SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
---------AGRICULTURE ENGINEERING----------

Semester/Year		III/II	Program		B.Tech
Subject Category	DC	Subject Code:	AE-301	Subject Name:	Mechanics of Materials

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	-	2	4

Prerequisites:

Physics and Mathematics.

Course Objective:

Students are expected to learn basic concepts of mechanical properties of materials, concept of stress, strain and deformation of solid and state of stress, strain energy, principal stress and principal planes, theory of torsion and stresses in springs, fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behaviour so that the students can solve real engineering problems and design engineering systems.

Course Outcomes:

After completion of the course, the student will be able to:

1. Develop an understanding of the engineering fundamentals of structural mechanics of deformable bodies.
2. Determine stress, strain, deflection and rotation in members subjected to combination of loadings.
3. Design simple bars, beams and circular shafts for allowable stresses and loads using appropriate material considering engineering properties.

UNITs	Descriptions	Hrs.	CO's
I	**Simple Stress and Strains:** Mechanical Properties of material, Concept of Elastic body, Stress and Strain, Hooke's law, various types of stress and strains, Elastic constants, Stresses in compound bars, composite and tapering bars, Temperature stresses and strain. **Complex Stress and Strains:** Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and strains, Mohr's circle of stresses.	8	CO1
II	**Shear Force, Bending Moment**: Shear Force and Bending moment Diagram in beams with various loads and couple, Simply Supported, Cantilever and Overhanging beams, Point of Contra flexure, Relationship between bending moment and shear force. SFD and BMD by Graphical Method. **Deflection of beams:** Double Integration Method, Macaulay's Method, Deflection by Method of Superposition, Conjugate Beam method, Moment Area Method..	9	CO2

III	**Theory of Bending:** Concept of pure bending. Equation of bending, Neutral axis, Section-Modulus, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to various loads and couples, Shear Stress distribution across a section in beams of various cross sections, Built-up beams and Shear flow.	7	CO2
IV	**Torsion of Shafts:** Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Torsional Moment Diagram (TMD), Hollow shafts, Transmission of power by circular shafts, Open and closed coil springs, Leaf Spring, Spiral Spring **Pressure Vessels:** Thin and Thick walled cylinders and spheres, Stress due to internal pressure, Change in diameter and volume, Compound cylinders and shrink fittings, Theories of failure.	8	CO3
V	**Columns and Struts:** Eccentric loading on columns, Euler's buckling load for uniform section, various end conditions, slenderness Ratio, Stress in columns, Secant formula.	8	CO3
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. To find Modulus of Elasticity 'E' of Mild Steel and Wood by Deflection method.
2. To find Modulus of Rigidity 'N' of Mild Steel by Barton's vertical torsion apparatus.
3. To find Modulus of Rigidity 'N' of spring material by spring test apparatus.
4. To verify Shear Force at a given section of a Simply Supported Beam.
5. To verify Bending Moment at a given section of a Simply Supported Beam.
6. To verify Maxwell's Theorem of Reciprocal Deflection.
7. To perform Tensile Test on M.S. and C.I. specimen and draw stress strain curve.
8. To perform Compression test on Teak and Jungle wood and R.C.C. C.I. cubes and compares their results.
9. To determine Ultimate Shear Strength of M.S., C.I. and Brass.
10. To determine Modulus of Rupture of Teak and Sal wood beam by Flexure Test.

Text Book-

1. Mechanics of Materials, by R.C. Hibbeler, Pearson Publications.
2. Mechanics of Materials, by Barry J. Goodno & James M.Gere, Cengage Publications.
3. Strength of Materials (Schaum's), Nash William; McGraw Hill International

Reference Books-

1. Strength of Materials, Pytel and Singer, Harper International.
2. Mechanics of Materials, Beer and Johnston, McGraw Hill.
3. Strength of Materials, Subramanian R, Oxford Publications

Modes of Evaluation and Rubric

Quiz, Assignment, Mid term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

https://swayam.gov.in/nd1_noc20_ce50/preview https://swayam.gov.in/nd1_noc20_ce34/preview	
Recommendation by Board of studies on	08-06-2023
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Civil Engineering Department

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---------AGRICULTURAL ENGINEERING----------

Semester/Year		III/II	Program		B.Tech
Subject Category	DC	Subject Code:	AE-302	Subject Name:	**Farm Power and Tractors**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	100	3		2	4

Prerequisites:

Course Objective:

To introduce the students to the different sources of farm power and systems and working principles of tractor, power tiller, makes of tractors and power tillers

Course Outcomes:

After completion of the course, the student will be able to:

1. Know different sources of farm power.
2. The students will be able to understand the types & working of various systems of tractor
3. The students will have the knowledge on earth moving machineries, tractor classification and tillage implements.

UNITs	Descriptions	Hrs.	CO's
I	**Sources of Power**: Sources of power on the farm - human, animal, mechanical, electrical, wind, solar and biomass; bio-fuels. Capacities and efficiencies. **TRACTORS** Classification of tractors - Tractor engines – construction of engine blocks, cylinder head and crankcase - features of cylinder, piston, connecting rod and crankshaft – firing order combustion chambers.		CO1
II	**ENGINE SYSTEMS** Valves-inlet and outlet valves – valve timing diagram. Air cleaner-exhaust – silencer. Cooling systems - lubricating systems - fuel system – governor- electrical system.		CO2
III	**TRANSMISSION SYSTEMS** Transmission - clutch - gear box - sliding mesh - constant mesh - synchro mesh. Differential, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system.		CO2
IV	**HYDRAULIC SYSTEMS** 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.		CO2
V	**POWER TILLER, BULLDOZER AND TRACTOR TESTING** Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors, power tillers and bulldozers. Bulldozer- salient features – turning mechanism, track mechanism, components –		CO3

	operations performed by bulldozers. Types of tests- test procedure - need for testing & evaluation of farm tractor -Test code for performance testing of tractors and power tillers.		
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Familiarization of tractor systems and controls: determination of tractor speed and slip
2. To study, working of two stroke and four stroke cycle SI & CI engines, firing interval firing order and valve timing diagram
3. To study cooling system of tractor engines
4. To study lubrication system of tractor engines
5. To study air cleaners and fuel systems of SI & CI engine
6. To study different types of governors and methods of governing
7. To study electrical system of tractors.
8. To study different types of clutches and brakes
9. To study different types of gear transmission systems calculation of speed ratio for different gears.

Text Book-

1. Jain, S.C. and C.R. Rai. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi, 1999.

Reference Books-

1. Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.
2. Domkundwar A.V. A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi,1999.
3. Black, P.O. Diesel engine manual. Taraporevala Sons& Co., Mumbai, 1996.
4. Grouse, W.H. and Anglin, D.L. Automative mechanics. Macmillan McGraw- Hill, Singapore, Indian Standard Codes for Agricultural Implements Published by ISI, New Delhi, 1993.
5. Jagadeeshwar Sahay, Elements of Agricultural Engineering, Standard Publishers Co., New Delhi, 2010.

Modes of Evaluation and Rubric

Quiz, Assignment, Mid-term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

Recommendation by Board of studies on	08-06-2023
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---------AGRICULTURE ENGINEERING----------

Semester/Year	III/II	Program	B.Tech
Subject Category: DC	Subject Code:	AE-303	Subject Name: Soil Mechanics

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	-	2	4

Prerequisites:

Course Objective:

To provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures to identify factors controlling soil behaviour and methods to determine soil properties. Students will acquire basic knowledge in engineering design of geotechnical systems. To learn the basic concept of types of foundation and bearing capacity, Basic understanding of Earth Pressure concept, slope stability.

Course Outcomes:

After completion of the course, the student will be able to:
CO1- Classify of soil and their structural arrangement.
CO2- Determines permeability, stress variation and distribution in soils.
CO3- Analyze Compressibility, strength and stability of soils.
CO4- Investigate the soil bearing capacity and method of stabilization.

UNITs	Descriptions	Hrs.	CO's
I	**Engineering Properties and Classification of Soils** -Water content, Unit weight of soil, Specific gravity, Void ratio, Porosity, Degree of saturation, Functional relationships, Determination of index properties, Liquid limit, Plastic limit, Shrinkage limit, Plasticity index, Particle size distribution curve. Particle size classification, Textural classification, HRB classifications, Unified soil classifications, Indian standards classification, Soil structure, Atomic and molecular bond structure of composite soils.	9	CO1
II	**Soli Hydraulics and elasticity of soils:** Modes of occurrence of water in soils**,** Stress condition in soil**,** Permeability**,** Factors affecting permeability**,** Laboratory and field methods of determining permeability coefficients. Definitions, Dupits theory, pumping out test, Pumping in test, and Interference among wells, Seepage analysis, 2-dimensional flow, and Flow nets.State of stress at a point; Equilibrium equations; Strain components; Stress distribution; Pressure distribution diagrams; Newmark's influence charts; Contact pressure; Principal stresses and maximum shear.	8	CO2

III	**Compression and Compressibility :** 1-dimensional consolidation; Solution of consolidation equation; Laboratory consolidation test; 3-dimensional consolidation test; Vertical sand drain; Compaction; Field compaction methods and controls. **Strength and Stability :** Shear strength; Mohr circle of stresses; Measurement of shear strength; direct shear tests; Tri-axial compression test; Unconfined compression test; vane shear test; Pore pressure parameters; Active and passive arth pressures; Stability of slopes; Taylors stability number and stability curves; Retaining walls and their stability conditions	8	CO3
IV	**Bearing Capacity of Soil and Foundations :** Definitions; Rankine analysis; Terzaghi analysis; General and local shear failure; Mayerhoff's analysis; Effect of water table on bearing capacity; Plate load test; Penetration test; Dutch conetest; types of foundations; settlement of footings; Pile foundations and their classify options; Load carrying capacity of piles; Piles in group; under-reammed pile foundations; Different types of well foundation.	8	CO4
V	**Stabilization of Soil and Site Investigation:** Introduction; Method of Stabilization; Site exploration; Depth of exploration; Methods of site exploration; Soil samples and samplers.	7	CO4
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

- Determination of water content by oven drying methods and pycnometer. Determination of specific gravity of soil by density bottle and pycnometer. Determination of grain size distribution by sieving.
- Determination of liquid limit of soil and plastic limit of soil. Determination of permeability by constant head test and falling head test.
- Calculation of void ratio and coefficient of volume changes by of solids methods. Standard proctor test.
- Determination of shear parameters by direct shear test and triaxial test. Determination of unconfined compression strength of soil.

Text Book-

1. Murthy, V.N.S. "Soil Mechanics and Foundation Engineering". Delhi, Dhanpat Rai, 1987.
2. Punmia,B.C."SoilMechanicsandFoundation".NewDelhiSTDBookHouse,1987Gopalra jan and Rao, A.S.R. "Basic and Applied Soil Mechanics", 1993.
3. Bowell,S'J."SoilMechanics".NewDelhiWileyEastern,1991.

Reference Books-

1. Soil Mechanics and foundation Engineering by B.C. Punmia.
2. Geotechnical Engineering by V.K. Kumawat.

Modes of Evaluation and Rubric

Quiz, Assignment, Mid term exam, End term exam and Practical Viva.

Rubric: End term exam. Practical: 50% Quiz and 50% Viva.	
List/Links of e-learning resource	
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Subject handled by department	Civil Engineering Department

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---------AGRICULTURAL ENGINEERING----------

Semester/Year	III/II	Program		B.Tech
Subject Category: DC	Subject Code:	AE-304	Subject Name:	**Surveying & Geomatics**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10				100	3	-		3

Prerequisites:

Course Objective:

The students are expected to understand the importance of surveying in the field of civil engineering and to learn the basics of linear/angular measurement methods like chain surveying, compass surveying, plane table surveying in plan making, leveling and theodolite survey in elevation and angular measurements & tachometric survey for distance and height measurement

Course Outcomes:

After completion of the course, the student will be able to:

1. Identify the concept of surveying , leveling and contouring and carry out linear and angular measurements required by different methods of surveying
2. Carry out traversing, trigonometrically leveling and tachometry using appropriate instruments and perform calculations
3. Identify different types of curves and perform calculations for setting out
4. Explain the triangulation principle and its application in control survey
5. Demonstrate the knowledge of hydrographic surveying, photographic surveying and remote sensing.

UNITs	Descriptions	Hrs.	CO's
I	Introduction to Surveying- Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Local attraction, Declination, Dip, Latitude and Departure. Levelling: Principles of levelling- Dumpy level booking and reducing levels, Methods- simple, differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling, Trigonometric levelling: Indirect levelling, levelling on steep ground-methods. Contouring: Characteristics, methods, uses.	9	CO1
II	Traversing by theodolite, Field work checks, traverse computations, latitude anddepartures, adjustments, computations of co-ordinates, plotting & adjusting or traverse, Omitted measurements, Measurement EDM, Trigonometricalleveling. Tachometry: Tachometric systems and principles, stadia system, uses of anallaticlens, tangential system, sublense system, instrument constant, field work reduction, direct-reading tachometers, use of tachometry for traversing and contouring.	8	CO2
III	Curves: Classification and use; elements of circular curves, calculations, setting outcurves by offsets and by theodolites, compound curves, reverse curves, transition curves, cubic spiral and lemniscates, vertical curves, setting out.	7	CO3
IV	Control Surveys: Providing frame work of control points, triangulation principle, conaissance, selection and marking of stations, angle	8	CO4

	measurements and corrections, baseline measurement and corrections, computation of sides, precise traversing.		
V	Hydrographic Surveying: Soundings, methods of observations, computations and plotting. Principles of photographic surveying: aerial photography, tilt and height distortions, Remote sensing, simple equipments, elements of image interpretation, image-processing systems.	8	CO5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Chain Surveying
2. Plane table Surveying
3. Compass surveying
4. Leveling by auto level
5. Measurement of Angle by theodolite
6. Plotting a closed Traverse in field by using Theodolite.
7. Plotting an open Traverse in field by sing Theodolite
8. Determination of constants of Tachometers
9. Measurement of Horizontal Distance by stadia Tachometer
10. Measurement of Height and distances by Tangential Tachometry.
11. To Settling and simple curve by linear methods.

Text Book-

1. T.P. Kanetkar, Surveying &Leveling, Vol. I & II.
2. Duggal; Surveying vol I and II; TMH
3. Basak; Surveying and Leveling; TMH
4. R.E.Devis, Surveying theory & Practice, Mc.Graw Hill, New York

Reference Books-

1. David Clark & J Clendinning, Plane & Geodetic surveying Vol. I & II, constable & Co, London.
2. S.K. Roy, Fundamentals of surveying, prentice - Hall of India New Delhi
3. B.C. Punmia, Surveying Vol. I, II, III, Laxmi Publications New Delhi
4. K.R. Arora, Surveying Vol. I & II, standard book House, New Delhi

Modes of Evaluation and Rubric

Quiz, Assignment, Mid term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

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Recommendation by Board of studies on	08-06-2023
Approval by Academic council on	
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Subject handled by department	Civil Engineering Department

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---------AGRICULTURE ENGINEERING----------

Semester/Year		III/II	Program		B.Tech
Subject Category	OE	Subject Code:	OE-305	Subject Name:	Material Science

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	3	-	-	3

Prerequisites:

Course Objective:

To provide the students with basic knowledge of materials science, so that they would be able to understand and distinguish between variety of materials based on their structure and properties

Course Outcomes:

After completion of the course, the student will be able to:

1. Know the different crystal structures and behaviour of materials used in agriculture engineering applications.
2. Know the Mechanical and dielectric properties of materials.
3. Knowledge of new materials and their properties.

UNITs	Descriptions	Hrs.	CO's
I	**Crystal Structures** Crystal Structures Space lattice and crystal structures, Determination of Crystal structure by X-ray technique, Imperfections in crystals like point, line and planar defects. Influence of imperfections on properties of materials, Dislocation multiplication. Diffusion, Mechanisms, Laws and applications.	9	CO1
II	**Behaviour of Materials** Elastic and viscoelastic behaviour of materials, plastic deformation, strain hardening, Yield point phenomena, Ductile and brittle fracture.	8	CO1
III	**Mechanical Properties of Materials** Tensile and compression test, shear test, fatigue test, hardness test, impact test, Creep strength of mater ails.	8	CO2
IV	**Dielectric Materials** Dielectric Materials Principles, temperature and frequency effects, ferroelectric materials.	8	CO2
V	**Polymers** Types, properties, additives, application.	7	CO3
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. To study the lattice structure of various types of unit Cells.
2. Observe the Miller Indices for various Planes and directions in a unit Cell.
3. To study the micro-structure of Cast Iron, Mild Steel, Brass Solder Under, Annealed, Cold Worked, forged/rolled conditions.
4. To verify the Hall effect--. To determine the fracture characterises of ductile and brittle materials.
5. To determine the chemical composition of a few common alloys.
6. To determine %age of C and S content in an alloy with Fe as main constituent.

Text Book-

1. Vlack, Van. "Material Science for Engineers".
2. Raghavan, V. "Material Science and Engineering", Prentice Hall.
3. Callister," Material Science and Engineering", astern Wiley.

Reference Books-

1. Materials Science and Engineering by R.Bala Subramanim
2. Materials Science and Engineering by I.P. Singh
3. Materials Science by G.K. Narula

Modes of Evaluation and Rubric
Quiz, Assignment, Mid term exam, End term exam and Practical Viva. Rubric: End term exam. Practical: 50% Quiz and 50% Viva.
List/Links of e-learning resource

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---------AGRICULTURE ENGINEERING----------

Semester/Year		III/II	Program		B.Tech
Subject Category	DLC	Subject Code:	AE-306	Subject Name:	Surveying & Geomatics

Maximum Marks Allotted							Contact Hours			Total Credits
Theory			Practical			Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
-	-	-	30	10	10	50	-	-	4	2

Prerequisites:

Course Objective:

Course Outcomes:

After completion of the course, the student will be able to:

Suggestive list of experiments:

1. Chain Surveying
2. Plane table Surveying
3. Compass surveying
4. Leveling by auto level
5. Measurement of Angle by theodolite
6. Plotting a closed Traverse in field by using Theodolite.
7. Plotting an open Traverse in field by sing Theodolite
8. Determination of constants of Tachometers
9. Measurement of Horizontal Distance by stadia Tachometer
10. Measurement of Height and distances by Tangential Tachometry.
11. To Settling and simple curve by linear methods.

Text Book-

1. Qiang Zhu, John Gould, Chengxiang Ma, Yuanhong Li- Rain Water harvesting for Agricultural and water supply.
2. Michelle Avis and Rob Avis - Essential Rainwater Harvesting: A Guide to Home-Scale System Design.
3. Anthony Zagelow- Rainwater Harvesting and Use.

Reference Books-

Modes of Evaluation and Rubric

Quiz, Assignment, Mid term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

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