

NANDHA ENGINEERING COLLEGE (AUTONOMOUS), ERODE – 638 052
REGULATIONS – 2022 **CHOICE BASED CREDIT SYSTEM**

B. Tech - AGRICULTURAL ENGINEERING

SEMESTER: I									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	22MAN01	Induction Programme	MC	-	0	0	0	0	0
THEORY									
2	22EYA01	Professional Communication - I	HSMC	-	4	2	0	2	3
3	22MYB01	Calculus and Linear Algebra*	BSC	-	4	3	1	0	4
4	22PYB02	Advanced Materials and Nano Technology	BSC	-	3	3	0	0	3
5	22AGC01	Basics of Engineering Mechanics	ESC	-	3	2	1	0	3
6	22MEC01	Engineering Graphics	ESC	-	4	2	0	2	3
7	22GYA01	தமிழர் மரபு / Heritage of Tamils*	HSMC	-	1	1	0	0	1
PRACTICAL									
8	22PYP01	Physics Laboratory*	BSC	-	2	0	0	2	1
9	22GEP01	Engineering Practices Laboratory	ESC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
10	22MAN02	Soft/Analytical Skills - I	MC	-	3	1	0	2	0
11	22MAN03	Yoga – I*	MC	-	1	0	0	1	0
TOTAL					29	14	2	13	20

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SEMESTER: II									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22EYA02	Professional Communication - II	HSMC	22EYA01	4	2	0	2	3
2	22MYB02	Partial Differential Equations and Transform Techniques*	BSC	-	4	3	1	0	4
3	22CYB05	Chemistry for Agricultural Engineers	BSC	-	3	3	0	0	3
4	22CSC01	Problem Solving and C Programming	ESC	-	3	3	0	0	3
5	22AGC02	Principles and Practices of Crop Production	PCC	-	3	3	0	0	3
6	22EEC04	Electrical Engineering*	PCC	-	3	3	0	0	3
7	22GYA02	தமிழ்நூல் தொழில்நுட்பமும் /Tamil and Technology*	HSMC	-	1	1	0	0	1
PRACTICAL									
8	22CSP01	Problem Solving and C Programming Laboratory	ESC	-	4	0	0	4	2
9	22AGP01	Crop Production and Husbandry Laboratory	PCC	-	4	0	0	4	2
10	22CYP01	Chemistry Laboratory*	BSC	-	4	0	0	2	1
Mandatory Non-Credit Courses									
11	22MAN04	Soft/Analytical Skills – II	MC	22MAN02	3	1	0	2	0
12	22MAN05	Yoga – II*	MC	-	1	0	0	1	0
13	22MAN06	Environmental Science	MC	-	2	2	0	0	0
TOTAL					39	21	1	15	25

*Ratified by Eleventh Academic Council

SEMESTER: III									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22MYB03	Statistics and Numerical Methods	BSC	-	4	3	1	0	4
2	22AGC03	Fundamentals of Soil Science	PCC	-	4	2	0	2	3
3	22AGC04	Strength of Materials for Agricultural Engineers	PCC	-	3	3	0	0	3
4	22AGC05	Basic workshop Technology	ESC	-	3	3	0	0	3
5	22AGC06	Thermodynamics for Agricultural Engineers	PCC	-	3	2	1	0	3
6	22AGC07	Farm Tractor Systems	PCC	-	3	3	0	0	3
PRACTICAL									
7	22AGP02	Workshop Technology Laboratory	ESC	-	4	0	0	4	2
8	22AGP03	Drawing of Farm Structures Laboratory	PCC	-	4	0	0	4	2
9	22AGP04	Farm Tractor and Engines Laboratory	PCC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
10	22MAN07	Soft / Analytical Skills - III	MC	-	5	3	0	2	0
11	22MAN09	Indian Constitution	MC	-	1	1	0	0	0
TOTAL					38	20	2	16	25

SEMESTER: IV									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22AGC08	Fluid Mechanics and Hydraulics	PCC	-	4	2	0	2	3
2	22AGC09	Heat and Mass Transfer for Agricultural Engineers	PCC	-	3	2	1	0	3
3	22AGC10	Crop Process Engineering	PCC	-	3	3	0	0	3
4	22AGC11	Irrigation and Drainage Engineering	PCC	-	3	3	0	0	3
5	22AGC12	Hydrology and Water Resources Engineering	PCC	-	3	3	0	0	3
6	22AGC13	Surveying and Levelling for Agricultural Engineers	PCC	-	4	2	0	2	3
PRACTICAL									
7	22AGP05	Crop Process Engineering Laboratory	PCC	-	4	0	0	4	2
8	22AGP06	Irrigation and Drainage Engineering Laboratory	PCC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
9	22MAN08	Soft/Analytical Skills - IV	MC	-	5	3	0	2	0
10	22GED01	Personality and Character Development	MC	-	0	0	0	1	0
TOTAL					33	18	1	15	22

SEMESTER: V									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22AGC14	Soil and Water Conservation Engineering	PCC	-	3	3	0	0	3
2	22AGC15	Unit Operations in Agricultural Processing	PCC	-	3	3	0	0	3
3	22AGC16	Farm Implements and Equipment (Theory + Lab)	PCC	-	5	3	0	2	4
4	E1	Elective(PEC)	PEC	-	3	3	0	0	3
5	E2	Elective(PEC)	PEC	-	3	3	0	0	3
6	E3	Elective(PEC/OEC)	PEC/OEC	-	3	3	0	0	3
PRACTICAL									
7	22AGP07	CAD for Agricultural Engineers	PCC	-	4	0	0	4	2
8	22AGP08	Unit Operations in Agricultural Processing Laboratory	PCC	-	4	0	0	4	2
Mandatory Non-Credit Courses									
10	22MAN10	Soft/Analytical Skills - V	MC	-	3	1	0	2	0
11	22MAN11	Certification Course - I	MC	-	1	0	0	1	0
TOTAL					32	19	0	13	23

SEMESTER: VI									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22AGC17	Renewable energy Sources	PCC	-	3	3	0	0	3
2	22AGC18	Food and Dairy Engineering	PCC	-	3	3	0	0	3
3	EM1	Elective - Management (ABM)	HSMC	-	3	3	0	0	3
4	E4	Elective(PEC)	PEC	-	3	3	0	0	3
5	E5	Elective(PEC/OEC)	PEC/OEC	-	3	3	0	0	3
6	E6	Elective(OEC)	OEC	-	3	3	0	0	3
PRACTICAL									
7	22AGP09	Food and Dairy Engineering Laboratory	PCC	-	4	0	0	4	2
8	22AGP10	Rural Agricultural Work Experiment	EEC	-	4	0	0	2	1
Mandatory Non-Credit Courses									
9	22MAN12	Soft/Analytical Skills - VI	MC	-	3	1	0	2	0
10	22MAN13	Certification Course - II	MC	-	1	0	0	1	0
TOTAL					30	19	0	9	21

SEMESTER: VII									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	22GEA01	Human Values and Ethics	HSMC	-	2	2	0	0	2
2	E7	Elective(PEC)	PEC	-	3	3	0	0	3
3	E8	Elective(PEC)	PEC	-	3	3	0	0	3
4	E9	Elective(PEC)	PEC	-	3	3	0	0	3
5	E10	Elective(OEC)	OEC	-	3	3	0	0	3
PRACTICAL									
6	22AGP11	Internship/ Inplant training (4 weeks)	EEC	-	0	0	0	0	2
TOTAL					14	14	0	0	16

SEMESTER: VIII									
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
PRACTICAL									
1	22AGD01	Project Work	EEC	-	20	0	0	20	10
TOTAL					20	0	0	20	10

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22AGC01 - BASICS OF ENGINEERING MECHANICS

	L	T	P	C
	2	1	0	3

PREREQUISITE: NIL

Course Objectives		Course Outcomes : The students will be able to	
1.0	To acquire knowledge on the behaviour of a particle under the action of forces	1.1	Evaluate the engineering problems on stable particles using conditions for equilibrium
2.0	To analyze the behaviour of the rigid body under the action of forces	2.1	Calculate the reaction forces of various supports and resultant forces on rigid bodies
3.0	To gain knowledge related to friction and their types	3.1	Solve the problems involving dry friction under equilibrium conditions
4.0	To study the geometric properties of the different plane surfaces.	4.1	Determine the centroid, Centre of gravity and moment of inertia of various plane and composite areas
5.0	To acquire knowledge on the behavior of moving body under the action of forces causing the motion.	5.1	Analyze the problems involving dynamics of particles

UNIT I – STATICS OF PARTICLE	(6+3)
Units and dimensions - fundamental principles - laws of mechanics, lame's theorem, parallelogram and triangular law of forces, principle of transmissibility – System of forces- coplanar and concurrent forces - resultant force - statics of particles in two dimension - free body diagram - equilibrium of particles in two dimensions -problems	
UNIT II – STATICS OF RIGID BODY	(6+3)
Rigid body-Statics of rigid body in two dimensions-- moment of a force about a point and about an axis-Varignon's theorem -Resultant of parallel and nonconcurrent forces-moments and couple- equilibrium of rigid bodies in two dimensions- requirements of stable equilibrium- types of supports and their reactions	
UNIT III - FRICTION	(6+3)
Frictional force - Laws of Coulomb friction -Limiting friction- co-efficient of friction and angle of friction - Impending motion-angle of repose- cone of friction - simple contact friction - ladder friction - belt friction - transmission of power through belts - problems involving the equilibrium of a rigid bodies with frictional forces	
UNIT IV - PROPERTIES OF SECTIONS	(6+3)
Centroid and Centre of Gravity- first and second moment of area -centroid of plan and composite plane areas- moment of Inertia of plane and composite plane areas – Radius of gyration-parallel axis theorem - perpendicular axis theorem - polar moment of inertia – Problems	
UNIT V - DYNAMICS OF PARTICLES	(6+3)
Kinematics-Displacements, velocity and acceleration, their relationship - linear motion with uniform and variable acceleration - curvilinear motion and projectile motion - Kinetics of particles- Newton's law, D'Alembert's Principle - work energy equation - impulse momentum equation-problems	
TOTAL (L:30 +T:15): 45 PERIODS	

TEXT BOOKS:

1. Vela Murali, "Engineering Mechanics", Oxford University Press, 2010.
2. Ferdinand, P., Beer and Russell Johnson, E., "Vector Mechanics for Engineers: Statics and Dynamics", Tata McGraw Hill International Edition, 9th Edition, 2010.

REFERENCES:

1. Irving H. Shames, "Engineering Mechanics: Statics and Dynamics", Prentice Hall of India Private limited, 2003.
2. Russell C. Hibbeler, "Engineering Mechanics: Statics and Dynamics", 12th Edition Prentice Hall, 2009.
3. Anthony M. Bedford and Wallace Fowler, "Engineering Mechanics: Statics and Dynamics", 5th Edition, Prentice Hall, 2007.
4. Palanichamy, M. S and Nagan, S., "Engineering Mechanics - Statics and Dynamics", Tata McGraw-Hill, 3rd Edition, New Delhi, 2005.
5. Meriam, J. L. and Kraige, L. G., "Engineering Mechanics: Statics and Dynamics", Wiley Publishers, 6th Edition, 2006.
6. Rajasekaran, S. and Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., 3rd Edition, New Delhi, 2005.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	2	3	-	-	2	-	-	-	2	2	1
2	3	2	-	2	3	-	1	-	-	-	-	-	2	2
3	2	3	2	-	-	2	-	-	-	-	-	-	-	3
4	3	3	2	2	3	-	-	2	-	-	-	-	3	3
5	3	3	1	2	3	-	-	-	-	-	-	1	2	3
CO (W.A)	2.8	2.6	1.8	2	3	2	1	2	-	-	-	1.5	2.3	2.4



22MEC01 - ENGINEERING GRAPHICS (Common to AGRI, CHEM, CIVIL and EEE Branches)					
		L	T	P	C
		2	0	2	3
PREREQUISITE: NIL					
Course Objectives			Course Outcomes : The students will be able to		
1.0	To Construct various plane curves	1.1	Construct various plane curves		
2.0	To Construct the concept of projection of points, lines and plane	2.1	Create the projection of points, lines and planes		
3.0	To Develop the projection of solids	3.1	Develop projection of solids		
4.0	To Solve problems in sectioning of solids and developing the surfaces	4.1	Solve problems in sections of solids and development of surfaces		
5.0	To Apply the concepts of orthographic and isometric	5.1	Apply the concepts of isometric in engineering practice		

CONCEPTS AND CONVENTIONS (Not for Examination)	
Importance of graphics in engineering applications - use of drafting instruments - BIS conventions and specifications - size, layout and folding of drawing sheets - lettering and dimensioning – scales	
UNIT I - PLANE CURVES	(6+6)
Basic geometrical constructions, curves used in engineering practices - conics - construction of ellipse, parabola and hyperbola by eccentricity method - construction of cycloid - construction of involutes of square and circle - drawing of tangents and normal to the above curves - theory of projection - principle of multi-view orthographic projection - profile plane and side views - multiple views - representation of three dimensional objects - layout of views.	
UNIT II - PROJECTION OF POINTS, LINES AND PLANES	(6+6)
Principal planes - first angle projection - projection of points - projection of straight lines (only first angle projections) inclined to both the principal planes - determination of true lengths and true inclinations by rotating line method - projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.	
UNIT III - PROJECTION OF SOLIDS	(6+6)
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to anyone of the principal plane and parallel to another by rotating object method.	
UNIT IV - SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	(6+6)
Sectioning of solids (prism, cube, pyramid, cylinder and cone) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section - development of lateral surfaces of simple and sectioned solids - prisms, pyramids cylinder and cone.	

UNIT V - ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS	(6+6)
Principles of isometric projection - isometric scale - isometric projections of lines, plane figures, simple solids and truncated solids - prisms, pyramids, cylinders, cones – free hand sketching of orthographic views from isometric views of objects.	
TOTAL (L:30+ P:30) : 60 PERIODS	

TEXT BOOKS:

1. Venugopal, K. and Prabhu Raja, V., “Engineering Graphics”, New Age International (P) Limited, 2022.
2. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015.

REFERENCES:

1. Bhatt N. D. and Panchal, V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.
2. Gopalakrishna, K. R., “Computer Aided Engineering Drawing”, Subhas Stores, Vol I and II combined, Bangalore, 2017.
3. Natarajan, K. V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
4. Luzzader, Warren. J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Prentice Hall of India Pvt. Ltd., Eastern Economy Edition, New Delhi, 2005.
5. Shah, M. B. and Rana, B. C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	-	-	1	-	-	-	2	-	3	-	1
2	3	2	1	-	-	1	-	-	-	2	-	3	-	1
3	3	2	1	-	-	1	-	-	-	2	-	3	-	1
4	3	2	1	-	-	1	-	-	-	2	-	3	-	1
5	3	3	1	-	-	1	-	-	-	2	-	3	-	1
CO (W.A)	3	2.2	1	-	-	1	-	-	-	2	-	3	-	1

S. V. Murali

22AGC02 - PRINCIPLES AND PRACTICES OF CROP PRODUCTION

		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
Course Objectives		Course Outcomes : The students will be able to			
1.0	To introduce agriculture and agronomy	1.1	Illustrate ancient Agriculture and acquire basic skills on agronomy.		
2.0	To acquire knowledge on crop selection and establishment	2.1	select suitable crops and decide upon its establishment procedures		
3.0	To acquire knowledge on various crop management practices	3.1	Suggest management practices on weeds, Pest & Disease, nutrients crop.		
4.0	To understand various concepts of cropping systems	4.1	Identify the various cropping and farming systems.		
5.0	Acquire knowledge on production practices for agricultural and horticultural crops	5.1	Implement effective production practices for agricultural and horticultural crops.		

UNIT I – HISTORY OF AGRICULTURE AND AGRONOMY	(9)
<p>Agriculture – Definition – Importance and scope – Branches of agriculture – Evolution of man and agriculture – History of agricultural development in the world and India – ITK – National and International Agricultural Research Institutes in India and Tamil Nadu.</p> <p>Agronomy – Definition – Importance, meaning and scope – Agro-climatic zones of India and Tamil Nādu – crops and classification – season – Units and measurements.</p>	
UNIT II – FIELD PREPARATION AND CROP ESTABLISHMENT	(9)
<p>Tillage – Definition – Types – Objectives – Modern concepts of tillage - Main field preparation – seeds – seed rate – sowing methods – crop establishment methods – plating geometry and factors affecting crop production – climatic – edaphic – biotic – physiographic and socio-economic factors – after cultivation – Thinning – Gap filing – Earthing up – detrashing – nipping – Pruning and Mulching.</p>	
UNIT III – CROP MANAGEMENT TECHNIQUES	(9)
<p>Weeds – Definition – types – weed control methods – physical cultural – mechanical – chemical – biological controls. Irrigation – methods. Pest and disease and their management. Manures and fertilizers- organic – inorganic – Time and methods of application – Integrated management practices- (IWM, INM, IPM)</p>	
UNIT IV – CROPPING SYSTEMS	(9)
<p>Cropping systems – Definition – Principles – Concepts – classification cropping systems of India and Tamil Nadu – cropping patterns – suitable Agriculture – integrated farming systems – organic agriculture – Dry farming.</p>	

UNIT V – PACKAGE OF PRACTICES FOR AGRI. AND HORTI. CROPS	(9)
Cultivation practices for cereals (Rice, maize) – millets (Cumbu, Ragi, sorghum) – minor millets, pulses (Black gram, green gram, Red gram) – Oil seeds (Groundnut and sesame) – Fiber (Cotton) – Sugar crop (sugarcane). Cultivation practices for Horticulture crops – Vegetables. Fruits and flowers.	
TOTAL (L: 45) = 45 PERIODS	

<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Yellamanda Reddy, T., Sankara Reddy, G. H., “Principles of Agronomy”, Kalyani Publishers, New Delhi, 2016. 2. Chidda Singh, Prem Singh and Rajtir Sing, "Modern techniques of raising field crops". Oxford & AMP; IBH Publishing Co. Pvt. Ltd., 2nd Edition, New Delhi, 2018. <p>REFERENCES:</p> <ol style="list-style-type: none"> 1. Hand book of Agriculture, ICAR publications, New Delhi, 2016. 2. Rajendra Prasad, “Text book of field crop production”, Directorate of Information and Publication, Krishi Anusandhan bavan, Pusa, New Delhi. 2015. 3. “Crop production guide”, Directorate of Agriculture and Tamil Nadu Agricultural University, Coimbatore, 2020. 4. Palaniyappan, S. P. and Sivaraman, K. “Cropping systems in the tropics principles and management”, New Age International Publishers, Revised 2nd Edition, New Delhi, 2006. 5. Kumar. N., “Introduction to Horticulture”, Rajalakshmi publications, 7th Edition, Nagercoil, 2015.
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Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	-	-	-	3	3	2	-	-	-	1	1	2
2	3	3	3	3	2	-	1	-	-	-	-	1	2	3
3	3	3	3	2	2	-	1	-	2	-	-	1	3	2
4	2	-	2	-	-	3	2	1	-	-	2	2	2	-
5	3	-	-	-	3	2	2	-	3	-	-	3	3	1
CO (W.A)	2.8	2.7	2.7	2.5	2.3	2.7	1.8	1.5	2.5	-	2	1.6	2.2	2

S. V. Narasimhan

22EEEC04- ELECTRICAL ENGINEERING <i>(For AGRI Branch only)</i>		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
Course Objectives		Course Outcomes : The students will be able to			
1.0	To impart knowledge on the concepts of measuring instruments	1.1	Explain the measurement of electrical parameters and various meters used.		
2.0	To analyze the layout of wiring.	2.1	Develop the wiring layout for electric fence		
3.0	To evaluate different Protection schemes.	3.1	Analyze the need of various protection schemes		
4.0	To understand the concept of characteristics of induction motor	4.1	Analyze the characteristics of induction motor in machineries		
5.0	To understand principles of sensors.	5.1	Exemplify the construction and operating characteristics of sensors used in agriculture applications		

UNIT I - MEASURING INSTRUMENTS	(9)
Instruments: Introduction, Classification – Indicating Instruments: Operating Principles, Moving Iron, Moving Coil – Induction type Energy meter - Measurement of Earth resistance: Fall of potential method and Earth tester.	
UNIT II - ELECTRICAL WIRING AND FENCING	(9)
Electric Wiring: Types of wires, Wiring materials, Casing and Capping wiring, Cleat wiring, Batten Wiring and Conduit Wiring - Electric Fencing: working principle, Earth Return System, Fence Return System, Bi-Polar Fencing System, Energisers.	
UNIT III – PROTECTION	(9)
Introduction to Fuses - Circuit Breaker: Operation - Types: MCB, MCCB, ELCB - Earthing: Types – Pipe and Plate Earthing, System and Equipments Earthing.	
UNIT IV - ELECTRICAL MACHINES AND DRIVES	(9)
Single Phase Induction Motor: Constructional details, Starting methods - Applications - Electric drives: Introduction, Classifications, General electric drive system (Block diagram Approach only)	
UNIT V SENSORS AND TRANSDUCERS	(9)
Sensors: Introduction, Position sensor, Velocity sensor, Proximity sensor, Hall effect sensor Thermistor and Thermocouple - Transducer: Principle of operation, Resistive potentiometer, LVDT, Piezo electric, capacitive.	
TOTAL = 45 PERIODS	

TEXT BOOKS:

1. Kothari, D. P. and Nagarath, I. J., “Basic Electrical Engineering”, McGraw Hill Education(India) Private Limited, 4th Edition, Third Reprint, 2019.
2. Muthusubramaian, R., Salivahanan, S. and Muraleedharan, K.A., “Basic Electrical, Electronics and Computer Engineering”, Tata McGraw Hill publishers, 2nd ed., New Delhi, 2012.

REFERENCES:

1. Bhattacharya, S. K., “Basic Electrical and Electronics Engineering”, Pearson India, Second Edition, New Delhi, 2017.
2. Sawhney, A. K., “A Course in Electrical and Electronic Measurement and Instrumentation”, Dhanpat Rai & Sons, 29th Edition, New Delhi, 2021.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3				-	-		-	-	-	-			
2	3				-	-		-	-	-	-			
3	3				-	-		-	-	-	-			
4	3				-	-		-	-	-	-			
5	3				-	-		-	-	-	-			
CO (W.A)	3	 	 	 	-	-	 	-	-	-	-	 	 	2



***Ratified by Eleventh Academic Council**

22MYB03 – STATISTICS AND NUMERICAL METHODS (Common to Mech,Civil,Agri,Chemical Branches)				
			L	T
			3	1
			P	C
			0	4
PRE REQUISITE : NIL				
Course Objectives			Course Outcomes : Students will be able to	
1.0	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.	1.1	Select a hypothesis testing method for the given numerical set of data to analyze the significance.	
2.0	To understand the knowledge of design of experiments	2.1	Apply analysis of Variance for the data set of selected number factors for analyzing the significance.	
3.0	To introduce the basic concepts of solving algebraic and transcendental equations.	3.1	Solve an algebraic or transcendental equation using an appropriate numerical method.	
4.0	To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in Engineering and technology disciplines.	4.1	Relate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for Engineering problems.	
5.0	To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.	5.1	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with Engineering applications.	

UNIT I - TESTING OF HYPOTHESIS	(9+3)
Sampling Distributions -Tests for single mean, difference of means (Large and Small samples) Using z, t -distribution, F – distribution- Chi-square - Test for independence of attributes and Goodness of fit.	
UNIT II - DESIGN OF EXPERIMENTS	(9+3)
Analysis of variance- Completely randomized design - Randomized block design - Latin square design.	
UNIT III - SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	(9+3)
Solution of algebraic and transcendental equations - Fixed point iteration method - Newton Raphson method- Solution of linear system of equations Gauss elimination method – Iterative methods of Gauss Jacobi and Gauss Seidel Methods- Eigen values of a matrix by Power method.	
UNIT IV - INTERPOLATION AND APPROXIMATION	(9+3)
Lagrange's and Newton's divided difference interpolations - Newton's forward and backward difference interpolation - Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules - Romberg's Methods.	

UNIT V - NUMERICAL DIFFERENTIATION AND INTEGRATION	(9+3)
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.	
TOTAL (L:45+T:15) : 60 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 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, 8th Edition, Asia, 2015. 3. Gupta, S. C. and Kapoor, V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 12th Edition, New Delhi, 2020.
REFERENCES:
<ol style="list-style-type: none"> 1. Burden, R. L. and Faires, J. D., "Numerical Analysis", Cengage Learning, 9th Edition, 2016. 2. Devore, J. L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, 8th Edition, New Delhi, 2014. 3. Gerald, C. F. and Wheatley, P. O. "Applied Numerical Analysis" Pearson Education, 7th Edition, Asia, New Delhi, 2007.
WEB REFERENCES:
<ol style="list-style-type: none"> 1. https://youtu.be/zmyh7nCjmsg 2. https://youtu.be/NmgbFJ4UwPs 3. https://youtu.be/RgKy7URFxIc 4. https://archive.nptel.ac.in/courses/111/107/111107105/

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	1	1	1	-	-	-	1	1	-	2	-	-
2	3	3	1	1	1	-	-	-	1	1	-	2	-	-
3	3	2	1	1	1	-	-	-	1	1	-	2	-	-
4	3	3	1	1	1	-	-	-	1	1	-	2	-	-
5	3	2	1	1	1	-	-	-	1	1	-	2	-	-
CO (W. A)	3	3	1	1	1	-	-	-	1	1	-	2	-	-

A. K. Mishra

22AGC03 - FUNDAMENTALS OF SOIL SCIENCE					
		L	T	P	C
		2	0	2	3
PREREQUISITE: NIL					
Course Objectives			Course Outcomes : Students will be able to		
1.0	To know about mechanics of different soils.	1.1	suggest manures and fertilizers for crop Production		
2.0	To gain knowledge on colloidal properties of soils.	2.1	suggest suitable crops for different soil		
3.0	Acquire knowledge on soil metabolism.	3.1	Analyse soil health.		
4.0	To know about the nutrient content, deficiency of soil.	4.1	suggest nutrients, fertilizers for effective production		
5.0	To know about various composting process & its composition.	5.1	Apply different composts for crop production.		
UNIT I – PHYSICAL PROPERTIES					(8)
Soil physical properties and their significance – Soil texture and textural classes – soil structure and classification – soil consistence. Bulk density, particle density and porosity – soil color- significance – causes and measurement. Soil temperature – Soil air – soil water – Measurements – Soil water potentials – Soil moisture constants – Movements of soil water – saturated and unsaturated flow – infiltration, hydraulic conductivity, percolation, permeability and drainage.					
UNIT II –CHEMICAL PROPERTIES					(7)
Soil colloids – properties, types and significance – layer silicate clays – their genesis and sources of charges – Ion exchange – CEC, AEC and Base saturation – Factors influencing Ion exchange – significance. Soil reaction, Buffering capacity and EC					
UNIT III – ORGANIC MATTER AND HUMUS					(5)
Soil organic matter – Composition – decomposition and mineralization, C: N ratio, carbon cycle – Fractions of Soil organic matter – Humus formation. Soil organisms – Beneficial and Harmful effects – Soil enzymes.					
UNIT IV – CLASSIFICATION OF FERTILIZERS AND ITS REQUIREMENT					(5)
Fertilizers – Definition and classification – Primary, Secondary and micronutrients. Calculating fertilizer requirements – simple fertilizer – Complex fertilizers – mixed fertilizers – water soluble fertilizers, liquid fertilizers.					
UNIT V – COMPOSTING TECHNOLOGY					(5)
Composting techniques – Aerobic and anaerobic – Enriched FYM and Vermi-compost. Composting of organic waste – Sugarcane trash and coir waste					
TOTAL (L: 30, P: 30) = 60 PERIODS					

TEXT BOOKS:

1. Brady, N. C. and Raymond, C. Weil, "The Nature and properties of Soils", Pearson Education, Inc. publishing as prentice Hall, 14th Edition, 2013.
2. Dilip Kumar Das, "Introductory Soil Science", Kalyani Publishers, New Delhi, 2004.
3. Schgal, J., "Pedology concepts and application", Kalyani Publishers, New Delhi, 2005.
4. "Fundamentals of Soil Science", ISS Publication, New Delhi, 2009.

REFERENCES:

1. Fanning, D. S. and Fanning, C. B., "Soil: Morphology, Genesis and classification", John Wiley and sons, Newyork, 1989.
2. Garrison Sposito, "The Chemistry of soils", Amazon Publishers, India, 2008.
3. Ghildyal, B. P. and Tripathi, R. P., "Soil physics", New Age International Publications, 2001.

LIST OF EXPERIMENTS

1. Soil sample collection
2. Visit to soils of different terrains and study of Soil profiles.
3. Determination of bulk density, particle density and porosity – cylinder, wax coating and core methods.
4. Soil textural analysis – feel method, International pipette method.
5. Determination of soil color and temperature.
6. Determination of soil moisture
7. Determination of Infiltration rate
8. Determination of Hydraulic conductivity.
9. Determination of soil pH and EC
10. Estimation of Soil organic carbon.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-			-			-	-	-	2	2	-
2	-	-	-			-			-	-	-			-
3	-	-	-			-			-	-	-			-
4	-	3	3	3		-			-	-	-	3	3	-
5	-	3	3	3		-			-	-	-	3	3	-
CO (W.A)	-	3	3	1.8	1	-	1	1	-	-	-	2	2	-



22AGC04 - STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERS					
		L	T	P	C
		2	1	0	3
PRE-REQUISITE: NIL					
Course Objectives			Course Outcomes : Students will be able to		
1.0	To provide knowledge about stress distribution and strains in regular and composite structures subjected to axial loads	1.1	Find stress distribution and strains in regular and composite structures subjected to axial loads		
2.0	To understand the importance of centroid and centre of gravity	2.1	Apply the concepts of centroid and center of gravity to solve practical problems in different disciplines, using appropriate mathematical and analytical techniques.		
3.0	To gain knowledge to analyze framed structures	3.1	evaluate the structural behavior, stability, and integrity of framed structures, ensuring their safety and optimizing their design for various engineering and farm structure applications.		
4.0	To gain knowledge on cantilever beams and simply supported beams	4.1	Apply the knowledge on finding slope and deflection of beams		
5.0	To know about the column, shells and shafts and the laws governing	5.1	Apply optimization techniques to enhance the design and performance of columns, shells, and shafts, considering factors such as material efficiency, cost-effectiveness, and safety		

UNIT I – BASICS OF STRESSES AND STRAINS	(6+3)
Simple Stresses and Strains Hookes Law Modulus of Elasticity Principle of Superposition bars of varying sections thermal stresses and strains Elastic Constants – Poisson’s Ratio - Bulk Modulus - Shear Modulus -interrelationships - Strain Energy and Impact Loading - Proof Resilience - Modulus of Resilience	
UNIT II – CENTRE OF GRAVITY AND MOMENT OF INERTIA	(6+3)
Centroid and Centre of Gravity -geometrical considerations - method of moments - Plane (laminae) sections - symmetrical sections - unsymmetrical sections -Moment of Inertia - Routh rule - method of integration - Theorem of Parallel axes - Theorem of Perpendicular axes - geometric sections - solid and hollow sections	
UNIT III – ANALYSIS OF FRAMED STRUCTURES (TRUSSES)	(6+3)
Structures built of Frames - Types of Frames - Perfect and imperfect frames - deficient and redundant frames - Loads and stresses - Method of Joints - Method of sections - Graphical method – Bow notations - - cantilever trusses - freely supported trusses - King Post and Queen Post Trusses	
UNIT IV – SHEAR FORCE, BENDING MOMENT AND DEFLECTION (BEAMS)	(6+3)
Beams – Types - Uniformly distributed load and gradually varying load -Shear Force and Bending Moment distributions - Theory of Simple Bending - Bending stress - modulus of section - deflection in beams and cantilevers - Double integration method	

UNIT V – COLUMNS, SHELLS AND SHAFTS	(6+3)
Columns and struts - Slenderness ratio - Buckling and crushing - Euler Column theory - applications - Rankine formula-Johnson formula - Indian Standards - Shells - Cylindrical and spherical shells - thin and thick shells - Shafts - torsion in circular shafts - Polar Moment of Inertia - strain energy due to torsion.	
TOTAL (L:30 +T:15): 45 PERIODS	

TEXT BOOKS:
1. Bhavikatti, S. S., 2008, “Engineering Mechanics”, 3 rd edition, New Age International. 2. Punmia, B. C., Jain, A. K. and Jain, A. K., 2002, “Strength of Materials”, Firewall Media. 3. Ramamrutham, S., 2008, “Strength of Materials”, Dhanpat Rai Publishing Co., 16 th edition, India

REFERENCES:
1. Rajput, R. K. “Strength of Materials” (Mechanics of Solids), S. Chand & Company Ltd., 4th edition India, 2010. 2. Khurmi, R. S. Strength of Materials (Mechanics of Solids), S. Chand & Company Ltd., 24th Edition, India, 2013.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	-	1	-	1	-	-	-	-	-	-	1	3	
2	2	2	3	-	1	-	1	-	-	-	1	1	3	
3	3	2	3	-	2	1	-	-	-	-	-	1	3	
4	3	3	3	2	2	2	-	-	-	-	-	-	3	
5	3	-	2	2	3	2	2	1	-	-	2	2	2	
CO (W.A)	2.8	2.7	2.4	2.0	1.8	1.7	2.0	1.0	-	-	2.0	1.3	2.8	

22AGC05 - BASIC WORKSHOP TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITE: NIL

Course Objectives		Course Outcomes : Students will be able to	
1.0	To introduce various methods of welding processes	1.1	Select a metal joining process for various materials
2.0	To understand the working of machine tools namely lathe, drilling machines & allied machines	2.1	Identify the components of lathe, drilling machine and explain their functioning
3.0	To acquire knowledge on basic concepts of foundry and casting processes and to understand the working of grinding	3.1	Describe the principles of foundry and casting, to choose the process parameters in grinding operations, finishing operations
4.0	To gain knowledge related to metal forming and their types	4.1	Demonstrate the concept of metal forming processes for various applications
5.0	To understand the basic concepts of Non Traditional Machining Processes	5.1	Choose the appropriate process parameters of various Non-Traditional Machining processes

UNIT I – WELDING**(9)**

Introduction to welding, types of welding, Oxyacetylene gas welding, types of flames, welding techniques and equipment. **Principle of arc welding**, equipment and tools.

UNIT II – LATHE AND DRILLING**(9)**

Constructional details of center lathe, Main accessories and attachments. Main operations and tools used on center lathes. Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations. **Types of drilling machines**. Constructional details of pillar types and radial drilling machines. Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes.

UNIT III – CASTING AND GRINDING**(9)**

Patterns - mould making - core - moulding sand - melting equipment - melting and pouring - gating system - cooling and solidification - casting - preparation, design - sand, shell mould, ceramic, vacuum, investment, die, centrifugal, continuous casting processes - casting defects, inspection and testing - **Grinding** - types of grinding -grinding wheel designation and selection - honing, lapping, super finishing, polishing, burnishing and buffing

UNIT IV – METAL FORMING PROCESSES**(9)**

Cold and hot working - rolling - forging - extrusion - drawing - metal stamping and forming - bending, deep drawing, stretch forming, metal spinning, shear and flow forming, blanking, piercing, embossing and coining, roll forming - forming defects - shot peening - types of dies, presses - comparison of forming

processes	
UNIT V – NON - TRADITIONAL MACHINING	(9)
Classification of Non-traditional Machining processes - Principle of operations - Process characteristics - applications - Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Chemical machining, Electro chemical machining, Electro chemical grinding, Laser beam machining, Electron beam machining	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. Rajput, R. K., “A Textbook of Manufacturing Technology”, Laxmi Publications (P) Ltd., 2nd ed., 2016. 2. Richard R. Kibbe, John E. Neely, Roland O. Meyer and Warren T. White, “Machine Tool Practices”, Prentice Hall of India, 10th Revised edition, New Delhi, 2014.
REFERENCES:
<ol style="list-style-type: none"> 1. Hajra Choudhury, S. K., Hajra Choundhury, A. K. and Nirjhar Roy, “Elements of Workshop Technology”, Media Promoters & Publishers Pvt. Ltd., Vol. I, II, 2017. 2. Jain, R. K. and Gupta, S. C., “Production Technology”, Khanna Publishers, New Delhi, 2014. 3. Sharma, P. C., “A Textbook of Production Technology”, S. Chand Publications, 2014. 4. Serope Kalpakjian, Steven R. Schmid, “Manufacturing Engineering and Technology”, Pearson Education, 4th ed., 2014.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	-	1	-	1	-	1	-	-	-	-	1	2	-
2	2	1	3	-	1	-	2	-	-	-	1	1	2	-
3	2	2	3	-	2	1	-	2	-	-	2	1	3	-
4	2	3	2	2	2	2	-	-	-	-	-	-	2	-
5	3	-	2	2	2	2	2	1	-	-	2	2	2	-
CO (W.A)	2.8	2.7	2.4	2.0	1.8	1.7	2.0	1.0	-	-	2.0	1.3	2.8	-

22AGC06 - THERMODYNAMICS FOR AGRICULTURAL ENGINEERS						
			L	T	P	C
			2	1	0	3
PREREQUISITE: NIL						
Course Objectives			Course Outcomes : Students will be able to			
1.0	To study the fundamentals of thermodynamics and zeroth law, First law of thermodynamics		1.1	Exemplify the basic concepts and zeroth law, First law of thermodynamics		
2.0	To impart the knowledge on second law of thermodynamics and entropy		2.1	Solve the problems related to cycles and cyclic devices using second law of thermodynamics		
3.0	To study the thermodynamic properties of pure substances and its phase change processes		3.1	Determine the thermodynamic properties of pure substances and its phase change processes		
4.0	To learn about gas power cycles and its performance		4.1	Analyze and compare the performance of Air Standard Cycles - Otto, Diesel, Dual and Rankine cycle .		
5.0	To analyze different types of boilers and its performance		5.1	Analyze the working of different types of boilers and its mountings, accessories		

UNIT I – BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS	(6+3)
Thermodynamic, Thermodynamic Systems and Surroundings, Different Approaches in The Study of Thermodynamics-Property, Thermodynamic Equilibrium , State, Process, Cyclic Process, Quasi-Static Process and Non Quasi-Static Process-Working Fluid, Gas, Vapour and Gas Laws-Temperature, Equality of Temperature, The Zeroth Law of Thermodynamics and Temperature Scale-Work & Heat - First law of thermodynamics - Applied to closed and open systems-isolated systems. Internal energy. Specific heat at constant volume (Cv) and Specific heat at constant pressure (Cp). Enthalpy-Limitations of Laws of thermodynamics.	
UNIT II –SECOND LAW OF THERMODYNAMICS	(6+3)
Second law of thermodynamics - Kelvin Planck and Clausius statements. Reversibility and Irreversibility. Clausius inequality. Entropy concept-a point function or a property of a system efficiency, Principle of increase of entropy - Change of entropy during thermodynamic processes. Carnot theorem- absolute entropy- availability. CARNOT CYCLE Coefficient of Performance of heat pumps and refrigerator.	
UNIT III - PROPERTIES OF PURE SUBSTANCES	(6+3)
Thermodynamic properties of pure substances in solid, liquid and vapour phases, Pressure-Volume (P-V), Pressure - Temperature (P-T), Temperature - Volume (T-V), Temperature - Entropy (T-S), Enthalpy - Entropy (H-S), Pressure-Volume-Temperature (P-V-T) diagrams, Triple Point And Critical Point. Thermodynamic properties of steam - Calculations of work done and heat transfer in non-flow and flow process	

UNIT IV - AIR STANDARD CYCLES AND PSYCHROMETRY	(6+3)
Air standard cycles - Otto, Diesel and Dual, Calculation of mean effective pressure and Air standard efficiency. Rankine cycle concept of ideal- Psychrometric chart	
UNIT V - STEAM BOILERS	(6+3)
Steam Boilers/Generators, Classification of Boilers - Lancashire Boiler - Cochran Boiler, Locomotive Boiler and Babcock-Wilcox Boiler - Boiler Mountings - Boiler Accessories	
TOTAL (L:30 +T:15): 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Rajput, R. K., "A Text Book of Engineering Thermodynamics", Laxmi publication Pvt. Ltd., New Delhi, 2009. 2. Cengel Y. and Boles, "Thermodynamics - An Engineering Approach", Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2003. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Ballaney, P. L., "Thermal Engineering (Engineering Thermodynamics & Energy Conversion Techniques)". 2. Arora, C. P., "Thermodynamics", Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2003. 3. Rayner Joel, "Basic Engineering Thermodynamics", Pearson Publications, 2012. Vikas Publishing House Pvt. Ltd., New Delhi, 2005. 4. Khurmi, S., "Text book of thermodynamics and Heat transfer", S. Chand Publications, New Delhi, 2002. 5. Merle C. Potter, Craig W. Somerton, "Thermodynamics for Engineers", Schaum Outline Series, Tata McGraw Hill Publishing Company Private Limited, New Delhi, 2004. 6. Khurmi, R. S., "Steam table with Psychometric chart", S. Chand Publications, New Delhi, 2002. 	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
2	3	3	-	1	-	-	1	-	-	2	-	3	-	-
3	3	3	-	-	-	-	2	-	-	1	-	3	2	-
4	3	3	1	2	2	2	2	-	-	2	-	3	3	-
5	3	3	-	2	2	2	1	-	-	2	-	3	3	-
CO (W.A)	3	3	1	1.7	2	2	1.5	-	-	1.8	-	3	2.7	-

Signature

22AGC07 - FARM TRACTOR SYSTEMS

		L	T	P	C
		3	0	0	3
PRE-REQUISITE: NIL					
Course Objectives		Course Outcomes : Students will be able to			
1.0	To gain knowledge on classification of tractors, tractor engines	1.1	Classify the different types of tractors based on their applications.		
2.0	To impart the knowledge on working of engine system	2.1	Summarize engine system components		
3.0	To know about the power transmission mechanism	3.1	Define transmission system, wheels and breaking systems		
4.0	To develop skills on safe and efficient use of tractors	4.1	Describe tractor hydraulic system and tractor ergonomics		
5.0	To work out the economics and testing procedure of tractors and power tillers	5.1	Recognize power tiller components, tractor testing codes and procedures		

UNIT I – TRACTORS	(9)
Classification of tractors – Tractor engines – Principles of operation of IC engines – construction of engine blocks, cylinder head and crankcase – features of cylinder, piston, connecting rod and crankshaft – firing order – combustion chambers.	
UNIT II – ENGINE SYSTEMS	(9)
Valves – inlet and outlet valves – valve timing diagram. Air cleaner – exhaust – silencer – Cooling systems – lubricating systems – fuel system – properties of fuels – governor – electrical system – engine trouble shooting	
UNIT III – TRANSMISSION SYSTEMS	(9)
Transmission – clutch – gear box – sliding mesh – constant mesh – synchro mesh – Differential, final drive and wheels – Steering geometry – steering systems – front axle and wheel alignment – wheel ballasting – Brake – types – system.	
UNIT IV – HYDRAULIC SYSTEMS	(9)
Hydraulic system – working principles, three point linkage – draft control – weight transfer, theory of traction – tractive efficiency – tractor chassis mechanics – stability – longitudinal and lateral – Controls – visibility – operators seat – tractor safety.	
UNIT V – POWER TILLER AND TRACTOR TESTING	(9)
Power tiller – special features – clutch – gear box – steering and brake – Makes of tractors and power tillers – Need – Advancements from BS IV to VI - Types of tests – test procedure – need for testing & evaluation of farm tractor – Test code for performance testing of tractors and power tillers	
TEXT BOOKS:	
<ol style="list-style-type: none"> Jain, S. C. and Rai, C. R., “Farm tractor maintenance and repair” Standard publishers and distributors, 3rd Edition, New Delhi, 2016. Jagdishwar Sahay, “Elements of Agricultural Engineering”, Standard Publishers and Distributors Pvt Ltd, 2020. 	

REFERENCES:

1. Barger, E. L., Liljedahl, J. B. and McKibben, E. C., "Tractors and their Power Units" Wiley Eastern Pvt. Ltd., New Delhi, 1997.
2. Indian Standard Codes for Agril. Implements. Published by ISI, New Delhi.
3. <http://ecoursesonline.iasri.res.in/course/view.php?id=39>

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	-	1	-	1	-	-	-	-	-	-	1	3	-
2	3	3	3	-	1	-	-	-	-	-	-	1	3	-
3	3	2	3	-	2	1	-	-	-	-	-	1	3	-
4	3	3	3	2	2	2	-	-	-	-	-	-	3	-
5	3	-	2	2	3	2	2	1	-	-	2	2	2	-
CO (W.A)	2.8	2.7	2.4	2	1.8	1.7	2	1	-	-	2	1.3	2.8	-



22AGC08 - FLUID MECHANICS AND HYDRAULICS				
		L	T	P
		2	0	2
PREREQUISITE: NIL				
Course Objectives		Course Outcomes : The students will be able to		
1.0	To study the different properties of fluids	1.1	Demonstrate the properties of fluid and its behaviour in static conditions along with pressure measurements.	
2.0	To gain basic knowledge on kinematics and dynamics flow	2.1	Analyze the various characteristics of fluid flow through fluid kinematics and dynamics.	
3.0	To learn various flow measurement device and techniques.	3.1	Calculate the rate of flow of fluids using flow measuring devices and design channels construction	
4.0	To impart knowledge on open channel flow	4.1	Explain the dimensional analysis methods in model studies	
5.0	To understand the working of pumps	5.1	Classify the different types of pumps based on their application	
UNIT I : BASIC CONCEPTS AND PROPERTIES				(6)
Properties of fluids - mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, surface tension and capillarity - Fluid statics: concept of fluid static pressure, absolute and gauge pressures -Pascal's law -hydrostatic law - pressure measurements using simple manometers and mechanical gauges				
UNIT II - FLOW MEASUREMENTS				(6)
Euler's equation of motion - Bernoulli's equation - applications - Venturimeter - orifice meter, Pitot tube- Flow through pipes - laminar and turbulent flow in pipes - Major losses ,Darcy Weisbach equation for friction head loss -minor losses in pipes				
UNIT III - OPEN CHANNEL FLOW				(6)
Types of flow in channel - Most economical section of channel - rectangular -trapezoidal. Flow measurement in channels – weirs and notches - rectangular, triangular				
UNIT IV DIMENSIONAL AND MODEL ANALYSIS				(6)
Dimensions -derived quantities - dimensional homogeneity - methods of dimensional analyses - Rayleigh"s and Buckingham's method - similitude - dimensionless numbers.				
UNIT V - PUMPS				(6)
Types of pumps - Centrifugal pumps - components- working - specific speed - characteristics curves. Submersible pumps - Jet pump- reciprocating pump				

1. Verification of Bernoulli's theorem
2. Determination of Co-efficient of discharge of Venturimeter/ orifice meter
3. Determination of co-efficient of velocity of given Flow through Pitot tube
4. Determination of Co-efficient of discharge of V-notch/ Rectangular Notch
5. To determine the major and minor head loss coefficient for different pipe fittings.
6. Conduct a test on Centrifugal pump/reciprocating pump
7. Conduct a test and on Submersible pump

TOTAL (L:30 +P:30): 60 PERIODS

TEXT BOOKS:

1. Bansal, R. K., "A text book of Fluid Mechanics and Hydraulic Machinery", Laxmi publications (P) Ltd., New Delhi, 2002.
2. Yunus A. Cengel, John M. Cimbala, "Fluid Mechanics-Fundamentals and Applications", Tata McGraw Hill Publishing Co., New Delhi, 2006.

REFERENCES:

1. Subramanya, K., "Flow in Open Channels", Tata McGraw Hill Publishing Co., New Delhi, 2009.
2. Modi, P. N. and Seth, S. M., "Hydraulics and Fluid mechanics", Standard Publishers & Distributors, New Delhi.
3. Grade, R. J., "Fluid mechanics through problems", Wiley eastern Ltd., Chennai, 2002.
4. Jagadish Lal, "Hydraulic machines", Metropolitan book house, New Delhi, 2000.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	-	-	-	-	-	-	-	-	3	-
2	3	2	2	3	-	2	-	-	-	-	-	-	2	-
3	3	2	2	-	2	-	-	-	-	-	-	-	2	-
4	3	3	3	2	2	3	-	-	-	-	-	-	2	-
5	3	2	2	2	2	3	-	-	-	-	-	-	3	-
CO (W.A)	3	2.2	2.2	2.3	2	2.7	-	-	-	-	-	-	2.4	-

Dr. N. Srinivas Reddy

22AGC09 - HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERS

	L	T	P	C
	2	1	0	3

PREREQUISITE: NIL

Course Objectives		Course Outcomes : The students will be able to	
1.0	To impart the knowledge on heat transfer mechanisms in conduction	1.1	Calculate the different types of conduction in heat transfer mechanism
2.0	To impart the knowledge on heat transfer mechanisms in Convection	2.1	Apply the concepts to solve convection problems in heat transfer mechanism.
3.0	To impart the knowledge on heat transfer mechanisms in Radiation	3.1	Solve numerical problems in the radiation for various geometries
4.0	To analyze heat exchangers and methods of evaluating the performance	4.1	Analyze the performance of heat exchangers and evaporators
5.0	To introduce non-dimensional numbers and their effects in governing various modes of mass transfer	5.1	Analyze the various modes of mass transfer and apply them in engineering problems

UNIT I CONDUCTION	(9)
Basic concepts - Mechanism of Heat transfer. Conduction - Fourier's Law , General differential equation in Cartesian and cylindrical coordinates, one dimensional steady state heat conduction, conduction through plane wall, cylinders and spherical systems.	
UNIT II – CONVECTION	(9)
Basic Concepts - Heat transfer coefficients , boundary layer concept. Types of convection – Natural and Forced convection, dimensional analysis, non-dimensional numbers, external flow, flow over plates, cylinders and spheres, internal flow, laminar and turbulent flow, combined laminar and turbulent.	
UNIT III - RADIATION	(9)
Radiation heat transfer - concept of black and grey body- Laws of Radiation - Stefan-Boltzmann Law, Kirchhoff's Law Black body radiation - Grey body radiation - Shape factor algebra - Radiation shields	
UNIT IV HEAT EXCHANGERS	(9)
Heat exchangers - Types, heat exchanger analysis, fouling factor, LMTD (Logarithmic mean temperature difference) and Effectiveness-NTU (number of transfer units) Method - Overall Heat Transfer Coefficient.	
UNIT V - MASS TRANSFER	(9)
Mass transfer- introduction - Fick law for molecular diffusion - molecular diffusion in gases - equimolar counters diffusion in gases- diffusion through a varying cross sectional area-diffusion coefficients for gases - molecular diffusion in liquids	
TOTAL (L:30 + T: 15): 45 PERIODS	

TEXT BOOKS:

1. Rajput, R. K., "Heat and Mass Transfer", S Chand and company Ltd., New Delhi, 2002.
2. Sachdeva, R. C., "Fundamentals of Engineering Heat and Mass Transfer", New Age International private limited, New Delhi, 2010.

REFERENCES:

1. Yunus A. Cengel, "Heat and Mass Transfer: a Practical Approach", Tata McGraw Hill publishing Company private limited, New Delhi, 2007.
2. Kothandaraman, C. P. and Subramanyan, S., "Fundamentals of Heat and Mass Transfer", New Age International private limited, New Delhi, 2014.
3. Frank P. Incropera, "Fundamentals of Heat and Mass Transfer", John Wiley, New Delhi, 2007.
4. Holman, J. P., "Heat Transfer", Tata McGraw Hill publishing Company private limited, New Delhi, 2009.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	-	-	-	-	-	-	-	-	3	-
2	3	2	2	3	-	2	-	-	-	-	-	-	2	-
3	3	2	2	-	-	-	-	-	-	-	-	-	2	-
4	3	3	3	2	-	3	-	-	-	-	-	-	2	-
5	3	2	2	2	-	3	-	-	-	-	-	-	3	-
CO (W.A)	3	2.2	2.2	2.3	-	2.7	-	-	-	-	-	-	2.4	-



22AGCI0 - CROP PROCESS ENGINEERING

L	T	P	C
3	0	0	3

PREREQUISITE : NIL

Course Objectives		Course Outcomes : The students will be able to	
1.0	To know the importance of moisture content during harvesting, threshing and storage of non-perishable crops	1.1	Interpret moisture content of crop to minimize post-harvest losses
2.0	To gain knowledge on psychrometry and its uses and drying methods.	2.1	Design dryers for different type of crops
3.0	To know the threshing and different types of cleaning, grading and material handling equipments	3.1	Design threshers and recommend cleaners, graders and conveying equipment to different types of crops.
4.0	To acquire knowledge on different storage structures	4.1	Design storage structure to minimize post-harvest losses
5.0	To gain knowledge on milling of cereals, pulses and oil seeds	5.1	suggest and differentiate between various types of milling equipment used for processing

UNIT I- INTRODUCTION**(9)**

Post-harvest engineering – introduction – objectives – post harvest losses of cereals, pulses and oilseeds – importance – optimum stage of harvest. Engineering properties of agricultural materials- optimum stage of harvest and its importance – importance of loss reduction- post harvest handling operations- moisture content – measurement - direct and indirect methods- equilibrium moisture content- RH measurement, air-grain measurement.

UNIT II PSYCHROMETRY AND DRYING**(9)**

Psychrometry – importance – Psychrometric charts and its uses – Drying – principles and theory of drying – thin layer and deep bed drying – Hot air drying – methods of producing hot air – Types of grain dryers – selection – construction, operation and maintenance of dryers – Design of dryers

UNIT III THRESHING, CLEANING, GRADING AND MATERIAL HANDLING**(9)**

Threshing – traditional methods mechanical threshers – types – principles and operation - principles – air screen cleaners – types – adjustments – cylinder separator – spiral separator – magnetic separator – colour sorter – inclined belt separator – length separators – effectiveness of separation and performance index. Different types of graders. Materials handling – belt conveyor – screw conveyor – bucket elevators – pneumatic conveying.

UNIT IV- PRINCIPLES AND PRACTICES OF STORAGE**(9)**

Importance of scientific storage systems, Post-harvest Physiology of semi-perishables and perishables- Damages direct damages-indirect damages- causes of spoilage in storage (moisture, temperature, humidity, respiration loss, heat of respiration, Sprouting)- destructive agents (rodents, birds, insects, etc.,)- sources of infestation and control. Storage structures- traditional storage structures- modern storage structures - conditions for storage - control of temperature and relative humidity inside storage.

UNIT V - CROP PROCESSING	(9)
Paddy processing – parboiling of paddy – methods – merits and demerits – dehusking of paddy – methods – merits and demerits – rice polishers – types – constructional details – polishing – layout of modern rice mill – performance evaluation of modern mills. Wheat milling. Pulse milling methods – Wet, Dry, CFTRI, CIAE, Punjab. Oil seed processing. Principles and operation – maize sheller, husker sheller for maize – groundnut decorticator – castor sheller.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> Chakraverty, A., “Post Harvest Technology of cereals, pulses and oilseeds”, Oxford & IBH publishing & Co. Pvt. Ltd., Third Edition, New Delhi, 2017 Sahay, K. M. and Singh, K. K., “Unit operations in Agricultural Processing”, Vikas Publishing House Pvt. Ltd., Second revised and enlarged edition, New Delhi, 2004. Ojha, T. P. and Michael, A. M., “Principles of Agricultural Engineering”. Jain Brothers, Tenth edition, Vol.- I, New Delhi, 2018. 	
REFERENCES:	
<ol style="list-style-type: none"> Henderson, S. M. and Perry, R. L., “Agricultural process engineering”, John Willey and Sons, New York, 1995. Pandey, P. H., 1994, “Principles of agricultural processing”, Kalyani Publishers, Ludhiana. Mohsenin, N. N., “Physical Properties of Plant and Animal Materials”, Gordon and Breach publishers, New York, 1986. McCabe, W. L. and Smith, J. C., “Unit Operations of Chemical Engineering”, McGraw Hill Education (India) Pvt. Ltd, Seventh Edition, Tokyo, 2015. 	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	1	-	-	-	-	-	-	-	-	1	-	2
2	3	1	-	-	1	-	-	-	-	-	1	2	-	3
3	3	2	2	1	1	-	-	-	1	-	1	2	2	3
4	3	2	1	1	-	-	-	-	-	-	1	1	1	3
5	3	2	2	2	2	-	-	-	1	-	1	1	2	3
CO (W.A)	3	1.6	1.5	1.3	1.3	-	-	-	1	-	1	1.4	1.7	2.8

Dr. Mohan Singh

22AGCI I - IRRIGATION AND DRAINAGE ENGINEERING

L	T	P	C
3	0	0	3

PREREQUISITE : NIL

Course Objectives		Course Outcomes : The students will be able to	
1.0	To acquire knowledge on water resources	1.1	Compare the development and utilization of water resources in India, as well as in Tamil Nadu, and estimate evapo-transpiration using direct and indirect methods
2.0	To understand the concept of soil water relationship	2.1	Analyse the relationship and measurement of soil water
3.0	To understand the concept of irrigation methods	3.1	Design different methods of surface irrigation and their adaptability to the specific characteristics of soil, topography and crops
4.0	To understand the concept and functioning of command area development programme	4.1	Execute the command area development works including on farm development works, maintenance and its economics and water distribution system like warabhandhi and rotational waters supply system
5.0	To understand different agricultural drainage systems	5.1	Design, monitor and maintain the surface and sub surface drainage systems for controlling the salinity and water logging in the agricultural area.

UNIT I – WATER SOURCES AND IRRIGATION REQUIREMENTS	(9)
Surface and ground water resources – River basins- Irrigation- development and Utilization in India and TamilNadu -Moisture use of crop- Evapotranspiration-methods. Crop water Requirement – duty and delta- Effective rainfall – crop water Requirement –measurement of irrigation water: weirs, notches and flume - Irrigation Scheduling - Irrigation Frequency, Irrigation Efficiencies.	
UNIT II – SOIL WATER TENSION AND MEASUREMENT OF SOIL WATER	(9)
Rooting characteristics – soil water tension and soil water stress - crop adaptation to moisture stress. Soil water potential concept – soil-water-plant relationships – soil water retention – hydraulic conductivity – determination. Measurement of soil water-gravimetric , volumetric – tensiometric, electrical resistance, pressure plate and pressure membrane apparatus methods – neutron scattering, immersion, dielectric, thermal conductivity, penetrometric and air permeability methods.	
UNIT III – METHODS AND QUALITY IRRIGATION	(9)
Soil, plant and meteorological factors determining water needs of crops, depth and Methods of Irrigation – Pressurized Irrigation, Hydraulics and design- alluvial channels Kennedy’s and Lacey’s theories, Materials for lining water courses and field channel, Water control and diversion structure - Underground pipeline irrigation system - Land grading - Land leveling methods. Quality of irrigation water and management of saline water for irrigation; water management in problem soils.	

UNIT IV – COMMAND AREA DEVELOPMENT	(9)
Command area - Concept, Components of CADA - CADA programmes in Tamil Nadu - On Farm Development works, Execution - maintenance and economics of OFD works, Farmer’s committee and its role for water distribution and system operation, Strategic outlet command – stream size for efficient warabandhi and rotational irrigation system	
UNIT V - AGRICULTURAL DRAINAGE AND SYSTEM	(9)
Agricultural drainage - Drainage coefficient; principles of flow through soils, Darcy law -infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage- Pipe materials - mole drains, drainage wells, Leaching requirements -irrigation and drainage water quality - recycling of drainage water for irrigation.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Michael, A.M., “Irrigation – Theory and Practice”, Vikas publishing house, Second edition, New Delhi, 2015. 2. Murthy, V. V. N., “Land and water management”, Kalyani publishing, Sixth edition, New Delhi, 2016. 3. Suresh, R., “Land and water management principles”, standard publishers, Second edition, New Delhi, 2017. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Dilip Kumar Majumdar, “Irrigation water Management – Principles and Practice”, Prentice – Hall of India Pvt. Ltd., New Delhi, 2006. 2. Luthin, J. N., “Drainage Engineering”, John Wiley and Sons, New York, 1966. 	

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	3	2	3	-	-	2	-	-	1	-	2	-
2	3	2	3	2	3	-	-	2	-	-	1	2	3	1
3	3	2	-	1	3	-	-	2	-	-	2	2	2	2
4	3	1	-	1	1	3	-	-	-	-	3	-	2	2
5	3	1	3	2	3	-	-	2	-	-	2	2	3	2
CO (W.A)	3	1.6	3	1.6	2.6	3	-	2	-	-	1.8	2	2.4	1.8

Signature

22AGC12 - HYDROLOGY AND WATER RESOURCES ENGINEERING						
			L	T	P	C
			3	0	0	3
PRE-REQUISITE: NIL						
Course Objectives			Course Outcomes : The students will be able to			
1.0	To acquire knowledge on hydrologic cycle and measurement of infiltration		1.1	Apply the basic concept of hydrologic cycle and measure the interception losses including evaporation, transpiration, infiltration and infiltration indices		
2.0	To understand the importance and interpretation of runoff and hydrograph		2.1	Classify the methods of estimation of runoff and construct the hydrographs based on different methods		
3.0	To know about the importance of drought prone program.		3.1	Analyze the frequency of disaster and provide solution to the area		
4.0	To classify and estimate the reservoirs		4.1	Classify and estimate the sedimentation and storage of reservoirs		
5.0	To gain knowledge on groundwater flow		5.1	Calculate the ground water flow and estimate the aquifer parameters by following various methods based on the groundwater movement and geological formation.		

UNIT I – PRECIPITATION AND ABSTRACTIONS	(9)
Hydrological cycle - Meteorological measurements – Types and forms of precipitation – Rain gauges - Spatial analysis of rainfall data using Thiessen polygon and Iso-hyetal methods - Interception – Evaporation: Measurement, Evaporation suppression methods – Infiltration: Horton’s equation - Double ring infiltrometer - Infiltration indices	
UNIT II – RUNOFF	(9)
Catchment: Definition, Morphological characteristics - Factors affecting runoff - Run off estimation using Strange’s table and empirical methods - SCS-CN method – Stage discharge relationship - Flow measurements - Hydrograph – Unit Hydrograph – IUH.	
UNIT III – HYDROLOGICAL EXTREMES	(9)
Natural Disasters - Frequency analysis - Flood estimation - Flood management - Definitions of drought: Meteorological, Hydrological, Agricultural and Integrated - IMD method - NDVI analysis - Drought Prone Area Programme (DPAP).	
UNIT IV – RESERVOIRS	(9)
Classification of reservoirs - Site selection - General principles of design - Spillways -Elevation- Area-Capacity curve - Storage estimation - Sedimentation - Life of reservoirs – Rule curve.	
UNIT V – GROUNDWATER AND MANAGEMENT	(9)
Origin - Classification and types - Properties of aquifers - Governing equations – Steady and unsteady flow - Artificial recharge - RWVH in rural and urban areas – Government schemes for Groundwater management.	

TEXT BOOKS:

1. Michael, A. M., "Irrigation: Theory and Practices", Vikas Publishing House Pvt., Limited, 2009.
2. Raghunath, H. M., "Groundwater", New Age International (p) Ltd., New Delhi, 2011.
3. Subramanya, K., "Engineering Hydrology", Tata McGraw Hill pub. Co., New Delhi, 2013.

REFERENCES:

1. Mutreja, K. N., 1990, "Applied Hydrology", Tata McGraw Hill pub. Co. New Delhi.
2. Ven te chow, David R. Maidment, Larry W. Mays, "Applied Hydrology", McGraw Hill pub. Co. New Delhi.
3. <http://ecoursesonline.iasri.res.in/course/view.php?id=39>

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	-	-	2	2	-	-	-	-	-	1	-	-
2	3	1	-	-	3	-	2	-	-	-	-	2	-	-
3	1	-	1	-	-	2	2	3	3	3	1	-	-	-
4	3	2	2	-	-	1	1	-	-	-	1	-	-	-
5	-	-	1	-	2	2	3	-	-	-	-	1	-	-
CO (W.A)	2.5	1.3	1.3	-	2.3	1.8	2	3	3	3	1	1.3	-	-



22AGC13 - SURVEYING AND LEVELLING FOR AGRICULTURAL ENGINEERS					
		L	T	P	C
		2	0	2	3
PRE REQUISITE: NIL					
Course Objectives			Course Outcomes : The students will be able to		
1.0	To understand the principle, concepts and methods of surveying	1.1	Identify the instruments required for conducting the survey in level and sloping ground		
2.0	To understand area and volume computation	2.1	Compute the area and volume of earth work by simple and numerical methods		
3.0	To practice compass traversing and plane table surveying	3.1	Identify the angle between the stations by prismatic compass and conduct the plane table surveying for locating the new station		
4.0	To learn leveling and contouring	4.1	Find the Reduced level for all points by using level instruments, prepare the contour map and also identify the horizontal, vertical angle using Theodolite		
5.0	To gain knowledge in total station survey	5.1	Demonstrate proficiency in planning and executing field surveys using a total station		

UNIT I - PRINCIPLES OF SURVEYING	(6)
Introduction - Principles and basic concepts and uses of surveying - classification and basic methods of surveying - Types of chains, Ranging rod, Ranging - Direct and Indirect methods –Method of Chaining on level and sloping ground - Obstacles in chaining.	
UNIT II - COMPUTATION OF AREA AND VOLUME	(6)
Introduction – Formulae for calculation of cross sectional area – calculation of volume - Area computation, Mid-Ordinate rule, Average ordinate rule, Trapezoidal rules, Simpson rule and Coordinate method of finding area-Computation of volume. Computation of Area from field notes and plot plan	
UNIT III - COMPASS TRAVERSING	(6)
Basic terminologies of Compass traversing – Prismatic and Surveyors Compass - Checking the accuracy of traverse - Errors and mistakes in Compass survey - Plane tabling - instruments and accessories - Radiation, Traversing, Orientation - Intersection and Resection.	
UNIT IV - LEVELLING AND CONTOURING	(6)
Levelling - definition - Benchmarks - different types of levels - Basic principles of leveling - Theory of simple, compound, cross sectional and reciprocal levelling -Contouring - definition - contour characteristics - direct and indirect methods -gradient contour - uses – Minor instruments, Hand level - Clinometer - Abney level– Theodolite types – adjustments – setting up – reading angles – measurements – Area and elevation determination.	
UNIT V - TOTAL STATION	(6)
Introduction- Accuracy of a Total Station- Accessories for Total Station- Functions Performed by Total Stations - Applications of Total Station- Remote Elevation Measurement (REM)- Missing Line Measurement (MLM)- Area Calculation- Setting out	

LIST OF EXPERIMENTS:	
1.	Open and closed compass traversing, Plotting and correction of closing error
2.	Differential levelling problems - Cross-sectioning – plotting
3.	Contouring – Grid method - Plotting of contour - preparation of map
4.	Theodolite surveying - elevation determination by measuring horizontal and vertical angles
5.	Remote elevation measurement Using Total Station
6.	Missing Line Measurement Using Total Station
7.	Area measurement using Total Station
TOTAL (L+P: 30+30) = 60 PERIODS	

TEXT BOOKS:	
1.	Basak, V. N., “Surveying and Levelling”, Tata McGraw hill publications, New Delhi. 1994.
2.	Gopi, S., “Advanced surveying: total station, GIS and remote sensing”, Pearson Education, Second Edition, India. 2018
REFERENCES:	
1.	Duggal, S. K., “Surveying”, McGraw hill education (India) Pvt. Ltd., 4th edition, New Delhi, 2013.
2.	Kanetkar, T. P., and Kulkarni, S. V., “Surveying and levelling Part II”, Pune Vidyarthi Griha Prakashan.
3.	Bharikatti, S. S., “Surveying Theory and Practice”, I.K. International publishing house Pvt. Ltd., New Delhi, 2013.
4.	Narinder Singh, “Surveying”, Tata McGraw hill publishing company Ltd., New Delhi, 1992.
5.	Michael, A. M. and Ojha, T. P., “Principles of Agricultural Engineering”, Jain Brothers, Vol. II, New Delhi, 2009.

Mapping of COs with POs / PSOs														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	-	-	-	-	3	-	-	-	-	1
2	3	3	3	3	-	-	-	-	3	-	-	3	-	3
3	3	3	-	3	2	-	-	-	3	-	-	3	-	1
4	3	3	3	3	3	-	-	-	3	-	-	2	-	2
5	3	3	3	3	3	3	-	-	3	-	-	2	-	3
CO (W.A)	3	3	2.8	2.8	2.7	3	-	-	3	-	-	2.5	-	2

