

25HAGT401	DESIGN AND MAINTENANCE OF GREENHOUSE	Category	L	T	P	R	Credit	Year of Introduction
		VAC	4	0	0	0	4	2025

Preamble

To enable the students to design and construction of green houses in different agro-climatic zones, greenhouse cooling and heating systems, environmental parameter and control, ventilation systems, to assess different root media, micro-irrigation, fertigation, planting techniques in green house cultivation

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain the fundamentals of protected cultivation and greenhouse technology.	K2 Understand
CO2	Explain the design and environmental control systems of greenhouses.	K2 Understand
CO3	Explain irrigation, fertigation and crop production practices in greenhouse cultivation.	K2 Understand
CO4	Explain the management and economic aspects of greenhouse production systems.	K2 Understand

Mapping of course outcomes with program outcomes and program specific outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	1	-	3	2	-	-	-	-	3	2
CO2	3	2	2	1	-	3	2	-	-	-	-	3	3
CO3	3	2	2	2	3	3	2	-	-	-	-	3	3
CO4	3	2	2	1	-	3	3	-	-	2	2	3	3
Avg	3	1.75	1.75	1.25	3	3	2.25	-	-	2	2	3	2.75

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*		*	*	*
CO2	*	*	*	*	*		*	*	*
CO3	*	*	*	*	*	*	*	*	*
CO4	*	*	*	*	*		*	*	*

Wks Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance	: 5 marks
Continuous Assessment Test	: 20 marks
Continuous Assessment Assignment	: 15 marks

SYLLABUS**Module 1 (14 hrs)**

Protected cultivation: introduction, history, origin, development, national and international scenario; Types of green houses, components of green house, cladding materials, plant environment interactions, principles of limiting factors, solar radiation and transpiration, greenhouse effect.

Module 2 (14 hrs)

Design and construction of greenhouses- site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment; Greenhouse cooling system- methods, ventilation with roof and side ventilators, evaporative cooling, different shading materials, fogging, combined fogging and fan-pad cooling system, maintenance of cooling and ventilation systems, pad care, etc.

Module 3 (14 hrs)

Greenhouse heating- components, methods, design of heating system; Root media- types, soil and soilless media, composition, estimation, preparation and disinfection, bed preparation; Planting techniques in green house cultivation; Irrigation in greenhouse: components, installation and material requirement; Fogging system for greenhouses: introduction, benefits, , installation and material requirement.

Module 4 (14 hrs)

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; Greenhouse climate measurement, control and management; Insect and disease management in greenhouse and net houses; Selection of crops for greenhouse cultivation, Economic analysis

Text Books

1. Panwar, N. L., Patel, M. R., & Lanjekar, P. R. (2024). *Design and maintenance of greenhouse: A comprehensive guide to greenhouse technology, structural design, heating, cooling, and cost economics*.
2. Nelson, P. V. (2012). *Greenhouse operation and management* (7th ed.). Pearson Education.
3. Manohar, K. R., & Thinathane, C. I. (2007). *Greenhouse technology and management*. B. S. Publications.

Reference Books

1. Resh, H. M. (2022). *Hydroponic food production* (8th ed.). CRC Press.
2. Singh, B., & Sirohi, N. P. S. (2021). *Protected cultivation of horticultural crops*. Kalyani Publishers.
3. Ghosh, A. (2021). *Greenhouse technology (Principles and practices)*. New India Publishing Agency. ISBN 978-9386546388.
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**END SEMESTER EXAMINATION - MODEL QUESTION PAPER
(STC 2025 SCHEME)**

Course Code	25HAGT401
Course Name	DESIGN AND MAINTENANCE OF GREENHOUSE
Max. Marks: 60	Duration: 2.5 Hours

Part A				
<i>(Answer all questions. Each question carries 3 marks)</i>				
Qn No.	Question	Marks	CO	BL
1.	Explain the concept of protected cultivation.	3	CO1	L2
2.	Explain the components of a greenhouse.	3	CO1	L2
3.	Explain the criteria for site selection and orientation of a greenhouse.	3	CO2	L2
4.	Explain the working of an evaporative cooling system in a greenhouse.	3	CO2	L2
5.	Explain the types of root media used in greenhouse cultivation.	3	CO3	L2
6.	Explain the components of a greenhouse irrigation system.	3	CO3	L2
7.	Explain nutrient deficiency symptoms in greenhouse crops.	3	CO4	L2
8.	Explain the principles of fertilizer scheduling in a greenhouse.	3	CO4	L2
Part B				
<i>(Answer any one full question from each Module. Each question carries 9 marks)</i>				
Module I				
Qn No.	Question	Marks	CO	BL
9	Explain the types of greenhouses, their components and cladding materials, and the principle of limiting factors.	9	CO1	L2
OR				
10	Explain plant-environment interactions and the greenhouse effect in protected cultivation.	9	CO1	L2
Module II				
Qn No.	Question	Marks	CO	BL
11	Explain the design and construction of a greenhouse including ventilation requirement using an exhaust fan system.	9	CO2	L2
OR				
12	Explain the methods of greenhouse cooling including the combined fogging and fan-pad system and its maintenance.	9	CO2	L2
Module III				
Qn No.	Question	Marks	CO	BL
13	Explain the components and design of a greenhouse heating system.	9	CO3	L2
OR				
14	Explain the preparation and disinfection of root media and the installation of a greenhouse irrigation system.	9	CO3	L2
Module IV				

Qn No.	Question	Marks	CO	BL
15	Explain the functions of essential nutrient elements and the principles of fertilizer scheduling and application in greenhouses.	9	CO4	L2
OR				
16	Explain greenhouse climate measurement and control and the management of insects and diseases.	9	CO4	L2
