Faculty of Engineering & Technology
P.K. University
Shivpuri (MP)

Department Of Agricultural Engineering

Evaluation Scheme & Syllabus for

Diploma- Agriculture Engg.
(IV Semester)
(Effective from session 2025-26)

EVALUATION SCHEME
DIPLOMA - AGRICULTURE ENGINEERING (4th Sem)

Study And Evaluation Scheme For Diploma Agriculture Engineering

YEAR 2ND /SEMESTER -4TH

SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	Int +Ext
DMECHAE401	Mechanics of Solids	3	0	0	3	30	-	30	70	-	70	100
DFARMAE402	Farm Power Engineering & Non-Conventional Sources of Energy	3	0	0	3	30	-	30	70	-	70	100
DELECAE403	Electrical Engineering & Rural Electrification	3	0	0	3	30	-	30	70	-	70	100
DAGRIAE404	Agricultural Engineering Drawing	3	0	0	3	30	-	30	70	-	70	100
DDAIRAE405	Dairy & Food Engineering	3	0	0	3	30	-	30	70	-	70	100
DMECHAE406	Mechanics of Solids Lab	0	0	2	1	-	25	25	-	25	25	50
DFARMAE407	Farm Power Engineering & Non-Conventional Sources of Energy Lab	0	0	2	1	-	25	25	-	25	25	50
DELECAE408	Electrical Engineering & Rural Electrification Lab	0	0	2	1	-	25	25	-	25	25	50
Total		15	0	6	18	150	75	225	350	75	495	750

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L	T	P
3	0	0

DMECHAE401:MECHANICS OF SOLIDS

DETAILED CONTENTS :

NOTE: The treatment of subject is limited to simple numerical problems. This subject previously known as "Strength of Materials" has been renamed as "Mechanics of Solids" .

1. STRESS STRAIN AND PROPERTIES OF MATERIALS:

Mechanical properties of materials Ductility, Tenacity, Brittleness, Toughness, Hardness, Factor of safety. Different types of loads and stresses, strain in a stepped bar. Determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only, stresses in compound bars and columns. Equivalent modulus of a compound bar, temperature stresses. Shrinkage of a tyre on a wheel. Temperature stress in compound bar, stress-stain curves for mild steel, Aluminium, cast iron & rubber.

2. COMPLEX STRESSES:

Stresses on an oblique plane in a body subjected to direct load, concept of compound stresses. Principal stress and Principl planes under direct and shear stresses. Graphical determination by Mohr's circle.

3. SHEAR FORCE AND BENDING MOMENT:

Shear force and bending moment for concentrated and uniformly distributed loads on simply supported beams, canti levear and overhanging beam. Shear force and bending moment diagrams. Relationship between shear force and bending moment. Point of contra flexure, calculations for finding the position of contra flexure.Condition for maximum bending momen

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4. THEORY OF SIMPLE BENDING:

Simple bending, examples of components subjected to bending such as beam, axle, carriage spring etc.. Assumptions made in the theory of simple bending in the derivation of bending formula. Section Modulus Definition of neutral surface and neutral axis

and calculation of bending stressess at different layers from the neutral surface for beam of different sections, Pure bending.

5. STRAIN ENERGY:

Meaning of strain energy and resilience. Derivation of formula for resilience of a uniform bar in tension. Proof resilience, modulus of resilience, suddenly applied load, Impact or shock load. Strain energy in a material subjected to uniaxial tension and uniform shear stress. General expression for total strain energy of simple beam subjected to simple bending.

6. TORSION:

Strength of solid and hollow circular shafts. Derivation of torsion equation. Polar modulus of section. Advantages of a hollow shafts over solid shaft. Comparison of weights of solid and hollow shafts for same strength. Horse power transmitted. Calculation of shaft diameter for a given horse power.

7. DEFLECTION:

Deflection of simple cases of cantilever and simply supported beams with concentrated and uniformly distributed loads (standard elementry cases only with no proof of formulae) conditions for circular bending.

8. COLUMNS AND STRUTS:

Definition of long column, short column and slenderness ratio. Equivalent length, Critical load, Collasping load, End conditions of columns. Application of Euler's and Rankines formule (No Derivation). Simple numerical problems.

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DFARMAE402: FARM POWER ENGINEERING & NON-CONVENTIONAL SOURCES OF ENERGY

DETAIL CONTENTS

1. INTRODUCTION:

Sources of power on farms, comparative study and uses,limitation and brief description of animal, fossil fuel (Diesel/petrol) wind, solar, Biogas and electrical power.

2. I.C. ENGINES **(a) Principle :** Heat engine, principle of operation, classifcation of I.C. engines, prinicples of operation two stroke and four stroke cycle Engine. Difference between two stroke and four stroke engine. Diesel and petrol engine, stationary, reciprocating and rotary parts, their material of construction and fuctions. Concept of terms related with I.C. engine. Numerical problems related with different terms. Performance of engine.

(b) Engine System : (i) Valve system-Arrangement of valve, Functions of different parts-Valve timing. Effect of incorrect valve timing. Valve clearance and their adjustment. Firing order. Scavenging systems. Ratio and efficiency.

(ii) Fuel supply systems-System of petrol and diesel engines. Properties of fuel. Fuel filter. Carburetion. Function of Carburettor. Construction and working of simple, compensating and Zenith carburettor. Adjustments in carburettor. Specific fuel consumption.

(iii) Fuel Injection-Method of injection, construction and working of fuel injection pump, injector atomiser, types of nozzles.

(iv) Air Cleaner - Importance of clean air in engine. Characteristics of air cleaner. Types of air cleaners,their construction and working. Maintenance of air cleaner.

(v) Ignition system - Ignition methods. Electric spark ignition, Battery & Magnetic ignition system. Spark plug, combustion in I.C. engine, combution chamber. Silencer.

(vi) Governing system - Governing, hit & miss system. Throttle system. Centrifugal & pneumatic governor. Governor hunting and governor regulations.

(vii) Lubricating system - Importance. Function & quality of lubricant. Types of lubricant used in engine. Sources of lubricant. Selection of lubricant. Splash system. Internal forced feed and splash syste, full internal forced feed system. Oil filter.

(viii) Cooling System - Importance. methods of cooling - Air cooling, water cooling. Thermo siphon and forced circulating system. Thermostate valve. Antifreeze mixture. Pressure Cooling.

3. TRACTOR :

(a) Introduction. Classifcation of tractor and adoptability. Factors affecting selection of Tractor. General idea about different makes, models, in different H.P. ranges of tractors.

(b) Tractor Clutches-Necessity, properties of clutch, types of clutches, construction and working of single ,dual and multi plate disc clutches, power transmition by single plate clutch, clutch troubles.

(c) Transmission System-Purpose, gear ratio, types of transmission-Selective gear type and constant mesh type. Differential gear type - construction and working. Final drives, power take-off. Belt-pulleys.

(d) Steering system of wheel tractor.

(e) Tractor brake mechanism.

(f) Hydraulic system of tractor-construction and working.

(g) Hitching system-Drawbar. Principle of hitching,vertical and horizontal hitching adjustments.

4. HOURLY COST OF OPERATION : Hourly cost of operation of small petrol engine, diesel engine and tractor.

5. NON-CONVENTIONAL ENERGY :

(a) Bio-Gas Technology

Introduction to Bio-gas, prodcution to Bio-gas, Bio-digestion of plants and animals waste, reaction taking place during bio-digestion, gases produced during the process, elimination of unwanted gases such as CO_2 and H_2S , factors affecting production of gas, efficiency of Bio-gas plants in winter, uses of biogas, use of digested sludge.

Bio-gas Plant

Construction & working: Main parts of gas plant-digester, gas holder, pressure gauge, gas main controlling cocks and gas meter,dimensional details of plant, working of gas plant. Bio-gas application and appliances.

(b) WIND ENERGY TECHNOLOGY:

Types of Wind Mills-vertical axis and horizontal axis. Various uses of wind mills-lifting water for drinking and irrigation, corn grinding, sewage pumping, electrical power generation. Site selection for a wind mill. Construction of wind mill. Working and maintenance of wind mills.

(c) SOLAR ENERGY TECHNOLOGY:

Solar radiation and potentiality of solar radiation in India. Application of solar energy- solar cooker , solar crop dryer, solar water heater and solar Photovolatic Technology. Solar collector-flat plate collector, concentration or focussing type collector.

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DELECAE403: ELECTRICAL ENGINEERING & RURAL ELECTRIFICATION

A MACHINES

1. D.C. Machines:

Principle of operation of D.C. Motor, E.M.F. equation, types and their uses. Principle of operation of D.C. Generators, types & application.

2. Elements of A. C.:

Definition, prodcution of A.C., parameters. Instantaneous values peak, value, R.M.S. Value, Average Value, difference between direct current and alternating current.

3. A.C. machines: Principle of operation and application of

(i) Alternator

(ii) Synchronous motor,

(iii)Induction motor.

4. Transformer:

Principle, operation, transformation ratio, application, cooling system. Types: Step down and step up transformers.

5. Transmission and Distribution:

Importance, necessity of transmission, transmission losses & how to minimize it. Basic idea about power transmission and substation. Method of distribution of electrical power.

6. Rural Electrification:

1. Electrical appliances: Switches, fuses, regulator boards.
2. Types of house wiring and wiring materials: wires, battens, conduit pipe (plastic and metal), clips etc.
3. Wiring tools and equipments.
4. Calculation of energy consumption and preparation of bills.
5. Street light connection.
6. Cables - Utility, specifications and installation with respect to save energy and economy.
7. Generalidea about the rules of U.P. Electricity Board for rural electrification.

B MEASURING INSTRUMENTS

1. Working principles and construction of the following instruments:
   (a) Ammeter and voltmeter (moving coil and moving iron type)
   (b) Dynamometer type wattmeter
   (c) Energy Meter
2. Measurement of power in single phase and three phase circuits by wattmeter .

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DAGRIAE404: AGRICULTURAL ENGINEERING DRAWING

A. MACHINE DRAWING:

1. Introduction:

Concept of half sectional and full sectional views. Concept of working drawing of assemblies from given components showing models of any machine.

2. Detail drawings of the following :

1. Two views of each, out of which one should be sectional view.
2. Cotter and knuckle joints
3. Bearings : Foot step bearing and pedestal bearing
4. Couplings : Flanged coupling and flexible coupling
5. I.C. Engine: piston, piston rod and connecting rods
6. Screw Jack
7. Free hand proportional sketches ofthe following agricultural implements and their components:
   a. Shovel and cultivator
   b. Simple drum type wheat thresher exploded view.
   c. Spool for the disc harrow.
   d. Mould Board Plough, Dis Plough & Reaper Cutter bar

B. CIVIL ENGINEERING DRAWING

Plan, elevation and section of following rural structures:

1. Farm House
2. Cattle barn
3. Poultry farm
4. Doors and windows : braced and battened door, fully panelled door and window, partially glazed and partially panelled door and window.
5. Drawing of Gobar gas plant of fixed dome type showing different parts and their sizes through visit to a near by plant.
6. Rural roads and sanitation - cross section of a rural road showing drains and trees etc., plan and section of septic tank and soakpit for a moderate rural family (6 to 10 users) as per BIS specification.
7. Sectional view of India Mark-II Hand Pump.

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DDAIRAE405: DAIRY & FOOD ENGINEERING

1. INTRODUCTION:

Sanitary features, sanitary pipes and fittings stainless steel pipes, glass pipes, plastic tubing, pipe and fitting standards, sanitary pipe and fitting. Sanitary pumps, centrifugal pump. Positive displacement pump specification, stuffing box, rotary seal.

2. MILK RECEIVING EQUIPMENT/ SOYABEAN MILK:

Weigh can and receiving tank, chilling equipment, weighing and measuring milk standards. Canwashers-principles of operation. Rotary and straight through can washer.

3. STORAGE EQUIPMENT:

Insulated storage tank. refrigarated storage tanks specification for the storage tanks. Milk transport tank. Milk processing equipments, separators-warm, milk seprators- cold milk spearators, Centrifugals cream sepraters.

4. HEAT EXCHANGING EQUIPMENT: Heat exchangers,

5. INSTALLATION OF INFLOOR AND ONFLOOR CONVEYOR:

Different types of conveyors used in dairy industry, their drives, take up units. conveyor components, Case stackers and unstackers, platising milk cases, handling of dispenser milk containers, handling of ice cream.

6. ICE CREAM EQUIPMENTS:

Ice cream freezer batch freezer, Continuous freezers, type of designs, air incorporation, over run, control systems, freezing cylinder, dasher, scrapping blades, controls of refrigeration.

7. HOMOGENISERS, SOYABEAN PULP GRINDER:

Theory of homogenization, design, material, single stage and two stage homogenizers, efficiency of homogenization.

8. CREAM, BUTTER AND GHEE EQUIPMENT, PANEER AND TOFFU MAKING:

Cream ripening tanks, design, material, automatic control, operation, cleaning, maintenance of Continious Butter making equipment. Wooden churn, metal churn. Ghee pan and Ghee making equipments

9. EVAPORATORS & DRYING EQUIPMENTS :

Introduction of evaporators, single and multiple operation, Introduction of drum dryer and spray dryer.

B. FOOD ENGINEERING :

Physical properties of food materials, Unit operation in food engineering : Grinding, Crushing, Mixing, Blending, Thermal processing, Dehydration. Packaging materials and methods of packing of different food products. Preservation of food product, site selection and plant layout and their cost economics.

NOTE : For Practical knowledge of above subject one week summer in plant training must be provided in Dairy Plant and report should also be submitted in the department by each student.

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DMECHAE406: MECHANICS OF SOLID LAB

1. To find the shear force at a given section of simply supported beam for different loading.
2. To find the value of 'E' for a steel beam by method of deflection for different loads.
3. To determine the Max-Fibre stress in X-section of simply supported beam with concentrated loads and to find the neutral axis of the section.
4. To determine the ultimate tensile strength, its modulus of Elasticity, Stress at yield point,% Elongation and contraction in x-sectional area of a specimen by U.T.M. through necking phenomenon.
5. To determine the ultimate crushing strength of materials like steel and copper and compare their strength.
6. To determine Rock Well Hardness No. Brinell Hardness No. of a sample.
7. To estimate the Shock Resistance of different qualities of materials by Izod's test and charpy test.
8. To determine the bending moment at a given section of a simply supported beam for different loading.
9. To determine the various parameters of Helical coil spring
10. To determine the angle of twist for a given torque by Torsion appratus and to plot a graph between torque and angle of twist.
11. Study of diamond polishing apparatus.
12. Study metallurgical microscope.
13. (a) To prepare specimens for microscope examination (For Polishing andetching).
    (b) To examine the microstructure of the above specimens under metallurgical microscope.
    (c) To know composition of alloy steel by spebber steeloscope
    (d) To know carbon in steel by carbon steel estimation apparatus
14. Perparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope. i. Brass. ii. Bronze. iii. Grey Cast Iron. iv. Malleable Cast Iron. v. Low Carbon Steel. vi. High Carbon Steel. vii. High Speed Steel. viii.Bearing Steel.
15. To perform heat treatment process on materials of known carbon percentage - 1. Annealing 2. Normalising 3. Case Hardening 16. Mini Project
    i. Collect samples of heat insulating materials
    ii. Collect samples of various steels and cast iron.
    iii. Collect sample of Non-Ferrous alloys.
    iv. Collect samples of Non-Metallic engineering materials

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DFARMAE407: FARM POWER ENGINEERING & NON-CONVENTIONAL SOURCES OF ENERGY LAB

LIST OF EXPERIMENTS:

1. Familiarisation with different gauges and controls of tractors and pre starting checks.
2. Tractor driving practice (a) Without implements in limited space like L shape, T shape & circle etc.
3. Practice of power tiller operations.
4. Hitching of trailor and different implements. Practice of trailer reversing.
5. Study of components and working of engines; two & four stroke cycle engines
   (a) With the help of cut way model.
   (b) Practice of starting, running adjusting and stopping, common trouble shooting.
   (c) Operation of biogas engine.
6. Study of valve arrangement , valve tuning and firing order.Valve grinding and setting of valve timing.
7. Study of diesel fuel supply system, air bleeding.
8. Study of battery, periodic battery care, ignition system and spark plug gap adjustment.
9. Study of cooling system in tractors and stationary engines.
10. Study and servicing of Lubrication system.
11. Study of transmission system.
12. Pereodic maintenance of engines and tractors.
13. Visit to gobar gas plant and draw its sketch.
14. Study of wind mill .

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0	0	2

DELECAE408: ELECTRICAL ENGINEERING & RURAL ELECTRIFICATION LAB

LIST OF EXPERIMENTS:

1. To Connect a single phase load with single phase supply and measure current, voltage, power and power factor.
2. To study and sketch single phase energy meter and caliberate it at different loads.
3. Stair-case wiring.
4. Study of D.O.L.starter and to connect three-phase moter with it.
5. To study star Delta starter - (a) Manually operated. (b) Automatic type.
6. To measure power and power factor of single phase circuit by a 3 voltmeter method, by 3 ammeter
7. To determine turn ratio and efficiency and regulation of a single phase transformer.
8. Estimation of cost of materials of wiring for a farm house specially batten and conduct wiring.

9.a) Electrical precautions to be strictly observed while working with appliances/equipments/supply lines especially for human safety.

b) Knowledge of First-Aid to be provided to the person involved in an accident by electricity.

10. Earthing of electrical equipments.