

AGRICULTURE SCIENCE**Course Code : 312340****Programme Name/s : Agricultural Engineering****Programme Code : AL****Semester : Second****Course Title : AGRICULTURE SCIENCE****Course Code : 312340****I. RATIONALE**

Agricultural engineering is the hybridization of science, art and technologies of agriculture. Before going through this course students should know the basic concepts of agriculture, to get familiar with various agriculture allied branches, and understand principle of soil formation, various farming operations, cropping systems, and basics of agricultural technologies. Knowledge of this course is essential for students to learn future agricultural engineering subjects.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Analyze the farming operations to increase the yield of the crop and learn technical skills to enter in a wide range of Farming or farm-based careers.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Undertake the required operations used in different streams of agriculture.
- CO2 - Identify different soil types.
- CO3 - Suggest relevant tillage operation for various crops patterns.
- CO4 - Choose appropriate cropping system.
- CO5 - Apply different Agricultural Engineering techniques.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory	Based on LL & TL			Based on SL						
				CL	TL	LL						Practical			SLA						
				Max	Max	Max	Min	Max			Min	Max	Min	Max	Min						
312340	AGRICULTURE SCIENCE	ASC	DSC	3	-	2	3	8	4	3	30	70	100	40	25	10	-	-	25	10	150

Total IKS Hrs for Sem. : 1 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Identify different plant production by given traditional methods. TLO 1.2 Describe the different branches of the agriculture. TLO 1.3 Explain various resources available in agriculture.	Unit - I Introduction to Agriculture 1.1 Definition, history and introduction of Indian agriculture heritage. Plant production through indigenous traditional methods. 1.2 Introduction to agriculture branches: Agronomy, Horticulture, Animal Husbandry, Fishery science, Forestry and Agricultural engineering 1.3 Current scenario of Indian agriculture resources i.e., land, weather, irrigation, labour, capital, market etc.	Lecture, improved lecture, Lecture,flow charts Self-learning
2	TLO 2.1 Identify Nature and Origin of soil. TLO 2.2 Describes the soil types. TLO 2.3 Explain soil classification. TLO 2.4 Classify various soil distribution in India.	Unit - II Introduction to Agricultural Soil 2.1 Origin and Nature of soil, Rocks and Minerals. 2.2 Soil forming processes and various soil properties (Texture, pH, color, organic matter, porosity and density etc.) 2.3 The soil profile, Soil Taxonomy system and soil particle distribution. 2.4 Soil mapping and areal soil distribution in India: (Alluvial Soil, Desert Soil, Black Soil, Red and Yellow Soil, Laterite Soil, Forest or Mountain Soil, Alkaline Soil, and Peaty and Marshy Soils)	Chart display, Field visit Animated videos USDA Soil textural chart. colored soil maps, internet photographs

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Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Describe tillage operations. TLO 3.2 Explain objectives and factors affecting tillage work. TLO 3.3 Explain Modern concept of tillage TLO 3.4 Identify Different Tillage Equipment's	Unit - III Tillage Practices 3.1 Define Tillage, Classification of tillage: primary tillage and secondary tillage. 3.2 Objectives of tillage, factor affecting tillage operations. 3.3 Modern concept of tillage: define tith, Characteristics and ideal tith. Minimum Tillage, zero and stubble mulch tillage. SRT(Saguna Rice Technique). 3.4 Modern concept of tillage: define tith, Characteristics and ideal tith. Minimum Tillage, zero and stubble mulch tillage. SRT(Saguna Rice Technique).	Field visit Lecture,self-learning. Improved lecture LCD Projector ,Seminar
4	TLO 4.1 Suggest cropping systems. TLO 4.2 Identify various cropping pattern according to soil. TLO 4.3 Explain classification of crops.	Unit - IV Cropping Systems and Patterns 4.1 Various cropping systems: Monocropping, intercropping, Mixed cropping, Relay cropping, Sequential cropping, Ratoon cropping etc. 4.2 Define cropping pattern, popular cropping patterns in Indian agriculture. 4.3 Classification of crops based on season, soil and whether: Kharip, Rabi and zaid.	Chart display,Field visit, Lecture,Self learning Seminar,role play
5	TLO 5.1 Describe various engineering techniques in agriculture. TLO 5.2 Explain importance and scope of agriculture. TLO 5.3 Identify the technical demand of Agriculture and Agro-Industry.	Unit - V Basics of Agricultural Engineering. 5.1 Introduction: Definition, various engineering application in agriculture. 5.2 Branches: farm implements and machinery, Soil and water conservation, Irrigation and drainage engineering, Food processing and technology 5.3 Scope and importance of Agro based industries in India.	Lectures Charts display,laboratory. Self-learning, role play, case studies.

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Collect information of diverse agriculture branches.	1	Draw flow chart of agriculture allied branches (Sketch).	2	CO1 CO5
LLO 2.1 Identify different soil types.	2	*Collect the minimum five soil samples within 25 km radius area. (Prepare comparison table of properties of analyze soil samples, Such as color, texture, moisture content etc.)	2	CO2
LLO 3.1 Identify soil pH and EC of soil.	3	*Determine pH and electrical conductivity of soil using pH and EC meter.	2	CO2
LLO 4.1 Determine soil moisture content using sensor.	4	*Determine the moisture content of soil using Tensiometer.	2	CO2 CO3 CO5

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 5.1 Determine soil moisture content.	5	Determine the moisture content of soil by using Oven dry method.	2	CO2 CO3 CO5
LLO 6.1 Identify bulk density of soil.	6	*Determine bulk density of given soil sample.	2	CO2 CO3
LLO 7.1 Use of Munsell color charts.	7	Determine the color of minimum five soil samples using Munsell color chart.	2	CO2 CO3
LLO 8.1 Identify organic carbon content present in soil.	8	*Determine soil organic carbon using Walkly and Black method.	2	CO2
LLO 9.1 Identify various tillage practices used.	9	Demonstrate minimum three types of tillage practices.	2	CO3
LLO 10.1 Differentiate primary and secondary tillage operation.	10	*Identify the primary and secondary tillage operations.	2	CO3 CO4
LLO 11.1 Identify different tillage equipment's.	11	*Collect the minimum five images of modern tillage equipment's.(Enlist equipments and objectives)	2	CO3 CO4
LLO 12.1 Familiarize with different types of Cropping systems.	12	*Collect the at least five aerial photographs with information of diverse cropping systems from ICAR, ISRO portals.	2	CO4
LLO 13.1 Classify the crops on the basis of seasons in India	13	Draw a flow chart of crops on the basis of seasons: Kharif, Rabi and Zaid.	2	CO4
LLO 14.1 Identify various Agricultural engineering Applications in industries.	14	Draw a flow chart of Agricultural engineering disciplines according to Agro industries.	2	CO5
LLO 15.1 Identify various soil and water testing equipment's.	15	*Visit to soil and water testing laboratory.(Collet the information of soil and water testing equipment's and prepare the report on it)	2	CO2 CO5
LLO 16.1 Explore the emerging technics and research.	16	*Visit to nearby Agriculture University to following departments. 1. Agricultural engineering department 2. Research and Development department 3. Protected cultivation farm (Greenhouse, Shed net)	2	CO1 CO4 CO5

Note : Out of above suggestive LLOs -

- '*1' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)**Assignment**

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- a. Collect the information about the history of diverse Indian Agriculture.
- b. Enlist and explain in details the different agriculture branches.
- c. Compare the Indian agriculture current scenario with first five year plan.
- d. Classify different soil forming rock types.
- e. Discuss in details the process of soil formation.
- f. Draw and explain the soil profile diagram in details.
- g. Describe the different soil taxonomy system.
- h. Analyze the different soil samples (Any 3).
- i. Determine the soil structure using USDA classification table.
- j. Classify the types of tillage.
- k. Make a chart for modern tillage equipment's showing their specifications.
- l. Collect the information about the SRT (Saguna Rice Technique).
- m. Classify various cropping system and explain it in details.
- n. Compare the state wise cropping pattern of India.
- o. Make chart showing season wise crop classification.
- p. Enlist and explain different streams of agricultural engineering.
- q. Describe the different change occurs in modern Agricultural engineering.
- r. Collect the information of given Agro based industries in India. 1. Dairy industry 2. Food processing 3. Tractor and farm machinery industry

Micro project

- a. Analysis of Soil –Collect the soil sample and test it by self. (Collect at least five soil samples from near by villages and analyze the following properties of soil and make a chart about comparison of soil properties)(Properties-pH, Electrical conductivity, Structure, Nitrogen(N), Phosphorus(P) and Potassium(K))
- b. Tillage practices – In this included various field operations like Ploughing, Seed bed preparation, Sowing, Intercultural operations: weeding, harrowing. (Prepare the chart of mentioned given tillage operation including implements needed to perform operations)
- c. Sowing– In that select the 5 seed sowing equipment's and go through seeding operations on farm. (Sowing equipment's such as Indigenous plough, Planter, Dibbler, Transplanter, seed drill etc.)
- d. Soil Profile: Take a soil Profile of your own and make a detailed report.
- e. Cropping system -Collect the Aerial photographs of given five cropping system including information from various state of India and prepare a poster of following cropping systems:(Monocropping, Relay cropping, Sequential cropping, Ratoon cropping and Mixed cropping.)

Note :

Student should maintain a separate notebook which will be the part of term work and submit it as an Assignment book. Following assignment should be written in the Assignment notebook.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Informative charts of Agriculture.	All
2	Soil sampling auger	2,5,6
3	pH, EC Meter (as per IS 2720:1987 part 26)	3
4	Tensiometer, Electric Oven Heating Capacity 200°C(as per IS 2720:1983 part 1)	4,5
5	Munsell color charts (10Y and 5GY)	7
6	Burette stand, Burette (100 ml), Conical flask (500ml)(glass) (as per IS 2619:2018)	3,5,6,8
7	Chemicals– Concentrated sulfuric acid H ₂ SO ₄ , Potassium Dichromate (merck) 100gm, Distilled water 5litre (merck), Ferrous ammonium sulphate 100gm (merck), Ferroin indicator (50ml).	3,4,5,6

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Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
8	Measuring Cylinders glass (50ml, 100ml) (glass)	3,4,5,6,8
9	Weighing Balance Digital with LC of 1gm. (as per IS 2720:1985 part 4)	4,5,6
10	Set of IS Sieves of size (02mm, 01mm, 500 μ , 300 μ , 150 μ , 75 μ), Pan (as per IS 2720:1985 part 4)	2
11	Cut models of indigenous plough, MB plough, Sickle, board plough, disc plough, heavy-duty disc harrow, chisel plough, Rotavator.	11,12

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Agriculture	CO1	8	2	6	2	10
2	II	Introduction to Agricultural Soil	CO2	11	4	6	6	16
3	III	Tillage Practices	CO3	8	2	8	6	16
4	IV	Cropping Systems and Patterns	CO4	10	2	6	8	16
5	V	Basics of Agricultural Engineering.	CO5	8	4	4	4	12
Grand Total				45	14	30	26	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Term work, Self -Learning (Assignment)

Summative Assessment (Assessment of Learning)

- Practicals (On field and Off field)

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	-	-	1	-	1	1			
CO2	3	2	-	3	2	1	2			
CO3	3	-	-	1	2	2	2			
CO4	3	-	2	-	2	2	-			
CO5	3	2	-	3	-	2	-			

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Legends :- High:03, Medium:02,Low:01, No Mapping: -

*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	M.M.Rai	Principles of Soil Science (Fourth Edition)	Macmillan Publishers India (2002) ISBN :978-0333934753
2	S.Y.Singh	Soil fertility & Nutrient Management	Kalyani Publishers; 3 edition (2011) ISBN :978-9390512270
3	T.Yellamanda Reddy & G.H.Sankara Reddy	Principles of Agronomy	Kalyani Publishers_ 523 edition (2015) ISBN :978-9327269154
4	A.M.Michael and T.P.Ojha	Principles of Agricultural Engineering (Vol.-1)	Science technology- Jain Brothers ISBN : 9788183602129
5	J.Sahay	Elements Of Agricultural Engineering	Standard Publishers and Distributors Pvt Ltd ISBN: 978-8180142048

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=eX1zW6lkYQY&pp=ygUsaW50cm9kdWN0aW9uIG9mIGFncljldWx0dXJlIGFuZCBpdHMgYnJhbmNoZXM%3D	Seven branches viz., 1. Agronomy 2. Horticulture 3. Forestry 4. Animal husbandry 5. Fishery science 6. Agricultural Engineering and 7. Home science.
2	https://www.youtube.com/watch?v=8XTtR96k_XA&list=PLLtcxq1-RGPtn-s8L9rZVEBVBcBxfkjRF	Introduction, Scope, Pedology, Edaphology, Soil forming process and factors, porosity, Various soil characteristics, components of soil etc.
3	https://www.youtube.com/watch?v=NjGGzZ3eoGs&pp=ygURdGlsbGFnZSBwcmFjdGljZXM%3D	Tillage, Its definition, Objectives of Tillage, Types of Tillage such as: Primary tillage, Secondary tillage, zero tillage, minimum tillage etc.
4	https://www.youtube.com/watch?v=T5KhzfBAabzg&pp=ygUdY3JvcHBpbmVlcmluZw%3D	Various types of cropping pattern such as monocropping, relay cropping, Mixed cropping, sequential cropping, eg.Rice-wheat,
5	https://www.youtube.com/watch?v=O0G8UCaPLfg&pp=ygUoaW50cm9kdWN0aW9uIG9mIGFncljldWx0dXJhCBlbmdpbmVlcmluZw%3D	Introduction, Scope, Various Agricultural engineering departments, introduction to the Agro based industries.
6	https://www.youtube.com/watch?v=A8qTRBc8Bws	Understanding the nature of soil. relation between crop and soil. Interaction of crop with soil nutrients.

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