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Date:

CSXX2025: Smart Agriculture

L-T-P-Cr: 3-0-0-3

Pre-requisites: Fundamental knowledge of Sensors, Statistics, Data Science, Internet of Things

Objective:

1. To recall the basic concepts of Adhoc Networks, Sensor Networks and Internet of Things
2. To study the requirements for smart agriculture
3. To analyze the application of IoT and Machine Learning in Agriculture sector

Course Outcomes:

At the end of the course, a student should be able to:

Sl. No.	Outcome
1.	Identify characteristics and requirements of agriculture sectors
2.	Understand the fundamentals of Adhoc Networks, Sensor Networks and Internet of Things
3.	Recognize sensors and actuators for agriculture use cases
4.	Apply machine learning techniques to agricultural data
5.	Model IoT based solution for smart agriculture

Course Contents:

UNIT I:

Lectures: 8

Agricultural Practices – Conditions for crop cultivation, Soil composition, Soil testing, Plant nutrition requirement, Plant Protection - Symptoms of major diseases, Major weeds, Methods of controlling weeds, Farm Management – Importance, Selection of cropping pattern, Understanding of cost benefit analysis, Risk analysis in agriculture

UNIT II:

Lectures: 10

Overview of Adhoc and Sensor Networks – Architecture, Characteristics, Challenges, Internet of Things – Smart Objects, Gateways, Communication Protocols, Applications

UNIT III:

Lectures: 6

Sensors in Agriculture – Sensor architecture, Classification, Characteristics, Working Principle, Application Area

Actuators for Agriculture – Types, Characteristics, Working Principle, Application Area

UNIT IV:

Lectures: 8

Decision Making in Agriculture Ecosystem – Descriptive and predictive analytics of agricultural data, Image based analysis of weed and crop using machine learning algorithm

UNIT V:

Lectures: 10

IoT for Smart Agriculture – Precision Farming, Soil Sampling and Mapping, Plant disease detection, Livestock Monitoring, Fish Farming, Smart Greenhouse, Vertical cultivation, Hydroponics, Recommendation Systems, Farmer Assistance Systems

Text Books:

1. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, First Edition, Cisco Press, USA

2. Castrignanò A, Buttafuoco G, Khosla R, Mouazen A, Moshou D, Naud O, editors. Agricultural internet of things and decision support for precision smart farming. Academic Press; 2020 Jan 9.
3. Patel GS, Rai A, Das NN, Singh RP, editors. Smart agriculture: emerging pedagogies of deep learning, machine learning and internet of things. CRC Press; 2021 Feb 10.
4. Handbook of agriculture.(Facts and figures for farmers, students and all interested in farming.) Indian Council Of Agricultural Research

Reference Books:

1. Zhang Q. Precision agriculture technology for crop farming. Taylor & Francis; 2016.
2. Abraham A, Dash S, Rodrigues JJ, Acharya B, Pani SK, editors. AI, edge and IoT-based smart agriculture. Academic Press; 2021 Nov 10.