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

Department of Agriculture Engineering

Evaluation Scheme & Syllabus

B.Tech. Fourth Year

(VII & VIII Sem)

(Effective from Session 2025-26)

EVALUATION SCHEME
B.TECH - AGRICULTURE ENGINEERING(7thSem)

STUDY AND EVALUATION SCHEME FOR B.TECH AGRICULTURAL ENGG.

YEAR 4th/SEMESTER-7th

SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			redits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
UFOODAE701	Food Quality & Control	3	0	0	3	30	-	30	70	-	70	100
UDESIAE702	Design of Agricultural Machinery	3	1	0	4	30	-	30	70	-	70	100
USOILAE703	Soil & Water Conservation Structures	3	1	0	4	30	-	30	70	-	70	100
UDRYIAE704	Drying and Storage Engineering	3	1	0	4	30	-	30	70	-	70	100
UGROUAE705	Ground Water & Well Pump Engineering	3	0	0	3	30	-	30	70	-	70	100
UMINOAE706	Minor Project	0	0	2	1	-	25	25	-	25	25	50
USOILAE707	Soil & Water Conservation Structure Lab	0	0	2	1	-	25	25	-	25	25	50
Total		15	3	4	20	150	50	200	350	50	400	600

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IV Year VII Semester

L	T	P
3	0	0

UFOODAE701:FOOD QUALITY AND CONTROL

Unit-I

Basics of Food Science and Food Analysis, Concept, objectives and need of food quality.Measurement of colour, flavour, consistency, viscosity, texture and their relationship with food quality and composition.Sampling; purpose, sampling techniques, sampling procedures for liquid, powdered and granular materials.

Unit-II

Quality control, Quality control tools, Statistical quality control, Sensory evaluation methods, panel selection methods, Interpretation of sensory results. Instrumental method for testing quality.Food adulteration and food safety.TQM and TQC, consumer preferences andacceptance.

Unit-III

Food Safety Management Systems GAP, GHP, GMP, Hazards and HACCP (Hazard analysis and critical control point), Sanitation in food industry (SSOP), Food Laws and Regulations in India, FSSAI, Food grades and standards BIS, AGMARK, PFA, FPO, ISO 9000, 22000 Series. CAC (Codex Alimantarious Commission),Traceability and Quality Assurance system in a process plant, Bio safety and Bioterrorism

SuggestedReading

1. RangannaS.HandbookofAnalysisandQualityControlforFruitandVegetableProducts.

Srilakshmi B, Food Science.

2. SharmaAvanthi. A text book of Food Science and Technology.

3. Mudambi Sumati R,Rao Shalini M and Rajagopal M.V. Food Science. Potter N N and

Hotchkiss JH, Food Science.

4. Dev Raj, Rakesh Sharma and Joshi V.K, Quality for Value Addition in Food Processing.

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L	T	P
3	1	0

UDESIAE702: DESIGN OF AGRICULTURAL MACHINERY

Unit-I
Materials of construction of agricultural farm machinery and tractor - their composition and properties.

Unit-II
Force analysis of primary tillage tools and their hitching systems, design of tillage implements- M B plough, disk plough, disk harrow, rotavator.
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Unit-III
Design of seed-drill, happy seed-drill, seed metering device, power transmission and furrow opener such as double disc, Inverted T type and roto type(rotavater).

Unit-IV
Design of planter such as maize, cotton, sugar cane planter, vegetable planter.

Unit-V
Design considerations of threshing machines, combines.

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L	T	P
3	1	0

USOILAE703: SOIL & WATER CONSERVATION STRUCTURES

UNIT- I

Introduction; classification of structures, functional requirements of soil erosion control structures; flow in open channels-types of flow, state of flow, regimes of flow, energy and momentum principles, specific energy and specific force; hydraulic jump and its application, type of hydraulic jump, energy dissipation due to jump, jump efficiency, relative loss of Energy.

UNIT- II

Runoff measuring structures-parshall flume, H - flume and weirs; straight drop spillway - general description, functional use, advantages and disadvantages, structural parts and functions; components of spillway, hydrologic and hydraulic design, free board and wave free board, aeration of weirs, concept of free and submerged flow.

UNIT- III

Structural design of a drop spillway-loads on headwall, variables affecting equivalent fluid pressure, determination of saturation line for different flow conditions, seepage under the structure, equivalent fluid pressure of triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension.

UNIT- IV

Chute spillway general description and its components, hydraulic design, energy dissipaters, design criteria of a SAF stilling basin and its limitations.

UNIT- V

Drop inlet spillway- general description, functional use, design criteria; design of diversions; small earth embankments-their types and design principles, farm ponds and reservoirs, cost estimation of structures.

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L	T	P
3	1	0

UDRYIAE704: DRYING AND STORAGE ENGINEERING

UNIT- I
Moisture content and methods for determination, importance of EMC and methods of its determination, EMC curve and EMC model, principle of drying, theory of diffusion, mechanism of drying- falling rate, constant rate, thin layer, deep bed and their analysis, critical moisture content, drying models.

UNIT- II
Calculation of drying air temperature and air flow rate, air pressure within the grain bed, Shred's and Hukill's curve, different methods of drying including puff drying, foam mat drying, freeze drying, etc. Study of different types of dryers- performance, energy utilization pattern and efficiency, study of drying and dehydration of agricultural products.

UNIT- III
Types and causes of spoilage in storage, conditions for storage of perishable products, functional requirements of storage, control of temperature and relative humidities inside storage, calculation of refrigeration load; modified atmospheric storage and control of its Environment, air movement inside the storage.

UNIT- IV
Storage of grains: destructive agents, respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through natural ventilation, mechanical ventilation, artificial drying, grain storage structures such as Bukhari, Morai,Kothar, silo, CAP, warehouse - design and control of environment.

UNIT- V
Storage of cereal grains and their products, storage of seeds, hermetically sealed and air cooled storages-refrigerated, controlled atmosphere, modified atmospheric and frozen storages. Storage condition for various fruits and vegetables under cold and CAP storage system. Economic, aspects of storage.

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L	T	P
3	0	0

UGROUAE705: GROUND WATER & WELL PUMP ENGINEERING

Unit I
Occurrence and movement of ground water, aquifer and its types, classification of wells, familiarization of various types of bore wells, design of open well, groundwater exploration techniques, methods of drilling of wells.

Unit II
Design of assembly and gravel pack, installation of well screen, completion and development of well, groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's etc.
Well interference, multiple well systems, surface and subsurface exploitation and estimation of ground water potential, quality of ground water, artificial groundwater recharge planning, modeling, ground water project formulation.

Unit III
Pumping Systems: Water lifting devices; different types of pumping machinery, classification of pumps, parts of centrifugal pumps; pump selection, installation and troubleshooting; design of centrifugal pumps.

Unit IV
Performance curves, effect of speed on head capacity, power capacity and efficiency curves, effect of change of impeller dimensions on performance characteristics; hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics.

Unit V

Priming, self priming devices, roto-dynamic pumps for special purposes such as deep well turbine pump and submersible pump.

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L	T	P
0	0	2

UMINOAE706: MINOR PROJECT

For a B.Tech AG (Agriculture) minor project, consider developing a solar-powered irrigation system, a smart water level sensing crane, or a motorized/automated vegetable cutting machine to improve efficiency and address common farming challenges. Other options include building a solar seed dryer, designing a Wind Mill water pump, or creating a robotic arm for tasks like weeding.

Here are some project ideas categorized for clarity:

Automation & Mechanization
Renewable Energy & Water Management
Harvesting & Crop Management

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L	T	P
0	0	2

USOILAE707: SOIL & WATER CONSERVATION STRUCTURE LAB

1. Study of soil loss measurement techniques.
2. Study of details of Coshocton wheel and multi-slot runoff samplers.
3. Determination of sediment concentration through oven dry method.
4. Problems on Universal Soil Loss Equation.
5. Preparation of contour map of an area and its analysis.
6. Design of vegetative waterways; Design of contour bunding system.
7. Design of graded bunding system.
8. Design of various types of bench terracing systems.
9. Determination of rate of sedimentation and storage loss in reservoir.
10. Design of Shelter belts and wind breaks.

EVALUATION SCHEME
B.TECH - AGRICULTURE ENGINEERING(8th Sem)

STUDY AND EVALUATION SCHEME FOR B.TECH AGRICULTURE ENGINEERING

SEMESTER-VIII

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	
UPRECAE801	Precision Farming Techniques for Protected Cultivation	3	1	0	4	30	-	30	70	-	70	100
UMECHAE802	Mechanics of Tillage & Traction	3	0	0	3	30	-	30	70	-	70	100
UAGRIAE803	Agricultural Structure & Environmental Control	3	1	0	4	30	-	30	70	-	70	100
UCROPAE804	Crop process Engg.	3	0	-	3	30	-	30	70	-	70	100
UMAJOAE805	Major Project	-	0	12	7		100	100		200	200	300
USEMIAE806	Seminar	-	0	2	1		25	25		25	25	50
Total		12	2	14	22	120	125	245	280	225	505	750

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L	T	P
3	1	0

UPRECAE801: PRECISION FARMING TECHNIQUES FOR PROTECTED CULTIVATION

Unit-I
Protected cultivation: Introduction, History, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment.

Unit-II
Design and construction of green houses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment.

Unit-III
Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan-pad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc. Greenhouse heating – necessity, components, methods, design of heating system. Root media – types – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Planting techniques in green house cultivation.

Unit-IV
Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design, installation and material requirement. Fogging system for greenhouses and net houses – introduction, benefits, design, installation and material requirement. Maintenance of irrigation and fogging systems. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application.

Unit-V
Greenhouse climate measurement, control and management. Insect and disease management in greenhouse and net houses Selection of crops for greenhouse cultivation, major crops in greenhouse – irrigation requirement, fertilizer management, cultivation, harvesting and post harvest techniques; Economic analysis.

Suggested Reading
Singh Brahma and Balraj Singh. 2014. Advances in protected cultivation, New India Publishing Company.
Sharma P. 2007. Precision Farming. Daya Publishing House New Delhi.

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L	T	P
3	0	0

UMECHAE802: MECHANICS OF TILLAGE & TRACTION

Unit-I

Introduction to mechanics of tillage tools, methods of soil testing, engineering properties of soil, principles and concepts, stress strain relationship. Measurement of static and dynamic soil parameter and soil compaction and plant growth.

UNIT- II

Design of tillage tools principles of soil cutting, design equation, force acting on tillage tools such as MB plough & cultivator, application of dimensional analysis in soil dynamics of tillage tools. Measurement of draft of various tillage tools like passive and oscillatory.

UNIT- III

Introduction to traction and mechanics, off road traction and mobility, traction model,traction improvement, traction prediction.

UNIT- IV

Tyre size, tyre lug geometry and their effects, tyre testing Variability and geo statistic, application of GIS in soil dynamics.

UNIT-V

Weight transfer and tractor loading including placement and traction aids; Studies on tyres, tracks and treads under different conditions, and soil compaction and number of operations.

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L	T	P
3	1	0

UAGRIAE803: AGRICULTURAL STRUCTURE & ENVIRONMENTAL CONTROL

Unit I
Planning and layout of farmstead. Scope, importance and need for environmental control, physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods.

Unit II
B.I.S standard for dairy, poultry, piggery and other farm structures. Design, construction, building materials, methods of cost estimation and cost estimation of farm residence, farm structures; animal shelters, compost pits, fodder silos, fencing and implements sheds, barn for cows, buffalos, and poultry etc.

Unit III
Rural living and development, rural roads, their construction cost and repair and maintenance, sources of water supply, norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community.

Unit IV
Importance of storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins),

Unit V
Design considerations for grain storage godowns, Bag storage structures, Shallow and Deep bins, Calculation of pressure in bins, Storage of seeds, Site and orientation of building in regard to sanitation, community sanitation system; sewage system and its design, cost and maintenance, design of septic tank for small family, Estimation of domestic power requirement, source of power supply and electrification of rural housing.

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L	T	P
3	0	0

UCROPAE804: CROP PROCESS ENGINEERING

UNIT- I

Scope and importance of food processing, principles and methods of food processing. Processing of farm crops; cereals, pulses, oil seeds, fruits and vegetables and their products for food and feed. Processing of animal products for food and feed.

UNIT- II

Principle of size reduction, grain shape, Size reduction machines; crushers, grinders, cutting machines etc. - operation, efficiency and power requirement – Rittinger's, Kick's and Bond's equation, fineness modulus.

UNIT- III

Theory of mixing, types of mixtures for dry and paste, materials, rate of mixing and power requirement, mixing index. Theory of separation, size and upsized separation, Types of separators, size of screens, sieve analysis, capacity and effectiveness of screens, pneumatic separation.

UNIT- IV

Theory of filtration, study of different types of filters, rate of filtration, pressure drop during filtration. Scope & importance of material handling devices,

UNIT- V

Study of different types of material handling systems; belt, chain and screw conveyor, bucket elevator, pneumatic conveying, gravity conveyor- design consideration, capacity and power requirement.

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L	T	P
0	0	12

UMAJOAE805: MAJOR PROJECT

Major project in B.Tech Agricultural Engineering could focus on various areas like precision farming, farm machinery design, or sustainable agricultural practices. Outcomes could include developing innovative solutions for irrigation, pest control, or crop yield optimization, potentially leading to improved efficiency and resource management in agriculture.

Here's a more detailed breakdown:

Potential Project Areas:

- **Precision Agriculture:**

Developing automated systems for tasks like planting, fertilization, or harvesting using technologies like drones, sensors, and GPS.

- **Farm Machinery Design**:

Creating or improving agricultural machinery for specific tasks, such as a more efficient tractor, a specialized harvester, or a soil preparation tool.

- **Sustainable Agriculture:**

Implementing projects focused on water conservation, soil health management, or integrated pest management to reduce environmental impact.

- **Post-Harvest Technology:**

Developing solutions for reducing post-harvest losses, such as improved storage facilities, packaging methods, or processing techniques.

- **Renewable Energy in Agriculture:**

Exploring the use of solar, wind, or biogas energy for farm operations, potentially reducing reliance on fossil fuels.

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L	T	P
0	0	2

USEMIAE806: SEMINAR

PPT Presentation related to major project.