analysis.	Apply
CO 5	Ability to conduct Spatial analysis of rainfall data and design water storage reservoirs	Apply
CO 6	Understand the concept and methods of ground water management.	Apply

Course Contents

Module – I   PRECIPITATION AND ABSTRACTIONS   9

Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception - Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton's equation - double ring infiltrometer, infiltration indices.
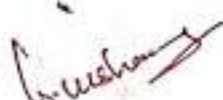
Module – II   RUNOFF ESTIMATION   9

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange's table and SCS methods – Stage discharge relationships- flow measurements- Hydrograph – Unit Hydrograph – IUH

Module – III   FLOOD AND DROUGHT   9

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts-Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)

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CHAIRMAN-BOARD OF STUDIES

Module – IV   RESERVOIRS   9

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve.

Module – V   GROUNDWATER AND IT'S MANAGEMENT   9

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas.

Total : 45 Periods

TEXT BOOKS

1. Subramanya K, "Engineering Hydrology"- Tata McGraw Hill, 2024
2. Engineering hydrology by JayaramReddy,Laxmi Publications pvt.Ltd.,NewDelhi, 2015
3. Irrigation and water power engineering by Punmia, Lal (2021),Laxmi publications Pvt.Ltd., New Delhi.

REFERENCE BOOKS

1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2015
2. Raghunath. H.M., "Hydrology", Wiley Eastern Ltd., 2016.
3. Bhagu R. Chahar, Groundwater Hydrology, McGraw Hill Education (India) Pvt Ltd, New Delhi, 2017.

Additional References

1. **INSTITUTE FOR WATER RESOURCES** - https://www.iwr.usace.army.mil/
2. **NPTEL** - https://nptel.ac.in/courses/105103213
3. **NPTEL**- https://archive.nptel.ac.in/courses/105/105/105105110/

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2				2	2	2						3	2
CO 2	3	3	2		2								3	2
CO 3	3	3	2	2	2								3	2
CO 4	3	3	2	2	3		3						3	2
CO 5	3	3	3	3	3	3	3						3	2
CO 6	3	3	3	2	2	2	2						3	2

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

3-High   2-Medium   1-Low

Passed in Board of Studies   CHAIRMAN-BOARD OF STUDIES   Approved in Academic Council

Formative Assessment

Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations (IAE) (40)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	(60)
Remember	10	10	10	20
Understand	20	20	20	60
Apply	20	20	20	60
Analyse				
Evaluate				
Create				

Passed in Board of Studies   *Approved in Academic Council*

CHAIRMAN-BOARD OF STUDIES

23AG404	Strength of Materials for Agriculture Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to

1. Learn the fundamental concepts of Stress, Strain and deformation of solids.
2. Gain knowledge on the analysis of trusses.
3. Know the mechanism of load transfer in beams.
4. Understand the effect of torsion on shafts andsprings.
5. Analyze the beam for determining slope and deflection of beams.
6.

Course Outcomes

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

CO.No.	Course Outcome	Bloom's Level
CO1	Determine stress and strain, principal stresses and principalplanes.	Apply
CO2	Analyze plane trusses	Analyze
CO3	Determine Shear force and bending moment in beams and understand the concept of theory of simplebending.	Apply
CO4	Apply theory of torsion in analysis of circular shafts	Apply
CO5	Apply theory of torsion in analysis of helical springs.	Apply
CO6	Calculate the slope and deflection of beams by various methods.	Apply

MODULE– I Simple Stress and Strain   9

Mechanical properties of Materials - Stress-strain curve -Factor of safety - Strain Energy and Impact Loading - Stepped and Composite bars - Axial Stresses - Thermal Stress and Volumetric Stresses - Elastic constants and their relationship.

MODULE – II Compound Stresses and Thin Cylinder   9

State of stresses at a point - 2D Stress System - Plane Stress Condition - Mohr circle - Thin Cylinders - Stresses - Strain - Maximum Shear stress - Changes in dimensions and volume - Theories of Failure - Significance and Graphical Representations

MODULE– III Shear Force, Bending Moment and Stresses in Beams   9

Beams - Types of supports - loads and beams - Shear force and Bending Moment in Cantilever -simply supported and overhanging beams - Point of contra flexure - Theory of Simple Bending. Section modulus - Bending stress and stress variation along the length and section of the beam.

MODULE – IV Deflection of Beams and Buckling of Columns   9

Slope and Deflection of cantilever and simply supported beams by Double integration method and Macaulay method - Theory of Columns - Slenderness ratio - End Conditions - Equivalent length - Euler and Rankine formulae.

Passed in Board of Studies Meeting   *Approved in Academic Council Meeting*

CHAIRMAN-BOARD OF STUDIES

MODULE - V Torsion in Shaft and Helical Spring 9

Theory of Torsion - Stresses and Deformations in Solid and Hollow Circular Shafts - Combined bending moment and torsion of shafts - Power transmitted to shaft - Shaft in series and parallel - Close coiled helical spring.

TOTAL: 45 Periods

TEXT BOOKS
1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2017
2. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Fifth Edition, 2018.

REFERENCE BOOKS
1. S.S.Rattan, Strength of Materials, McGraw Hill Education (India) Private Limited, Chennai, Third Edition, 2017.
2. F. P. Beer and R. Johnston, McGraw Hill Education India Private Limited, Seventh edition, 2017
3. William Nash and Nilanjan Malik, Strength of Materials (Schaum"s Outline Series), McGraw Hill Education, Fourth Edition, 2017
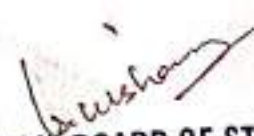
NPTEL LECTURE VIDEOS
1. https://nptel.ac.in/courses/112107146
2. http://www.nptelvideos.com/video.php?id=841&c=7

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2		2				2		3	1	
CO2	3	3	2	2		2				2		3	1	
CO3	3	3	2	2		2				2		3	2	
CO4	3	3	2	2		2				2		3	1	
CO5	3	3	2	2		2				2		3	1	
CO6	3	3	2	2		2				2		3	1	
	3	High				2	Medium				1		Low	

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Passed in Board of Studies Meeting   Approved in Academic Council Meeting

CHAIRMAN-BOARD OF STUDIES

| Bloom's Category | Summative Assessment | | | |
| | Internal Assessment Examinations | | | Final Examination (60) |
	IAE 1 (5)	IAE 2 (10)	IAE 3 (10)	
Remember				
Understand	20	10	10	20
Apply	20	20	10	20
Analyze	10	20	30	60
Evaluate				
Create				

Passed in Board of Studies Meeting   Approved in Academic Council Meeting

CHAIRMAN-BOARD OF STUDIES

23AG405	Surveying and Levelling	L	T	P	C
		3	0	2	4
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Introduce the principle of surveying
2. Know compass and plane table surveying in Agriculture
3. Learn about the uses of theodolite and modern surveying in irrigation projects
4. Provide knowledge on levelling in agriculture
5. Learn levelling applications in agriculture and irrigation projects

Course Outcomes

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

CO.No.	Course Outcome	Bloom's Level
CO1.	Assess the instruments required for conducting the chain survey in level and sloping ground	Understand
CO2	Find the area of the land by chain surveying and also can apply the necessary chain corrections	Apply
CO3	Compute the area and volume of earth work by simple and numerical methods	Apply
CO4	Find the angle between the stations by prismatic compass and conduct the plane table surveying for locating the new stations	Apply
CO5	Find the reduced level for all points by using dumpy level, prepare the contour map	Apply
CO6	To identify the horizontal, vertical angle using Theodolite	Apply

Course Content:

MODULE- I   Introduction   9

Introduction-classification and basic principles of surveying-Types of chains, Ranging rod, Ranging- Direct andIndirect methods in chaining. Chain Surveying-Principles of chain surveying-cross staff and optical square -Stepsinvolved in Chain Survey-Errors in measurements.

MODULE – II Levelling and Compass Traversing   9

Levelling-Principles and theory of Levelling -Datum -Bench Marks-Temporary and Permanent Adjustments-Methods of Levelling-Theory of simple, compound, cross sectional and reciprocal levelling.Basic terminologiesof Compass traversing- Prismatic and Surveyors Compass - Checking the accuracy of traverse - Errors andmistakes in Compass survey.

MODULE – III Theodolite and Tacheometric Surveying   9

Theodolite-Types-Temporary and Permanent adjustments-Horizontal and vertical angle measurements-Heights and distances-Reduced levels -Tacheometric surveying - Tangential and Stadia Tacheometry -Subtense bar method - Stadia constants -Anallactic lens-Tacheometric contouring.

Passed in Board of Studies Meeting   *Approved in Academic Council Meeting*

CHAIRMAN-BOARD OF STUDIES

MODULE – IV Contouring and Plane Table Surveying   9

Contour -Contouring -Characteristics of contours-Methods of contouring -Contour gradient - Contour plan and map. Plane tabling - Radiation, Traversing, Orientation- Intersection and Resection.

MODULE - V Modern Surveying and Computation of Area   9

Introduction-Total Station-Global Positioning System (GPS)-GNSS. Formulate for calculation of cross-sectional area- calculation of volume-Area computation, Mid-Ordinate rule- Average ordinate rule- Trapezoidal rulesSimpson rule and Coordinate method – Drone surveying.

TOTAL: 45 Periods

List of Exercises

S.No.	List of Experiments	CO Mapping	RBT
1	Linear measurement and Area computation by cross staff survey and plotting	CO3	Apply
2	Chain traversing of cropped area and error correction.	CO3	Apply
3	Compass Survey - radiation method-Closed compass traversing, Plotting and correction of closing error	CO3	Apply
4	Open compass traversing-Problems on Compass traversing	CO4	Apply
5	Area computation by plane table survey - radiation method	CO5	Apply
6	Plane table survey - intersection -Plane table traversing resection methods	CO3	Apply
7	Measurement of area using Total Station and GPS	CO3	Apply
8	Dumpy level- handling - shifting- Simple levelling - temporary adjustments -Differential levelling in field Profile levelling	CO3	Apply

TEXT BOOKS

1. Basak, N.N, Surveying and Levelling, Mc Graw Hill 2001, New Delhi, 2nd Edition 2017.
2. Punmia, P.C., Surveying, Laxmi Publications, New Delhi, 17th Edition, 2017.
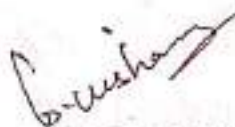
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1. S.K. Roy, Fundamentals of Surveying, Fourth Edition, Prentice Hall of India, 2018.
2. A.M. Chandra, Plane Surveying, New Age International Publishers, 2018.
3. Rangwala, S.C., Surveying and Levelling, Charutar Publishing House, Anand, 6th Revised Edition, 2017.

NPTEL LECTURE VIDEOS
1. https://archive.nptel.ac.in/courses/105/104/105104101/
2. https://nptel.ac.in/courses/105107122

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3										2	
CO2	3	2	3	2	2								1	
CO3	3	3	1	2			1						1	
CO4	3	3	2	2			1						1	
CO5	3	3	1	1			1						1	
CO5	3	3	1	1			1						1	
	3	High				2		Medium			1		Low	

	Summative assessment					
	Continuous Assessment					Final Examination (Theory) [50 marks]
Bloom's Level	Theory				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	10				20	20
Understand	40	20	20		40	40
Apply		30	30		40	40
Analyze						
Evaluate						
Create						

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23AG405	Strength of Materials for Agriculture Engineering Laboratory	L	T	P	C
		0	0	4	2
Nature of Course	Professional Core				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to

1. Learn the fundamental concepts of Stress, Strain and deformation of solids.
2. Gain knowledge on the analysis of trusses.
3. Know the mechanism of load transfer in beams.
4. Understand the effect of torsion on shafts and springs.
5. Analyze the beam for determining slope and deflection of beams.

Course Outcomes

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

CO.No.	Course Outcome	Bloom's Level
CO1	Determine stress and strain, principal stresses and principal planes.	Apply
CO2	Analyze plane trusses	Analyze
CO3	Determine Shear force and bending moment in beams and understand the concept of theory of simple bending.	Apply
CO4	Apply theory of torsion in analysis of circular shafts	Apply
CO5	Apply theory of torsion in analysis of helical springs.	Apply
CO6	Calculate the slope and deflection of beams by various methods.	Apply

List of Exercises

S.No	List of Experiments	COMapping	RBT
1	Tension test on steel rod	CO1	Apply
2	Compression test on wood	CO2	Apply
3	Double shear test on metal	CO3	Apply
4	Torsion test on mild steel rod	CO3	Apply
5	Impact test on metal specimen (Izod and Charpy)	CO4	Apply
6	Hardness test on metals (Rockwell and Brinell Hardness Tests)	CO4	Apply

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7	Deflection test on metal beam	CO4	Apply
8	Compression test on helical spring	CO4	Apply
9	Deflection test on carriage spring	CO5	Apply

Total: 30 Periods

TEXT BOOKS
1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2017
2. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Fifth Edition, 2018.

REFERENCE BOOKS
1. S.S.Rattan, Strength of Materials, McGraw Hill Education (India) Private Limited, Chennai, Third Edition, 2017
2. F. P. Beer and R. Johnston, McGraw Hill Education India Private Limited, Seventh edition, 2017
3. William Nash and Nilanjan Malik, Strength of Materials (Schaum"s Outline Series), McGraw Hill Education, Fourth Edition, 2017

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and PSOs

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3		2			2									
CO2	3		2			2									
CO3	3		2			2									
CO4	3		2			2									
CO5	3		2			2									
CO6	3		2			2									
	3		High			2		Medium			1			Low	

Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [50 marks]**	**End Semester Examination [50 marks]**
Remember		
Understand	10	10
Apply	40	40
Analyze	50	50
Evaluate		
Create		

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