Faculty of Engineering &Technology

P.K. University

Shivpuri (MP)

Department of Agriculture Engineering

Evaluation Scheme & Syllabus of

B.Tech -AG

Third Year V & VI Semester

(Effective from session 2025-26)

EVALUATION SCHEME
B.TECH - AGRICULTURE ENGINEERING(5thSem)

Study And Evaluation Scheme For B.Tech.
Agriculture Engineering

Year- 3rd /Semester -5th

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	Total Internal	Th	Pr	Total External	Grand Total
UMANAAE501	Managerial Economics	4	0	0	4	30	-	30	70	-	70	100
UIRRIAE502	Irrigation & Drainage Engg	3	0	0	3	30	-	30	70	-	70	100
UINDUAE503	Industrial Sociology	3	0	0	3	30	-	30	70	-	70	100
UFARMAE504	Farm Machinery and Equipment-II	3	0	0	3	30	-	30	70	-	70	100
UTHERAE505	Thermodynamics, Refrigeration and Air Conditioning	3	0	0	3	30	-	30	70	-	70	100
USEEDAE506	Seed Processing	3	0	0	3	30	-	30	70	-	70	100
UIRRIAE507	Irrigation & Drainage Engg, Lab	0	0	2	1	-	25	25	-	25	25	50
UFARMAE508	Farm Machinery and Equipment-II Lab	0	0	2	1	-	25	25	-	25	25	50
UTHERAE509	Thermodynamics, Refrigeration and Air Conditioning Lab	0	0	2	1	-	25	25	-	25	25	50
USEEDAE510	Seed Processing Lab	0	0	2	1	-	25	25	-	25	25	50
UTRACAE511	Tractor & Farm Machinery Operation & maintenance Lab	0	0	2	1	-	25	25	-	25	25	50
Total		19	0	8	24	180	125	305	420	125	545	850
For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.												425

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III Year V Semester

L	T	P
4	0	0

UMANAAE501:MANAGERIAL ECONOMICS

UNIT I : Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Meaning of Demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of Demand &Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and
Importance of elasticity.

UNIT II: Concept of Supply: Law of Supply, Factors affecting Supply, Elasticity of supply.

Demand Forecasting: Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product;

UNIT III: Cost Analysis- Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external**.**

UNIT IV: Market Structure: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

UNIT V: Nature and characteristics of Indian economy, concepts of LPG, elementary concepts of National Income, Inflation and Business Cycles ,Concept of N.I. and Measurement., Meaning of Inflation, Types and causes , Phases of business cycle .Investment decisions for boosting economy(National income and per capital income)

TEXT BOOKS-

1. PremvirKapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)
2. Salvatore D, —Principles of Microeconomics‖, Oxford University Press.
3. **Koutsoyiannis A, —Modern Microeconomic‖, Macmillan Education Ltd.**
4. DwivediDN, —Principles of Microeconomics‖, Pearson Education.
5. Cowell, FA, —Microeconomic Principles and Analysis‖, Oxford University Press.

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L	T	P
3	0	0

UIRRIAE502: IRRIGATION AND DRAINAGE ENGG

Unit-1

Major and medium irrigation schemes of India, purpose of irrigation, environmental impact of irrigation projects, source of irrigation water, present status of development and utilization of different water resources of the country; measurement of irrigation water: weir, flumes and orifices and other methods.

Unit-2

Open channel water conveyance system: design and lining of irrigation field channels, on farm structures for water conveyance, control & distribution; underground pipe conveyance system: components and design.

Unit-3

Land grading: criteria for land levelling, land levelling design methods, estimation of earth work; soil water plant relationship: soil properties influencing irrigation management, soil water movement, infiltration, soil water potential, soil moisture characteristics, soil moisture constants, measurement of soil moisture, moisture stress and plant response.

Unit-4

Water requirement of crops: concept of evapotranspiration (ET), measurement and estimation of ET, water and irrigation requirement of crops, depth of irrigation, frequency of irrigation, irrigation efficiencies; surface methods of water application: border, check basin and furrow irrigation- adaptability, specification and design considerations.

Unit-5

Sub-surface drainage purpose and benefits, investigations of design parameters, hydraulic conductivity, drainable porosity, water table etc., types of use of subsurface drainage system, steady and unsteady state methods for drain depth and spacing, installation and cost estimation, drainage of salt affected soils and leaching requirement inter-relation of irrigation and drainage, canal command area, development programmes.Adaptability, merit, demerit and design consederation of Drip and sprinkeler Irrigation method.

Suggested Reading

1)Michael A.M. 2012. Irrigation: Theory and Practice. Vikas Publishing House New Delhi.

2)Majumdar D. K. 2013. Irrigation Water Management Principles. PHI learning Private Limited New Delhi 2nd Edition.

3) Allen R. G., L. S. Pereira, D. Raes, M. Smith. 1998. Crop Evapotranspiration guidelines for computing crop water requirement. Irrigation and drainage Paper 56, FAO of United Nations, Rome.

4)Murthy VVN. 2013. Land and Water Management Engineering. Kalyani Publishers, New Delhi.

5) Israelsen O W. and Hansen V. E and Stringham G. E. 1980. Irrigation Principles and Practice, John Wiley & Sons, Inc. USA.

6)Bhattacharya AK and Michael AM. 2013. Land Drainage, Principles , Methods and Applications. Vikas Publication House, Noida (UP)

7) Ritzema H.P.1994 Drainage Principles and Applications, ILRI Publication 16, Second Edition (Completely Revised)

8) Michael AM. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-II 5th Edition. Jain Brothers Publication, New Delhi

9) Kadam U.S., Thokal R.T., Gorantiwar S.D. and Powar A.G. 2007. Agricultural Drainage- Principles and Practices, Westville Publishing House

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L	T	P
3	0	0

UINDUAE503: INDUSTRIAL SOCIOLOGY

Unit-I

Industrial Sociology: Nature,Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organisation in Industry- Bureaucracy, Scientific Management and Human Relations.

Unit-II

Rise and Development of Industry : Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system ,and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.

Unit-III

Industrialization in India. Industrial Policy Resolutions – 1956.Science.Technology And Innovation Policy of India 2013.

Unit-IV

Contemporary Issues : Grievances and Grievance handling Procedure.

Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement ,Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals,

Text and References books:

1. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIAC.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHAG.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.
5. NADKARNI, LAKSHMI, Sociology of Industrial Worker,Rawat,Jaipur,1998.
6. BHOWMICKSHARIT, Industry,Labour and Society,Orient,2012.

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L	T	P
3	0	0

UFARMAE504: FARM MACHINERY AND EQUIPMENT-II

Unit-1

Introduction to plant protection equipment – sprayers and dusters. Classification of sprayers and sprays. Types of nozzles. Calculations for calibration of sprayers and chemical application rates. Introduction to interculture equipment. Use of weeders – manual and powered. Study of functional requirements of weeders and main components.

Unit-2

Familiarization of fertilizer application equipment. Study of harvesting operation – harvesting methods, harvesting terminology. Study of mowers – types, constructional details, working and adjustments. Study of shear type harvesting devices – cutter bar, inertial forces, counter balancing, terminology, cutting pattern.

Unit-3

Study of reapers, binders and windrowers – principle of operation and constructional details. Importance of hay conditioning, methods of hay conditioning, and calculation of moisture content of hay. Introduction to threshing systems – manual and mechanical systems. Types of threshing drums and their applications. Types of threshers- tangential and axial, their constructional details and cleaning systems. Study of factors affecting thresher performance.

Unit-4

Study of grain combines, combine terminology, classification of grain combines, study of material flow in combines. Computation of combine losses, study of combine troubles and troubleshooting. Study of chaff cutters and capacity calculations. Study of straw combines – working principle and constructional details. Study of root crop diggers – principle of operation, blade adjustment and approach angle, and calculation of material handled.

Unit-5

Study of potato and groundnut diggers. Study of Cotton harvesting – Cotton harvesting mechanisms, study of cotton pickers and strippers, functional components. Study of maize harvesting combines. Introduction to vegetables and fruit harvesting equipment and tools.

Suggested Reading

1)Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.

2)Smith HP and LH Wilkey. Farm Machinery and Equipment.

3)Culpin Claude. Farm Machinery.

4)Srivastava AC. Elements of Farm Machinery.

5)Lal Radhey and AC Datta. Agricultural Engineering Principles of Farm Machinery.

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L	T	P
3	0	0

UTHERAE505: THERMODYNAMICS, REFRIGERATION AND AIR CONDITIONING

UNIT-I

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow process. Carnot cycle, Carnot theorem.

UNIT-II

Entropy, physical concept of entropy, change of entropy of gases in thermodynamics process. Otto, diesel and dual cycles. Principles of refrigeration, - units, terminology, and air refrigerators working on reverse Carnot cycle and Bell Coleman cycle, open air refrigeration cycle, merit demerit of air refrigeration.Vapour refrigeration-mechanism, P-V, P-S,P-H diagrams, vapour compression cycles, dry and wet compression, super cooling and sub cooling.

Unit-III

Vapour absorption refrigeration system. Common refrigerants and their properties. Design calculations for refrigeration system. Cold storage plants.Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process. Air conditioning – principles –Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods.

UNIT-IV

Fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers – cooling load calculations, types of air conditioners – applications, Food preservation, Domestic refrigerators ,commercial refrigerators, method of Food freezing. Study of cold storage for fruits and vegitable, freezing load and time calculations for food materials,study of window air conditionors repair and maintenace of referigeration and air condioning systems and chilling or ice making and cold storage plants.

Suggested Reading.

Kothandaraman, CP, Khajunia; P.R and Arora, SC, 1992. A couse in thermodynamics and heat engines. Dhanpat Rai and sons 1982 Nai Sarak New Delhi.

Khurmi R S. 1992. Engineering Thermodynamics. S Chand and Co. Ltd., Ram Nagar, New Delhi.

Mathur M L and Mehta F S. 1992. Thermodynamics and Heat PowerEngineering.DhanpatRai and Sons 1682 Nai Sarak, New Delhi.

Nag P K. 1995. Engineering Thermodynamics. Tata McGraw Hill Publishing Co.Ltd., 12/4 Asaf Ali Raod, New Delhi.

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L	T	P
3	0	0

USEEDAE506:SEED PROCESSING

Unit-1

Seed processing and its importance, principles of seed processing, seed industry and seed acts; Development of seed industry in India, Preparing seed for processing; Seed conditioning machines. Debearder machines, Hand and power operated shelling machines; Seed cleaning, machines.

UNIT- II

Seed drying, natural and mechanical, dryers for seeds. Types & operation and maintenance of seed dryers; Seed cleaning; different type of air-screen operation, & maintenance machines, Seed grading; different types of seed graders such as length and breadth separators, disc separators,Indented cylinder separator, gravity separator; De-stoner; Air classifier Magnetic separators, colour separators,etc.

UNIT- III

Seed treatment; types of treatment, methods and related equipments such as liquid treaters, slurry treaters, dust and fumigants, precautions regarding the seed treatment and ISI recommendations; Seed packaging, stitching and bag closing machines, automatic weighing machines and tagging, etc.

UNIT- IV

Seed storage; principles of seed storage, storage structures; Dehumidifiers to control temp, and moisture, changes in seed quality during storage. CAP storage of hermetically sealed storages; Grain bins and silos, drying-cum-storage bins;

UNIT- V

Seed conveyors; bucket elevators, belt conveyors, screw conveyors, trucks bagons; Repair and maintenance of different types of conveying devices; Seed plant layout design and construction. . Kessler, H.G. 1981. Food Engineering and Dairy Technology Verlag A. Kessler, Freising, F.R. Germany

Suggested Reading.

1. Kessler, H.G. 1981. Food Engineering and Dairy Technology Verlag A. Kessler, Freising, F.R. Germany.
2. Physical properties of plant and animal materials by N.N. Mohenensin Brennan, J.G., Butters,J.r. Cowell, N.D. and Lilly, A.E.V. 1976.
3. Food Engineering Operations Applied Science Publihers
4. Farrall, A.W. 1967. Engineering for Dairy and Food Products Wiley Eastern Pvt. Ltd. New Delhi.

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III Year V Semester

L	T	P
0	0	2

UIRRIAE507: IRRIGATION & DRAINAGE ENGG, LAB

1. Measurement of soil moisture by different soil moisture measuring instruments
2. Measurement of infiltration rate, computation of evaporation and transpiration.
3. Design of underground pipe line system.
4. Measurement of advance and recession in border irrigation and estimation of irrigation efficiency.
5. Measurement of uniformity coefficient of sprinkler irrigation method.
6. Measurement of uniformity coefficient of drip irrigation method.
7. In-situ measurement of hydraulic conductivity.
8. Determination of drainage coefficients.
9. Installation of piezometer and observation well.
10. Preparation of iso-bath and isobar maps.
11. Measurement of hydraulic conductivity and drainable porosity.
12. Design of surface drainage systems and subsurface drainage systems.
13. Determination of chemical properties of soil and water.
14. Fabrication of drainage tiles and testing of drainage tiles.
15. Determination of gypsum requirement for land reclamation;
16. Installation of sub-surface drainage system;
17. Cost analysis of surface and sub-surface drainage system.

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III Year V Semester

L	T	P
0	0	2

UFARMAE508: FARM MACHINERY AND EQUIPMENT-II LAB

(1) Familiarization with plant protection and interculture equipment.

(2) Study of sprayers, types, functional components.

(3) Study of dusters, types and functional components.

(4) Calculations for chemical application rates.

(5) Study of nozzle types and spread pattern using patternator with referance to BIS code.

(6) Familiarization with manual and powered weeding equipment and identification of functional components.

(7) Study of fertilizer application equipment including manure spreaders and fertilizer broadcasters.

(8) Study of various types of mowers, reaper, reaper binder.

(9) Study of functional components of mowers and reapers.

(10) Familiarization with threshing systems, cleaning systems in threshers.

(11) Calculations of losses in threshers with referance to BIS code.

(12) Familiarization with functional units of Grain combines and their types.

(13) Calculations for grain losses in a combine.

(14) Study of root crop diggers and familiarization with the functional units and attachments. Familiarization with the working of cotton and maize harvesters.

(15) Familiarization with vegetable and fruit harvesters.

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III Year V Semester

L	T	P
0	0	2

UTHERAE509: THERMODYNAMICS, REFRIGERATION AND AIR CONDITIONING LAB

1. Study of vapour compression and vapour absorption systems

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2. Solving problems on refrigeration on vapour absorption system

3. Experiments with the refrigeration tutor to study various components of refrigeration

4. Determination of the coefficient of performance of the refrigeration tutor

5. Experiment on humidifier for the determination of humidifying efficiency

6. Experiment on dehumidifier for the determination of dehumidifying efficiency

7. Experiment on the cooling efficiency of a domestic refrigerator

8. Experiments on working details of a cold storage plant and air conditioning unit

9. Experiments with air conditioning tutor to study various components

10. Determination of the coefficient of performance of air condititiong tutor.

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III Year V Semester

L	T	P
0	0	2

USEEDAE510: SEED PROCESSING LAB

Practical Exercises:

Seed Identification: Identifying seeds of different varieties of common crops.

Seed Treatment: Performing seed treatments using appropriate methods and materials.

Seed Certification Procedures: Participating in field inspections, sampling, and tagging activities.

Seed Testing: Analyzing seed samples and interpreting test results.

Seed Processing Operations: Working with various seed processing equipment to gain hands-on experience.

Seed Storage: Learning about the principles and practices of seed storage.

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III Year V Semester

L	T	P
0	0	2

UTRACAE511: TRACTOR & FARM MACHINERY OPERATION & MAINTENANCE LAB

(1) Familiarization with different makes and models of Agricultural tractors.

(2) Identification of functional systems including fuel systems, cooling system, transmission system, steering hydrolic system.

(3) Practice of operating of trillage tools(Mould board plough/disc plough) and their adjustment in the field.

(4) Study of field patterns while operating a tillage implement. Hitching and de-hitching of mounted and trail type implment of the tractor.

(5) Care and maintenance produce of Agricultural machinery during operation and off season.

(6) Repaire and maintenace of implements -adjustment of functional parameters in tillage implements.

(7) Replacement of furrow openers and change of blades of rotabators.

(8) Maintenace of cutter bar in a reaper.

(9) Adustments in a thresher for differant crops.

EVALUATION SCHEME

B.TECH - AGRICULTURE ENGINEERING(6thSem)

Department of Agriculture Engineering

Study And Evaluation Scheme For B.Tech.
Agriculture Engineering

Year- 3rd /Semester -6th

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	Total Internal	Th	Pr	Total External	Grand Total
UINDUAE601	Industrial Management	3	0	0	4	30	-	30	70	-	70	100
UTRACAE602	Tractor & Automotive Engine	3	1	0	4	30	-	30	70	-	70	100
UEPAPAE603	EPAP,Post Harvesting Engg. Of Horticulture ,Medicinal and Aromatic Plants	3	1	0	4	30	-	30	70	-	70	100
UWATEAE604	Water Harvesting and Soil Conservation Structures	3	0	0	3	30	-	30	70	-	70	100
UFIELAE605	Field Operation and Maintenance of Tractor and Farm Machinery	3	1	0	4	30	-	30	70	-	70	100
UTRACAE606	Tractor & Automotive Engine -Lab	0	0	2	1	-	25	25		25	25	50
UPOSTAE607	Post Harvesting Engg. Of Horticulture ,Medicinal and Aromatic Plants Lab	0	0	2	1	-	25	25	-	25	25	50
UWATEAE608	Water Harvesting and Soil Conservation Structures Lab	0	0	2	1	-	25	25	-	25	25	50
UEPAPAE609	EPAP -Lab	0	0	2	1	-	25	25	-	25	25	50
Total		19	3	8	23	150	100	250	350	100	450	700
For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.												280

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L	T	P

3	0	0

UINDUAE601:INDUSTRIAL MANAGEMENT

Unit-I

Introduction: Concept, Development, application and scope of Industrial Management. **Productivity:** Definition, measurement, productivity index, types of production system, Industrial Ownership.

Unit-II

Management Function:Functions of Management, Taylor's Scientific Management Theory,

Fayol's Principles of Management, Social responsibilities of Management,

Introduction to Human resources management: Nature of HRM, functions and importance of HRM.

Unit-III

Work Study: Introduction, definition, objectives, steps in work study, Method study: definition, objectives, and steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations — work sampling, Production Planning and Control

Inventory Control: Inventory, Cost, Deterministic Models, and Introduction to supply chain management.

Unit-IV

Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling, Introduction to TQM.

Unit-V

Project Management: Project network analysis, CPM, PERT and Project crashing and resource Leveling

BOOKS AND REFERENCE:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Industrial Management By O P Khan.
3.Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand

P.K.University , Shivpuri(MP)
III Year VI Semester

L	T	P
3	1	0

UTRACAE602: TRACTOR & AUTOMOTIVE ENGINE

Unit-I

Study of sources of farm power –conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. General energy equation and heat balance sheet. Study of mechanical, thermal and volumetric efficiencies.

Unit-II

Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines. Study of Engine Valve systems, valve mechanism, Valve timing diagram, and valve clearance adjustment.

Unit-III

Study of Cam profile, valve lift and valve opening area. Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners. Study of fuel supply system. Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines.

Unit-IV

Study of detonation and knocking in IC engines. Study of carburetion system, carburettors and their main functional components. Study of fuel injection system – Injection pump, their types, working principles. Fuel injector nozzles – their types and working principle. Engine governing – need of governors, governor types and governor characteristics.

Unit-V

Study of lubrication system – need, types, functional components. Study of lubricants – physical properties, additives and their application. Engine cooling system – need, cooling methods and main functional components. Study of need and type of thermostat valves. Additives in the coolant. Study of radiator efficiency. Study of ignition system of SI engines. Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing with referance to BIS code**.**

Suggested Reading :-

1. Tractors and their Power Units,John B. Lijiedahal, Paul K. Turnquist :CBS Publication
2. Farm Tractor maintenance and repair, S.C.Jain; Standard Publishers Distributors.
3. Frazeee, Irving and Philip, V.E. Tractors and Crawlers.

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L	T	P
3	1	0

UEPAPAE603:
EPAP,Post Harvesting Engg. Of Horticulture ,Medicinal and Aromatic Plants

Unit-I

Classification and importance of engineering properties of Agricultural Produce, shape, size, roundness, sphericity, volume, density, porosity, specific gravity, surface area of grains, fruits and vegetables, Thermal properties, Heat capacity, Specific heat, Thermal conductivity, Thermal diffusivity, Heat of respiration; Co-efficient of thermal expansion, Friction in agricultural materials; Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, Flow of bulk granular materials, Aero dynamics of agricultural products, drag coefficients, terminal velocity.

Unit-II

Rheological properties; force, deformation, stress, strain, elastic, plastic and viscous behaviour, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non- Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves. Electrical properties; dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination. Application of engineering properties in handling processing machines and storage structure.

Unit-III

Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing, Peeling: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling), Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc.

Unit-IV

Blanching: Importance and objectives; blanching methods, effects on food (nutrition, colour, pigment, texture), Chilling and freezing: Application of refrigeration in different perishable food products, Thermophilic, mesophilic & Psychrophilic micro-organisms, Chilling requirements of different fruits and vegetables, Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic), Effect on food during chilling and freezing.

Unit-V

History, scope, opportunities and constraints in the cultivation and utilization of medicinal And aromatic plants in India. Importance, origin, distribution, area, production, climatic and Soil requirements, Propagation and nursery techniques, planting and aftercare, training and pruning, nutritional and water requirements. Harvesting, processing and economics of under mentioned important medicinal and aromatic plants. Medicinal Plants: pepper, cardamom, clove, ginger, turmeric, betelvine, periwinkle, Rauvolfia, Dioscorea, isabgol, Ammi majus, belladonna, Cinchona, pyrethrum and other species relevant to local conditions. Study of chemical composition of a few important medicinal and aromatic plants, their extraction and use. Therapeutic and pharmaceutical uses of important species.

Suggested Reading

Arthey, D. and Ashurst, P. R. 1966. Fruit Processing. Chapman and Hall, New York.

Pantastico, E.C.B. 1975. Post harvest physiology, handling and utilization of tropical and subtropical fruits and vegetables AVI Pub. Co., New Delhi.

Pandey, R.H. 1997. Post harvest Technology of fruits and vegetables (Principles and practices). Saroj Prakashan, Allahabad

Sudheer, K P. and India, V. 2007. Post Harvest Engineering of horticultural crops. New India Publishing House.

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L	T	P
3	0	0

UWATEAE604:
WATER HARVESTING AND SOIL CONSERVATION STRUCTURES

Unit-I

Water harvesting -principles, importance and issues. Water harvesting techniques - classification based on source, storage and use. Runoff harvesting – short-term and long-term techniques. Short-term harvesting techniques - terracing and bunding, rock and ground catchments.

Unit-II

Long-term harvesting techniques - purpose and design criteria. Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes. Farm pond - components, site selection, design criteria, capacity, embankment, mechanical and emergency spillways, cost estimation and construction.

Unit-III

Percolation pond - site selection, design and construction details. Design considerations of nala bunds. Soil erosion control structures - introduction, classification and functional requirements. Permanent structures for soil conservation and gully control - check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures - hydrologic, hydraulic and structural design and stability analysis.

Unit-IV

Hydraulic jump and its application. Drop spillway - applicability, types - straight drop, box- type inlet spillways - description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components and functions. Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway - description, functional use and design criteria.

Suggested Reading

Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Michael, A.M. and T.P. Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition, Jain Brothers, New Delhi.

Murthy, V.V.N. 2002. Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.

Schwab, G.O., D.D. Fangmeier, W.J. Elliot, R.K. Frevert. 1993. Soil and Water Conservation Engineering.4th Edition, John Wiley and Sons Inc. New York.

Suresh, R. 2014. Soil and Water Conservation Engineering. Standard Publisher Distributors, New Delhi.

OP Gupta, Element of Land/Soil Pollution, Khana Publishing House.

Samra, J.S., V.N. Sharda and A.K. Sikka. 2002. Water Harvesting and Recycling: Indian Experiences. CSWCR&TI, Dehradun, Allied Printers, Dehradun.

Theib Y. Oweis, Dieter Prinz and Ahmed Y. Hachum. 2012. Rainwater Harvesting for Agriculture in the Dry Areas. CRC Press, Taylor and Francis Group, London.

Studer Rima Mekdaschi and Hanspeter Liniger. 2013. Water Harvesting - Guidelines to Good Practice. Centre for Development and Environment, University of Bern, Switzerland.

Department of Agriculture Engineering
(Faculty of Engineering &Technology)
P.K.University , Shivpuri(MP)
III Year VI Semester

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UFIELAE605:
FIELD OPERATION AND MAINTENANCE OF TRACTOR AND FARM MACHINERY

Unit-I

Familiarization with different makes and models of agricultural tractors. Identification of functional systems including fuels system, cooling system, transmission system, steering and hydraulic systems. Study of maintenance points to be checked before starting a tractor.

Unit-II

Familiarization with controls on a tractor. Safety rules and precautions to be observed while driving a tractor. Driving practice of tractor. Practice of operating a tillage tool (mould-board plough/ disc plough) and their adjustment in the field. Study of field patterns while operating a tillage implement.

Unit-III

Hitching & De-hitching of mounted and trail type implement to the tractor. Driving practice with a trail type trolley – forward and in reverse direction. Introduction to tractor maintenance – precautionary and break-down maintenance. Tractor starting with low battery charge. Introduction to trouble shooting in tractors.

Unit-IV

Familiarization with tools for general and special maintenance. Introduction to scheduled maintenance after 10, 100, 300, 600, 900 and 1200 hours of operation. Safety hints. Top end overhauling. Fuel saving tips. Preparing the tractor for storage. Care and maintenance procedure of agricultural machinery during operation and off-season. Repair and maintenance of implements – adjustment of functional parameters in tillage implements.

Unit-V

Replacement of broken components in tillage implements. Replacement of furrow openers and change of blades of rotavators. Maintenance of cutter bar in a reaper. Adjustments in a thresher for different crops. Replacement of V-belts on implements. Setting of agricultural machinery workshop.

Suggested Reading

Ghosh RK and S Swan. Practical Agricultural Engineering.

Black PO and WE Scahill. Diesel Engine Manual.

Southorn N. Tractor operation and maintenance.

Jain SC and CR Rai. Farm Tractor Maintenance and Repair.

Operators manuals of tractors.

Service manuals provided by manufacturers.

Department of Agriculture Engineering
(Faculty of Engineering &Technology)
P.K.University , Shivpuri(MP)
III Year VI Semester

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UTRACAE606: TRACTOR & AUTOMOTIVE ENGINE -LAB

LIST OF EXPERIMENTS

1. Introduction to different systems of CI engines; Engine parts and functions, working principles, etc.
2. Valve system - study, construction and adjustments.
3. Oil and Fuel - determination of physical properties.
4. Air cleaning system and fuel supply system of SI and CI engine.
5. Cooling system, and fan performance, thermostat and radiator performance evaluation.
6. Part load efficiencies and governing; Lubricating system and adjustments Starting and electrical system; Ignition system.
7. Tractor engine heat balance and engine performance curves.
8. Visit to engine manufacturer/ assembler/ spare parts agency.

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III Year VI Semester

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UPOSTAE607: POST HARVESTING ENGG. OF HORTICULTURE ,MEDICINAL AND AROMATIC PLANTS LAB

(1) Performance evaluation of peeler and slicer.

(2) Performance evaluation of juicer and pulper.

(3) Performance evaluation of blanching equipment,

(4) Testing adequacy of blanching, Study of cold storage and its design,

(5) Study of CAP and MAP storage, Minimal processing of vegetables.

(6) Preparation of value added products.

(7) Visit to fruit and vegetable processing industry, Visit to spice processing plant.

(8) Study of characteristics of differant medicinal and aeromatic plant & Identification of their economic part.

(9) Harvesting drying, grading,storage and packaging of medicinal and aeromatic plant.

(10) Study on preparation of plant materials for extraction and value added products from medicinal and aromatic plants.

Department of Agriculture Engineering
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III Year VI Semester

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UWATEAE608:
WATER HARVESTING AND SOIL CONSERVATION STRUCTURES LAB

(1) Study of different types of farm ponds.

(2) Computation of storage capacity of embankment type of farm ponds.

(3) Design of dugout farm ponds. Design of percolation pond and nala bunds.

(4) Runoff measurement using H-flume.

(5) Exercise on hydraulic jump. Exercise on energy dissipation in water flow.

(6) Hydrologic, hydraulic and structural design of drop spillway and stability analysis.

(7)Design of SAF stilling basins in chute spillway.

(8)Hydrologic, hydraulic and structural design of drop inlet spillway.

(9)Design of small earthen embankment structures.

(10)Practice on softwares for design of soil and water conservation structures.

(11) Field visit to watershed project areas treated with soil and water conservation measures / structures.

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III Year VI Semester

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UEPAPAE609: EPAP -Lab

(1)Determination of the shape and size of grains, fruits and vegetables.

(2)Determination of bulk density and angle of repose of grains,

(3)Determination of the particle density/true density and porosity of solid grains.

(4)Finding the co-efficient of external and internal friction of different crops.

(5)Finding out the terminal velocity of grain sample and study the separating behaviour in a vertical wind tunnel.