



SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)



**Approved by AICTE, Recognized by UGC &
Affiliated to Anna University Accredited by
NBA-AICTE, NAAC-UGC with 'A++' Grade
Saravanampatti, Coimbatore – 641035.**

**REGULATION 2023 CURRICULAM
I – VIII SEMESTER
CHOICE BASED CREDIT SYSTEM**

DEPARTMENT OF AGRICULTURAL ENGINEERING

B.Tech – AGRICULTURAL ENGINEERING



SNS COLLEGE OF TECHNOLOGY
 (An Autonomous Institution)
COIMBATORE-35
 DEPARTMENT OF AGRICULTURAL ENGINEERING
R 2023 – SUGGESTED CURRICULUM
B.Tech – AGRICULTURAL ENGINEERING



Description / Semester	AICTE	SNSCT – Suggested	Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6	Sem 7	Sem 8
Humanity, Social Science & Mandatory (HSMC)	12	11	3	4	2				2	
Basic Science (BSC)	25	28	8	8	5	5				
Engineering Sciences (ESC)	24	22.5	8	8	2	4.5				
Programme Core (PCC)	48	55.5		2	13	11.5	11	13	5	
Programme Elective (PEC)	18	15					3	3	3	6
Open Elective (OEC)	18	9					3	3	3	
Project/Seminar/Internship (EEC)	15	28	3	1	1	3	5	3	2	12
Mandatory Courses (MC)	(Non Credit)									
TOTAL	160	169	22	23	23	24	22	22	15	18

SEMESTER I									
S.No.	CourseCode	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category
Theory Courses									
1.	23MAT101	Matrices and Calculus	3	1	0	4	4	40/60	BSC
2.	23PYT101	Engineering Physics	3	0	0	3	3	40/60	BSC
3.	23MET101	Engineering Mechanics	3	0	0	3	3	40/60	ESC
4.	23EET101	Basics of Electrical and Electronics Engineering	3	0	0	3	3	40/60	ESC
5.	23GET103	Heritage of Tamils	1	0	0	1	1	40/60	HSMC
Theory Integrated Practical Courses									
6.	23GEB101	Design Thinking and Innovation	1	0	4	5	3	50/50	EEC
Practical Courses									
7.	23PYP101	Physics Laboratory	0	0	2	2	1	60/40	BSC
8.	23ENP101	Professional Communication	0	0	4	4	2	60/40	HSMC
9.	23GEP101	Workshop Practices	0	0	4	4	2	60/40	ESC
Mandatory Course									
10.	23CHT103	Environmental Science and Sustainability	2	0	0	2	0	100/0	MC
Total			16/1/14			31	22		

SEMESTER II									
SNo.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category
Theory Courses									
1.	23MAT102	Complex Analysis and Laplace Transforms	3	1	0	4	4	40/60	BSC
2.	23CHT102	Chemistry of Engineering Materials	3	0	0	3	3	40/60	BSC
3.	23ENT101	Communicative English	3	0	0	3	3	40/60	HSMC
4.	23ITT101	Programming In C and Data Structures	3	0	0	3	3	40/60	ESC
5.	23MET102	Engineering Drawing	1	0	4	5	3	40/60	ESC
6.	23AGT101	Introduction to Agricultural Engineering	2	0	0	2	2	40/60	PCC
7.	23GET104	Tamils and Technology	1	0	0	1	1	40/60	HSMC

Practical courses										
8.	23CHP101	Chemistry Laboratory	0	0	2	2	1	60/40	BSC	
9.	23ITP101	Programming In C and Data Structures Laboratory	0	0	4	4	2	60/40	ESC	
10.	23AGP101	Internship-I	2 Weeks			-	1	100/0	EEC	
Mandatory Course										
11.	23HST103	Indian Constitution	2	0	0	2	0	100/0	MC	
Total			18/1/10			29	23			

SEMESTER III										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	PRE-REQUISITES
Theory Courses										
1.	23MAT201	Partial Differential Equations and Transforms	3	0	0	3	3	40/60	BSC	
2.	23AGT201	Principles of Soil Science	3	0	0	3	3	40/60	PCC	
3.	23AGT202	Fluid Mechanics and Hydraulics	3	0	0	3	3	40/60	PCC	
4.	23AGT203	Thermodynamics and Heat Transfer	3	0	0	3	3	40/60	PCC	
5.	23AGT204	Surveying and Levelling	2	0	0	2	2	40/60	PCC	
6.	23GET275	VQAR-I	2	0	0	2	2	40/60	BSC	
Theory Integrated Practical Courses										
7.		Language Elective	1	0	2	3	2	50/50	HSMC	
Practical Courses										
8.	23AGP201	Surveying Laboratory	0	0	4	4	2	60/40	PCC	
9.	23ITP204	Programming in Python	0	0	4	4	2	50/50	ESC	
10.	23AGP202	Mini Project – I	0	0	2	2	1	100/0	EEC	
Total			17/0/12			29	23			

SEMESTER IV										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	PRE-REQUISITES
Theory Courses										
1.	23MAT204	Statistics and Numerical Methods	3	0	0	3	3	40/60	BSC	

2.	23AGT205	Strength of Materials for Agricultural Engineering	2	0	0	2	2	40/60	PCC	
3.	23AGT206	Unit Operations in Agricultural Process Engineering	3	0	0	3	3	40/60	PCC	
4.	23GET276	VQAR-II	2	0	0	2	2	40/60	BSC	
5.	23AGT207	Engineering Properties of Agricultural Produce	2	0	0	2	2	40/60	PCC	
6.	23CST205	Object Oriented Programming using Java	3	0	0	3	3	40/60	ESC	
Theory Integrated Practical Courses										
7.	23AGB201	Tractor and Automotive Engines	2	0	2	4	3	50/50	PCC	
Practical Courses										
8.	23AGP203	Crop Production Practices	0	0	3	3	1.5	60/40	PCC	
9.	23CSP205	Object Oriented Programming using Java Laboratory	0	0	3	3	1.5	60/40	ESC	
10.	23GEP275	Personal Branding	0	0	4	4	2	60/40	EEC	
Mandatory Course										
11.	23AGP204	Internship-II				2 Weeks	1	100/0	EEC	
Total			17/0/12			29	24			

SEMESTER V										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	PRE-REQUISITES
Theory Courses										
1.	23AGT301	Farm Power and Machinery	3	0	0	3	3	40/60	PCC	
2.	23AGT302	Bio-energy Systems: Design and Applications	2	0	0	2	2	40/60	PCC	
3.	23AGT303	Post-Harvest Engineering of Cereals, Pulses and Oil Seeds	2	0	0	2	2	40/60	PCC	
4.		Professional Elective - I	3	0	0	3	3	40/60	PEC	
5.		Open Elective - I	3	0	0	3	3	40/60	OEC	
Theory Integrated Practical Courses										
6.	23AGB301	Geographical Information System	2	0	2	4	3	50/50	PCC	
7.		Career Course - I	2	0	4	6	4	50/50	EEC	
Practical Courses										
8.	23AGP301	Mini Project – II	0	0	2	2	1	100/0	EEC	
9.	23AGP302	Farm Machinery Laboratory	0	0	2	2	1	100/0	PCC	
Total			17/0/10			27	22			

SEMESTER VI										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	PRE-REQUISITES
Theory Courses										
1.	23AGT304	Irrigation and Drainage Engineering	3	0	0	3	3	40/60	PCC	
2.	23AGT305	Renewable Energy Sources	2	0	0	2	2	40/60	PCC	
3.	23AGT306	Precision Farming Techniques for Protected Cultivation	3	0	0	3	3	40/60	PCC	
4.		Professional Elective - II	3	0	0	3	3	40/60	PEC	
5.		Open Elective - II	3	0	0	3	3	40/60	OEC	
Theory Integrated Practical Courses										
6.	23AGB302	Dairy and Food Engineering	2	0	2	4	3	50/50	PCC	
7.		Career Course -II	1	0	2	3	2	50/50	EEC	
Practical Courses										
8.	23AGP303	Solar and Wind Energy Laboratory	0	0	2	2	1	60/40	PCC	
9.	23AGP304	Computer Aided Design Laboratory	0	0	2	2	1	60/40	PCC	
Mandatory Course										
10.	23HST105	Essence of Indian Traditional Knowledge	2	0	0	2	0	100/0	MC	
11.	23AGP305	Internship-III				2 Weeks	1	100/0	EEC	
Total			19/0/8			27	22			

SEMESTER VII										
S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	PRE-REQUISITES
Theory Courses										
1.	23AGT401	Agricultural Business Management	3	0	0	3	3	40/60	PCC	
2.	23AGT402	Soil and Water Conservation Engineering	2	0	0	2	2	40/60	PCC	
3.	23GET401	Universal Human Values	2	0	0	2	2	40/60	HSMC	
4.		Professional Elective - III	3	0	0	3	3	40/60	PEC	
5.		Open Elective - III	3	0	0	3	3	40/60	OEC	

Practical courses										
6.	23AGP401	Project - I	0	0	4	4	2	60/40	EEC	
Total			13/0/4			17	15			

SEMESTER VIII

S No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category	PRE-REQUISITES
1.	23AGP402	Project - II	0	0	24	24	12	60/40	EEC	
2.		Professional Elective – IV	3	0	0	3	3	40/60	PEC	
3.		Professional Elective - V	3	0	0	3	3	40/60	PEC	
Total			6/0/24			30	18			

ADDITIONAL LANGUAGE COURSES

S.No	Course Code	Courses Offered	L	T	P	C
1	23GEB202	HINDI	1	0	2	2
2	23GEB203	JAPANESE	1	0	2	2
3	23GEB204	GERMAN	1	0	2	2
4	23GEB205	FRENCH	1	0	2	2

CAREER COURSES (UG)

S.No	Course Code	Courses Offered	Sem	L	T	P	C
Track 1 Job (6 Credits)	23GEB375	Personnel Psychology and Technical Interviewing	V Semester	2	0	4	4
	23GEB379	Employable Skill Development	VI Semester	1	0	2	2
Track 2 Entrepreneurship (6 Credits)	23GEB376	Entrepreneurship and Business Canvas Model	V Semester	2	0	4	4
	23GEB382	Economics, Finance and Accounting and Intellectual Property Rights	VI Semester	1	0	2	2
Track 3 Higher	23GEB377	Advanced Verbal Quantitative Aptitude and Reasoning and Networking	V Semester	2	0	4	4

Education (6 Credits)	23GEB380	Higher Studies in Abroad and India	VI Semester	1	0	2	2
Track 4 Govt. /RRB/ Bank (6 credits)	23GEB378	Foundation Course on Competitive Exams	V Semester	2	0	4	4
	23GEB381	Personnel Psychology for Government Jobs	VI Semester	1	0	2	2

Mandatory Courses (UG)

Course Code	Course Title	L	T	P	C
23CHT103	Environmental Sciences and sustainability	2	0	0	0
23HST103	Indian Constitution	2	0	0	0
23HST105	Essence of Indian Traditional Knowledge	2	0	0	0

Other Special Courses (UG)

Course Code	Course Title	L	T	P	C
23GEB101	Design Thinking and Innovation	1	0	4	3
23GET275	VQAR – I	2	0	0	2
23GET277	Biology for Engineers	2	0	0	2
23GEP275	Personal Branding	0	0	4	2
23GET276	VQAR - II	2	0	0	2
23GET201	Professional Ethics and Human Values	2	0	0	2

Professional Electives

S.No	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.	23AGE301 – 23AGE305	Professional Elective – I	3	0	0	3	V
2.	23AGE306 – 23AGE310	Professional Elective – II	3	0	0	3	VI
3.	23AGE401 – 23AGE405	Professional Elective – III	3	0	0	3	VII
4.	23AGE406 – 23AGE410	Professional Elective – IV	3	0	0	3	VIII
5.	23AGE411 – 23AGE415	Professional Elective – V	3	0	0	3	VIII
		TOTAL	15	0	0	15	

S.No	Course Code	Courses Offered	L	T	P	C
Professional Elective - I						
1.	23AGE301	Technology of Seed Processing	3	0	0	3
2.	23AGE302	Testing and Evaluation of Farm Machinery and Equipment	3	0	0	3
3.	23AGE303	Energy Storage Systems	3	0	0	3
4.	23AGE304	Ergonomics of Farm machinery and Implements	3	0	0	3
5.	23AGE305	Geo informatics and Nanotechnology	3	0	0	3
6.	23MEE305	Principles of Management	3	0	0	3
Professional Elective – II						
1.	23AGE306	Green Buildings	3	0	0	3
2.	23AGE307	Emerging technologies in Food Process Engineering	3	0	0	3
3.	23AGE308	Principles of Organic Farming	3	0	0	3
4.	23AGE309	Watershed Planning and Management	3	0	0	3
5.	23AGE310	Agro-Energy Audit and Management	3	0	0	3
6.	23MEE310	Engineering Economics and Cost Analysis	3	0	0	3
Professional Elective – III						
1.	23AGE401	Climate Change and Adaptation	3	0	0	3
2.	23AGE402	Disaster Management	3	0	0	3
3.	23AGE403	Energy Conservation in Agro Industry	3	0	0	3
4.	23AGE404	Fruit and Vegetables Processing	3	0	0	3
5.	23AGE405	Agricultural Economics and Farm Management	3	0	0	3
6.	23MEE405	Total Quality Management	3	0	0	3
Professional Elective – IV						
1.	23AGE406	Sustainable Agriculture and Food Security	3	0	0	3
2.	23AGE407	Mushroom cultivation and Vermi composting	3	0	0	3
3.	23AGE408	Storage and Packaging Technology	3	0	0	3
4.	23AGE409	Human Engineering and Safety in Agriculture	3	0	0	3
5.	23AGE410	Water and Wastewater Engineering	3	0	0	3
Professional Elective - V						
1.	23AGE411	Groundwater and Well Engineering	3	0	0	3
2.	23AGE412	Waste and By Products Utilization	3	0	0	3
3.	23AGE413	Landscape Architecture	3	0	0	3
4.	23AGE414	Integrated Farming System	3	0	0	3

5.	23AGE415	Refrigeration and Cold Storage	3	0	0	3
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S.No	Course Code	Open Elective Courses Offered	L	T	P	C
(To Other Department Students)						
1.	23AGO301	Energy Conservation and Management	3	0	0	3
2.	23AGO302	Waste and Hazardous Management	3	0	0	3
3.	23AGO303	Environmental Laws and Policies	3	0	0	3
4.	23AGO304	Farm Mechanization	3	0	0	3
5.	23AGO305	Introduction to Bio Energy	3	0	0	3

SEMESTER I

23MAT101	MATRICES AND CALCULUS	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	1	0	4
UNIT I	MATRIX EIGENVALUE PROBLEM				9+3
Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley Hamilton Theorem (statement only) and its applications – Eigenvalue problems arising from population models (Leslie model).					
UNIT II	ORTHOGONAL TRANSFORMATION OF A REAL SYMMETRIC MATRIX				9+3
Diagonalization of a real symmetric matrix – Quadratic form – Canonical form – Nature of the quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation – Applications: Stretching of an elastic membrane.					
UNIT III	DIFFERENTIAL CALCULUS				9+3
Curvature – Radius of Curvature in Cartesian co-ordinates – Centre of curvature and circle of curvature in Cartesian Co-ordinates – Evolutes – Envelopes.					
UNIT IV	FUNCTIONS OF SEVERAL VARIABLES				9+3
Partial derivatives – Homogeneous functions and Euler’s theorem – Jacobians – Taylor’s series for functions of two variables – Applications: Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.					
UNIT V	MULTIPLE INTEGRALS				9+3
Double integrals (Cartesian co-ordinates) – Change of order of integration – Applications of double integrals (Area) – Triple integrals (Cartesian co-ordinates) – Applications: Volume of solids.					
		L : 45	T:15	P: 0	Total: 60 PERIODS
TEXT BOOKS					
1	Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10 th Edition, New Delhi 2016.				
2	James Stewart, Calculus, Cengage Learning, 8 th Edition, New Delhi 2015.				
REFERENCES					
1	Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44 th Edition, 2018.				
2	Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7 th Edition, 2009.				
3	Jain. R.K. and Iyengar. S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5 th Edition, 2016.				
4	Ramana. B.V., Higher Engineering Mathematics, McGraw Hill Education Pvt. Ltd, New Delhi, 2016.				
5	Thomas. G. B., Hass. J, and Weir. M.D, Thomas Calculus, 14 th Edition, Pearson India, 2018.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO1	Know about Eigen values and Eigen vectors and its role in the system of equations.				
CO2	Transform the real symmetric matrix from quadratic form to canonical form by means of orthogonal transformation.				

CO3	Determine the radius, centre and circle of curvature of any curve.
CO4	Use differential calculus ideas on several variable functions.
CO5	Apply multiple integral ideas in solving areas, volumes and other practical problems.

23PYT101	ENGINEERING PHYSICS			L	T	P	C
	(Common for AEROSPACE, AGRI, AUTO, CIVIL, FT, MECH & MCT)			3	0	0	3
UNIT I	CRYSTAL STRUCTURE						9
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystalsystems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP structures; Crystal imperfections – point, line, surface and volume imperfections.							
UNIT II	QUANTUM PHYSICS						9
Black body radiation – Planck’s theory (derivation) – Deduction of Wien’s displacement law and Rayleigh – Jean’s Law from Planck’s theory — Properties of Matter waves –Physical significance of wave function-Schrödinger’s wave equations: Time independent and time dependent equations– Particle in a one dimensional box–Electron microscope-Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM).							
UNIT III	ELASTICITY						9
Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders							
UNIT IV	PHYSICS OF ADVANCED MATERIALS						9
Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity. Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory. Nanomaterials: introduction and properties – synthesis – top-down process: Ball milling method - bottom-up approach: Physical Vapour deposition – applications.							
UNIT V	NON-DESTRUCTIVE TESTING						9
Introduction- Types of defects-Methods of NDT-Visual inspection- Liquid / Dye penetrant testing- Magnetic particle testing-Eddy current testing-Ultrasonic inspection method- Advantages-X-Ray radiography- X-ray fluoroscopy-Comparison of conventional and real timeradiography.							

L: 45 T: 0 P: 0 T: 45 PERIODS

TEXTBOOKS	
1.	Gaur R.K. And Gupta S.L, “Engineering Physics”, Dhanpat Rai publishers, 2013 (Unit I, II, III)
2.	Dr.M.N.Avandhanulu, Dr.P.G.Kshirsagar, “A Textbook of Engineering Physics”, S.Chand, 2014 (Unit I, II & V)
3.	Murugesan R And Kiruthika Sivaprasath, “Modern Physics” 18 th edition, S.Chand 2016 (Unit I, II, IV)
REFERENCES	
1.	Rajendran.V, Engineering Physics, Tata Mcgraw-Hill Publishing Company Limited, New Delhi. 2017. (Unit I, II, III, V)
2.	“Engineering Physics”, Wiley, 2013 (Unit I, II, III, V)
3.	A.S.Vasudeva, “Modern Engineering Physics”, S.Chand, 2001 (Unit I, II, III & V)
4.	B.K.Pandey Chaturvedi, “Engineering Physics”, Cengage Learning, 2012 (Unit I, II & IV)

5.	Charles Kittel, "Solid State Physics", Wiley(2009), Unit(I&II)
6.	Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill, New Delhi, 2010.(Unit I,IV,V)
7.	C.P. Poole and F.J. Owens, Introduction to Nanotechnology, Wiley, New Delhi, 2007(Unit V)

COURSE OUTCOMES
At the end of the course students should be able to Co1: Understand the properties of Crystalline Materials. Co2: learn the basic concepts of Quantum Mechanics Co3: Analyze the elastic properties of materials. Co4: Utilize the knowledge to identify and develop the materials for specific applications. Co5: Make use of Knowledge on different Non-Destructive testing techniques.

23MET101	ENGINEERING MECHANICS	L	T	P	C
	(Common to All Non Circuit Branches)	3	0	0	3
UNIT I	BASICS & STATICS OF PARTICLES				9
Introduction - Units and Dimensions - Vectorial representation of forces and moments –Coplanar Forces - Laws of Mechanics - Lamé's theorem, Resolution and Composition of forces -Equilibrium of a particle - Principle of transmissibility -Free body diagram					
UNIT II	EQUILIBRIUM OF RIGID BODIES				9
Types of supports and their reactions -requirements of stable equilibrium -Moments and Couples- - Vectorial representation of moments and couples --Varignon's theorem and applications--Forces in space -Equilibrium of a particle in space — Equilibrium of Rigid bodies in three dimensions					
UNIT III	PROPERTIES OF SURFACES AND SOLIDS				9
Determination of centroid of areas, volumes and mass – moment of inertia of plane – Parallel axis theorem and perpendicular axis theorem-product of inertia- mass moment of inertia.					
UNIT IV	DYNAMICS OF PARTICLES				9
Displacements, Velocity and acceleration, their relationship - Relative motion –Curvilinear motion-Newton's law-Work Energy Equation of particles					
UNIT V	FRICTION AND RIGID BODY DYNAMICS				9
Friction force - Laws of sliding friction - equilibrium analysis of simple systems with sliding friction - wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies –Velocity and acceleration					
		L :45	T: 0	P: 0	T: 45 PERIODS
TEXT BOOKS					
1	Beer, F.P and Johnston Jr. E.R. "Vector Mechanics for Engineers", McGraw-Hill Education 11th Edition (India) Pvt Ltd. (2016).				
2	J.L.Meriam & L.G. Karidge, Engineering Volume I) and Engineering Mechanics: Dynamics, 8th edition, Wiley student edition, 2016				
REFERENCES					
1	VelaMurali, "Engineering Mechanics", Oxford University Press (2010)				

2	D.P.Sharma “Engineering Mechanics”, Dorling Kindersley (India) Pvt. Ltd, New Delhi 2010.
3	Dr.I.SGujral “Engineering Mechanical” second edition, 2011, Lakshmi Publication (P).Ltd.
4	Arthur P.Boresi and Richard J.Schmidt, “Engineering Mechanics: Statics and Dynamics”, Thomson Asia Private Limited, Singapore, 2010.
5	Hibbeler, R.C., “Engineering Mechanics”, 14th edition, Prentice hall (2016).

COURSE OUTCOMES :

At the end of the course student should be able to:

CO1	recognize the basics of equilibrium of particles in 2D and 3D
CO2	review the requirements of equilibrium of rigid bodies in 2D and 3D
CO3	compute the center of mass and moment of inertia of surfaces and solids
CO4	predict displacement, velocity and acceleration of dynamic particles
CO5	solve for friction force and rigid body dynamics

23EET101	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
	(Non circuit branches)	3	0	0	3
UNIT I	ELECTRICAL CIRCUITS				9
DC Circuits: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws – Simple problems: Nodal analysis, Mesh analysis with Independent sources only (Steady state)					
AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor (Simple problems only)					
UNIT II	ELECTRICAL MACHINES				9
Construction, Principle of operation, Basic equations and applications of DC Generator, DC Motor- Elementary treatment of Single phase Transformer, Single and three phase Induction Motors, Synchronous Generator					
UNIT III	WIRING, GROUNDING AND SAFETY				9
Wiring: General Rules, materials and accessories, Types of wiring - Conduit wiring –Wiring layout of Residential building, Grounding: Importance of grounding, Types of grounding - Safety: Causes of accidents, Accident prevention.					
UNIT IV	ANALOG ELECTRONICS				9
Construction, working principle and VI characteristics of Diode, Zener diode, BJT, MOSFET, Applications: Bridge Rectifier, Voltage regulators, UPS, SMPS					
UNIT V	DIGITAL ELECTRONICS AND MEASURING INSTRUMENTS				9
Boolean Algebra-Logic Gates - Half Adder and Full Adders - A/D and D/A Conversion (Any one concept) Functional elements of an instrument, Construction and Operating Principle: Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Data acquisition					
		L :45	T: 0	P: 0	T: 45 PERIODS
TEXT BOOKS					
1	Muthusubramanian R, Salivahanan S, “Basic Electrical and Electronics Engineering”, TataMcGrawHillPublishers,2010				

2	Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020
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REFERENCES

1	V.Mittle, “Basic Electrical Engineering”, Tata McGraw Hill Publishers, 2017
2	Mehta VK, Mehta Rohit, “Principles of Electrical Engineering and Electronics”, S.Chand & Company Ltd, 2010
3	Black & Decker, “The complete guide to Electrical Wiring”, S.Chand & Company Ltd, 2012
4	Nagrath. I.J, “Electronics: Analog and Digital”, Prentice Hall India Pvt. Ltd., 2013
5	Mehta V K, Mehta Rohit, “Principles of Electronics”, S.Chand & Company Ltd, 2005

COURSE OUTCOMES :

At the end of the course student should be able to:

CO1	Familiarize the elementary concept of electric circuits
CO2	Understand the construction, operation and applications of electrical machines
CO3	Apply the concept of wiring and acquire the importance of grounding and safety
CO4	Gain knowledge on electronic devices and its applications
CO5	Acquire knowledge on basics of digital electronics and measurements

23GET103	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 a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil and – 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.

TOTAL : 15 PERIODS

TEXT BOOKS

1.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB &ES Cand RMRL– (inprint)
2.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Publishedby: International Institute of Tamil Studies).

TOTAL:15 PERIODS

REFERENCES

1.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
2.	Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
3.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

COURSE OUTCOMES

At the end of the course students should be able to

CO 1: Know about the language families of India

CO 2: summarize the rock art paintings and sculptures **CO 3:** describe the folk and marital arts of tamils **CO 4:** demonstrate the thinai concepts of Tamil

CO 5: have knowledge on the contribution of tamils in Indian National Movement

23GEB101	DESIGN THINKING AND INNOVATION	L	T	P	C
		1	0	4	3
UNITI	INTRODUCTION TO DESIGN THINKING				3+12
A brief in sight to Design Thinking and Innovation –People Centered Design & Evoking the ‘right problem’ – Purpose of Design Thinking – Design Thinking Framework					
UNITII	PROCESS IN DESIGN THINKING (EMPATHY, DEFINE)				3+12
Design Thinking Process – Empathy – Uncovering and Investigating Community Concerns - Define: Examine and Reflect on the problem					
UNITIII	CONCEPTING AND BUILDING (IDEA, CREATE)				3+12

Generating Ideas – Identifying top three ideas – Bundling the Ideas and create concepts- Rapid Prototyping

UNITIV	TESTING, REFINING AND PITCHING THE IDEAS	3+12
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Importance & Testing the Design with People – Re test and Redefine Results – Creating a Pitch for the design

UNITY	VALUE PROPOSITION DESIGN	3+15
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Business Vs Startup –Briefing the Problem – Problem Validation and User Discovery - Challenge Brief

L:15T:0 P:60 TOTAL : 75PERIODS

REFERENCE BOOKS

1.	Robert A Curedale, Design Thinking Process & Methods 4thEdition, December2017, Design Community College Inc.
2.	Andrew Pressman, DesignThinking : A Guide to Creative Problem Solving for Everyone, First Edition, Nov 2018, Routledge.
3.	Brown,Tim, and Barry Katz. Change by Design : How Design Thinking Transforms Organizations And Inspires Innovation, 2009, Harper Business
4.	Idris Mootee, Design Thinking for Strategic Innovation – What They Can't Teach You at Business Or Design School, First Edition,2017, Wiley
5.	Yves Pigneur, Greg Bernarda, Alan Smith, Trish Papadakos Alex Osterwalder, ValueProposition Design: How to Create Products and Services Customers Want, 2015, Wiley

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Learn new approach –design thinking—that enhances innovation activities in terms of market impact, value creation, and speed.

CO2:Feel the Empathy and can define their problems based on the Community Concerns

CO3:Strengthen their individual and collaborative capabilities to identify customer needs, create sound concept hypotheses, collect appropriate data, and develop a prototype that allows for meaningful feedback in a real-world environment

CO4:Translate broadly defined opportunities into actionable innovation possibilities and recommendations for client organization

CO5:Become an Entrepreneurs

23PYP101	PHYSICS LABORATORY (Common to All Branches)	L	T	P	C
		0	0	2	1
BASIC MEASURING INSTRUMENT					
<ol style="list-style-type: none"> 1. Screw Gauge 2. Vernier Caliper 3. Travelling Microscope 4. Spectrometer 					
LIST OF EXPERIMENTS (ANY EIGHT) 30 hours					
<ol style="list-style-type: none"> 1. Determination of wavelength of mercury spectrum – Spectrometer grating. 2. Determination of Young’s modulus of the material – uniform bending. 3. Determination of viscosity of liquid – Poiseuille’s method. 4. (a) Particle size determination using Diode Laser. (b) Determination of Laser parameters – Wavelength. 5. Determination of the Numerical Aperture and the acceptance angle of an optical fiber. 6. Determination of thickness of a thin wire – Air wedge method. 7. Determination of dispersive power of a prism using spectrometer. 8. Determination of Young’s modulus of the material – non uniform bending. 9. Torsional Pendulum - determination of rigidity modulus of wire and moment of Inertia of disc. 10. Determination of Band gap of semiconductor material. 					

L :0 T: 0 P: 30 T: 30 PERIODS

TEXT BOOK	
1.	Physics Laboratory Manual, Department of Physics, SNSCT, 2019.
REFERENCE BOOK	
1.	R.Jayaraman, V.Umadevi, S.Maruthamuthu, B.Saravanakumar “Engineering Physics Laboratory Manual”, Pearson Education India, 2013.

COURSE OUTCOMES
At the end of the course students should be able to
CO1: Evaluate the young’s and Rigidity Modulus of the given material.
CO2: Utilize the concept of diffraction to determine the wavelength of given light source
CO3: Extend the knowledge on applying the principles of laser, fiber optics, viscosity and Band Gab of the Materials.

23ENP101	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	4	2

UNIT I	LISTENING SKILLS	10
The process of Listening & Barriers of listening, Listening to TED Talks and note taking, – Listening to conversations for specific information, Listening to classroom lectures/ talks/ documentaries.		
UNIT II	READING	10
Cloze exercises, Picture perception, Reading and paraphrasing, Reading and interpreting.		
UNIT III	PROFESSIONAL WRITING	10
Cover letter & Resume preparation, Email writing – formal & Informal, Content writing- planning- writing- editing and proof reading, Report writing- types of report, report format - Fire Accident & Road Accident.		
UNIT IV	COMMUNICATION & SOFT SKILLS	15
Communication & Barriers of Communication- Verbal & Nonverbal Communication, Time Management, Stress Management, Inter & Intra personal skills, Professional ethics, Basic Etiquettes- Social Etiquette- Telephone Etiquettes- Corporate Etiquette.		
UNIT V	SPEAKING	15
Introduction of self and others, Extempore Speech, Public Speaking, Art of Storytelling- Describing and Narrating, Presentation Skills- preparing PPT and Oral presentation, – Group Discussion – Team building- Mock GD, Interview skills- resume based questions- competency based question- Mock Interview.		
L: 0 T: 0 P: 60		TOTAL:60 Periods

TEXT BOOKS	
1.	Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2011.
2.	Rizvi, Ashraf. M. Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.

REFERENCES

1.	Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011
2.	Mitra K. Barun, —Effective Technical Communication – A Guide for Scientists and Engineers, Oxford University Press, New Delhi, 2006.
3	Leo Jones, Richard Alexander, New International Business English, updated Edition, Cambridge University Press, NY, USA.
4	Smith—Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA.
5	Sharon J. Gerson, Steven M. Gerson, —Technical Writing – Process & Product. 3rd Edition, Pearson Education (Singapore) (P) Ltd., New Delhi.

COURSE OUTCOME

At the end of the course students should be able to

CO1: Make use of listening skills in both formal and informal contexts

CO2: Develop reading skill to comprehend ambiguity and complexity, and can articulate their own interpretations.

CO3: Demonstrate their writing skills for effective communication in both formal and informal situations

CO4: Discuss clearly, confidently, comprehensibly and communicate with one or many listeners using appropriate communicative strategies

CO5: Apply the various principles of communication in the work place environment

23GEP101	WORKSHOP PRACTICES (Common to All Branches)	L	T	P	C
		0	0	4	2
GROUP A (CIVIL & MECHANICAL)		30			
CIVIL ENGINEERING 12					
Study of plumbing tools and Components Preparation of threads in pipes					
Preparation of single and multi-tap connections for domestic					
Study of carpentry tools and its applications					
Preparation of Cross Lap and Dove Tail Joints.					
MECHANICAL ENGINEERING 18					
Study of different types of Welding and its applications					
Preparation of Butt, Lap and Tee joints					
Study of sheet metal and its applications					
Preparation of Rectangular, Square Trays and Funnel					
Demonstration of Lathe and Drilling Operations					
Demonstration of Smithy, Foundry tools and Power Tool Operations					
Plastic Moulding and Glass Cutting					
GROUP B (ELECTRICAL AND ELECTRONICS) 30					
ELECTRICAL ENGINEERING PRACTICE 18					
Residential house wiring using switches, fuse, miniature circuit breaker, indicator, Lamp and energy meter.					
Fluorescent lamp wiring.					
Stair-case wiring.					
Measurement of electrical quantities –voltage, current, power & power factor in RL Circuit.					
Measurement of energy using single phase energy meter.					
Measurement of insulation resistance to earth of electrical equipment.					
Measurement of single and three phase voltages.					
Study of Iron Box, Emergency Lamp and Fan.					
ELECTRONICS ENGINEERING PRACTICE 12					
Study of Electronic components and equipments –Resistor, color coding, measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.					
Verification of logic gates: AND, OR, Ex-OR and NOT.					
Generation of Clock Signal.					
Soldering practice–Components Devices and Circuits Using general purpose PCB.					
Characteristics of a PN Junction diode					

L :0 T: 0 P: 60: Total:60 PERIODS

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Demonstrate plumbing system and Carpentry for the required applications.
- CO2: Relate the basic machining operations with engineering problems.
- CO3: Apply different types of Welding processes and Sheet metal processes for the Industrial applications.
- CO4: Illustrate Residential House wiring and simple wiring circuits.
- CO5: Employ knowledge on measuring electrical quantities and usage of energy meters

23CHT103	ENVIRONMENTAL SCIENCE & SUSTAINABILITY	L	T	P	C
	(Common to all B.E / B.Tech)	2	0	0	2
UNIT I	ENVIRONMENT AND BIODIVERSITY				6
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Introduction to biodiversity– Values of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex- situ conservation of biodiversity. Field visit on Biodiversity.					
UNIT II	ENVIRONMENTAL POLLUTION				6
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.					
UNIT III	RENEWABLE SOURCES OF ENERGY				6
Energy management and conservation, New Energy Sources: Need of new sources. Solar energy, Wind energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Case study on Present Energy resources in India and its sustainability.					
UNIT IV	SUSTAINABILITY PRACTICES				6
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Energy Cycles carbon cycle, emission and Sequestration, Sustainable urbanization and technological change.					
UNIT V	SUSTAINABILITY AND MANAGEMENT				6
Development, GDP, Sustainability - concept, needs and challenges-economic and social aspects of sustainability - millennium development goals and protocols Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry- A case study.					
L :30		T: 0	P: 0	T: 30 PERIODS	

TEXT BOOKS	
1	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,2016.
3	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
REFERENCES	
1	G.Tyler Miller, "Environmental Science" Cengage Learning India Pvt.Ltd.New Delhi.2011
2	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.
3	Gilbert M. Masters and Wendell. P.Ela, "Introduction to EnvironmentalEngineering and Science" PHI Learning Pvt. Ltd. New Delhi.2010.
4	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

COURSE OUTCOMES :	
At the end of the course student should be able to:	
CO1	Understand the ecological balance and preservation of bio diversity.
CO2	Know the role of human in prevention of pollution and making a clean environment.
CO3	Explore the environmental impact of various energy resources and also get knowledge about conservation of non-conventional energy resources.
CO4	Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5	Demonstrate the knowledge of sustainability practices and identify green materials, energy cyclesand the role of sustainable urbanization.

SEMESTER II

23MAT102	COMPLEX ANALYSIS AND LAPLACE TRANSFORMS	L	T	P	C
	(Common to AEROSPACE,AGRI,AUTO,BME,CIVIL,ECE,EEE,FT,MECH,MCT)	3	1	0	4
UNIT I	VECTOR CALCULUS				9+3
Derivatives: Gradient and Directional derivatives – Divergence and Curl of a vector field – Solenoidal and Irrotational of a vector – Green’s, Gauss divergence and Stoke’s theorems (statements only) – Verification of theorems and application in evaluating line, surface and volume integrals.					
UNIT II	ORDINARY DIFFERENTIAL EQUATIONS				9+3
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – Solution of system of simultaneous linear first order differential equations with constant coefficients.					
UNIT III	COMPLEX DIFFERENTIATION				9+3
Derivatives of $f(z)$ – Analytic function – Cauchy-Riemann Equations – Harmonic function – Harmonic conjugate – Construction of Analytic function – Conformal Mapping – Mapping by functions: $w = z + c$, cz , $1/z$ – Bilinear transformations – Application to flow problems.					
UNIT IV	COMPLEX INTEGRATION				9+3
Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s series – Zeros of an analytic function – singularities – Laurent’s series – Residues – Cauchy Residue theorem .					
UNIT V	LAPLACE TRANSFORMS				9+3
Definition, properties, existence conditions – Transforms of elementary functions – Shifting theorem – Transforms of derivatives and integrals – Periodic functions – Initial and final value theorem – Inverse transforms – Application to solution of linear second order ordinary differential equations with constant coefficients.					
L : 45	T:15	P: 0	Total: 60 PERIODS		
TEXT BOOKS					
1.	Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10 th Edition, New Delhi 2016.				
2.	Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44 th Edition, 2018.				
REFERENCES					
1.	Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7 th Edition, 2009.				
2.	G.B.Thomas, Calculus, 12 th Edition, Pearson Education India, 2015.				
3.	Jain. R.K. and Iyengar. S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5 th Edition, 2016.				
4.	Peter V.O Neil, “Advanced Engineering Mathematics”, 7 th Edition, Cengage learning India Pvt Ltd, New Delhi, 2012.				
5.	Srimanta Pal, Subodh C Bhunia, “Engineering Mathematics”, Oxford University Press,2015.				

COURSE OUTCOMES

At the end of the course students should be able to

CO1	Evaluate gradient, divergence and curl and solve engineering problems involving cubes, rectangular parallelepipeds by applying various integral theorems.
CO2	Solve the higher order linear differential equations with various methods and apply them in some physical situations.
CO3	Test the analyticity, construct the analytic function and transform complex functions from z-plane to w-plane graphically by using conformal mapping.
CO4	Evaluate real and complex integrals over suitable closed path using various integral theorems.
CO5	Understand the mathematical principles on Laplace transforms and would provide them the ability to formulate and solve some of the physical problems of engineering.

23CHT102	CHEMISTRY OF ENGINEERING MATERIALS	L	TP	C
	(Common to MECH, MCT, AUTO, AERO, AGRI, CIVIL & FT)	3	0 0	3
UNIT I	CORROSION AND ITS CONTROL			9
Corrosion - Chemical corrosion (Oxidation corrosion)-Electrochemical corrosion-Types of electrochemical Corrosion -Corrosion control-Corrosion inhibitors- Cathodic protection (Sacrificial anodic protection and Impressed current Cathodic protection) – Protective coating-Paints and its constituents -Fire Retardant paint - Electroplating (Au)				
UNIT II	NANOMATERIALS			9
Nano materials and Bulk materials - Size dependent properties (Optical, Electrical and Mechanical) –Synthesis - Sol gel method - Chemical Vapour Deposition, Solvothermal, laser ablation - Types of nanomaterials - Carbon nanotubes – Properties and uses - Application of Nanotechnology in Electronics Energy science and Medicine.				
UNIT III	FUELS AND COMBUSTION			9
Fuels- Solid Fuel-Coal-classification-manufacture of metallurgical coke by Otto-Hoffmann method- Liquid Fuel–Synthetic petrol-Fischer and Bergius method- - Gaseous fuels- CNG and LPG.- Bio fuels: Categories, Types –Biodiesel, Biogas. Combustion-Calorific value-Gross and Net calorific value - Definition -Flue gas analysis by Orsat Apparatus.				
UNIT IV	WATER TECHNOLOGY			9
Introduction-Hard water and Soft water-Hardness-Types-Boiler Troubles- Water Softening – External treatment-Demineralization- Internal Treatment- Water Quality parameters (pH,TDS,Chloride, Fluoride, Sulphate, Iron, BOD ,COD and Heavy metals)- Municipal water treatment - Desalination –Reverse osmosis.				
UNIT V	ALLOYS AND ENGINEERING MATERIALS			9

Alloys-classification -Ferrous alloys (Nichrome and stainless steel only)-Non-ferrous alloys (brass and bronze) Heat treatment of steel- Definition of light metals, Characteristics and applications of light metals-Super alloys - Lubricants –Solid lubricants (Graphite and Molybdenum disulphide)-Mechanism of Lubrications. Cement – Portland cement-Chemical composition of Portland cement. Functions and limitations of cement ingredients.	
L :45 T:0 T : 45 PERIODS	
TEXT BOOKS	
1	P.C.Jain&Monicka Jain, “Engineering Chemistry”, Dhanapat Rai Publising Company Pvt.Ltd. 2017.
2.	Wiley, “Engineering Chemistry”, John Wiley &Sins.InC,USA (2014]
REFERENCES	
1	B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2009).
2	Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, Second Edition, 2019.
3	Dr.Sivanesan and Nandagopal, “Engineering Chemistry-I” V.K.Pub.Pvt.Ltd. 2011.
4	O.G.Palanna, “Engineering Chemistry”Tata McGraw-Hill Pub.Co.Ltd, New Delhi.2017.
5	Dara, S.S.; A Text Book of Engineering Chemistry (Tenth edition); S. Chand, 2003

COURSE OUTCOMES :

At the end of the course student should be able to:

CO1	Develop new strategy for protection of metals and to improve engineering design
CO2	Design environmentally benign method for nanoparticle synthesis
CO3	Acquire knowledge on various types of fuels .
CO4	Develop innovative and eco-friendly method for water purification .
CO5	Gain skill sets and usage of various engineering materials.

23ENT101	COMMUNICATIVE ENGLISH	L	T	P	C
		3	0	0	3

UNIT I		9
Grammar - Tenses - Verb forms, Spelling and Importance of Punctuation, Vocabulary - Word formation- Prefixes & Suffixes, One word Substitution, Reading -Reading and understanding the Context, Writing - Sentence completion- filling the gap, Instructions-Imperative Instructions		
UNIT II		9

Grammar- Uses of Preposition, Active & Passive Voice- impersonal passive, Vocabulary- Technical Vocabulary- Synonyms-Antonyms-Compound words, Reading -Transfer of information (chart, pictures), Writing- Recommendations- writing suggestions, Preparing Checklist.	
UNIT III	9
Grammar- Concord (Subject & Verb agreement), Definite & Indefinite Article, Vocabulary- Uses of Connectives and Linking words, Reading- Summarizing the given passage - Précis writing, Writing - Paragraph writing – Process writing, Analytical, Argumentative paragraphs.	
UNIT IV	9
Grammar- Direct and Indirect speech, Cause and Effect Expression, Vocabulary- Logical sequence of words, Reading -Note-making using Linear method, Writing- Formal Letterwriting- Permission letter for Industrial Visit & In-plant training.	
UNIT V	9
Grammar- Clauses -If Conditionals, Vocabulary- Words often confused - Verbal Analogy, Reading- Writing a Book Review Writing - Business Letters- Letter of Quotations, Clarification, Placing orders & Complaint letter.	
L: 45 T: 0 P: 0 TOTAL:45 Periods	

TEXT BOOKS	
1.	Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2011.
2.	Rizvi, Ashraf. M. Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.
REFERENCES	
1.	Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011
2.	Mitra K. Barun, —Effective Technical Communication – A Guide for Scientists and Engineers, Oxford University Press, New Delhi, 2006.
3.	Leo Jones, Richard Alexander, New International Business English, updated Edition, Cambridge University Press, NY, USA.
4.	Smith—Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA.
5.	Sharon J. Gerson, Steven M. Gerson, —Technical Writing – Process & Product. 3rd Edition, Pearson Education (Singapore) (P) Ltd., New Delhi.

COURSE OUTCOME

At the end of the course students should be able to

CO1: **Use** their active and passive vocabulary and construct basic sentence structures

CO2: **Develop** reading skill to comprehend ambiguity and complexity, and can articulate their own interpretations

CO3: **Mark** effectively and flawlessly avoiding grammatical errors for a variety of professional and social settings

CO4: **Make use of** their letter writing skills for effective communication in formal situations

CO5: **Build** their communication skills and enable to articulate with confidence

23ITT101	PROGRAMMING IN C AND DATA STRUCTURES			L	T	P	C
	(Common to BME, ECE and All Non Circuit Branches)			3	0	0	3
UNIT I	INTRODUCTION TO C						8
Basic blocks of computers – Algorithm, Pseudo code, Flowchart - Structure of C program- Data types - Variables - Constants, Operators - Input and Output Statements							
UNIT II	DECISIONS STATEMENTS AND FUNCTIONS						11
Decision making and Branching statements - Looping statements, Functions, Call by value, Call by reference							
UNIT III	ARRAYS AND INTRODUCTION TO DATA STRUCTURES						10
Arrays - One dimensional arrays - Two dimensional Arrays - Structures – Pointers Introduction to Data structures - Types of Data structures - ADT							
UNIT IV	STACK AND QUEUE						9
Stack ADT - Queue ADT - Array implementation of Queue and Stack ADT - Infix to Postfix conversion - Postfix expression evaluation							
UNIT V	TREES						7
Trees - Binary Tree - Binary Search Tree - Insertion and Deletion Operation - Tree Traversal							
TOTAL : 45 PERIODS							
TEXT BOOKS							
1.	Kamthane Ashok, “Programming in C, Pearson Education India 3/e, 3rd Edition, 2015.						
2.	Aaron M. Tenenbaum, Yedidyah Langsam, Moshe Augenstein, “Data Structures Using C”, Prentice-Hall of India, 2003						
REFERENCES							
1.	A. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 2nd Edition, 2007. (Unit III-V)						
2.	E.Balagurusamy “Data Structures Using”, McGraw-Hill Education (India) , 2013 (IV-V)						
3.	E.Balagurusamy, “Fundamentals of Computing and Computer Programming”, Tata McGRaw-Hill Publishing Company Limited, (2011). (UNIT I, II)						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1: develop algorithms and draw flow chart for solving real world problems							
CO 2: summarize decision making branching and looping statement.							
CO 3: demonstrate functions, arrays and data structure.							
CO 4: describe stack and queue data structure.							
CO 5: have knowledge in tree and its operation.							

23MET102	ENGINEERING DRAWING				L	T	P	C
	(Common to all Non-Circuit Branches)				1	0	4	3
UNIT I	PROJECTION OF POINTS, LINES AND PLANE SURFACES							3+12
Projection of points-Projection of straight lines located in the first quadrant-Determination of true Lengths and true inclinations Projection of polygonal surface and circular lamina inclined to both reference planes.								
UNIT II	PROJECTION OF SOLIDS							3+12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method								
UNIT III	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES							3+12
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other-Obtaining true shape of section. Development of lateral surfaces of Simple and truncated solids -Prisms, pyramids, cylinders and cones.								
UNIT IV	PICTORIAL PROJECTIONS AND FREE HAND SKETCHING							3+12
Principles of isometric projection -isometric scale -isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Free hand sketching: Representation of Three-Dimensional objects Need for importance of multiple views and their placement -First angle projection -layout views -Developing visualization skills through free hand sketching of multiple views from pictorial drawing. Perspective projection of prisms,pyramids and cylinders by visual ray method (Not for Examination).								
UNIT V	BUILDING DRAWING							3+12
Drawing of a plan, Elevation and sectioning of security room and residential building (Two bedrooms, kitchen, hall, etc.) Practicing design in the CAD Software (Not for Examination).								
				L:15	T: 0	P:60	Total:75 PERIODS	
TEXTBOOKS								
1	N.D.Bhattand V.M.Panchal,“Engineering Drawing”,Charotar Publishing House,53 rd Edition,2016							
2	K.R.Gopalakrishnan, “Engineering Drawing”(Vol.I&II),Subhas Publications,2014							
REFERENCES								
1	K.V.Natarajan,“A textbook of Engineering Graphics”,Dhanalakshmi Publishers,Chennai, 2015							
2	M.S.Kumar,“Engineering Graphics”,D.D.Publications,2011							
3	Venugopal & V.PrabhuRaja,“Engineering Graphics”,New Age International (P) Limited,2014							
4	M.B.Shahand B.C.Rana,“Engineering Drawing”, Pearson Education,2011.							
5	K.L.Narayanan and P.Kannaiah,“Engineering Drawing”SciTech Publications,2 nd edition,2012.							

COURSE OUTCOMES

At the end of the course student should be able to:

CO1	Sketch the projections of a points, straight lines and plane surfaces
CO2	Illustrate top view and front view of the solids
CO3	Sketch sectioned views and develop area required
CO4	Demonstrate knowledge about isometric, Perspective and orthographic projections
CO5	Design simple buildings with detailed plan and sectional elevation

23AGT10	INTRODUCTION TO AGRICULTURAL ENGINEERING	L	T	P	C
1		2	0	0	2
COURSE OBJECTIVES:					
<ol style="list-style-type: none"> To introduce the students about the principles of agricultural and about organic agriculture. Understand the various streams of agriculture engineering in the aspect of soil and water conservation engineering, farm machinery, food engineering and renewable energy sources. 					
UNIT I	IMPORTANCE OF AGRICULTURAL ENGINEERING				6
Introduction to Agriculture – Impact of green revolution on food production- Contribution of Agriculture to the GDP of the nation – Introduction to Agriculture Engineering and its branches- organic agriculture-precision farming – Need for Farm Mechanization.					
UNIT II	SOIL AND WATER CONSERVATION ENGINEERING				6
Soil & water – Soil health - Soil quality- Soil health and crop production relationship-Soil erosion - Soil conservation methods – Instruments used for measuring different parameters of climate - Sources of water – Tanks – Wells & Reservoirs – Rain water Harvesting – Runoff computation – Water harvesting – Farm ponds and Percolation ponds – Watershed concepts – integrated approach and Management – Overview of irrigation methods.					
UNIT III	FARM STRUCTURES AND FARM MACHINERY				6
Farm structures- Farm Roads, Cattle sheds, Poultry shed, Machinery and implement shed, Storage structures for food grain, feed & forage – Protected Cultivation - Green houses, Poly houses - Shade net- Farm Machinery -Tractors and Power Tiller – Introduction to Tillage implements, Sowing and intercultural implements, plant protection and Harvesting machinery					
UNIT IV	PROCESS FOOD ENGINEERING				6
Post-harvest losses of crops - Role of processing in minimizing losses - Importance of value addition of farm produce -Unit operations in agricultural processing – Equipment’s used for processing, handling and packaging of agricultural produces – Processing of Milk and dairy products.					
UNIT V	RENEWABLE ENERGY SOURCES				6
Energy crisis – Classification of energy sources – Renewable energy – Significance – potential achievements in India - Types of Energy used in the farms– Application of renewable energy in Agriculture- Solar, Wind, Biogas and biomass – Methods of energy conversion –Utilization of					

Agro residues by improved Chula's and biomass gas stove	
TOTAL : 30 PERIODS	
TEXT BOOKS	
1.	Michael, A.M. & Ojha, T.P. "Principles of Agricultural Engineering Vol. I & II", Seventh Edition, Jain Brothers, New Delhi, 2011
2.	Jagdishwar Sahay. "Elements of Agricultural Engineering", Standard Publishers Distributors, 2010
REFERENCES	
1.	Harry L. Field, John B. Solie, Introduction to Agricultural Engineering Technology – A problem solving approach, Springer Science, NY, USA, 2007.
2.	Michael, A.M. 2010. Irrigation -Theory and Practice, Vikas publishing house, New Delhi.
3.	Rai, G.D. 2012 (Reprint). Non- Conventional Energy Sources. Khanna Publishers, New Delhi.
4	Mehta M.L, Verma S.R, Misra S.K and Sharma V.K. 2005, Testing and Evaluation of Agricultural Machinery, Daya Publishing House, Delhi.
5	Suresh, R. 2012. Soil and Water Conservation Engineering, Standard Publishers & Distributors, New Delhi.
COURSE OUTCOMES	
At the end of the course students should be able to	
<p>CO 1: Describe about basics of Agri Engg.</p> <p>CO 2: Display about the fundamentals of Soil and water Conservation Engg.</p> <p>CO 3: Describe the different farm structures and farm equipments</p> <p>CO 4: Explain about the agricultural processing operations and machinery</p> <p>CO 5: Summarize the applications of renewable energy in agriculture</p>	

23GET104	TAMILS AND TECHNOLOGY				L	T	P	C
					1	0	0	1
UNIT I	WEAVING AND CERAMIC TECHNOLOGY						3	
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries								
UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY						3	
Designing and Structural construction House & Designs in house hold materials during Sangam Age lding 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 - ChettiNadu Houses, Indo-Saracenic architecture at Madras during British Period.								
UNIT III	MANUFACTURING TECHNOLOGY						3	
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold-Coins as source of history-Minting of Coins–Beads making-industries Stone beads – Glass beads Terracotta beads- Shell beads/ bone beats-Archeological evidences-Gem stone types described in Silappathikaram.								
UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY						3	
Dam,Tank,ponds,Sluice, Significance of Kumizhi Thoempu of Chola Period, Animal Husbandry- Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society								
UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING						3	
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.								
TOTAL : 30 PERIODS								
TEXT BOOKS								
1.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (In print)							
2.	Social Life of the Tamils -The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.							

REFERENCES	
1.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Publishedby: International Institute of Tamil Studies).
2.	Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: DepartmentofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

3.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
4	Studies in the History of India with Special Reference toTamil Nadu (Dr.K.K.Pillay) (Published by: The Author
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1: Describe about weaving and ceramic technology during sangam age CO 2: Display about the construction details of hindu temples CO 3: Describe the art of ship building CO 4: Explain about the agriculture and irrigation methods of ancient tamil people CO 5: Summarize the scientific tamil and computing methods	

23CHP101	CHEMISTRY LABORATORY (Common to All Branches)	L	T	P	C
		0	0	2	1
LIST OF EXPERIMENTS (ANY EIGHT) 30 hours					
<ol style="list-style-type: none"> 1. Estimation of alkalinity of water sample by indicator method. 2. Determination of hardness of water sample by EDTA method. 3. Estimation of Dissolved oxygen in water sample by Winkler's method. 4. Estimation of Chloride in water sample by Argentometric method. 5. Estimation of copper in brass by EDTA method. 6. Determination of strength of HCl and CH₃COOH present in a mixture conductometrically. 7. Estimation of strength of iron by potentiometric titration. 8. Determination of molecular weight of given polymer by Ostwald's viscometer. 9. Determination of Strength of HCl by pH metry. 10. Determination of corrosion rate of mild steel by weight loss method. 					
Demo Experiments					
<ol style="list-style-type: none"> 11. Synthesis of nanomaterials by chemical precipitation method. 12. Estimation of strength of iron by spectrophotometry. 					

L :0 T: 0 P: 30 T: 30 PERIODS

TEXT BOOKS	
1.	Department of Chemistry "Chemistry Laboratory Manual",2019
REFERENCE BOOKS	
1.	Vogel's "Text book of Quantitative Analysis", Jeffery G H,Basset J.Mentom J,Denney R.C.,6 th edition,EBS,2009.

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Analyze the quality of water samples through basic techniques.

CO2 Estimate the amount of metal ions in domestic and industrial waste water.

CO3: Determine the absolute viscosity and molecular weight of Organic solvents.

CO4: Interpret the corrosion rate of metals.

23ITP101	PROGRAMMING IN C AND DATA STRUCTURES LABORATORY	L	T	P	C
	(Common to BME, ECE and All Non Circuit Branches)	0	0	4	2
LIST OF EXPERIMENTS					
1	Algorithms and Flow Chart i) Sequential ii) Branching and Looping				
2	Operators & Expressions i) Arithmetic ii) Logical iii) Relational				
3	Condition Statements i) Nested if else ii) Else-if Ladder				
4	Looping i) For ii) While iii) Do-while				
5	Functions i) With and without arguments ii) With and without return type iii) Call by value and Call by reference				
6	Arrays i) Searching element in one dimensional array ii) Matrix multiplication				
7	Structures				
8	Pointers				
9	Implementation of Stack ADT				
10	Implementation of Queue ADT				
11	Implementation of Tree Traversal				
12	Implementation of Binary Search Tree ADT				
P: 60				TOTAL: 60 PERIODS	

HARDWARE / SOFTWARE REQUIRED**(For a Batch of 30 Students)**

Hardware	<ul style="list-style-type: none">• 30 PCs with Processor-2.0 GHz or Higher• RAM-1 GB or Higher• Hard disk-20 GB or Higher
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Software	<ul style="list-style-type: none">• TURBO C version 3 (or) GCC version 3.3.4• OS-Windows2000/Windows XP/NT
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COURSE OUTCOMES

At the end of the course students should be able to

CO 1: develop algorithm and draw flow chart to solve problem.

CO 2: write simple programs using basic concepts and control statements in C language.

CO 3: write programs using arrays, structures and pointers.

CO 4: implement stack and queue data structure

CO 5: implement binary search tree ADT

23AGP101	INTERNSHIP -I	L	T	P	J	C
		-	-	-	-	1
<ol style="list-style-type: none"> 1. The Internship is provided for the students to update themselves with the recent Technologies and professional skills for better prospects in the future. 2. Internship in industry subjected to permissions from Government and concern Industry subject to the conditions of following the SOP issued by the concern and written consent of the student and parents. 3. Student is supposed to produce joining letter and relieving letter once the internship is over in case of offline internship in any industry. 4. Online internship in industry/ other agencies. 5. Seminar by student under mentorship of a faculty. 6. A detailed report shall be submitted based on his Internship and shall be done by only one student. 7. A Mini Project- on some suitable topic related to the branch of study. It can be small fabrication / experimental results/ simulations / Programmes/ application development etc., depending on the branch of the student. Preferably a single student should do it. <p>Student has to prepare detailed report and submit to his / her college.</p> <ol style="list-style-type: none"> 8. A copy of report can be kept in the departments for record. 9. Each student must be assigned a faculty as a mentor from the college and an Industry expert as co-mentor. 10. The evaluation of the work done by students will be carried by the internal and external examiner. 11. External examiner will evaluate for 80marks and internal examiner will evaluate for 20 marks. 12. The presentation by student in the presence of all students is desirable. 13. Student should produce successful completion certificate in case of offline/online internship in industry 						
						2 Weeks

23HST103	INDIAN CONSTITUTION				L	T	P	C
	(Common to All B.E./B.Tech. Courses)				2	0	0	0
UNIT I	INTRODUCTION							6
Historical Background–Constituent Assembly of India–Philosophical foundations of the Indian Constitution–Preamble–Fundamental Rights–Directive Principles of State Policy–Fundamental Duties–Citizenship–Constitutional Remedies for citizens.								
UNIT II	STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT							6
Union Government– Structures of the Union Government and Functions– President–Vice President – Prime Minister– Cabinet –Parliament –Supreme Court of India –Judicial Review.								
UNIT III	STRUCTURE AND FUNCTION OF STATE GOVERNMENT							6
State Government–Structure and Functions– Governor–Chief Minister–Cabinet–State Legislature – Judicial System in States – High Courts and other Subordinate Courts.								
UNIT IV	CONSTITUTION FUNCTIONS							6
Indian Federal System–Center –State Relations–President’s Rule–Constitutional Amendments– Constitutional Functionaries – Assessment of working of the Parliamentary System in India.								
UNIT V	ELECTION COMMISSION							6
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.								
L :30					T: 0	P:0		T:30 PERIODS
TEXT BOOKS								
1	DurgaDasBasu, “Introduction to the Constitution of India”, Prentice Hall of India, NewDelhi.							
2	R.C.Agarwal, “Indian Political System”, S.Chandand Company, New Delhi.(1997)							
REFERENCES								
1	Maciver and Page, “Society: An Introduction Analysis“, Mac Milan India Ltd., New Delhi.							
2	K.L.Sharma, “Social Stratification in India:Issues and Themes”, Jawaharlal Nehru University, NewDelhi. (1997)							
3	Sharma, BrijKishore, “Introduction to the Constitution of India”, Prentice Hall of India, NewDelhi.							
4	U.R.Gahai, “Indian Political System”, New Academic Publishing House, Jalaendhar.							
5	R.N.Sharma, “Indian Social Problems”, Media Promoters and Publishers Pvt.Ltd.							
COURSE OUTCOMES:								
At the end of the course students should be able to								
CO1	Understand the functions of the Indian government.							
CO2	Know the structure and functioning of central government.							
CO3	Understand functioning of Indian constituent.							
CO4	Analyze the functions of the Indian government							
CO5	Summarize the functioning of election commission.							

SEMESTER III

23MAT201	PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS	L	T	P	C	
	(Common to AEROSPACE, AGRI, AUTO, BME, CIVIL, ECE, EEE, FT, MECH, MCT)	3	0	0	3	
UNIT I	PARTIAL DIFFERENTIAL EQUATIONS				9	
Formation of partial differential equations – Solutions of standard types of first order partial differential equations – Lagrange’s linear equation – Linear partial differential equations of second order with constant coefficients of homogeneous types – Applications.						
UNIT II	FOURIER SERIES				9	
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval’s identity – Harmonic analysis.						
UNIT III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS				9	
Classification of PDE – Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).						
UNIT IV	FOURIER TRANSFORMS				9	
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval’s identity.						
UNIT V	Z - TRANSFORMS AND DIFFERENCE EQUATIONS				9	
Z-transforms – Elementary properties – Initial and final value theorems – Inverse Z-transform using partial fraction and convolution theorem – Formation of difference equations – Solution of difference equations using Z - transforms.						
		L : 45	T:0	P: 0	J: 0	Total: 45 PERIODS
TEXT BOOKS						
1.	Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10 th Edition, New Delhi 2016.					
2.	Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44 th Edition, 2018.					
REFERENCES						
1.	Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7 th Edition, 2009.					
2.	James. G., "Advanced Modern Engineering Mathematics", 4 th Edition, Pearson Education, New Delhi, 2016.					
3.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.					

4.	Wylie. R.C. and Barrett . L.C., “Advanced Engineering Mathematics “Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
5.	Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO1	Understand how to solve the given standard partial differential equations.
CO2	Solve differential equations using Fourier series analysis which plays a vital role in Engineering applications.
CO3	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
CO4	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some physical problems of engineering.
CO5	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

23AGT201	PRINCIPLES OF SOIL SCIENCE	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ol style="list-style-type: none"> To expose the students to the fundamental knowledge on Soil classification, physical parameters and phase relationship of various soils. The students will be exposed to the soil properties and fertility. 					
UNIT I	CLASSIFICATION AND FORMATION OF SOILS	9			
Nature and origin of soil; Pedological and edaphological concepts - Definition of soil, rocks and minerals-Soil formation – Factors affecting soil formation processes –Weathering - Physical, chemical and biological weathering of soil					
UNIT II	PHASE RELATIONSHIP OF SOIL	9			
Soil texture and textural classes – Soil textural classification - Soil structure and classification – Gradation analysis- Soil consistency- Major types of soils in Tamil Nadu - Major soil types of India					
UNIT III	PROPERTIES OF SOIL	9			
Properties of Soil – Physical physical properties of soil and their significance – soil texture, structure,- Bulk density, particle density and porosity soil particle size distribution, pore space, soil colour, soil temperature, soil water. Soil physical constrains and their management, Soil inorganic colloids – their composition					
UNIT IV	SOIL WATER AND SOIL ORGANISMS	9			
Soil water - Soil water potentials – Soil moisture constants- Water movement -Infiltration, hydraulic conductivity, percolation, permeability and drainage –Soil Micro organisms -Beneficial and harmful effects.					
UNIT V	SOIL FERTILITY	9			
Soil organic matter – C : N ratio, Carbon cycle – Nitrogen cycle – Humus formation - Soil fertility - Soil nutrients - significance of macro and micro nutrients – Soil pH, Soil EC – Soil testing – Water testing - Soil test andwater test report					

L : 45	T:0	P: 0	Total: 45 PERIODS
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TEXT BOOKS	
1.	Brady Nyle C. and Ray R. Well. 2002. Nature and properties of soil. Pearson Education Inc., New Delhi. 2. Indian Society of Soil Science. 1998. Fundamentals of Soil Science. IARI, New Delhi.
2.	Tisdale, S. L., Nelson W. L., Beaton J. D. and Havlin J.L. 1995. Soil Fertility and Fertilizers. Prentice Hall of India, New Delhi
3.	Dilip Kumar Das, Introductory Soil Science, 2004, Kalyani publishers, New Delhi.

REFERENCES	
1.	Hillel D. 1982. Introduction to Soil Physics. Academic Press, London.
2.	HLS Tandon, 2006, Methods of Analysis of soils, plants, waters, fertilizers and organic manures, Fertilizer Development & Consultation Organization, New Delhi
3.	Indian Society of Soil Science, Fundamentals of Soil Science, ISSS Publication, IARI, New Delhi, 2012.
4.	T.D. Biswas and S.K. Mukherjee, Text Book of Soil Science, 2nd Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2001.
5.	Daji A.J., (1970) A Text Book of Soil Science - Asia Publishing House, Madras.

COURSE OUTCOMES	
At the end of the course students should be able to	
CO1	Understand the nature of soil and Factors affecting soil formation processes
CO2	Know about the Soil texture and textural classes
CO3	Explain the properties of soil in detail
CO4	Understand the properties of soil and its organisms
CO5	Define about soil and water testing.

23AGT202	FLUID MECHANICS AND HYDRAULICS	L	T	P	J	C
		3	0	0	0	3
COURSE OBJECTIVES:						
1. To introduce the students about the properties of the fluids, behaviour of fluids under static, kinematic and dynamic conditions through the control volume approach.						
2. The students will be exposed to the basic concepts of open channel flows with significance to steady uniform flows along with flow measurements in open channels and classification of pumps the basic principles of working.						
UNIT I	PROPERTIES OF FLUIDS					9
Properties of fluids – definition – units of measurement - Mass density – specific weight, specific volume – specific gravity - equation of state – perfect gas - Viscosity – vapour pressure – compressibility and elasticity - surface tension – capillarity. Fluid pressure and measurement – simple- manometers – introduction on mechanical gauges						
UNIT II	FLUID FLOW ANALYSIS					9

Types of fluid flow – velocity and acceleration of a fluid particle - Rotational – irrotational circulation and vorticity - Flow pattern introduction– types. Principles of conservation of mass – energy – momentum – continuity equation in Cartesian co-ordinates - Euler's equation of motion.						
UNIT III	FLOW MEASUREMENT				9	
Bernoulli's equation – applications - Venturimeter – orifice meter -pitot tube – mouth piece - Flow through orifice under variable head – time of emptying a tank with and without inflow. Flow through pipes – laminar and turbulent flow in pipes. Reynold's experiment - Darcy – Weisbach equation for friction head loss –Major and minor losses in pipes – hydraulic gradient line – energy gradient line.						
UNIT IV	OPEN CHANNEL FLOW				9	
Types of flow in channel – uniform flow – most economical section of channel – rectangular – trapezoidal. Flow measurement in channels – notches – rectangular, - Flow measurement in rivers/ streams / canals – weirs – free and submerged flow – current meter - CASE STUDY: Open Channel Aquaculture Monitoring.						
UNIT V	DIMENSIONAL ANALYSIS & PUMPS				9	
DIMENSIONAL ANALYSIS: Dimensional analysis – Fundamental dimensions – dimensional homogeneity –Buckingham Pi-Theorem- concept of geometric, kinematic and dynamic similarity. non-dimensional numbers – Reynolds, Froude.						
PUMPS: Centrifugal pumps – components – working – types of pumps and impellers - Priming – cavitation – Submersible pumps - CASE STUDY: Agriculture and Irrigation - Pump Applications.						
		L : 45	T: 0	P: 0	J: 0	Total: 45 PERIODS
TEXT BOOKS						
1.	Bansal, R. K. . “A Textbook of Fluid Mechanics and Hydraulic Machines”, (Revised 9th Edition), Laxmi Publications (P) Ltd, New Delhi, 2019.					
2.	Modi, P.N. and Seth S. M. “Hydraulics and Fluid Mechanics”. (22 nd Edition) Standard Publishers Distributors, New Delhi, 2019.					
3.	Jagdish Lal,. “Hydraulic Machines”. Metropolitan Book House, New Delhi, 2016.					
4.	Rajput, R. K.. “A Textbook of Fluid Mechanics and Hydraulic Machines”, (6 th Edition), S. Chand and Company Limited, New Delhi. 2016.					
REFERENCES						
1.	Streeter, V.L. Wylie, E. B. and Bedford K.W. “Fluid Mechanics”, (9th Edition) Tata McGraw Hill, New Delhi.. 2017					
2.	Michael A.M. and S.D. Khepar, Water Well and Pump Engineering. Tata McGraw Hill Co. New Delhi, 2008.					
3.	Chow V. T. “Open Channel Hydraulics”. Mc Graw Hill Book Co., New Delhi. 1983.					
4.	Michael A.M. Irrigation Theory and Practice, Vikas Publishing House, New Delhi, 2008.					
COURSE OUTCOMES At the end of the course student should be able to:						
CO1	Acquire knowledge of fluids in static, kinematic and dynamic equilibrium.					
CO2	Know the applicability of physical laws in addressing problems in hydraulics.					
CO3	Analyze and calculate major and minor losses associated with pipe flow in piping networks.					
CO4	Analyze the flow through open channels					
CO5	Predict the behavior of the prototype/model by applying model laws and also analyze the performance of hydraulic pumps.					

23AGT203	THERMODYNAMICS AND HEAT TRANSFER	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ol style="list-style-type: none"> 1. Impart knowledge on the basics and application of zeroth and first law of thermodynamics, second law of thermodynamics in analyzing the performance of thermal devices. 2. Teach the various properties of steam through steam tables and Mollier chart and impart knowledge on the macroscopic properties of ideal and real gases. 					
UNIT I	BASIC CONCEPTS OF THERMODYNAMICS	9			
Thermodynamics and Energy – Systems – Types and properties - State and Equilibrium - Processes and Cycles – Forms of Energy – Temperature and Zeroth law of Thermodynamics – Pure substances – Phase change processes of pure substances – Property diagrams – Internal energy – Enthalpy – Energy transfer by Heat, Work and Mass – Applications.					
UNIT II	FIRST AND SECOND LAW OF THERMODYNAMICS	9			
First law of thermodynamics – Energy balance for closed systems and steady flow systems – Applications of First law of Thermodynamics – Energy balance for Unsteady flow processes Second law of Thermodynamics – Entropy – Carnot principles – Change in Entropy – Entropy and irreversibility - Applications.					
UNIT III	HEAT ENGINES	9			
Internal Combustion Engines – C.I and S.I Engines – Four Stroke and Two Stroke Engines – Gas Turbines - Boilers – Fire Tube Boiler & Water Tube Boilers , Boiler Accessories and Components. Turbines – Impulse Turbine and Reaction Turbine , Turbine Components - Refrigeration Cycle – Vapour Compression & Vapour Absorption System , Gas Refrigeration System – Environmental friendly Refrigerants – Air Conditioning.					
UNIT IV	GASES AND VAPOUR MIXTURES	9			
Ideal and Real gases – Vander waals equations – Reduced property – Compressibility chart - Properties of mixture of gases – Dalton’s law and Gibbs – Dalton law – Internal energy, Enthalpy and specific heats of gas mixtures.					
UNIT V	HEAT TRANSFER	9			
Conduction – Plane Wall, Cylinder system, Composite Walls – Critical insulation thickness – Simple, fins convection – Free convection and forced convection – Flow over Flat plates and Flowthrough Pipes – Radiation – Black Body, Grey Body Radiation					
		L : 45	T : 0	P : 0	Total: 45 PERIODS
TEXT BOOKS					
1.	Yunus A. Cengel and Michael A.Boles, “Thermodynamics: An Engineering Approach”, Fourth Edition, Tata McGraw-hill, 2004.				
2.	Michael J.Moran, Howard N.Shapiro, “Fundamentals of Engineering Thermodynamics”, Fourth Editon, John wiley & Sons, 2000.				
REFERENCES					
1.	R.K.Rajput, “A Text book of Engineering Thermodynamics”, Third Edition, Laxmipublication (P) Ltd., 2007.				
2.	Nag.P.K., “Engineering Thermodynamics”, Third Edition, Tata McGraw hill, 2005.				

3.	Domkundwar.S., C.P.Kothandaraman “A course in Thermal engineering”, Fifth Edition, Dhanpat Rai & Co (P) Ltd, 2000.
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COURSE OUTCOMES	
At the end of the course student should be able to:	
CO1	Know about the basic concepts of thermodynamics
CO2	Understand the first and second law of thermodynamics and its applications
CO3	Know about the basics of Heat Engines
CO4	Understand the concepts of gases and vapour mixtures
CO5	Familiarise the modes of heat transfer

23AGT204	SURVEYING AND LEVELLING	L	T	P	C
		2	0	0	2
COURSE OBJECTIVES:					
1. This course deals with the concept of basic engineering survey which ensures the quality of the project because it can provide accurate data for the subsequent construction.					
2. The students are required to develop such competency to carry out the given type of survey using relevant equipment's so as to prepare the plan to interpret the information to take the appropriate decisions.					
UNIT I	OVERVIEW AND CLASSIFICATION OF SURVEYING	6			
Introduction –History of Surveying - Principles and basic concepts and uses of surveying -Types, branches, and methods of surveying- Process of Survey - Units of Measurement- Responsibilities, Role and task of a surveyor- Responsibilities, Role and task of a survey assistant, Survey control stations – Definition, protection measures, Ranging - Direct and Indirect methods					
UNIT II	CHAIN SURVEYING	6			
Introduction – Principles of chain surveying –Instruments involved in chain surveying, Types of chain, Selection of survey stations and lines - Offsets - types, Measurement - cross-staff and optical square - Steps involved in Chain Survey - Reconnaissance, Index sketch, Reference sketch, Booking entries in field book - Testing of Chain, Degree of accuracy in chaining, Errors and compensation - cumulative, mistakes					
UNIT III	LINEAR MEASUREMENT AND COMPUTATION OF AREA, VOLUME	6			
Linear Measurement - Types– Traditional Distance measurement, Equipment for traditional methods - Electronic Distance measurement- Principle of EDM operation – Errors affecting EDM Operation - classification of EDM instruments – Formulae for calculation of area, Mid-Ordinate rule, Average ordinate rule, Trapezoidal rules, Simpson rule -Computation of volume.					
UNIT IV	COMPASS TRAVERSING	6			
Basic terminologies of Compass traversing, Geographic/True Magnetic and Arbitrary Meridians and Bearings, Meridian and Bearing – Whole Circle Bearing System and Reduced Bearing System- Numerical on converting given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing - Calculation of internal and external angles from bearings at a station – Types of compass, Prismatic and Surveyors Compass - Checking the accuracy of the traverse - Errors and mistakes in Compass survey.					
UNIT V	LEVELLING	6			
Levelling - definition, terminologies- Different types of levels - Dumpy, Auto level, Digital level, Fundamental axis of Dumpy Level. Temporary adjustments of Level - Types of Levelling Staffs: Self-reading staff and Target staff - Basic principles of leveling - Theory of simple, compound, cross sectional and reciprocal levelling - Reduced level by Plane of collimation method and Rise/ Fall Method- Numerical Problems					
		T: 30	P: 0	Total: 30 PERIODS	
TEXT BOOKS					
1	Punmia, B.C, Jain, Ashok Kumar, Arun Kumar “Surveying (Vol- I &Vol-II)” Laxmi publications, New Delhi. 1991.				

2	Michael Minchin “Introduction to Surveying 2 nd Edition”, Department of Training and workforce development, Australia, 2003
3.	S. K. Duggal, Survey I, McGraw Hill Education, New Delhi, ISBN:978-00-701-5137-6
REFERENCES	
1	Kanetkar, T.P. & Kulkarni, S.V., “Surveying & leveling”. Part –I, A.V.G. Prakashan, Poona. 1984.
2	A Text Book of Surveying and Levelling, R. Agor, 2013, Khanna Publs., New Delhi.
3	S.K. Roy, 2014, Fundamentals of Surveying, Khanna Publs., New Delhi
4	R. Subramanian, 2014, Surveying and Levelling, Oxford University Press
5	Basak, N. N. “Surveying & leveling”. McGraw Hill Education, New Delhi ISBN93-3290-153-8

COURSE OUTCOMES

At the end of the course student should be able to:

CO1	Suggest a relevant type of survey required for the given situation
CO2	Know about different aspects of chain surveying
CO3	Calculate the area and volume of earthwork needed to construct farm structures.
CO4	Know about compass traversing
CO5	Determine Reduced Level to prepare maps for the given type of terrain

23GET275	VQAR-I	L	T	P	C
	(Common to All B.E./B.Tech.Courses)	2	0	0	2
UNIT I	QUANTITATIVE ABILITY I				8
Number theory- Shortcuts, Divisibility rule-Unit placed education –LCM & HCF, Square root and Cube Root, Decimal & Fraction Percentage, Profit, loss and discount, Simple and compound interest, Ratio & Proportions, Mixtures & Allegation, Partnership.					
UNIT II	QUANTITATIVE ABILITY II				6
Problems on Ages, Average, Clocks, Calendar, Data Interpretation-Bar chart-Piechart-Linechart-Tables chart.					
UNIT III	VERBAL REASONING I				7
Analytical reasoning–Linear and circular arrangement, Blood relation, Direction Problems, Puzzles. Logical reasoning - Number and Alpha series, Odd man out, Element series and Logical series, Coding and decoding, Analogy, Classification, Logical sequence of words.					
UNIT IV	LINGUISTICS SKILLS I				6
PartsofSpeech-Noun,Verb,Participle,Articles,Pronoun,Preposition,Adverb,Conjunction.Logical Sequence of words, Tense&Voice, Comparison.					
UNIT V	LINGUISTICS SKILLS II				3
Comprehension-Comprehend and understand paragraph, Paragraph writing.					
		L :30	T: 0	P:0	T: 30 PERIODS

TEXTBOOKS	
1	RajeshVarma,“Fast Track Objective Arithmetic”, Arihant Publications.
2	M.K.Panday,“Analytical Reasoning”, Magical Series.
3	BSSijwali-InduSijwali, ANewApproach to “Reasoning Verbal, Non-Verbal & Analytical”, Arihant Publications.
4	John Eastwood,“Oxford Practice Grammar”, Oxford.
REFERENCES	
1	R.V.Praveen, “Quantitative Aptitude and Reasoning” PHI Publication.
2	R.S.Agarwal,“Quantitative Aptitude for Competitive Examinations”,S.Chand&CompanyPvt Limited.
3	R.S.Agarwal, “A modern approach to Verbal & Non-verbal reasoning”, S.Chand & Company Pvt Limited.
COURSEOUTCOMES:	
At the end of the course students should be able to	
CO1	Apply the number system for solving application- orientated concepts in quantitative aptitude.
CO2	Apply the financial ability for solving application-orientated concepts in quantitative aptitude and in the data interpretation techniques.
CO3	Analyze the analytical reasoning and logical reasoning in verbal aptitude applications.
CO4	Apply appropriate grammar in both speaking and writing.
CO5	Analyze the given content and write a creative content.

23AGP201	SURVEYING LABORATORY	L	T	P	C
		0	0	4	2
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> 1. Plotting the outline of the given building-cross staff survey 2. Determination of the area of closed traverse using chain surveying 3. Compass traversing – Measuring bearings & arriving Included angles- Open Traverse 4. Compass traversing – Measuring bearings & arriving Included angles- Closed Traverse 5. Plane table surveying – Radiation method 6. Plane table surveying – Intersection method 7. Plane table surveying – Closed traversing method 8. Measurement of horizontal angles by repetition method 9. Measurement of horizontal angles by reiteration method 10. Measurement of Vertical angles 11. Fly levelling -Height of collimation method 1. Fly levelling -Rise and fall method 					
L : 0		T: 0	P: 60	Total:60 PERIODS	

COURSE OUTCOMES	
At the end of the course student should be able to:	
CO1	Acquire skill on chain and compass surveying
CO2	Gain experience on plane table surveying
CO3	Hands on experience on operating Compass
CO4	Acquire knowledge on utilisation of Theodolite
CO5	Gain practical knowledge on levelling

23ITP204	PROGRAMMING IN PYTHON (Common to All B.E/B.Tech Programme Except CSE, IT and AIML)	L	T	P	C
		0	0	4	2
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> 1. Program for various base conversion functions. 2. Programs to demonstrate the usage of operators and conditional statements 3. Programs to demonstrate usage of control structures 4. Program using array operation 5. Programs to demonstrate the usage of String functions 6. Program using classes and functions 7. Program to implement recursive function. 8. Program to implement lambda function. 9. Program on file manipulation 10. Programs to demonstrate the usage of lists, sets, dictionaries and tuples. 11. Program to implement function template. 12. Program to implement class template 					
L: 0 T:0 P:60 TOTAL:60 PERIODS					
COURSE OUTCOMES					
At the end of the course student should be able to:					
CO1	Write simple programs using built-in data types of Python.				
CO2	Apply the conditional statements and loops for solving problems.				
CO3	Implement arrays, strings and functions in Python				
CO4	Identify the commonly used operations involving lists, sets, dictionaries, tuples and file handling in real time applications.				
CO5	Implement exemplary applications related to templates for solving real time problems.				

23AGP202	MINI PROJECT - I				L	T	P	C
					0	0	2	1
Guidelines								
<ol style="list-style-type: none"> 1. The scope of the project work is to enable the students in convenient groups (not more than 4 members) involving theoretical and experimental studies through Design Thinking approach. 2. The aim of the project work is to deepen comprehension of principles by applying them to a new problem based on the courses such as Thermodynamics and Heat Transfer, Fluid Mechanics, Principles of Soil science, Surveying and Levelling and Python programming studied by the students in the current semester of study. 3. Project periods shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project. 4. Create a model/fabricate a model/conduct experiment/simulate mechanical system/implement the same. Analyze data, evaluate the results and conclude the appropriate solution, suggestion for feature work. 5. The continuous assessment shall be made according to the regulation which is tabulated below. 6. The progress of the project is evaluated based on a minimum of two reviews. 7. The review committee may be constituted by the Head of the Department 8. Each student shall finally produce a comprehensive report covering background information, empathy, problem statement, project work details, result, conclusion and publications. 9. This final report shall be typewritten form as specified in the guidelines. 								
					L : 0	T: 0	P: 30	Total: 30 PERIODS

SEMESTER IV

23MAT204	STATISTICS AND NUMERICAL METHODS	L	T	P	C
	(Common to AEROSPACE, AGRI, AUTO, EEE, FT, MECH)	3	0	0	3
UNIT I	TESTING OF HYPOTHESIS				9
Sampling distributions – Tests for single mean, proportion and difference of means (large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.					
UNIT II	DESIGNS OF EXPERIMENTS				9
One way and two way classifications – Completely randomized design – Randomized block design – Latin square design – Applications of ANOVA.					
UNIT III	SOLUTIONS OF EQUATIONS				9
Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting Gauss Jordan methods – Iterative methods of Gauss Jacobi and Gauss Seidal.					
UNIT IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION				9
Lagrange's interpolation – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single integration using Trapezoidal and Simpson's 1/3 rules.					
UNIT V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS				9
Single step methods: Taylor's series method – Euler's method – Modified Euler's Method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods: Milne's predictor-corrector methods for solving first order equations.					
		L : 45	T: 0	P: 0	Total: 45 PERIODS
TEXT BOOKS					
1.	Grewal, B.S., and Grewal, J.S., "Numerical methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.				
2.	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and statistics for Engineers", Pearson Education Asia, 9th Edition, 2018.				
REFERENCES					
1.	Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.				
2.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9 th Edition, Cengage Learning, 2016.				
3.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8 th Edition, 2014				
4.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7 th Edition, 2007.				
5.	Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill edition, 4th Edition, 2012.				

23AGT205	STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING	L	T	P	C
		2	0	0	2
COURSE OBJECTIVES:					
<ol style="list-style-type: none"> 1. This course deals with the concept of forces, force systems and moments under static condition. It also introduces the concept of simple stresses and strains subjected to axial force, bending and shear to understand the behaviour of member of a structure. 2. It introduces various concepts and simple analysis techniques of structural components 					
UNIT I	CONCEPT OF SHEAR FORCE AND BENDING MOMENT	6			
Concept of shear force and Bending Moment-shear force and bending Moment diagrams For cantilever and simply supported beams subjected to point load, uniformly distributed loads, uniformly varying load and their combinations					
UNIT II	THEORY OF SIMPLE BENDING	6			
Theory of simple and pure bending-Bending equation- Section modulus (only for Rectangular, hollow rectangular)- Shear stress distribution for rectangular beam section-Torsion, Combined loading- Beams with axial load- bending and torsion- torsion and tension- bending and shear					
UNIT III	SLOPE AND DEFLECTION	6			
Slope and deflection at a section - Double Integration and Macaulay's method for Simply supported, Introduction to determinate and indeterminate structures-Static and kinematic in determinacies					
UNIT IV	THEORY OF COLUMNS	6			
Short and long columns - Euler's method and its limitation, Types of end conditions of columns- column with both ends hinged - one end fixed other free- both ends fixed- with one end fixed and other hinged, Rankine's formula for columns effect of eccentric loading					
UNIT V	STABILITY ANALYSIS OF GRAVITY DAMS	6			
Dams, types, stresses at the base width of dams - conditions for the stability of a dam, Minimum base width, and maximum height of a dam- Applications					
		L : 30	T: 0	P: 0	Total: 30 PERIODS
TEXT BOOKS					
1.	R.K.Bansal (2005), Strength of Materials, Laxmi Publications				
2.	S. Ramamrutham & R.Narayanan (2005), Strength of Materials, Dhanpat Raipublications				
3.	Garg, S.K. Irrigation Engineering and Hydraulic Structures. Khanna Pub.				
REFERENCES					
1.	Jain, A.K., Punmia, B.C., Jain, A.K., (2004). Theory of Structures. Twelfth Edition, Laxmi Publications.				
2.	Timoshenko,S.P..and D.H. Young, Elements of Strength of Materials, Fifth Edition, East West Press				
3.	Gere & Thimoshenko (2004), Mechanics of Materials, CBS Publishers & Distributors				
4.	S.S.Bhavikatti (2012), Engineering Mechanics, New Age International Publishers				
5.	Yoo, C.H., Lee, S.C. (2011). Stability of Structures: Principles and Applications. Elsevier.				

COURSE OUTCOMES

At the end of the course student should be able to:

CO1: Practice shear force and bending moment computations and construct shear force and bending moment diagrams

CO2 : Analyze the structural concept of determinate & indeterminate structures and Combined loading

CO3 : Compute bending stresses and deflection in determinate beams

CO4 : Evaluate theories to design columns and understand the effect of eccentric loading

CO5 : Understand and analyze the stresses in gravity dam

23AGT206	UNIT OPERATIONS IN AGRICULTURAL PROCESS ENGINEERING	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ol style="list-style-type: none"> The students would be exposed to the fundamental knowledge in Evaporation, Filtration, Sedimentation, Processing, Sieve analysis, Crystallization in processing of agricultural produce. Impart knowledge on the basics of drying and will be exposed to different types of dryers. 						
UNIT I	EVAPORATION					9
Evaporation – definition – liquid characteristics – single and multiple effect evaporation, performance of evaporators and boiling point elevation – capacity – economy and heat balance types of evaporators – once through and circulation evaporators – short tube evaporators and long tube evaporators – agitated film evaporator						
UNIT II	MECHANICAL SEPARATION					9
Sedimentation in liquids - Gravitational sedimentation – Floatation -Sedimentation of particles in gas. Centrifugal separation – Velocity of particles – Radius of neutral zone – Measurement- Equipment's. Filtration – Constant rate and Constant pressure filtration – Area calculation- Equipment's, Sieving effectiveness and Applications						
UNIT III	SIZE REDUCTION					9
Fibrous foods, Dry foods and Liquid foods – Calculation of Energy Used in Grinding. New Surface Formed by Grinding. Grinding and Cutting equipment's - Crushers, Hammer mills, Fixed head mills, Ball mills, Plate mills and Roller mills. Cutters - Slicers, Dicers, Shredder and Pulper. Size reduction in liquids						
UNIT IV	DRYING					9
Basic drying theory, heat and mass transfer in drying, drying rate curves, calculation drying times, dryer efficiencies; classification and selection of dryers; tray, vacuum, osmotic, fluidized bed, pneumatic, rotary, tunnel, trough, bin, belt, microwave, IR, heat pump and freeze dryers; dryers for liquid: Drum or roller dryer, spray dryer and foam mat dryers						
UNIT V	CRYSTALLISATION					9
Crystallization-Equilibrium –Rate of crystal growth stage-Equilibrium crystallization-Crystallizers. Equipment- Classification- Construction and operation – Crystallizers-Tank-Agitated batch Swenson-Walker and Vacuum crystallizers-Distillation-Binary mixtures-Flash and differential distillation-Steam distillation –Theory- Continuous distillation with rectification –Vacuum distillation -Batch distillation-Operation and process- Advantages and limitation-Distillation equipment Construction and operation-Factors influencing the operation.						
		L: 45	T: 0	P: 0	Total: 45 PERIODS	

TEXT BOOKS	
1	Paul Singh R. and Dennis R. Heldman, -Introduction to Food Process Engineering, 5 th Edition, Academic Press, USA,2014
2	R.L. Earle, Unit Operations in Food Processing, Pergamon Press, New York,1989
REFERENCES	
1	Geankoplis, C.J. “Transport Processes and Separation Process Principles”, 4th Edition, Prentice Hall, 2003.
2	Coulson, J.M and J.F. Richardson. Chemical Engineering. Volume I to V. The Pergamon Press. New York, 1999
3	Albert Ibarz and Gustavo V. Barbosa-Cánovas. Unit Operations in Food Engineering. CRC Press LLC, Florida, 2003..
4	K. M. Sahay and K.K.Singh, Unit operations of Agricultural Processing, Vikas Publishing House Pvt. Ltd., New Delhi, 2004.
5.	Fellows P.J., "Food Processing Technology: Principles and Practice", 4rd Edition, Woodhead Publishing Ltd, New Delhi, 2016
COURSE OUTCOMES	
At the end of the course student should be able to:	
CO1	Investigate the evaporation process and varieties of evaporators for the food sector.
CO2	Analyze the principles of filtration and mechanical separation equipment.
CO3	Identify size reduction and grinding equipment and understand the factors affecting the Process.
CO4	Identify the gas-liquid and solid-liquid equilibrium concepts and factors influencing equilibrium separation process.
CO5	Differentiate crystallization and distillation processes and identify processing equipment.

23GET276	VQAR-II			L	T	P	C
	(Common to All B.E. / B. Tech. Courses)			2	0	0	2
UNIT I	QUANTITATIVE ABILITY III						6
Time, speed & distance- Average speed- Relative speed- Train problems- Boats and streams- Races, Chain rule, Time and work -Pipes and cisterns							
UNIT II	QUANTITATIVE ABILITY IV						4
Permutation & Combination, Probability, Mensuration							
UNIT III	VERBAL REASONING II						7
Machine Input and Output, Coded Inequalities, syllogisms, Problems on Cubes, Data sufficiency. Critical Reasoning -Statement and Argument, Statement and Assumption, Statement and Conclusion, Cause and effect, Course of action.							
UNIT IV	NON- VERBAL REASONING						5
Figure series, Odd man out, Mirror Image, Water image, Embedded Image, Cubes and Dices, Insert the Missing Characters, Analytical reasoning.							
UNIT V	LINGUISTICS SKILLS III						8
Sentences - Simple, Compound, Complex & Mixed sentences, Sentence Rearrangement, Idioms & Phrases, Reading Comprehension at higher level, Word Substitution, Synonyms & Antonyms, Error Spotting.							
				L :30	T: 0	P: 0	T: 30 PERIODS
TEXT BOOKS							
1	Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications.						
2	M.K.Panday, "Analytical Reasoning", MagicalSeries.						
3	BS Sijwali- Indu Sijwali, A New Approach to "Reasoning Verbal, Non-Verbal & Analytical", Arihant Publications.						
4	S.P.Bakshi, "Objective English" Arihant Publications.						
REFERENCES							
1	R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication.						
2	R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited.						
3	R.S.Agarwal, "A modern approach to Verbal & Non-verbal reasoning", S.Chand & Company Pvt Limited.						
COURSE OUTCOMES :							
At the end of the course students should be able to							
CO1	Learn the time and distance for solving application orientated concepts in quantitative aptitude						
CO2	Apply the financial ability for solving application orientated concepts in quantitative aptitude						
CO3	Analyze the verbal reasoning and the critical reasoning in quantitative aptitude.						
CO4	Analyze the non-verbal reasoning in verbal aptitude applications						
CO5	Apply appropriate LSRW skills						

23AGT207	ENGINEERING PROPERTIES OF AGRICULTURE PRODUCE			L	T	P	C
				2	0	0	2
COURSE OBJECTIVES:							
<ol style="list-style-type: none"> 1. This course deals with various engineering properties such as physical, mechanical, thermal, electrical and rheological and its importance in Agriculture produce. 2. Relate engineering properties of food and agricultural materials to process design and quality control. 							
UNIT I	PHYSICAL PROPERTIES						6
Introduction, Classification, and the importance of engineering properties in the design of agricultural machinery. Physical Properties: shape, size, roundness, sphericity, volume, density, porosity, specific gravity, the surface area of grains, fruits, and vegetables.							
UNIT II	MECHANICAL PROPERTIES						6
Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, Rolling resistance coefficient of friction, Flow of bulk granular materials, coefficient of friction between granular material.							
UNIT III	THERMAL PROPERTIES						6
Thermal properties; co-efficient of thermal expansion, friction in agricultural materials; static friction, kinetic friction, rolling resistance, angle of internal friction, angle of repose, flow of bulk granular materials, Aero dynamics of agricultural products, drag coefficients, terminal velocity.							
UNIT IV	ELECTRICAL PROPERTIES						6
Conductivity and dielectric constant, method of determination. dielectric loss factor, loss tangent, A.C, electric conductance, electric resistance, resistivity, impedance, admittance, permittivity, relative permittivity. Application of engineering properties in handling processing machines and storage structures.							
UNIT III	RHEOLOGICAL PROPERTIES						6
Rheological properties: force, deformation, stress, strain, elastic, plastic and viscous behavior, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non-Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves. Electrical properties: dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination.							
				L:30	T: 0	P: 0	Total: 30 PERIODS
TEXT BOOKS							
1	Mohesin, N.N. 1980. Physical Properties of Plants & Animals. Gordon & Breach Science Publishers, New York.						
2	Singhal OP and Samuel DVK. 2003. Engineering Properties of Biological Materials. Saroj Prakashan						
3.	Rao, M.A. and Rizvi, S.H., 1995. Engineering Properties of Foods. Marcel Dekker Inc. New York						
REFERENCES							
1	Rao, M.A. and Rizvi, S.H., 1995. Engineering Properties of Foods. Marcel Dekker Inc. New York.						
2	Singhal OP & Samuel DVK. 2003. Engineering Properties of Biological Materials. Saroj Prakashan.						
3	Prentice, J.H. 1984. Measurement in Rheological Properties of Food Stuffs. Elsevier Applied science Pub. Co. Inc. New York.						

4	Singhal OP and Samuel DVK. 2003. Engineering Properties of Biological Materials. Saroj Prakashan, New Delhi
5	Serpil S and Servet G S.2005. Physical Properties of Foods. (Springer Science+Business Media, LLC, 233 Spring Street, New York,
COURSE OUTCOMES	
At the end of the course student should be able to:	
CO1	Gain Knowledge on Concepts of engineering properties of agriculture produce.
CO2	Analyse the aerodynamic properties of agricultural products
CO3	Examine the thermal properties, rheological properties and electrical properties of food
CO4	Determine the physical and frictional properties of food materials
CO5	Relate engineering properties of food and agricultural materials to process design and quality control.

23CST205	OBJECT ORIENTED PROGRAMMING USING JAVA	L	T	P	C
		3	0	0	3
UNIT I	INTRODUCTION TO OOP				9
Object Oriented Programming concepts–Objects–Classes–Inheritance– polymorphism – Abstraction–Encapsulation, Features of Java, Byte code and Java Virtual Machine, JDK					
UNIT II	INTRODUCTION TO JAVA				9
Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.					
UNIT III	OBJECTS AND CLASS				9
Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.					
UNIT IV	INHERITANCE AND POLYMORPHISM				9
Inheritance- Super class - Sub class - protected members - constructors in sub class – Overriding – Abstract class-Final methods and classes, Interfaces, Packages.					
UNIT V	MULTI THREADING IN JAVA				9
Multithreading - Thread life cycle and methods, Thread Creation, Thread synchronization, Inter-thread communication,Exception handling with try-catch-finally					
		T:45	P: 0	Total: 45 PERIODS	
TEXT BOOKS					
1	Herbert Schildt, “Java: The Complete Reference”, 11 th Edition, McGraw Hill Education, New Delhi, 2019.				
REFERENCES					
1	Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11 th Edition, Prentice Hall, 2018.				
COURSE OUTCOMES					
At the end of the course student should be able to:					
CO1	Understand the basic concepts of OOP				
CO2	Adapt control structures and looping in solving problems				
CO3	Apply the concepts of classes and objects in real time applications				
CO4	Develop programs using inheritance, packages and interfaces				
CO5	Make use of exception handling mechanisms and multithreaded model to solve real world problems				

23AGB201	TRACTOR AND AUTOMOTIVE ENGINES	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
1. To introduce the students to the different systems and working principles of tractor, tractor engine systems and its control.					
2. Imparts the knowledge on testing aspects of power tiller and tractor.					
UNIT I	INTRODUCTION	6+6			
Tractor engines – Engine operation-Understanding the working principle of a Diesel engine - 4 Stroke compression- Ignition engine cycle-Inlet and Outlet valves– Valve timing diagram- Engine efficiency - Engine operating cycle -Firing order –Firing interval - Combustion chambers – Construction details of engine blocks, Cylinder head and Crankcase - Features of cylinder , Piston, Connecting rod and Crankshaft.					
Lab Experiments:					
Hand tools used in garage-fault diagnosis.					
Study of valve and valve actuation systems					
UNIT II	TRACTOR ENGINE SYSTEMS	6+6			
Air and fuel supply-air cleaner- Fuel pump- Exhaust– Silencer. Cooling and lubrication system- Starting and electrical system-Transmission system-clutches, brakes, power train- transmission- Gears- Types of high and low gears transmission- Gearbox- Differential and final drive mechanism- Engine governing .Steering geometry– Steering systems- Front axle and wheel alignment Brake– types.					
Lab Experiments:					
Study of tractor engine systems using a working model of a tractor engine					
Piston and cylinder-inspection – reconditioning and assembly of cranking system.					
UNIT III	POWER OUTLETS AND TRACTOR CONTROL	6+6			
Tractor PTO, Belt-pulley, properties of Hydraulic fluids- Hydraulic system -hydraulic couplings, Torque convertors- Hydraulic circuits- position and draft control- Weight transfer-theory of traction- Tractive efficiency–Tractor chassis mechanics- Stability- longitudinal and lateral .Controls- visibility–operator’s seat.Tractor Hitching.					
Lab Experiments:					
Study of fuel system assembly and adjustment					
Study of lubricating system components.					
UNIT IV	TESTING OF POWER TILLER AND TRACTOR	6+6			
Power tiller-Special features-Clutch-Gearbox-Steering and brake. Makes of tractors and power tillers. Types of tests-test procedure- Need for testing & Evaluation of farm tractor–Test codes for performance testing of tractors and power tillers. Cost of operation of tractors and power tillers.					
Lab Experiments:					
Study of cooling system components.					
Study of transmission system-assembly of gearbox, differential and final drive					
UNIT V	ERGONOMICS AND ENVIRONMENTAL PROTECTION	6+6			
Ergonomic aspects of tractors and power tillers- Substitution of fossil fuels with Biofuels to protect the environment from GHG pollution-case studies on EV tractors.					
Lab Experiments:					
Study of brake and its adjustment-Steering system– assembly and adjustment-wheel tread Adjustment					
Study of Tyres, Rims and Balancing methods of a tractor					
Visit to tractor/power tiller manufacturing companies					
		T: 30	P: 30	Total: 60 PERIODS	
TEXT BOOKS					
1	Sanjay Kumar, 2007, A TEXT BOOK OF TRACTOR AT A GLANCE, International book distributing company, Lucknow.				
2	R.K. Veera Selvam, Farm Machinery and Power, Oxford Book Company, 2010,ISBN 10: 9380179634 / ISBN 13: 9789380179636				

3	Barger, E.L., J.B. Lilijedahl and E.C. Mc Kibben, 1997. Tractors and their power units. Wiley Easterb Pvt Ltd, New Delhi
4	Nakra C.P 1970. FARM MACHINERY AND EQUIPMENT: Dhanpat Rai Publishing Company Ltd, New Delhi
REFERENCES	
1	S.C.Jainand C.R.Rai, Farm tractor maintenance and repair. Standard publishers and distributors ,NewDelhi, 1999.
2	Jagadishwar Sahay, 1992. Elements of Agricultural Engineering. Agro book agency, Patna – 20.
3	Ralph Alcock, 1986, Tractor implement system. AVI Pub, co., Inc. West poert, Connecticut.
4	Sreevastave, A.C., 1990. Elements of Farm Machinery, Oxford and IBH Publication Co. New Delhi.
5	Mechanic Tractor, February 2016, Sector: Automobile, Common for Mechanic Tractor/ Mechanic Agriculture Machinery, Trade Practical, Developed by National Instructional Media Institute, Directorate General of Employment & Training, Ministry of Labour & Employment, Government of India, Chennai.
COURSE OUTCOMES	
At the end of the course student should be able to:	
CO1	Possess the knowledge on the working principle of diesel engine and engine components
CO2	Know about tractor engine systems
CO3	Know about taking power output from a tractor and tractor control
CO4	Know about testing of tractor and power tiller
CO5	Know about ergonomic aspects of tractors and power tillers

23AGP203	CROP PRODUCTION PRACTICES	L	T	P	C
		0	0	2	1
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> 1. Acquiring skill on the organizational setup of the agricultural farm and studying basic requirements of crop production 2. Studies of climatic factors on crop growth - meteorological instruments 3. Practicing different sowing / planting methods; fertilizers and irrigation methods 4. Practicing different weed management practices; cropping system in intensive or organic farming 5. Study the integrated pest and diseases management practices 6. To identify the damage symptoms of pest and diseases 7. Practicing cultivation operations of major cereal, pulse and Oil seed crops 8. Practicing cultivation operations of Bhendi 9. Practicing cultivation operations of Brinjal crop 10. Practicing cultivation operations of Tomato, Mint and Coriander crop 11. Practicing cultivation operations of different Gourds crop 					
		L : 0	T: 0	P: 30	Total:30 PERIODS

COURSE OUTCOMES	
At the end of the course student should be able to:	
CO1	Understand the concepts and principles of crop growth, climate influence, soil fertility and tillage to increase the crop productivity

CO2	Apply the various agronomic inputs for raising different crops under organic or intensive cultivation through use of improved varieties or hybrids and the liberal use of irrigation, fertilizers and weed management to increase the food production.
CO3	Identify the major insects, diseases and their damage symptoms to suggest the better management practices
CO4	Apply the various cultivation practices for major cereals, oil seeds crops and pulse crops
CO5	Apply the various cultivation practices for major vegetable crops

23CSP205	OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY				L	T	P	C
		0	0	3	1.5			
LIST OF EXPERIMENTS								
<ol style="list-style-type: none"> 1. Solving programs with I/O Statements 2. Solving programs using Data types, variables and Operators 3. Solving problems using Control structures 4. Solving problems using arrays 5. Programs using class, methods and objects using overloading 6. Programs using class and constructors 7. Programs employing inheritance 8. Programs employing Polymorphism 9. Programs employing Abstract Class 10. Solving problems using the concept of Exception Handling 11. Solving problems using the concept of Multithreading 								
HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS								
Hardware								
<ul style="list-style-type: none"> ▪ LAN System with 33 nodes (OR) Standalone PCs – 33 Nos. ▪ Printers – 3 Nos. 								
Software								
<ul style="list-style-type: none"> ▪ Java/J2SE Compiler, NetBeans 								
		L : 0	T : 0	P : 45	Total: 45 PERIODS			

COURSE OUTCOMES	
At the end of the course student should be able to:	
CO1	Solve simple problems using data types, variables, operators in Java.
CO2	Discover the use of control structures and Looping using classes and methods.
CO3	Infer the use constructors in solving real time applications
CO4	Apply the concepts of inheritance, polymorphism and packages to solve real world problems.
CO5	Develop applications using the concept of threads and exceptions.

23GEP275	PERSONAL BRANDING (PRACTICAL)				L	T	P	C
					0	0	4	2
UNIT-I	SELF-AWARENESS & PERSONAL DEVELOPMENT							
Self-Awareness: Key Areas -Personality, Values, Habits, Needs & Emotions, Impact of Self-Awareness on Personal Development Personality –Definition, Elements, Determinants, Needs and Benefits, Personality traits. Personality development skills, Positive traits for effective people, SWOT :Analyzing Strength and weakness (SWOT), Building Esteem & Self-Confidence, Working on attitudes (aggressive, assertive, submissive), Self-Motivation								
UNIT-II	BODY LANGUAGE							
Body Language and Gestures, Personal Grooming, Personal Hygiene, Social Effectiveness, Business Etiquette								
UNIT-III	INTERVIEW AND LEADERSHIP SKILLS							
Resume Building, Video Resume, Leadership Styles, Leadership Traits, Group Dynamics- Conflict management								
UNIT-IV	SOCIAL IMAGE TRAITS							
Social etiquettes -Positive Social Image, Social Graces, Online Etiquettes, Dining Etiquettes, Voice Modulation, – Networking: Case Study and Company website references.								
UNIT-V	PERSONALITY TEST							
Big Five Personality Test, Open DISC Assessment Test.								

TEXT BOOKS	
1	Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2	Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th Edition: Prentice Hall.
REFERENCES	
1	Smith, B. Body Language. Delhi: Rohan Book Company. 2004
2	Personality Development and Career management: By R.M.Onkar (S Chand Publications)

Practical-60 Hours, Total 60 Hours

List of Exercises	
1	Swot Analysis
2	Grooming, Dressing and Photo-shoot
3	Body Language, Handshaking
4	Art of Storytelling, Marketing & selling yourself
5	Self-Discipline: Goal setting (Qualitative and Quantitative)
6	Teamwork & Leadership Activity
7	Dealing with Pressure, Failure & Decision Making
8	Psychological/Personality test
9	Video Resume
10	Business Card creation

11	Social Profiling in FB/Insta/Linked In/Personal Website
12	Online Interview
13	Speed Interview
14	Networking Event-Online/Offline

23AGP204	INTERNSHIP - II	L	T	P	C
		0	0	4	2
<ol style="list-style-type: none"> The Internship is provided for the students to update themselves with the recent Technologies and professional skills for better prospects in the future. Internship in industry subjected to permissions from Government and concern Industry subject to the conditions of following the SOP issued by the concern and written consent of the student and parents. Student is supposed to produce joining letter and relieving letter once the internship is over in case of offline internship in any industry. Online internship in industry / other agencies. Seminar by student under mentorship of a faculty. A detailed report shall be submitted based on his Internship and shall be done by only one student. A Mini Project- on some suitable topic related to the branch of study. It can be small fabrication / experimental results/ simulations / Programmes/ application development etc., depending on the branch of the student. Preferably a single student should do it. <p>Student has to prepare detailed report and submit to his/her college.</p> <ol style="list-style-type: none"> A copy of report can be kept in the departments for record. Each student must be assigned a faculty as a mentor from the college and an Industry expert as co-mentor. The evaluation of the work done by students will be carried by the internal and external examiner. External examiner will evaluate for 80 marks and internal examiner will evaluate for 20 marks. The presentation by student in the presence of all students is desirable. Student should produce successful completion certificate in case of offline / online internship in industry 					
					2 Weeks

SEMESTER V

23AGT301	FARM POWER AND MACHINERY	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> • To introduce the students with the working principles of various farm equipment. • To expose the students about the implements used for intercultural and Harvesting operations 						
UNIT I	FARM MECHANIZATION					9
Farm mechanisation – objectives. Tillage - objectives - methods – primary tillage implements - secondary tillage implements - animal drawn ploughs - construction. Types of farm implements – trailed, mounted . Field capacity - forces acting on tillage tool.						
UNIT II	PRIMARY AND SECONDARY TILLAGE IMPLEMENTS					9
Mould board plough- attachments – mould board shapes and types. Disc plough – force representation on disc – Types of disc ploughs – Subsoiler plough - Rotary plough. Cultivators - types - construction. Disc harrows - Bund former - ridger – leveller. Basin lister-Wetland preparation implements.						
UNIT III	SOWING AND FERTILIZING EQUIPMENT					9
Crop planting - methods - row crop planting systems - Devices for metering seeds – furrow openers – furrow closers- types – Types of seed drills and planters – calibration-fertilizer metering devices - seed cum fertilizer drills – paddy transplanters – nursery tray machines.						
UNIT IV	WEEDING AND PLANT PROTECTION EQUIPMENT					9
Weeding equipment – hand hoe – long handled weeding tools – dryland star weeder – wetland conoweeder and rotary weeder – Engine operated and tractor weeders. Sprayers –types- classification – methods of atomization, spray application rate, droplet size determination – volume median diameter, numerical median diameter – drift control						
UNIT V	HARVESTING MACHINERY					9
Principles of cutting crop, types of harvesting machinery, vertical conveyor reaper and binder combine harvesters, balers, threshers, tractor on top combine harvester, combine losses						
		L:45	T:0	P: 0	Total: 45 Periods	
TEXT BOOKS						
T1	Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6.,2010					
T2	Michael and Ohja. Principles of Agricultural Engineering. Jain brothers, New Delhi., 2005					
REFERENCES						
R1	Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.					
R2	Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.					
R3	Smith, J. R., & Taylor, L. K. (2023). Modern farm equipment: Design, operation, and maintenance. Springer.					
R4	Kumar, R., & Singh, V. P. (2023). <i>Innovations in agricultural machinery: An integrated approach</i> . Elsevier.					
R5	Miller, P. C. H. (2023). <i>Precision agriculture technology for crop farming</i> . Academic Press					

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Realize the necessity of farm mechanization.
CO 2	Interpret the components of various tillage equipment.
CO 3	Know about different sowing and fertilizing attachments and stand-alone units.
CO 4	study about weeder attachments and sprayers.
CO 5	Have knowledge about combine harvester-thresher for various crops.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2			2		2	2		2	3	3
CO2	3	3	3	1			2		3	3		1	3	3
CO3	3	3	3	1			1		2	3		1	3	3
CO4	3	3	2	3			2		2	1			3	
CO5	3	3	2	3		2	2		2	2			3	1

23AGT302	BIO-ENERGY SYSTEMS: DESIGN AND APPLICATIONS			L	T	P	C
				2	0	0	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To discuss with Fermentation and Biomass production methods. To know about Gasification and Bio diesel production methods 							
UNIT I	FERMENTATION PROCESSES AND ITS REQUIREMENTS						6
Fermentation processes and its general requirements - Aerobic and anaerobic fermentation processes and their industrial application - Biogas generation from industrial waste - Heat transfer processes in anaerobic digestion systems, land fill gas technology and potential.							
UNIT II	BIOMASS PRODUCTION						6
Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting - Harvesting of biomass and coppicing characteristics - Biomass preparation techniques for harnessing (size reduction, densification and drying).							
UNIT III	GASIFICATION						6
Thermo-chemical degradation. History of small gas producer engine system - Chemistry of gasification - anaerobic fermentation system for industrial application - biomass densification technique (briquetting, pelletization, and cubing) - Gasification for industrial process heat.							
UNIT IV	GAS PRODUCER						6
Gas producer - type, operating principle -Gasifier fuels, properties, preparation, conditioning of producer gas - Application, shaft power generation, thermal application and economics - Power generation by using gasifier.							
UNIT V	BIO DIESEL PRODUCTION						6
Bio-alcohol, Trans-esterification. for biodiesel production - Bio-hydrogen production routes - Environmental aspect of bio-energy - Assessment of greenhouse gas mitigation potential							
				L:30	T:0	P: 0	Total: 30 Periods
TEXT BOOKS							
T1	Mathur, A.N. & N.S. Rathore. 1992. Biogas Production Management & Utilization, Himanshu Publications, Udaipur.						
T2	Rathor, S. R., Panwar N. L. and Kothari, S. Biomass production and Utilization Technics, Himanshu Publication.						
REFERENCES							
R1	Chakraverty A. Biotechnology and Other Alternative Technologies for utilization of Biomass/Agricultural Wastes. Oxford & IBH Publishing Co.PVT.LTD. New Delhi.						
R2	Butler, S. 2005. Renewable Energy Academy: Training wood energy professionals.						
R3	Brown, R. C., & Zhang, Y. (2023). Bioenergy systems for a sustainable future: Design, implementation, and optimization (2nd ed.). Elsevier.						
R4	Khanal, S. K., & Surampalli, R. Y. (2023). Advances in bioenergy engineering: Systems and applications. CRC Press.						
R5	Demirbas, A. (2023). Biorefineries and bioenergy systems: Design, operation, and case studies. Springer.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Gain Knowledge on Fermentation processes and its requirements
CO 2	Analyse the Biomass production methods
CO 3	Examine the biomass densification technique in Gasification process
CO 4	Determine the methods and applications of Gas producer
CO 5	Relate the methods of Bio diesel production

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01			3	2		2					1		3	
C02	3	2	3	2		2			1		1	2	3	3
C03	3	2	3	2		2			1		1	2	3	3
C04	3	2	3	2		2			1		1	2	3	3
C05	3	2	3	2		2			1		1	2	3	3

23AGT303	POST-HARVEST ENGINEERING OF CEREALS, PULSES AND OIL SEEDS	L	T	P	C
		2	0	0	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To provide the basic understanding of cereals, oilseeds and pulses after harvesting. To impart knowledge about the new technologies in oil seed processing. 					
UNIT 1	INTRODUCTION				6
Introduction to cereal grains, legumes and oilseeds: Structure and composition of cereal grains, legumes and oilseeds, Supply chain of food grains, Hydrothermal treatment of grains- cereal based fermented products, breakfast cereal foods -flaked, puffed, expanded, extruded and shredded products etc. Corn-milling (wet and dry), cornflakes. Barely-Milling, Malting, Processing of beer. Oats- Milling (oatmeal, oat flour & oat flakes). Sorghum, Pearl Millet, finger millet- Milling.					
UNIT II	RICE PROCESSING				6
Paddy processing and rice milling; conventional milling; modern milling; milling operations, milling machines, milling efficiency. Quality characteristics influencing final milled products. Milling of rice types; huller mill, sheller-cum-cone polisher mill. Modern rice milling unit operation-dehusking, paddy separating, polishing and grading. Factors affecting rice yield during milling.					
UNIT III	WHEAT PROCESSING				6
Wheat classification, Structure of wheat grain, Wheat milling soft and durum wheat processing - basic concepts, products and by-products, Flour milling, Turbo grinding and air-classification, Quality characteristics of flour and their suitability for baking.					
UNIT IV	PULSE MILLING				6
Need for pulse milling -unit operations of pulse milling-domestic and commercial scale pulse milling methods - Dry and wet milling, Improved milling method. Pulse milling machineries dehusking in pulse pearer-splitting of pulse in pulse splitter-Mini dhal mill -working principle advantage and disadvantage-pulse milling efficiency-Grinding of split pulses-pulse flour products - their applications and equipments used. Cereal bran fractionation: Processing techniques for the recovery of functional components and their applications to the food industry.					
UNIT V	OIL SEED PROCESSING				6
Oil seeds processing, Sesame, Coconut, Groundnut, Mustard, Soyabean, Sunflower, Safflower. Oil seeds extraction traditional methods, New Technologies in oil seed processing, Calculation of extraction efficiency, new technologies in oilseed processing, Modification of oil seed process. Hydrogenation, utilizations of oil seed meals of different food use. Desolventization and refining of oils; degumming, neutralization bleaching, filtration, deodorization.					
		L:30	T:0	P: 0	Total: 30 Periods
TEXT BOOKS					
T1	Chakraverty, Post-Harvest Technology of Cereals, Pulses and oilseeds, revised ed., Oxford & IBH Publishing Co. Pvt Ltd, 1988				
T2	Marshall, Rice Science and Technology, Wadsworth Ed., Marcel Dekker, New York, 1994.				
REFERENCES					
R1	Kent, Technology of Cereal, 5th ED. Pergamon Press, 2003				
R2	Amalendu Chakraverty, R. Paul Singh, Postharvest Technology and Food Process Engineering, CRC Press, 2016				
R3	Chakraverty, A., Mujumdar, A. S., & Raghavan, G. S. V. (2023). Handbook of post-harvest engineering: Processing of cereals, pulses, and oilseeds (3rd ed.). CRC Press.				

23AGB301	GEOGRAPHICAL INFORMATION SYSTEM	L	T	P	C
		2	0	2	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To provide the basic understanding of GIS, Remote sensing and Satellites. To impart knowledge about the applications of RS and GIS. 					
UNIT I	CONCEPTS OF GIS	6+6			
Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition - Components - Hardware and Software.					
Experiments:					
<ol style="list-style-type: none"> Data Base Management System Data conversion-Vector to Raster, Raster to Vector 					
UNIT II	REMOTE SENSING AND SATELLITES	6+6			
Components of remote sensing – Energy source, electromagnetic spectrum, radiation principle, platforms and sensors - Active and passive remote sensing interference - Atmospheric effects on remote sensing – Energy interaction with earth surface feature - Data acquisition - Reflectance, spectral signatures for water, soil and vegetation.- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT,SPOT & IRS - Recent satellites with its applications					
Experiments:					
<ol style="list-style-type: none"> Simple visual display on screen and Screen management of vector data, raster data Use of Index map 					
UNIT III	DATA PRODUCTS AND IMAGE ANALYSIS	6+6			
Data products –based on level of processing- o/p – scale – area/coverage – data availability – data ordering- data price - Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.					
Experiments:					
<ol style="list-style-type: none"> Preparation of Drainage maps from Remote Sensing Photographs Exercise on digitizer coding point, line and polygon data 					
UNIT IV	DATA INPUT AND ANALYSIS	6+6			
Data – Spatial, Non-Spatial – Database models – Hierarchical network, Relational and Object Oriented Data Models – Raster and Vector – Methods of Data input – Data Editing – Files and formats – Data structure – Data compression. Introduction to analysis – Measurements – Queries – Reclassification – Simple spatial analysis – Buffering – Neighboring functions – Map overlay – Vector and raster – Spatial interpolation – Modelling in GIS – Digital Elevation Modelling – Expert systems					
Experiments:					
<ol style="list-style-type: none"> Point line-Polygon co-ordinate system Digitizer- Digitizing line and polygon data 					
UNIT V	APPLICATION OF RS AND GIS	6+6			
Crop Acreage estimation - Estimation of Crop Water Requirement – Crop condition - Soil mapping – classification of soil with digital numbers – soil erosion mapping- reservoir sedimentation using image processing - Inventory of water resources – water quality assessment - Application of Remote Sensing and GIS in Precision Agriculture - Monitor Crop Health - Management Decision Support Systems					
Experiments:					

23AGP302	FARM MACHINERY LABORATORY	L	T	P	C
		0	0	2	1
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To perform tillage operations using various tractor implements To perform tests on Dryland and Power weeder To perform tests on Crop protection equipment 					
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> Operation of a tractor drawn mould board plough - Adjustments - Determination of field capacity Operation of a tractor drawn disc plough - Adjustments - Determination of field capacity Hitching of mounted type tillage implements to the tractor and ploughing methods Operation of tractor drawn cultivator - Adjustments- and Determination of field capacity Experiment on Calibration of seed drills Operation of seed drill and centrifugal broadcasting device in the field Study of paddy Transplanter and drum seeder, Puddlers and Trampers Operation and evaluation of Dry Land weeder Operation and evaluation of Power operated weeder Dismantling, parts identification and assembly of different components of knapsack power sprayer and duster. 					
		L:0	T:0	P: 30	Total: 30 Periods
TEXT BOOKS					
T1	Michael and Ohja. Principles of Agricultural Engineering. Jain brothers, New Delhi., 2005				
REFERENCES					
R1	Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.				

23AGP301	MINI PROJECT - II	L	T	P	C
		0	0	2	1
Guidelines					
<p>10. The scope of the project work is to enable the students in convenient groups (not more than 4 members) involving theoretical and experimental studies through Design Thinking approach.</p> <p>11. The aim of the project work is to deepen comprehension of principles by applying them to a new problem based on the courses such as Strength of materials, Unit operations in Agricultural processing, Engineering properties of Agricultural produce, Tractor and Automotive Engines studied by the students in the current semester of study.</p> <p>12. Project periods shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.</p> <p>13. Create a model/fabricate a model/conduct experiment/simulate mechanical system/implement the same. Analyze data, evaluate the results and conclude the appropriate solution, suggestion for feature work.</p> <p>14. The continuous assessment shall be made according to the regulation which is tabulated below.</p> <p>15. The progress of the project is evaluated based on a minimum of two reviews.</p> <p>16. The review committee may be constituted by the Head of the Department</p> <p>17. Each student shall finally produce a comprehensive report covering background information, empathy, problem statement, project work details, result, conclusion and publications.</p> <p>18. This final report shall be typewritten form as specified in the guidelines.</p>					
		L : 0	T : 0	P : 30	Total: 30 PERIODS

Professional Elective - I

23AGE301	TECHNOLOGY OF SEED PROCESSING	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To learn production and processing of Seed • To study about the testing, certification , storage and marketing of Seed 					
UNIT I	SEED PRODUCTION TECHNOLOGY				8
General Principles- Foundation and certified seed production - Seed production of Food crops, fibre crops, forage crops, sugar crops and their hybrid varieties- physiological and harvestable maturity of different kinds of seeds, Role of Seed Centers in Seed Multiplication					
UNIT II	SEED PROCESSING TECHNOLOGY				10
Preparing seed for processing - Seed moisture and drying - Air screen cleaner, shape and size separators, gravity separators, surface texture separators, affinity for liquid separators, colour separators, electrical conductivity separators - seed treatment - seed packaging and handling - seed bins - dust removal, seed blending - seed marketing and distribution- methods for assessment of seed quality, Advanced Seed Drying Technology, Breeder seed production					
UNIT III	SEED TESTING				10
Sampling methods - Determination of seed density – Tolerances – heterogeneity – Purity - genuineness of variety – moisture estimation- Germination – equipment's –seed scarification – pre sowing treatment – seed priming - pelleting Viability - Vigour and health, Biological Methods to control Seed Storage Pest, Role of Seed Inspectors					
UNIT IV	SEED CERTIFICATION AND LEGISLATION				9
Seed Certification; Seed Act; Seed Control Orders and New Seed Policy; IPR; Varietal Identification.					
UNIT V	SEED STORAGE AND MARKETING				8
Seed storage – principles- factors affecting seed longevity during storage – Seed treatments and packaging materials - measures for pest and disease control during storage and godown sanitation. Seed marketing - structure and organization - sales promotional activities. factors affecting seed marketing and demand - International seed movement - role of international organizations, WTO and OECD in seed trade.					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	R.L Agrawal, A text book on "Seed Technology", Oxford & IBH Publication, Co. Pvt Ltd, New Delhi- 2012.				
T2	Vanangamudi et.al, "Recent techniques and participatory approaches on quality seed production" Kaiser graphics Ltd., Coimbatore, 2001				
REFERENCES					
R1	B.R Gregg, A.G. Law, S.S Viridi and J.S Balis "Seed Processing", National seed corporation. New Delhi,1990.				
R2	L.O Copeland and M.B Mc Donald, "Principles of Seed Science and Technology, Chapman and Hall, NewYork, 1995				
R3	Basra, A. S. (2023). Seed processing and storage: Principles and practices. CRC Press.				
R4	Copeland, L. O., & McDonald, M. B. (2023). Principles of seed science and technology (6th ed.). Springer.				

R5	Agrawal, P. K., & Khurana, S. M. P. (2023). Seed technology and processing innovations. Wiley.
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COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Know about the basic principles about seed production technology
CO 2	Explain about the processing of Seed
CO 3	Have a detailed knowledge about Seed Testing
CO 4	Understand the importance of seed certification and their legislation
CO 5	Interpret about the storage and marketing methods of seed.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	3	3				2				1		3	
C02		3	3							3			3
C03		2		3			2					2	
C04	3			3			3		2		2	3	
C05		3	2		2			2		2		3	

23AGE302	TESTING AND EVALUATION OF FARM MACHINERY AND EQUIPMENT	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To learn the testing methods of various Machineries and Implements used in farming operations To learn the safety practices in operating the farm implements and machinery 					
UNIT I	TESTING OF AGRICULTURAL TRACTORS	9			
Testing and evaluation system in India - Agricultural machinery situation -Mechanization policy – future prospects - standardization efforts - type of testing systems – General regulations - terminology- basic measurements, speed, fuel consumption, smoke density and power measurement - test items, specifications checking - PTO performance test- engine test, drawbar performance test - field test procedures -interpretation of results					
UNIT II	TESTING OF TILLAGE AND SOWING EQUIPMENT	9			
Testing of tillage machinery - laboratory test (hardness testing, chemical analysis) - field test (rate of work, quality of work, draft measurement, fuel consumption) - seed drill - laboratory test (seed drill calibration) - field checking and field tests					
UNIT III	TESTING OF INTERCULTURAL EQUIPMENT	9			
Testing and evaluation of weeders - types of tests for weeder - types of pesticide application equipment - terminology - types of tests for sprayers - testing methods - types of test for duster - testing methods					
UNIT IV	TESTING OF COMBINE HARVESTER	9			
Types of grain combines - combine systems - test items - procedure for laboratory testing - materials for field test - observations during field tests - sample analysis- data analysis - summary of performance parameters - analysis of field test data					
UNIT V	SAFETY TESTING OF AGRICULTURAL MACHINERY	9			
Types of agricultural machinery accidents - causes of agricultural machinery accidents - technical measurements for ensuring safety - methods of safety testing- ROPS and FOPS -safety precautions					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	Metha M.L., SR.Verma, K Mishra and VK Sharma. 1995. Testing and Evaluation of Agricultural Machinery, National Agricultural Technology Information Centre, Ludhiana				
T2	Indian Standards Test Codes related to tractors, power tillers and agricultural implements				
REFERENCES					
R1	Anonymous. 1983. RNAM Test Codes & Procedures for Farm Machinery. Technical Series 12.				
R2	Nebraska Tractor Test Codes for Testing Tractors, Nebraska, USA.				
R3	Hunt, D., & Wilson, B. (2023). Testing and evaluation of agricultural machinery. Wiley.				
R4	Kumar, R., & Singh, V. P. (2023). Farm machinery testing and performance				

	evaluation: Principles and practices. CRC Press.
R5	Gupta, C. P., & Sharma, R. K. (2023). Evaluation of farm equipment: Techniques and methodologies. Springer.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understand the basics of testing procedures and standards of tractor testing
CO 2	Understand the testing procedures and standards of tillage, sowing equipment
CO 3	Understand the testing procedures and standards of intercultural equipment
CO 4	Understand the testing procedures and standards of harvesting equipment
CO 5	Understand the safety standards and testing procedures

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	3	1	1			2		3	3	
CO2	3	3	3	3	3	2	1		3	3		3	3
CO3	3	3	3	3		3	1	1	3	2		3	3
CO4	3		3	3			2	1	1			3	
CO5	3		3		3	3		3				3	3

23AGE303	ENERGY STORAGE SYSTEMS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To learn the various Energy storage methods To learn about Energy carriers, Storage and its applications 							
UNIT I	ENERGY AVAILABILITY						9
Demand and storage, Need for energy storage, Different types of energy storage; Mechanical, Chemical, Electrical, Electrochemical, Biological, Magnetic, Electromagnetic, Thermal; Comparison of energy storage technologies.							
UNIT II	THERMAL AND MECHANICAL ENERGY STORAGE						9
Principles and applications, Sensible and Latent heat, Phase change materials; Energy and exergy analysis of thermal energy storage, solar energy and thermal energy storage, case studies - Flywheel and compressed air storage; Pumped hydro storage; Hydrogen energy storage, Capacitor and super capacitor, Electrochemical Double Layer Capacitor: Principles, performance and applications							
UNIT III	ELECTROCHEMICAL ENERGY STORAGE						9
Battery – fundamentals and technologies, characteristics and performance comparison: Lead-acid, Nickel-Metal hydride, Lithium Ion; Battery system model, emerging trends in batteries							
UNIT IV	HYDROGEN AS ENERGY CARRIER AND STORAGE AND FUEL CELLS						9
Hydrogen resources and production; Basic principle of direct energy conversion using fuel cells; Thermodynamics of fuel cells - Fuel cell types: AFC, PEMFC, MCFC, SOFC, Microbial Fuel cell, Fuel cell performance, characterization and modeling; Fuel cell system design and technology, applications for power and transportation							
UNIT V	APPLICATION OF ENERGY STORAGE						9
Food preservation, Waste heat recovery, Solar energy storage: Greenhouse heating; Drying and heating for process industries.							
				L : 45	T : 0	P : 0	Total: 45 PERIODS
TEXT BOOKS							
T1	Dincer I., and Rosen M. A. (2011); Thermal Energy Storage: Systems and Applications, Wiley						
T2	Huggins R. A. (2015). Energy Storage: Fundamentals, Materials and Applications. Springer						
REFERENCES							
R1	Narayan R. and Viswanathan B. (1998). Chemical and Electrochemical Energy System, Universities Press						
R2	Moseley P. T., and Garche J. (2014). Electrochemical Energy Storage for Renewable Sources and Grid Balancing, Elsevier Science.						
R3	Chen, H., & Zhang, X. (2023). <i>Advanced energy storage systems: Technologies and applications</i> . Elsevier.						
R4	Ibrahim, H., & Ilinca, A. (2023). <i>Energy storage systems: Fundamentals, design, and applications</i> . Wiley.						
R5	Kalaiselvam, S., & Parameshwaran, R. (2023). <i>Thermal energy storage technologies for sustainability: Systems design and application</i> . Springer.						
COURSE OUTCOMES							
At the end of the course student should be able to:							
CO1	Understand the theory and applications of different energy storage devices						
CO2	Identify the optimal (appropriateness, cost and sustainability) solutions to any potential energy storage application.						

C03	Identify the various Electrochemical energy storage devices
C04	Analyze the various types of Fuel cells
C05	Have a clear idea on applications of Energy storage

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	3	-	3	-	3	3	-	3	3	3	3	3	2
C02	3	3	2	-	2	-	2	2	2	3		3	3
C03	3	-	-	3	2	3	-		-	3	3	2	2
C04	3	3		2	3	-	2		-	1		3	
C05	2	2	3	-	2	3	2	1	1	2	2		3

23AGE304	ERGONOMICS OF FARM MACHINERY AND IMPLEMENTS	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To learn the ergonomics of various machineries and implements used in farming operations To learn about maintenance and repairing methods of various farm implements 						
UNIT I	INTRODUCTION					9
Importance of ergonomics and its application in agriculture; Energy liberation in human body; Assessment of energy expenditure- direct calorimetry, Indirect calorimetry- Assessment by oxygen consumption; Techniques of measuring oxygen consumption; Assessment by heart rate and calibration; Assessment by subjective rating of perceived effort- Overall discomfort score and BPDS; Basal metabolism and work metabolism; Assessment of work load; Assessment of Individual's maximal work capacity.						
UNIT II	ANTHROPOMETRY					9
Anthropometry; Anthropometric data and measurement techniques; Anthropometric dimensions and strength parameters; Causes of variability of anthropometric data; Analysis of anthropometric data and use of percentiles						
UNIT III	BIOMECHANICS OF MOTION					9
Biomechanics of motion. Vibration- hand arm vibration and whole body vibration, physiological effects; Noise and its physiological effects.						
UNIT IV	MAINTENANCE OF IMPLEMENTS					9
Familiarization with tools for general and special maintenance. Introduction to scheduled maintenance after 10, 100, 300, 600, 900 and 1200 hours of operation. Safety hints. Top end overhauling. Fuel saving tips. Preparing the tractor for storage. Care and maintenance procedure of agricultural machinery during operation and off- season. Repair and maintenance of implements – adjustment of functional parameters in tillage implements.						
UNIT V	REPAIRING OF IMPLEMENTS					9
Replacement of broken components in tillage implements. Replacement of furrow openers and change of blades of rotavators. Maintenance of cutter bar in a reaper. Adjustments in a thresher for different crops. Replacement of V-belts on implements. Setting of agricultural machinery workshop.						
		L:45	T:0	P: 0	Total: 45 Periods	

TEXT BOOKS	
T1	Astrand, P.O and Rodahl, K, Text book of work physiology, McGraw Hill, New York, 1977.
T2	Bridger, R.S, Introduction to Ergonomics, McGraw Hill, New York, 1995.
REFERENCES	
R1	Dul J and Weerdmeester B, Ergonomics for Beginners. A Quick Reference Guide. Taylor and Francis, London, 1993.
R2	Kroemer, K.H.E., Kroemer, H.J. and K.E. Kroemer-Elbert, Engineering Physiology: bases of human factors/ergonomics, VAN NOSTRAND REINHOLD, New York.
R3	Gite, L. P., & Singh, G. (2023). Ergonomics in agricultural equipment design: Principles and applications. CRC Press.
R4	Singh, J., & Kumar, R. (2023). Human factors engineering in agriculture: Ergonomics and safety of farm implements. Wiley.
R5	Debnath, S., & Pradhan, S. (2023). Ergonomics of farm machinery: Design and evaluation techniques. Springer.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Know about the importance of Ergonomics of farm machinery
CO 2	Gain knowledge about Anthropometry
CO 3	Information about Biomechanics of motion
CO 4	Knowledge about maintenance of farm implements
CO 5	Know about the repairing and replacement of Implement parts

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	2	2	1	1	2	1	-	-	-	1	3	2	3
CO2	2	3	2	2	1	2	1	-	-	1	1	3	2	2
CO3	2	2	3	2	3	3	2	1	-	2	1	3	3	2
CO4	2	2	2	3	2	3	1	-	-	-	2	3	2	2
CO5	3	3	3	3	3	2	1	-	1	2	3	3	3	3

23AGE305	GEO INFORMATICS AND NANOTECHNOLOGY	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To Understand the basic principles of Geo informatics and its application Learn the application of Nanotechnology in Agriculture and Food production 					
UNIT I	INTRODUCTION	9			
Meaning and Scope of Geoinformatics – Science and Technologies involved: Cartography- Geodesy- Geology- Remote Sensing- Geographical Information System Photogrammetry - Information & Communication Technologies- Global Positioning System- Digital Image Processing - Map as decision tool.					
UNIT II	BASICS OF EARTH	9			
Earth – Origin, Interior, Age, size, shape and Physiography of the Earth - Sources and methods of acquiring geodata Atmosphere: Origin and nature, Composition and layers of the atmosphere. Fundamental principles of acquiring earth related information: geodetic information - lat - long - time - altimetry – bio-physical and bio-chemical information.					
UNIT III	GEOSPATIAL TECHNOLOGIES IN AGRICULTURE	9			
Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Variable Rate Technology (VRT), STCR approach for precision agriculture; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.					
UNIT IV	NANOTECHNOLOGY AND ITS APPLICATIONS IN AGRICULTURE	9			
Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nanoparticles, application in agriculture- nano-pesticides, nano fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.					
UNIT V	NANOTECHNOLOGY IN FOOD PRODUCTION	9			
Food and new ways of food production -Efficient fractionation of crops, Efficient product structuring -Optimizing Nutritional Values - Applications of Nanotechnology in Foods : Sensing, Engineering Food Ingredients to Improve Bioavailability - Nanocrystalline Food Ingredients – Nano-emulsions - NanoEngineered Protein Fibrils as Ingredient Building Blocks.					
		L:45	T:0	P: 0	Total: 45 Periods

TEXT BOOKS	
T1	Arthur M Lesk, 'Introduction to Bioinformatics", Oxford University Press, 2014
T2	Thomas Varghese, K. M. Balakrishna, "Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials" Atlantic Publishers & Distributors, 2012
REFERENCES	
R1	Tore Samuelsson, "Genomics and Bioinformatics" Cambridge University Press, 2012
R2	Marcel H. van de Voorde, Marcel Van de Voorde, Monique A. V. Axelos, "Nanotechnology in Agriculture and Food Science", Wiley, 2017.
R3	Gupta, R., & Singh, A. K. (2023). Applications of geoinformatics in

	environmental and agricultural management. Springer.
R4	Patel, R., & Kumar, S. (2023). Geospatial technologies for sustainable development. CRC Press.
R5	Das, S., & Sharma, V. (2023). Nanotechnology in agriculture and environmental sciences: Applications and innovations. Elsevier.

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Explain the basic principles of Geo informatics
CO 2	Have a clear knowledge on basics of Earth
CO 3	Apply Geospatial technologies in Agriculture
CO 4	Analyze the applications of Nanotechnology in Agriculture
CO 5	Have a clear knowledge on applications of Nanotechnology in Food Production

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	2	2	1	1	2	1	-	-	-	1	3	2	3
CO2	2	3	2	2	1	2	1	-	-	1	1	3	2	2
CO3	2	2	3	2	3	3	2	1	-	2	1	3	3	2
CO4	2	2	2	3	2	3	1	-	-	-	2	3	2	2
CO5	3	3	3	3	3	2	1	-	1	2	3	3	3	3

OPEN ELECTIVE COURSES (OEC)

23AG0301	ENERGY CONSERVATION AND MANAGEMENT	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To Understand and analyse the energy data of industries To Conduct energy audit and suggest methodologies for energy savings and Utilise the available resources in optimal ways 					
UNIT I	INTRODUCTION	9			
Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.					
UNIT II	ELECTRICAL SYSTEMS	9			
Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.					
UNIT III	THERMAL SYSTEMS	9			
Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution & U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories					
UNIT IV	ENERGY CONSERVATION IN MAJOR UTILITIES	9			
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets					
UNIT V	ECONOMICS	9			
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept					
		L : 45	T: 0	P: 0	Total: 45 PERIODS
TEXT BOOKS					
T1	Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com . a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.				
T2	Witte. L.C., P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.				
REFERENCES					
R1	Callaghn, P.W. “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.				
R2	Dryden. I.G.C., “The Efficient Use of Energy” Butterworths, London, 1982				
R3	Gupta, M., & Kumar, P. (2023). Energy conservation and management: Technologies and strategies. Wiley.				
R4	Singh, M., & Verma, A. (2023). Energy efficiency and conservation in industrial systems. Elsevier.				
R5	Jain, A. K., & Sharma, M. (2023). Sustainable energy management: Principles and practices. Springer.				
COURSE OUTCOMES					
At the end of the course student should be able to:					

C01	Gain knowledge on Environmental aspects associated with energy utilization
C02	Understand the components of EB billing
C03	Have a clear idea on Energy conservation in Thermal system
C04	Interpret the Energy utilization on major utilities
C05	Calculate the life cycle costing of Energy utilization

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3		1	2		3	3				2		1	
C02	2	2	2				2				2	1		
C03	2	3	2				2				1	1	2	
C04	2			3				3	2					
C05	2	2		2			2	2				2	3	

23AGO302	WASTE AND HAZARDOUS MANAGEMENT	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To develop an understanding of industrial pollution and waste management systems To enable students to design and evaluate waste treatment systems for industrial application 					
UNIT I	SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK	9			
Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Elements of integrated waste management and roles of stakeholders - Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, electronic wastes , plastics and fly ash – Financing waste management.					
UNIT II	WASTE CHARACTERIZATION AND SOURCE REDUCTION	9			
Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse Practical: Composition of MSW, Determination of Physical and Chemical Properties of MSW					
UNIT III	STORAGE, COLLECTION AND TRANSPORT OF WASTES	9			
Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport					
UNIT IV	WASTE PROCESSING TECHNOLOGIES	9			
Objectives of waste processing – material separation and processing technologies – biological & chemical conversion technologies – methods and controls of Composting - thermal conversion technologies, energy recovery – incineration – solidification & stabilization of hazardous wastes-treatment of biomedical wastes					
UNIT V	WASTE DISPOSAL	9			
Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation					
		L:45	T:0	P:0	Total: 45 Periods
TEXT BOOKS					
T1	George Tchobanoglous et al, Integrated Solid Waste Management , McGraw - Hill, 2014.				
T2	Manual on Municipal Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000				
REFERENCES					
R1	Georges E. Ekosse, Rogers W'O Okut-Uma, Pollution control & Waste management in Developing Countries, Commonwealth Publishers, New Delhi, 2000.				

R2	B. B. Sundaresan, A. D. Bhide – Solid Waste Management, Collection, Processing and Disposal, Mudrashilpa Offset Printers, 2001.
R3	Pichtel, J. (2023). Waste management practices: Municipal, hazardous, and industrial (4th ed.). CRC Press.
R4	Sharma, A., & Singh, R. (2023). <i>Hazardous waste management: Trends, technologies, and applications</i> . Springer.
R5	Tchobanoglous, G., & Kreith, F. (2023). Handbook of solid waste management (3rd ed.). McGraw-Hill Education.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Interpret the classifications on Waste and its sources
CO 2	Understand the characterization of Waste and methods for reducing its sources.
CO 3	Explain about the collection, storage and transport of Waste
CO 4	Analyze the technologies involved in Waste processing
CO 5	Have a clear idea on Waste disposal methods.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	2		1				2	1			3	1	
C02	3	1				1	2			1	3	1	1	
C03			2		3					2	1		2	
C04	1		3		2	1	1		1	3		2	1	
C05	2	1						3			1			

23AGO303	ENVIRONMENTAL LAWS AND POLICIES	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To explain the role of law, policy and institutions in the conservation and management of natural resources as well as pollution control To introduce the laws and policies both at the national and international level relating to environment. 						
UNIT I	BASIC CONCEPTS IN ENVIRONMENTAL LAW					10
Introduction to environmental laws in India; Constitutional provisions, Stockholm conference; Bhopal gas tragedy; Rio conference. General principles in Environmental law: Precautionary principle; Polluter pays principle; Sustainable development; Public trust doctrine. Overview of legislations and basic concepts.						
UNIT II	FOREST, WILDLIFE AND BIODIVERSITY RELATED LAWS					9
Evolution and Jurisprudence of Forest and Wildlife laws; Colonial forest policies; Forest policies after independence- Statutory framework on Forests, Wildlife and Biodiversity: IFA, 1927; WLPA, 1972; FCA, 1980; Biological Diversity Act, 2002; Forest Rights Act, 2006. Strategies for conservation–Project Tiger, Elephant, Rhino, Modulew leopard.						
UNIT III	AIR, WATER AND MARINE LAWS					9
National Water Policy and some state policies Laws relating to prevention of pollution, access and management of water and institutional mechanism: Water Act, 1974; Water Cess Act, 1977, EPA, 1986. Pollution Control Boards Ground water and law Judicial remedies and procedures Marine laws of India; Coastal zone regulations. Legal framework on Air pollution: Air Act,1981; EPA, 1986						
UNIT IV	ENVIRONMENT PROTECTION LAWS AND LARGE PROJECTS					8
Legal framework on environment protection-Environment Protection Act as the framework legislation–strength and weaknesses; EIA; National Green tribunal The courts infrastructure projects						
UNIT V	INTERNATIONAL ENVIRONMENTAL LAW					9
An introduction to International law; sources of international law; law of treaties; signature, ratification Evolution of international environmental law: Customary principles; Common but differentiated responsibility, Polluter pays.						
		L : 45	T: 0	P: 0	Total: 45 PERIODS	

TEXT BOOKS	
T1	Divan S. and Rosencranz A. (2005) Environmental Law and Policy in India, 2 nd ed., Oxford, New Delhi
T2	Leelakrishnan P. (2008) Environmental Law in India, 3rd ed., Lexis Nexis, India
REFERENCES	
R1	Birnie P. (2009) et al., International Law and the Environment, 3rd ed., Oxford
R2	Leelakrishnan P. (2006) Environmental Law Case Book, 2nd ed, Lexis Nexis, India.
R3	Lee, J. A., & Park, S. (2023). Environmental law and policy: A comprehensive guide (5th ed.). Wiley.
R4	Repetto, R., & Smith, L. M. (2023). <i>Environmental law in practice: Case studies and policies for the 21st century</i> . CRC Press.

R5	Fisher, R., & Shapiro, S. (2023). Environmental policies and sustainability: Principles and practices. Springer.
COURSE OUTCOMES	
At the end of the course student should be able to:	
C01	Explain the basic concepts of Environment law
C02	Gain knowledge on the laws related to Forest, Wild life and Bio diversity
C03	Analyze about Air, Water and Marine laws
C04	Interpret on the laws protecting our Environment
C05	Have a clear idea on International laws on Environment

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C01	3	3	3	2	2	2	1				1	2		
C02	3	3	3	2	2	2	1				1	2	2	
C03	3	3	3	2	2	2	2				2	3		3
C04	3	3	3	2	2	2	2				2	3		
C05	3	3	3	3	3	2	2	2		2	3	3		

23AGO304	FARM MECHANIZATION			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To Understand the necessity of Farm Mechanization To Learn about Implements used in various stages of Agriculture and its safety methods of operation. 							
UNIT I	THE SCOPE OF MECHANIZATION INDIAN AGRICULTURE						9
Introduction to the concept of mechanization - definition and its impact in the agricultural development of the country and the role of agriculture in the economic progress of the country. Precision farming-its significance-history of farm mechanization in India. Different Sources of Power in agriculture -tractors, power tillers-bulldozers etc. -History of Development of farm tractors in India.							
UNIT II	TILLAGE AND PROBLEMS IN FARM MECHANISATION						9
Major problems in adopting and adapting farm mechanisation inputs suitable to their specific needs-possible solutions to overcome them. Tillage-definition -objectives-types- their functions and applications.							
UNIT III	IMPLEMENTS USED IN FARMING OPERATIONS						9
Types of implements based on usage-primary and secondary-trailed and mounted- functions- applications-animal drawn ploughs. Planting machinery-Intercultural operations-weeders-types and their functions.							
UNIT IV	HARVESTING EQUIPMENTS AND PLANT PROTECTION MACHINERY						9
Different kinds of crop harvesting machinery-features-functions and applications. Basics of knapsack sprayers, foot pedal operated sprayers, power sprayers, boom sprayers and dusters.							
UNIT V	ERGONOMICS AND AUTOMATION						9
Ergonomic aspects of farm implements-automation of agricultural machinery-latest developments in automation- application of electronics in agriculture							
			L : 45	T: 0	P: 0	Total: 45 PERIODS	
TEXT BOOKS							
T1	J.M. Shippen, C.R.Ellin and C.H. Clover, Basic farm machinery, Pergamon Press Ltd, 1987.						
T2	C.J. Studman, Agricultural and horticultural engineering, Butterworths PVT Ltd, 1990.						
REFERENCES							
R1	R.N. Kaul, and C.O. Egbo, Introduction to Agricultural Mechanisation, Macmillan, London, 1985						
R2	S. Nath, Manual of Practicals in Farm Mechanisation, Unitech Printery, 1988.						
R3	Kumar, R., & Yadav, S. K. (2023). <i>Farm mechanization and automation: Principles, applications, and advances</i> . Wiley.						
R4	Singh, G., & Agarwal, P. (2023). <i>Principles of farm mechanization: Concepts, tools, and systems</i> . CRC Press.						
R5	Hossain, M. A., & Kundu, S. (2023). <i>Advances in farm mechanization for sustainable agriculture</i> . Springer.						
COURSE OUTCOMES							
At the end of the course student should be able to:							
CO1	Discuss the various sources of power used in Agriculture						
CO2	Analyze problems in adopting Farm Mechanization						
CO3	Design of selected farm implements/equipment						
CO4	Have a through knowledge on Harvesting and Plant protection machinery.						

C05	Understand the safety methods of operating farm implements and machinery.
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COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3	3	3			2	2			2	2	2	
C02	3	3	3	3			2	1			2	2	2	
C03	3	3	3	3			2	2			-	2	2	3
C04	3	3	2	3			2	1			2	2	2	
C05	3	3	2	3			2	2			2	2	2	

23AG0305	INTRODUCTION TO BIO ENERGY			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To acquire knowledge on cutting-edge technologies for conversion of various biomass feedstock to bioenergy Biofuel production and their utilization in combustion engines. Providing biomass based sustainable energy solutions. 							
UNIT I	BIOMASS RESOURCE ASSESSMENT						9
Introduction, Classification and properties of biomass, Biomass characterization, different energy conversion methods, Bio Energy Resources, World Bio Energy Potential, India's Bio Energy Potential, Biomass Resources and classification, Physio-chemical characteristics. Biomass Combustion, Loose biomass densification, Biomass based power generation and utilization for domestic cooking, Improved biomass cookstoves.							
UNIT II	BIOGAS SYSTEMS						9
Technology of Biogas production, Biogas Plants, Digester types, Digester design, Chemical kinetics and mathematical modeling of bio methanation process, Dung, Vegetable Waste and Municipal Waste based Biogas plants, Biogas as fuel for transportation, Lighting, Running Dual Fuel Engines, Electricity generation, Biogas Bottling Plant Technology, Application of Biogas slurry in agriculture, Design of Biogas for cold climates. Case studies and numerical							
UNIT III	BIOMASS GASIFIERS						9
History , Principle , Design of Bio mass Gasifiers , updraft gasifier, down draft gasifier, zero carbon biomass gasification plants, Gasification of plastic-rich waste, applications for cooking, electricity generation, Gasifier Engines, Operation of spark ignition and compression ignition engine with wood gas, methanol, ethanol and biogas, Biomass integrated gasification/combined cycles systems, gasification, pyrolysis, liquification, biomass pretreatment and processing, Case studies							
UNIT IV	BIOFUEL						9
Bioethanol production from lignocelluloses, waste material, including crop residue, sugar and starch; biodiesel production from vegetable oil and animal fat, algae; biofuel derived from; economics of biofuel production; environmental impacts of biofuels; biofuel blends; green diesel from vegetable oil; biodiesel production process, by-product utilization. Production of butanol and propanol; Production of biohydrogen; production of hydrogen by fermentative bacteria.							
UNIT V	BIO-REFINERY CONCEPT						9
Bio-refinery concept: definition; different types of bio-refinery; challenge and opportunities; Fuel and chemical production from saccharides, lingocellulosic biomass, protein; vegetable oil; algal biorefinery							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Clark, J. H., & Deswarte, F. (Eds.). (2014). Introduction to chemicals from biomass. John Wiley & Sons						
T2	Mutha, V. K. (2010). Handbook of bioenergy and biofuel SBS Publishers, Delhi						
REFERENCES							
R1	Mukunda, H. S. (2011). Understanding clean energy and fuels from biomass. Wiley India						
R2	Speight, J. (2008). Synthetic fuels handbook: properties, process and performance.						

	McGraw-Hill
R3	Demirbas, A. (2023). <i>Introduction to bioenergy: Fundamentals and applications</i> (2nd ed.). Springer.
R4	Ren, J., & Yang, L. (2023). <i>Bioenergy: Technologies and applications for sustainable energy production</i> . Elsevier.
R5	Kumar, R., & Sahu, S. K. (2023). <i>Introduction to bioenergy systems and biofuels: Principles and applications</i> . Wiley.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Asses the various classifications of Biomass
CO 2	Explain the technology of Bio gas production
CO 3	Design of Bio mass Gasifiers and to analyze various case studies associated
CO 4	Understand the concepts of Bio fuel and its production methods
CO 5	Interpret the different types of Bio refinery

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C01	C01	3	3	2	2	2	1	1	-	-	-	-	3	2
C02	C02	3	3	2	3	2	1	-	1	-	-	-	3	2
C03	C03	3	3	3	3	3	2	-	-	-	-	-	3	2
C04	C04	3	3	3	3	3	2	-	-	-	-	2	3	2
C05	C05	3	2	3	2	3	2	-	2	2	3	3	3	2