DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME
&
SYLLABUS

FOR
B. TECH. IVth YEAR

Agricultural Engineering (AG)

[Effective from the Session: 2025-26]

FOURTH YEAR EVALUATION SCHEME

(AGRICULTURAL ENGINEERING)

(Effective from the Session: 2025-26)

SEMESTER- VII														
Sl. No.	**Subject Codes**	**Subject**	**Learning Mode**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	BAG701	Ground water, well & pumps	Offline	3	0	0	20	10	30	-	70	-	100	3
2	BAG070-074	Departmental Elective-IV	Offline	3	0	0	20	10	30	-	70	-	100	3*
4	BOE070-080	Open Elective-II	Offline/ MOOCs	3	0	0	20	10	30	-	70	-	100	3*
5	BAG 751	CAD LAB	Offline	0	0	2	-	-	-	50	-	50	100	1
6	BAG752	Mini Project or Internship Assessment*	Offline	0	0	2	-	-	-	100	-	-	100	2
7	BAG-753	Project	Offline	0	0	8	-	-	-	150	-	-	150	5
8	BAG-754	Start-up and Entrepreneurial Assessment#		0	0	4	-	-	-	100	-	-	100	2
		Total		**9**	**0**	**12**							**750**	**19**
		Minor Degree / Honors Degree MT-7 / HT-7												

*The Mini Project or internship (4 weeks) conducted during summer break after VIth semester and will be assessed/ evaluated in semester- VIIth.
The Startup and Entrepreneurial activity assessment will be done in 7th semester under which a student will have to undergo a startup/ Entrepreneurial activity of at least 60 hours till 6th semester.

Department Elective-IV

BAG070	Watershed Planning and Management
BAG071	Tractor Design Principle
BAG072	Waste & By-Product Utilization
BAG073	Food Packaging Technology
BAG074	Agricultural Marketing Management

FOURTH YEAR EVALUATION SCHEME

(AGRICULTURAL ENGINEERING)

(Effective from the Session: 2025-26)

SEMESTER- VIII														
Sl. No.	**Subject Codes**	**Subject**	**Learning Mode**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	BOE08X	Open Elective-III *	MOOCs	3	0	0	20	10	30	-	70	-	100	3*
2	BOE08X	Open Elective-IV*	MOOCs	3	0	0	20	10	30	-	70	-	100	3*
3	BAG-851	Project		0	0	20	-	-	-	100	-	350	450	10
		Total		**6**	**0**	**18**	-						**650**	**16**
		Minor Degree / Honors Degree MT-8 / HT-8												
	*These credits will be earned through MOOCs.													

Subject Code	BAG701					
Category	Departmental Core Subject					
Subject Name	**Ground water well & Pumps**					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
	3-0-0	70	20	10	100	3*
Pre-requisites (if any)	Basic knowledge of fluid mechanics concepts.					

Course Outcome (CO)		Bloom's Knowledge Level
At the end of this course, the student will be able to:		
CO 1	Understand ground water occurrence and movement, well classification, groundwater exploration techniques.	K_2 & K_1
CO 2	Understand the drilling methods of a well, development of well and analyze the design criteria of tube well, gravel pack.	K_2 & K_4
CO 3	Analyze the aquifer parameters by Theis, Jacob and Chow's, Theis recovery method. And also understand the well interference, multiple well systems, Estimation of ground water potential, quality of ground water; artificial groundwater recharge techniques.	K_4
CO 4	Familiar with the pumps, its classification, components and their performance characteristics curves.	K_2
CO 5	Understand about hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; deep well turbine pump and submersible pump.	K_2

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5-Evaulate, K_6- Create

DETAILED SYLLABUS

Module 1

Occurrence and movement of ground water; aquifer and its types; classification of wells, fully penetrating tube wells and open wells, familiarization of various types of bore wells; groundwater exploration techniques.

Module 2

Methods of drilling of wells: percussion, rotary, reverse rotary; design of tube well and gravel pack, installation of well screen, completion and development of well;

Module 3

groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's, Theis recovery method; well interference, multiple well systems, Estimation of ground water potential, quality of ground water; artificial groundwater recharge techniques.

Module 4

Pumping systems: water lifting devices; different types of pumps, classification of pumps, component parts of centrifugal pumps, priming, pump selection, installation and trouble shooting, performance curves, effect of speed on capacity. Performance characteristics curves.

Module 5

Hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; deep well turbine pump and submersible pump.

Suggested Reading:

1. Michael AM, Khepar SD. and SK Sondhi. 2008. Water Well and Pumps, 2nd Edition, Tata Mc- GrawHill.
2. Todd David Keith and Larry W. Mays. 2004. Groundwater Hydrology, 3rd Edition, John Wiley & Sons, New York (International Book Distributing Company Lucknow).
3. Michael A.M. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-II, 5th Edition. Jain
4. Brothers Publication, New Delhi.

Subject Code	BAG-070					
Category	Departmental Elective-IV					
Subject Name	**Watershed Planning and Management**					
Scheme and Credits	**L-T-P**	**Theory Marks**	**Sessional**		**Total**	**Credit**
			Test	**Assig/Att.**		
	3-0-0	70	20	10	100	3*
Pre-requisites (if any)	Basic knowledge of watershed area and Hydrology.					

Course Outcome (CO)		**Bloom's Knowledge Level**
At the end of this course, the student will be able to:		
CO 1	Understand the characteristics of watershed, watershed development problems, soil characteristics and land use practices and socio- economic factors.	K_2
CO 2	Understand the concept, objective, factor effecting in watershed planning and hydrological data also prioritization of watershed.	K_2
CO 3	Describes the rain water conservation technologies, and understand the integrated watershed management.	K_2
CO 4	Analyze the effect on watershed hydrology, and understand the watershed programme.	K_4 & K_2
CO 5	Remember and understand the Participatory watershed management, and formulation of project proposal for watershed management.	K_1 & K_2

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5-Evaulate, K_6- Create

DETAILED SYLLABUS

Module 1

Watershed - introduction and characteristics. Watershed development - problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio-economic factors.

Module 2

Watershed management - concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologic data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index. Water budgeting in a watershed.

Module 3

Management measures - rainwater conservation technologies - in-situ and ex-situ storage, water harvesting and recycling. Dry farming techniques - inter-terrace and inter-bund land management. Integrated watershed management - concept, components, arable lands - agriculture and horticulture, non-arable lands - forestry, fishery and animal husbandry.

Module 4

Effect of cropping systems, land management and cultural practices on watershed hydrology. Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation.

Module 5

Participatory watershed management - role of watershed associations, user groups and self-help groups. Planning and formulation of project proposal for watershed management programme including cost-benefit analysis.

Suggested Reading:

1. Ghanshyam Das. 2008. Hydrology and Soil Conservation Engineering: Including Watershed Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
2. Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
3. Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.

4. Sharda, V.N., A.K. Sikka and G.P. Juyal. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Research and Training Institute, Dehradun.
5. Singh, G.D. and T.C. Poonia. 2003. Fundamentals of Watershed Management Technology. Yash Publishing House, Bikaner.
6. Singh, P.K. 2000. Watershed Management: Design and Practices. E-media Publications, Udaipur.

Subject Code	BAG071					
Category	Departmental Elective-IV					
Subject Name	**Tractor Design Principles**					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
	3-0-0	70	20	10	100	3*
Pre-requisites (if any)	Basic knowledge of Engg. Mechanics, advanced mathematics and farm power concepts.					

Course Outcome (CO)		Bloom's Knowledge Level
At the end of this course, the student will be able to:		
CO 1	Understand agricultural tractor design and development procedure, parameters of stability by weight distribution.	K_2 & K_1
CO 2	Analyze the design of hydraulic lift system, hitch system and mechanical power transmission of a tractor.	K_4 & K_2
CO 3	Analyze the design parameters of Ackerman Steering, hydraulic systems, seat and controls of tractor and understand Testing of a tractor.	K_4
CO 4	Understand design features selection of tractor engines.	K_2
CO 5	Analyze the design consideration of standard power transmission components and understand the safety precautions in power transmission.	K_4 & K_1

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5-Evaulate, K_6- Create

DETAILED SYLLABUS

Module 1

Procedure for design and development of agricultural tractor, study of parameters for balanced design of tractor for stability weight distribution.

Module 2

Hydraulic lift and hitch system design. Design of mechanical power transmission in agricultural tractors.

Module 3

Design of Ackerman Steering and tractor hydraulic systems. Design of seat and controls of an agricultural tractor. Tractor Testing.

Module 4

Study of special design features of tractor engines and their selection.

Module 5

Design of Standard power transmission components use in agriculture mechanics Mechanical & hydraulic units. Introduction of safety in power transmission.

Suggested Reading:

1. Tractors and their Power Units, John B. Lijiedahal, Paul K. Turnquist :CBS Publication
2. Karl Theodor Renius, Fundamentals of Tractor Design
3. J.B. Liljedahl, Paul k. turnquist, David W. Smith, Makoto Hoki, Tractors and Their Power Units, 4e Fourth Edition
4. Michael AM. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-I 12th Edition. Jain Brothers Publication, New Delhi
5. Er. Sanjay Kumar, A text book of tractor at a glance, international book distribution company
6. Lal Radhey and AC Datta. Agricultural Engineering Principles of Farm Machinery.
7. Tractors and their Power Units,John B. Lijiedahal, Paul K. Turnquist :CBS Publication
8. Barger, E.L.; Lijedehl, J.B; Carleton, W.B. and Mc Kibben, E.G. Tractors and their Power Units.
9. Renius, K., Fundamentals of Tractor Design.

Subject Code	BAG072					
Category	Departmental Elective-IV					
Subject Name	**Waste and By-Products Utilization**					
Scheme and Credits	**L-T-P**	**Theory Marks**	**Sessional**		**Total**	**Credit**
			Test	**Assig/Att.**		
	3-0-0	70	20	10	100	3*
Pre-requisites (if any)	Basic knowledge of EPBM and Unit operation in process engineering concepts.					

Course Outcome (CO)		**Bloom's Knowledge Level**
At the end of this course, the student will be able to:		
CO 1	Understand the types and formation of by-products and waste, uses of different agricultural by-products.	K_2 & K_1
CO 2	Understand the concept, scope, maintenance of waste management and effluent treatment, Waste water contents and treatments and also familiar with microbiology of waste, ingredients like insecticide, pesticides & fungicides residues.	K_2
CO 3	Understand utilization of waste in various industries, biomass as fuel, charcoal briquette, and generation of electricity using surplus biomass and remember producer gas generation.	K_2 & K_1
CO 4	Understand the design consideration of waste treatment and disposal of community & family size biogas plants, vermin-composting and pre- treatment of waste.	K_4 & K_2
CO 5	Familiar with the secondary treatments for food plant wastes, tertiary treatments, effluent treatment plants and environmental performance of food industry.	K_2

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5-Evaulate, K_6- Create

DETAILED SYLLABUS

Module 1

Types and formation of by-products and waste; Magnitude of waste generation in different food processing industries; Uses of different agricultural by-products from rice mill, sugarcane industry, oil mill etc.

Module 2

Concept, scope and maintenance of waste management and effluent treatment, Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues.

Module 3

Waste utilization in various industries, furnaces and boilers run on agricultural wastes and byproducts, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and utilization.

Module 4

Waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, concept of vermin-composting, Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation. Secondary treatments: Biological and chemical oxygen demand for different food plant waste–trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons,

Module 5

Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters , phosphorous, sulphur, nitrogen and heavy metals removal, Assessment, treatment and disposal of solid waste; and biogas generation, Effluent treatment plants, Environmental performance of food industry to comply with ISO- 14001 standards

Suggested Reading:

1. Markel, I.A. 1981. Managing Livestock Waste, AVI Publishing Co.
2. Pantastico, ECB. 1975. Post Harvest Physiology, Handling and utilization of Tropical and Subtropical fruits and vegetables, AVI Pub. Co.
3. Shewfelt, R.L. and Prussi, S.E. 1992. Post-Harvest Handling – A Systems approach, Academic Press Inc. USDA. 1992. Agricultural Waste Management Field Hand book. USDA, Washington DC.
4. Weichmann J. 1987. Post Harvest Physiology of vegetables, Marcel and Dekker Verlag. V.K. Joshi & S.K. Sharma. Food Processing Waste Management: Treatment & Utilization. New India Publishing Agency.
5. Vasso Oreopoulou and Winfried Russ (Edited). 2007. Utilization of By-products and Treatment
6. of waste in the Food Industry. Springer Science & Business media, LLC 233 New York.
7. Prashar, Anupama and Bansal, Pratibha. 2007-08. Industrial Safety and Environment. S.K. Kataria and sons, New Delhi
8. Garg, S K. 1998. Environmental Engineering (Vol. II) – Sewage Disposal and Air Pollution Engineering. Khanna Publishers, New Delhi
9. Bhatia, S.C. 2001. Environmental Pollution and Control in Chemical Process Industries. Khanna
10. Publishers, New Delhi.

Subject Code	BAG073					
Category	Departmental Elective-IV					
Subject Name	**Food Packaging Technology**					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
	3-0-0	70	20	10	100	3*
Pre-requisites (if any)	Basic knowledge of Engg. Hydrology and Irrigation engineering concepts.					

Course Outcome (CO)		Bloom's Knowledge Level
At the end of this course, the student will be able to:		
CO 1	Understand the development of safe food packaging material and role of packaging in extending shelf life of food.	K_2 & K_1
CO 2	Understand about Packaging requirement of food product and different types of food packaging systems.	K_2
CO 3	Understand about the use of paper, plastic, aluminum & Tin as the packaging material.	K_2
CO 4	Familiar with package accessories and advances in packaging technology.	K_2
CO 5	Understand the packaging technology and equipments/machinery used in packaging.	K_2

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5-Evaulate, K_6- Create

DETAILED SYLLABUS

Module 1

Introduction of Food Packaging, Need of food Packaging Role of Packaging in extending shelf life of foods. Introduction of Packaging materials, Types of Packaging materials their characteristics and uses. Designing of Package materials. Testing of Package materials. Testing of Package performance. Principles in the development of safe and protective packing, Safety assessment of food Packaging materials.

Module 2

Introduction of food packaging system, product characteristics and package requirements. Different forms of packaging. Rigid, semi-rigid, flexible forms of packaging. Different packaging system for-Dehydrated foods, Frozen foods, Dairy products, Fresh fruits, Vegetables, Meat, Poultry, Sea foods.

Module 3

Paper as a packaging material-Pulping Fibrillation, Beating, Types of papers ,Testing methods. Use of glass as a packaging material-Composition, Properties, Methods of bottle making. Use of metals as a packaging material-Tinplate containers, Tinning process, Components of tinplate, Tin free steel (TFS), Types of cans, Aluminum containers, Lacquers. Use of plastics as a packaging material-Types of plastics, Plastic films, laminated plastic materials, Co-extrusion.

Module 4

Package accessories and advances in Packaging technology-Introduction, Active packaging, Modified atmosphere Packaging, Aseptic Packaging, Packages for microwave ovens, Biodegradable plastics, Edible gums, Coatings.

Module 5

Packaging equipment and machinery- Vacuum packaging machine, CA & MA packaging machine, Gas packaging machine, Seal and shrink Packaging machine. Form & fill sealing machine, Aseptic packaging systems, Retort pouches, Bottling machines, Carton making machines, Package printing machines.

Suggested Reading:

1. Gordon L. Robertson, Food Packaging: Principles and Practice, Third Edition, 2013.
2. Gordon L. Robertson, Food Packaging and Shelf Life: A Practical Guide, 2010.

3. Ruben Hernandez, Susan E. M Selke, John Culter, John D. Culter, Plastics Packaging: Properties, Processing, Applications, and Regulations, 2000.
4. Walter Soroka, Fundamentals of Packaging Technology-Fourth Edition,

Subject Code	BAG074					
Category	Departmental Elective-IV					
Subject Name	**Agricultural Marketing Management**					
Scheme and Credits	L-T-P	Theory Marks	Sessional		Total	Credit
			Test	Assig/Att.		
	3-0-0	70	20	10	100	3*
Pre-requisites (if any)	Basic knowledge of marketing and entrepreneurship development concepts..					

Course Outcome (CO)		Bloom's Knowledge Level
At the end of this course, the student will be able to:		
CO 1	Understand the fundamentals of agricultural marketing, its role in economic development, market structures, and the formulation of effective marketing strategies.	K_1
CO 2	Analyze the agribusiness marketing environment, develop marketing mixes, segment and target markets, and comprehend consumer behavior and product management decisions.	K_2 & K_4
CO 3	Evaluate the process of new product development, demand estimation, product life cycle, and pricing strategies specific to agribusiness.	K_2 & K_5
CO 4	Explain logistics concepts, objectives, and activities, and assess factors influencing logistics management in the agricultural sector.	K_2
CO 5	Apply principles of promotional management, advertising, sales promotion, grading, standardization, and distribution management, including the roles of marketing agencies in agribusiness.	K_2 & K_3

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5-Evaulate, K_6- Create

DETAILED SYLLABUS

Module 1

Agricultural marketing, agricultural marketing and economic development, Agricultural market structure, components and dynamics of market structure, Marketing strategy, formulation of marketing strategy.

Module 2

Agribusiness marketing environment, design of marketing mix, market segmentation and targeting, Determinants of consumer's behavior, Product management, product management process and decisions

Module 3

New product development- significance and classification of new product, Stages and estimation of demand of new product, product life cycle, Pricing policies and practices for agribusiness - determinants of price, objectives of pricing policies and pricing methods

Module 4

Logistics- concepts, factors affecting logistics, objectives of logistics management, activities of logistics function order, processing, packaging, transport management inventory, warehousing etc.

Module 5

Promotional management, advertising, planning and execution, Sales promotion, grading and standardization, Distribution management- storage & warehousing, transportation, Management for agricultural products, Marketing agencies/intermediaries, roles and functions of marketing agencies

Suggested Readings

1. Acharya, S. S. and Agarwal, N.L.. 2004. Agricultural Marketing in India. 4th Ed. Oxford & IBH.
2. Kohls, R. L & Uhl, J. N. 2005. Marketing of Agricultural Products. 9th Ed. Prentice Hall.
3. Kotler, P. 2002. Marketing Management – Analysis, Planning, Implementation and Control. Pearson Edu.
4. Krishnamacharyulu, C & Ramakrishan, L. 2002. Rural Marketing. Pearson Edu.
5. Ramaswamy, V. S & Nanakumari, S. 2002. Marketing Management. 2nd Ed. Mac Millan India.
6. Beri, G.C. Marketing Management, Tata McGraw Hill Publishing Company Ltd, New Delhi.

Subject Code	BAG751				
Category	Departmental Course Lab				
Subject Name	**CAD Lab**				
Scheme and Credits	**L-T-P**	**Practical Sessional**	**Practical External**	**Total**	**Credit**
	0-0-2	50	50	100	1
Pre-requisites (if any)	Basic knowledge of basic engineering drawing concepts and basic computer skills.				

Course Outcome (CO)		**Bloom's Knowledge Level**
At the end of this course, the student will be able to:		
CO 1	Attain Gain foundational knowledge of engineering drawings and familiarize with the AutoCAD interface	K_2 & K_1
CO 2	Learn to use basic drawing tools and commands for creating 2D shapes in AutoCAD.	K_2 & K_6
CO 3	Understand and apply modification tools to edit and refine drawings in AutoCAD.	K_2 & K_3
CO 4	Set appropriate units and utilize coordinate systems for precise drafting in AutoCAD.	K_3 & K_2
CO 5	Develop skills to draft fundamental geometric shapes using AutoCAD tools.	K_3
CO 6	Explore 3D drafting and rendering features to create and visualize three-dimensional models.	K_2 & K_6
CO 7	Write and validate a computer program for automated line or circle drawing.	K_2 & K_5
CO 8	Develop and test a computer program for designing a machine component or system.	K_3 & K_5
CO 9	Acquire practical knowledge of essential commands in a 3D modeling software.	K_2
CO 10	Create a solid model of a machine component using 3D modeling techniques.	K_6

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5-Evaulate, K_6- Create

DETAILED SYLLABUS

1. An Introduction to Engineering Drawings and Auto Cad
2. Introduction to the Draw tools and commands
3. Introduction to the Modify tools
4. Unit setting and coordinate System
5. Drafting of Basic Geometry Shapes in Auto cad
6. Introduction of 3D drafting and rendering tools
7. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
8. Design of machine component or other system experiment: Writing and validation of computer program.
9. Understanding and use of any 3-D Modeling Software commands.
10. Solid modeling of a machine component

Suggested Reading:

1. CAD/CAM Lab Manual (Prepared by Staff)
2. Bathe K.J, (2007), Finite Element Procedures, Prentice-Hall of India Pvt. Ltd., third edition ISBN: 978-0- 979-00490-2
3. Zienkiewicz O.C.(1979), The Finite Element Method, McGraw-Hill, ISBN- 978-0-750-66431-84. ANSYS Help manual Hyper mesh Help manual
4. Yorem Koren (1983), Computer Integrated Manufacturing Systems, McGraw Hill, ISBN- 978-0-891- 16874- 4
5. Ranky, Paul G.(1986), Computer Integrated Manufacturing, Prentice Hall International, ISBN- 978- 0-131- 656550
6. R.W. Yeomamas, A. Choudry and P.J.W. Ten Hagen (1985.), Design rules for a CIM system, North Holland Amsterdam, ISBN - 978-0-444-87812-0