

- Lecture 1 - Food Microbiology: Microbial Growth and Concerns in Various Foods
- Lecture 2 - Blanching, Pasteurization, Ultra-pasteurization, Hot fill and UHT
- Lecture 3 - Thermal processing equipment
- Lecture 4 - Milk pasteurization
- Lecture 5 - Canning operations
- Lecture 6 - Temperature distribution and heat penetration
- Lecture 7 - Kinetics of reactions
- Lecture 8 - F value and process requirements
- Lecture 9 - Quality considerations and process optimization
- Lecture 10 - Shelf life studies
- Lecture 11 - Validation of heat processes
- Lecture 12 - Fundamentals of aseptic processing
- Lecture 13 - Aseptic equipment design
- Lecture 14 - Aseptic process design
- Lecture 15 - Microwave and radio frequency heating
- Lecture 16 - Ohmic heating
- Lecture 17 - Overview of non-thermal processing technologies
- Lecture 18 - Advanced separation processes
- Lecture 19 - High pressure dialysis, ultrafiltration and reverse osmosis
- Lecture 20 - Nanofiltration, electrodialysis and membrane separation
- Lecture 21 - Various types of heat exchangers for food process engineering
- Lecture 22 - Various types of driers for food process engineering
- Lecture 23 - Importance and applications of extrusion technology in food processing
- Lecture 24 - Changes of properties and functional components of extruded foods
- Lecture 25 - Food biosensors
- Lecture 26 - Types of functional foods: Probiotics and nutraceuticals
- Lecture 27 - Packaging considerations: Barrier and mechanical properties of food packaging materials
- Lecture 28 - Biocomposite/bionanocomposite materials for food packaging applications
- Lecture 29 - Sanitary components and requirements
- Lecture 30 - Regulatory considerations
- Lecture 31 - Special Lecture: Membrane Separation

- Lecture 1 - Introduction to Natural Resource bases - Part 1
- Lecture 2 - Introduction to Natural Resource bases - Part 2A
- Lecture 3 - Introduction to Natural Resource bases - Part 2B
- Lecture 4 - Introduction to Natural Resource bases - Part 2C
- Lecture 5 - Resource management Paradigms - Part 1
- Lecture 6 - Resource management Paradigms - Part 2
- Lecture 7 - Approaches to NRM
- Lecture 8 - Biodiversity and conservation - Part 1
- Lecture 9 - Biodiversity and conservation - Part 2
- Lecture 10 - Biodiversity and conservation - Part 3
- Lecture 11 - Participatory Rural Appraisal and Rapid Rural Appraisal - Part 1
- Lecture 12 - Participatory Rural Appraisal and Rapid Rural Appraisal - Part 2
- Lecture 13 - Participatory Rural Appraisal and Rapid Rural Appraisal - Part 3
- Lecture 14 - Participatory Rural Appraisal and Rapid Rural Appraisal - Part 4
- Lecture 15 - Introduction to INRM
- Lecture 16 - Learning cycle in Integrated Natural Resources Management
- Lecture 17 - Technologies for Integrated Natural Resources Management
- Lecture 18 - PRA techniques within INRM
- Lecture 19 - Ranking technique
- Lecture 20 - Community Based Natural Resources Management - Part 1
- Lecture 21 - Community Based Natural Resources Management - Benefits from CBNRM
- Lecture 22 - Community Based Natural Resources Management - Part 2
- Lecture 23 - Watershed management
- Lecture 24 - Watershed management: Flood control
- Lecture 25 - National Water Policy
- Lecture 26 - Soil erosion management
- Lecture 27 - Landuse management for flood risk reduction
- Lecture 28 - Drought Management
- Lecture 29 - Common Property Right (CPR)
- Lecture 30 - A Tutorial on Tragedy of the Commons
- Lecture 31 - Environmental Management Systems (EMS)

- Lecture 32 - National Environment Policy (NEP)
- Lecture 33 - Modeling And Simulations Applications in Agriculture for NRM - Part 1
- Lecture 34 - Modeling And Simulations Applications in Agriculture for NRM - Part 2
- Lecture 35 - Modeling And Simulations Applications in Agriculture for NRM - Part 3
- Lecture 36 - Modeling And Simulations Applications in Agriculture for NRM - Part 4
- Lecture 37 - Modeling And Simulations Applications in Agriculture for NRM - Part 5
- Lecture 38 - Precision Farming and Protected Cultivation - Part 1
- Lecture 39 - Precision Farming and Protected Cultivation - Part 2
- Lecture 40 - Precision Farming and Protected Cultivation - Part 3
- Lecture 41 - Environmental Impact Assessment (EIA) - Part 1
- Lecture 42 - Environmental Impact Assessment (EIA) - Part 2
- Lecture 43 - Environmental Impact Assessment (EIA) - Part 3
- Lecture 44 - Environmental Impact Assessment (EIA) - Part 4
- Lecture 45 - Environmental Impact Assessment (EIA) - Part 5
- Lecture 46 - Environmental Impact Assessment (EIA) - Part 6
- Lecture 47 - Environmental Impact Assessment (EIA) - Part 7
- Lecture 48 - CBNRM in Kenya
- Lecture 49 - Model sensitivity and Uncertainty
- Lecture 50 - MCDA in Agriculture
- Lecture 51 - MCDM for NRM - Part 1
- Lecture 52 - MCDM for NRM - Part 2
- Lecture 53 - MCDM for NRM - Part 3
- Lecture 54 - Remote Sensing and GIS Application in Agriculture and NRM (Introduction)
- Lecture 55 - Remote Sensing and GIS Application in Agriculture and NRM - Part 1
- Lecture 56 - Remote Sensing and GIS Application in Agriculture and NRM - Part 2
- Lecture 57 - Remote Sensing and GIS Application in Agriculture and NRM - Part 3
- Lecture 58 - Climate change; vulnerability; adaptation - Part 1
- Lecture 59 - Climate change; vulnerability; adaptation - Part 2
- Lecture 60 - Climate change; vulnerability; adaptation - Part 3
- Lecture 61 - ICT: Introduction
- Lecture 62 - ICT for Soil management
- Lecture 63 - ICT for Water management
- Lecture 64 - Collective Management of resources

Lecture 1 - Introduction

Lecture 2 - Irrigation and irrigation needs

Lecture 3 - Source of Irrigation

Lecture 4 - Importance of crops and classification

Lecture 5 - Crop rotation principle

Lecture 6 - Importance of vegetable and classification

Lecture 7 - Paddy crop production

Lecture 8 - Sorghum crop production

Lecture 9 - Pearl millet crop production

Lecture 10 - Maize crop production

Lecture 11 - Pigeon pea crop production

Lecture 12 - Green gram crop production

Lecture 13 - Black gram crop production

Lecture 14 - Cowpea crop production

Lecture 15 - Groundnut crop production

Lecture 16 - Sesame crop production

Lecture 17 - Soybean crop production

Lecture 18 - Sunflower crop production

Lecture 19 - Mango crop production

Lecture 20 - Guava crop production

Lecture 21 - Banana crop production

Lecture 22 - Papaya crop production

Lecture 23 - Tomato crop production

Lecture 24 - Brinjal crop production

Lecture 25 - Chili crop production

Lecture 26 - Okra crop production

Lecture 1 - Introduction

Lecture 2 - Our Agriculture Practices and Lessons

Lecture 3 - Climate and Scale of Change

Lecture 4 - Course Corrections

Lecture 5 - Modified Agriculture - Precision Agriculture

Lecture 6 - Modified Agriculture Practice - Climate Smart Agriculture

Lecture 7 - Maps and Information in Practice

Lecture 8 - Geographical Information System (GIS)

Lecture 9 - Types of input

Lecture 10 - Analysis - Map overlay

Lecture 11 - Buffering and Perspective View

Lecture 12 - GIS Type and Available GIS Softwares

Lecture 13 - Village Cadastral Map and Property Card

Lecture 14 - Cadastral Maps and Contents

Lecture 15 - Creation of Cadastral Information Base

Lecture 16 - Land Information System

Lecture 17 - Creation of Village Boundary Based Basin Analysis

Lecture 18 - Village Information System

Lecture 19 - Needs and Weather Forecast

Lecture 20 - Cloud Types and Rain Bearing Clouds

Lecture 21 - Weather Satellites and Cloud Pattern Reading

Lecture 22 - Rainfall and Supplementary Irrigation

Lecture 23 - Synergistic Use

Lecture 24 - Surface Rainfall - Run off Assessment and Model

Lecture 25 - Soil and Water Assessment Tools (SWAT) Model

Lecture 26 - Groundwater Availability

Lecture 27 - Groundwater Potential Mapping

Lecture 28 - Water Storage and Water Availability and Release

Lecture 29 - Growth of Crop Area in Command Area and Impact Climate Change

Lecture 30 - Impact of Climate on Agriculture

Lecture 31 - Crop Water Requirement and Distribution Loss

[Lecture 32 - Village Agriculture and Other Water Demand and Supply Source](#)

[Lecture 33 - Water Security Assessment](#)

[Lecture 34 - Land Degradation: Soil Salinity](#)

[Lecture 35 - Water Logging](#)

[Lecture 36 - Water Balance Under Different Rainfall](#)

[Lecture 37 - Drought and Characteristics](#)

[Lecture 38 - Drought Vulnerability and Risk Assessment](#)

[Lecture 39 - Monitoring and Warning](#)

[Lecture 40 - Drought Monitoring: a global perspective](#)

[Lecture 41 - Drought Risk and Vulnerability Assessment: a global perspective](#)

[Lecture 42 - GIS in Sustainable Agriculture](#)

[Lecture 43 - Assessment of Existing Water Storage Structures and Rehabilitation](#)

[Lecture 44 - Sustainable Development and Agriculture: a confluence of pressures](#)

[Lecture 45 - Climate Change and Drought: a global perspective](#)

[Lecture 46 - GIS and Drought Management: a global perspective](#)

Lecture 1 - Introduction

Lecture 2 - Insect, abundance and diversity

Lecture 3 - Insect classification based on economic importance

Lecture 4 - Pest, causes for outbreaks and categories

Lecture 5 - Pest, causes for outbreaks and categories (Continued...)

Lecture 6 - Pest surveillance and methods of sampling

Lecture 7 - Principles of Pest Management and History

Lecture 8 - IPM, Definition and Concepts

Lecture 9 - Ecological Methods of Pest Management - Legal and Cultural

Lecture 10 - Ecological Methods of Pest Management - Cultural (Continued...)

Lecture 11 - Ecological Methods of Pest Management - Cultural (Continued...)

Lecture 12 - Ecological Methods of Pest Management - Physical

Lecture 13 - Ecological Methods of Pest Management - Mechanical

Lecture 14 - Host Plant Resistance

Lecture 15 - Host Plant Resistance (Continued...)

Lecture 16 - Biological Control - Predators

Lecture 17 - Biological Control - Parasitoids

Lecture 18 - Biological Control - Microbes: Fungi, Bacteria and Viruses

Lecture 19 - Biological Control - Microbes: Entomopathogenic Nematodes

Lecture 20 - Pest management by modifying insect behaviour

Lecture 21 - Use of sex pheromones in pest management

Lecture 22 - Use of attractants and repellants in pest management

Lecture 23 - Pest management through radiation technology - Principles

Lecture 24 - Sterile Insect Technique - case studies

Lecture 25 - Pest management through botanicals

Lecture 26 - Pest management through botanicals (Continued...)

Lecture 27 - Chemical Control - History and classification

Lecture 28 - Mode of Action of different insecticide groups

Lecture 29 - Chemical Control - Considerations for Chemicals Integration

Lecture 30 - Insecticide Resistance and Management

Lecture 31 - Insecticide as component of IPM

[Lecture 32 - Biotechnological Approaches in IPM](#)

[Lecture 33 - Agro-ecosystem Analysis](#)

[Lecture 34 - IPM in Paddy](#)

[Lecture 35 - IPM in Paddy \(Continued...\)](#)

[Lecture 36 - IPM in Pigeon pea](#)

[Lecture 37 - IPM in Pigeon pea \(Continued...\)](#)

[Lecture 38 - IPM in Groundnut](#)

[Lecture 39 - IPM in Mustard and Soyabean](#)

[Lecture 40 - IPM in Cotton](#)

[Lecture 41 - IPM in Cotton \(Continued...\)](#)

[Lecture 42 - IPM in Sugarcane](#)

[Lecture 43 - IPM in Sugarcane \(Continued...\)](#)

[Lecture 44 - IPM in Tomato](#)

[Lecture 45 - IPM in Cabbage](#)

[Lecture 46 - IPM in Mango](#)

[Lecture 47 - IPM in Grapes](#)

Lecture 1 - Introduction

Lecture 2 - Relationship between Food, Nutrition and Health 1

Lecture 3 - Relationship between Food, Nutrition and Health 2

Lecture 4 - Digestion, absorption and utilization of Nutrients 1

Lecture 5 - Digestion, absorption and utilization of Nutrients 2

Lecture 6 - Recommended dietary allowances

Lecture 7 - Carbohydrate

Lecture 8 - Fiber

Lecture 9 - Protein

Lecture 10 - Protein - health significance

Lecture 11 - Fat

Lecture 12 - Energy 1

Lecture 13 - Energy 2

Lecture 14 - Energy 3

Lecture 15 - Fat Soluble Vitamins 1

Lecture 16 - Fat Soluble Vitamins 2

Lecture 17 - Fat Soluble Vitamins 3

Lecture 18 - Water Soluble Vitamins 1

Lecture 19 - Water Soluble Vitamins 2

Lecture 20 - Water soluble Vitamins 3

Lecture 21 - Water soluble Vitamins 4

Lecture 22 - Major minerals 1

Lecture 23 - Major minerals 2

Lecture 24 - Trace minerals 1

Lecture 25 - Trace minerals 2

Lecture 26 - Water

Lecture 27 - Nutritional Disorders

Lecture 28 - Balanced diet and food groups

Lecture 29 - Food guide for selecting adequate diet, practical aspects of food selection

Lecture 30 - Meal planning

Lecture 31 - Other aspects affecting food selection

Lecture 32 - Food sanitation and hygiene

Lecture 33 - Water Purification

Lecture 34 - Therapeutic adaptation of normal diet

Lecture 35 - Principles of therapeutic diet

Lecture 36 - Diet during fevers

Lecture 37 - Diet in lung disease

Lecture 38 - Diet in GI disorders - constipation

Lecture 39 - Diet during diarrhoea

Lecture 40 - Diet in disorders of liver

Lecture 41 - Diseases of gall bladder

Lecture 42 - Diet in Diabetes

Lecture 43 - Diseases of Heart and blood vessels

Lecture 44 - Diet for myocardial infarction

Lecture 45 - Diet in kidney disorders

Lecture 46 - Diet in renal failure

Lecture 47 - Diet in cancer

Lecture 48 - Diet in metabolic disorders

Lecture 49 - Diet in stress, burns and surgery

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : NOC:Weather Forecast in Agriculture and Agro-advisory (WF) (Agriculture)

Co-ordinators : Dr. R. Nagarajan, Co Faculty, Dr.T.N.Balasubramanian (Rtd.), Instructor Incharge

Lecture 1 - Introduction

Lecture 2 - Basic aspects of Atmosphere, Climate, Weather

Lecture 3 - Basic aspects of Rainfall and their application in crop production

Lecture 4 - Basic aspects of Temperature and their application in crop production

Lecture 5 - Basic aspects of Relative humidity, Cloud cover and their application in crop production

Lecture 6 - Basic aspects of wind, wind direction and their application in crop production

Lecture 7 - Three weather codes and crop production

Lecture 8 - Crop production risks and their management

Lecture 9 - Weather sensitive crops, stages and farm operations

Lecture 10 - Crop-weather interactions and definition

Lecture 11 - Crop-Weather Interactions: Wheat, Rice and Maize

Lecture 12 - Crop-Weather Interactions: Sorghum, Groundnut and Pigeon pea

Lecture 13 - Crop-Weather Interactions: Cotton and Sugarcane

Lecture 14 - Crop-Weather Interactions: Sugarbeet and Chickpea

Lecture 15 - Crop-Weather Interactions: Sunflower and Mustard

Lecture 16 - Genesis of weather forecast in India and Abroad

Lecture 17 - Types of weather forecast and details

Lecture 18 - Types of weather forecast and details (Continued...)

Lecture 19 - Simple methods of verification of weather forecast with real event

Lecture 20 - Traditional knowledges on weather forecast and their validity

Lecture 21 - Weather thumb rules and their validity

Lecture 22 - Development and component of agro advisory for weather forecast

Lecture 23 - Development and component of agro advisory for weather forecast (Continued...)

Lecture 24 - Model agro advisories for selected five days weather forecast

Lecture 25 - Mass communication mode of agro advisories and their effectiveness

Lecture 26 - Discussion on weather forecast and agro advisory from different website

Lecture 27 - Role of climate manager on farm management decision based on weather forecast at village level and assignment

Lecture 28 - Development of selected weather window for issuing agro advisory - case study from Tamil Nadu

Lecture 29 - Model of agro advisory for 54 selected weather window of Tamil Nadu for rice

Lecture 30 - Response farming- a type of farm planning being practiced in Australia considering seasonal climate forecast

Lecture 31 - Case study in India on the adoption of weather based crop production - Crop management

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

[Lecture 32 - Case study in India on the adoption of weather based crop production - Pest and disease management](#)

[Lecture 33 - Case study in India on the adoption of weather based animal production](#)

[Lecture 34 - Cost benefit analysis for the case study done on crop management](#)

[Lecture 35 - Cost benefit analysis for the case study done on animal management](#)

[Lecture 36 - Summary](#)

Lecture 1 - Introduction

Lecture 2 - Highlights Week 0 and 1

Lecture 3 - What is ICT?

Lecture 4 - Architecture of a Computer

Lecture 5 - Architecture of a Phone

Lecture 6 - What is the Internet?

Lecture 7 - What is WWW?

Lecture 8 - Highlights Week 2

Lecture 9 - Phones, Smart Phones, Phablets, Tablets

Lecture 10 - Introduction to Android

Lecture 11 - Network Architectures - Part-1 (Introduction to Computer Networks)

Lecture 12 - Network Architectures - Part-2 (Overview of Network Architecture)

Lecture 13 - Network Architectures - Part-3 (Architecture of Internet)

Lecture 14 - Mobile Wireless Communications - Introduction (Module-1)

Lecture 15 - Mobile Wireless Communication (Module-2)

Lecture 16 - Highlights Week 3

Lecture 17 - Adaptive and Responsive Websites

Lecture 18 - Data management

Lecture 19 - Knowledge Representation

Lecture 20 - Knowledge Representation Techniques

Lecture 21 - Expert Systems

Lecture 22 - Highlights Week - 4

Lecture 23 - Speech Recognition

Lecture 24 - Speech Synthesis

Lecture 25 - Identity Management - Part 1

Lecture 26 - Identity Management - Part 2

Lecture 27 - Location Recognition - Part 1

Lecture 28 - Location Recognition - Part 2

Lecture 29 - Parameter Sensing

Lecture 30 - Highlights Week-5

Lecture 31 - Social Networking - Part 1

[Lecture 32 - Social Networking - Part 2](#)

[Lecture 33 - Blogs](#)

[Lecture 34 - Facebook](#)

[Lecture 35 - Twitter](#)

[Lecture 36 - 3G WCDMA \(Module- 3\)](#)

[Lecture 37 - 4G Mobile Wireless WiMAX \(Module-4\)](#)

[Lecture 38 - Advanced Wireless Technologies \(Module-5\)](#)

[Lecture 39 - LTE, WLAN, Bluetooth and Future](#)

[Lecture 40 - Highlights Week-6](#)

[Lecture 41 - Introduction to Cloud Computing](#)

[Lecture 42 - Introduction to Cloud Services](#)

[Lecture 43 - Cloud Service Providers](#)

[Lecture 44 - GIS Application in Agriculture - Part 1](#)

[Lecture 45 - GIS Application in Agriculture - Part 2](#)

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11 - Application of Navier Stoke's equation for finding out viscosity - Part 2

Lecture 12 - Application of Navier Stoke's equation for finding out viscosity - Part 3

Lecture 13 - Flow through pipes

Lecture 14 - Hagen-poiseuille equation from Navier stokes equation

Lecture 15 - Fanning friction factor

Lecture 16 - Moody's chart

Lecture 17 - Laminar and turbulent flow in a pipe

Lecture 18 - Flow through flat and parallel plates

Lecture 19 - Flow of film or film flow

Lecture 20 - Problems and solution of falling film

Lecture 21 - Flow through annulus - Part 1

Lecture 22 - Flow through annulus - Part 2

Lecture 23 - Stoke's law

Lecture 24 - Flow through flat plates or slits

Lecture 25 - Problems and solution for flow through flat plates or slits

Lecture 26 - Compressible fluid flow

Lecture 27 - Flow through nozzle - I

Lecture 28 - Flow through nozzle - II

Lecture 29 - Flow through nozzle - problems and solutions

Lecture 30 - Nozzle flow- problems and solutions

Lecture 31 - Sonic velocity

- Lecture 32 - Sonic velocity - Mach number
- Lecture 33 - Variable fluid flow
- Lecture 34 - Variable fluid flow - problems and solutions
- Lecture 35 - Variable fluid flow - problems and solutions (Continued...)
- Lecture 36 - Pneumatic conveying
- Lecture 37 - Problem on Pneumatic conveying - Part 1
- Lecture 38 - Problem on Pneumatic conveying - Part 2
- Lecture 39 - Non Newtonian fluid flow - Part 1
- Lecture 40 - Non Newtonian fluid flow - Part 2
- Lecture 41 - Velocity profile for Non Newtonian fluid
- Lecture 42 - Average velocity for Non Newtonian fluid
- Lecture 43 - Problems and solution of Non Newtonian fluid - Part 1
- Lecture 44 - Problems and solution of Non Newtonian fluid - Part 2
- Lecture 45 - Flow of Non Newtonian fluid through slit
- Lecture 46 - Generalized coefficient of Reynolds number
- Lecture 47 - Flow through packed beds
- Lecture 48 - Ergun's equation- derivation - Part 1
- Lecture 49 - Ergun's equation- derivation - Part 2
- Lecture 50 - Solving problems on Ergun's equation
- Lecture 51 - Solving problems on Ergun's equation
- Lecture 52 - Fluidization
- Lecture 53 - Fluidized bed flow
- Lecture 54 - Problem of Fluidized bed condition - Part 1
- Lecture 55 - Problem of Fluidized bed condition - Part 2
- Lecture 56 - Problem and solution
- Lecture 57 - Problem and solution
- Lecture 58 - Problem and solution
- Lecture 59 - Problem and solution
- Lecture 60 - Problem and solution with comprehension of course

Lecture 1 - Importance of Farm Machines in the Contest of Enhance Production, Multiple Cropping, Labour Scarcity etc.

Lecture 2 - Ploughing and first opening of the soil, the design and component details

Lecture 3 - Tractor, implement and soil force consideration for tillage implement design

Lecture 4 - Tractor, implement and soil force consideration for tillage implement design

Lecture 5 - Mechanics of rotavator or rotary tillers

Lecture 6 - Design of a tractor PTO operated rotavator

Lecture 7 - Tractor implement hitching systems

Lecture 8 - Mechanics of tractor implement hitch system and traction prediction models

Lecture 9 - Laboratory class on traction and tire testing

Lecture 10 - Combination tillage implements for efficient land preparation

Lecture 11 - LASER guided land leveller

Lecture 12 - Introduction of seeding operation

Lecture 13 - Types of seed metering devices and their operation

Lecture 14 - Types of fertilizer metering, furrow opening and soil covering devices

Lecture 15 - Equipment for seeding and planting

Lecture 16 - Equipment for precision planting

Lecture 17 - Equipment for Paddy Transplanting

Lecture 18 - Microcontroller based uniform seed rate application system

Lecture 19 - GPS based automatic Variable rate fertilizer applicator

Lecture 20 - Embedded GPS integrated Variable Rate Fertilizer Applicator

Lecture 21 - Design of a seeding equipment - PART 1

Lecture 22 - Design of a seeding equipment - PART 2

Lecture 23 - Design of a seeding equipment - PART 3

Lecture 24 - Design a tractor drawn seed drill for a 40 hp tractor - I

Lecture 25 - Design a tractor drawn seed drill for a 40 hp tractor - II

Lecture 26 - Testing of tractor operated seeding equipment

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

Lecture 32 - Farm machines for interculture operation

Lecture 33 - Performance of weeding blades of a push-pull weeder

Lecture 34 - Advanced level machinery for inter and intra row weeding

Lecture 35 - Tractor mounted contact type microcontroller based improved variable rate herbicide applicator

Lecture 36 - Design of manually operated weeding equipment

Lecture 37 - Plant protection equipment/machinery

Lecture 38 - Selection and design of plant protection equipment/machinery

Lecture 39 - Manually operated knapsack-cum-boom sprayer

Lecture 40 - Performance evaluation of sprayer

Lecture 41 - Testing and certification of spraying equipment

Lecture 42 - Problems based on the design and selection of spraying equipment - I

Lecture 43 - Problems based on the design and selection of spraying equipment - II

Lecture 44 - Advanced level spraying equipment: Ultrasonic sensor based sprayer

Lecture 45 - Advanced level spraying equipment: Drone assisted variable rate chemical application system and electrostatic sprayer

Lecture 46 - Harvesting equipment

Lecture 47 - Machines for harvesting cereal crops, root and fruit crops

Lecture 48 - Combine Harvester

Lecture 49 - Advanced technology approach for cotton harvesting

Lecture 50 - Threshing operation and equipment

Lecture 51 - Design of threshing equipment

Lecture 52 - Performance evaluation and testing of thresher

Lecture 53 - Conservation Agriculture

Lecture 54 - Materials for construction of farm machinery

Lecture 55 - Machinery for Land Drainage, Land Reclamation and Estate Maintenance Part - I

Lecture 56 - Machinery for Land Drainage, Land Reclamation and Estate Maintenance Part - II

Lecture 57 - Machinery for Land Drainage, Land Reclamation and Estate Maintenance Part - III

Lecture 58 - Machinery Selection and Management - Part 1

Lecture 59 - Machinery Selection and Management - Part 2

Lecture 60 - Epilogue

Lecture 1 - Introduction

Lecture 2 - Soil Properties - I

Lecture 3 - Soil Properties - II

Lecture 4 - Soil Water

Lecture 5 - Tutorial - I

Lecture 6 - Field water balance

Lecture 7 - Evapotranspiration

Lecture 8 - Crop water requirement

Lecture 9 - Irrigation Scheduling

Lecture 10 - Tutorial

Lecture 11 - Irrigation Water Conveyance System

Lecture 12 - Irrigation Water Conveyance

Lecture 13 - Channel Design Structures

Lecture 14 - Measurement of Irrigation Water: Pipe

Lecture 15 - Tutorial

Lecture 16 - Water Application Methods

Lecture 17 - Surface Irrigation Hydraulics

Lecture 18 - Furrow Irrigation Hydraulics

Lecture 19 - Border Irrigation Design

Lecture 20 - Tutorial

Lecture 21 - Sprinkler Irrigation Design

Lecture 22 - Sprinkler Irrigation : Hydraulic Design

Lecture 23 - Drip Irrigation - I

Lecture 24 - Drip Irrigation Design

Lecture 25 - Tutorial (Week 5)

Lecture 26 - Irrigation Wells

Lecture 27 - Aquifer Properties

Lecture 28 - Well Hydraulics - 1

Lecture 29 - Well Hydraulics - 2

Lecture 30 - Tutorial

Lecture 31 - Introduction

[Lecture 32 - Centrifugal Pump: Basics](#)

[Lecture 33 - Centrifugal Pumps: Power Requirement](#)

[Lecture 34 - Pump Characteristic Curves](#)

[Lecture 35 - Tutorial](#)

[Lecture 36 - Management of salt affected soils: Saline and alkali soils - 1](#)

[Lecture 37 - Management of salt affected soils: Saline and alkali soils - 1](#)

[Lecture 38 - Agricultural Drainage: Related Concepts](#)

[Lecture 39 - Agricultural Drainage: Introduction](#)

[Lecture 40 - Tutorial](#)

[Lecture 41 - Drainage System Components](#)

[Lecture 42 - Drainage System : Drain Pipe](#)

[Lecture 43 - Drainage System : Structures](#)

[Lecture 44 - Drainage System Design](#)

[Lecture 45 - Tutorial](#)

[Lecture 46 - Subsurface Drainage Design - 1](#)

[Lecture 47 - Subsurface Drainage Design - 2](#)

[Lecture 48 - Subsurface Drainage Design - 3](#)

[Lecture 49 - Subsurface Drainage Design - 4](#)

[Lecture 50 - Tutorial](#)

[Lecture 51 - Surface drainage system design - 1](#)

[Lecture 52 - Surface drainage system design - 2](#)

[Lecture 53 - Non-conventional drainage](#)

[Lecture 54 - Economics of drainage project](#)

[Lecture 55 - Tutorial](#)

[Lecture 56 - Case study of drainage system](#)

[Lecture 57 - Drainage Model](#)

[Lecture 58 - Irrigation Efficiency](#)

[Lecture 59 - Irrigation Economics](#)

[Lecture 60 - Irrigation model](#)

Lecture 1 - Importance Of Rheology In Food

Lecture 2 - Food Rheology

Lecture 3 - Food Rheology

Lecture 4 - Food Rheology

Lecture 5 - Food Rheology

Lecture 6 - Measurements of Rheological Properties

Lecture 7 - Measurements of Rheological Properties

Lecture 8 - Rheological Properties of Viscoelastic Food

Lecture 9 - Rheological Properties of Viscoelastic Food

Lecture 10 - Rheological Properties of Viscoelastic Food

Lecture 11 - Thermal Processing And Microbial Death Kinetics

Lecture 12 - Thermal processing and microbial death kinetics

Lecture 13 - Thermal processing and microbial death kinetics (Continued...)

Lecture 14 - Thermal processing and microbial death kinetics (Continued...)

Lecture 15 - Thermal processing and microbial death kinetics (Continued...)

Lecture 16 - Evaporation and concentration

Lecture 17 - Evaporation and concentration

Lecture 18 - Evaporation and concentration

Lecture 19 - Evaporation and concentration

Lecture 20 - Evaporation and concentration

Lecture 21 - Heat Exchangers

Lecture 22 - Heat Exchangers

Lecture 23 - Heat Exchangers

Lecture 24 - Heat Exchangers

Lecture 25 - Heat Exchangers

Lecture 26 - Drying Technology

Lecture 27 - Drying Technology

Lecture 28 - Drying Technology

Lecture 29 - Drying Technology

Lecture 30 - Drying Technology

Lecture 31 - Freezing and Freeze Drying

[Lecture 32 - Freezing and Freeze Drying](#)

[Lecture 33 - Freezing and Freeze Drying](#)

[Lecture 34 - Freezing and Freeze Drying](#)

[Lecture 35 - Freezing and Freeze Drying](#)

[Lecture 36 - Size Reduction](#)

[Lecture 37 - Size Reduction \(Continued...\)](#)

[Lecture 38 - Size Reduction \(Continued...\)](#)

[Lecture 39 - Size Reduction \(Continued...\)](#)

[Lecture 40 - Size Reduction \(Continued...\)](#)

[Lecture 41 - Mechanical Separation Techniques](#)

[Lecture 42 - Mechanical Separation Techniques](#)

[Lecture 43 - Mechanical Separation Techniques](#)

[Lecture 44 - Mechanical Separation Techniques](#)

[Lecture 45 - Mechanical Separation Techniques](#)

[Lecture 46 - Mixing and agitation](#)

[Lecture 47 - Mixing and agitation \(Continued...\)](#)

[Lecture 48 - Mixing and agitation \(Continued...\)](#)

[Lecture 49 - Mixing and agitation \(Continued...\)](#)

[Lecture 50 - Mixing and agitation \(Continued...\)](#)

[Lecture 51 - Leaching and Extraction](#)

[Lecture 52 - Leaching and Extraction \(Continued...\)](#)

[Lecture 53 - Leaching and Extraction \(Continued...\)](#)

[Lecture 54 - Leaching and Extraction \(Continued...\)](#)

[Lecture 55 - Leaching and Extraction \(Continued...\)](#)

[Lecture 56 - Non Thermal Processing](#)

[Lecture 57 - Non Thermal Processing \(Continued...\)](#)

[Lecture 58 - Non Thermal Processing \(Continued...\)](#)

[Lecture 59 - Non Thermal Processing \(Continued...\)](#)

[Lecture 60 - Non Thermal Processing \(Continued...\)](#)

Lecture 1 - Introduction

Lecture 2 - Soil erosion causes and types

Lecture 3 - Factors affecting soil erosion and effects of soil erosion

Lecture 4 - Soil erosion - Mechanics

Lecture 5 - Water erosion control measures

Lecture 6 - Soil loss estimation

Lecture 7 - Erosivity and Erodibility

Lecture 8 - Modification in Universal soil loss equation - Part I

Lecture 9 - Modification in Universal soil loss equation - Part II

Lecture 10 - Soil loss measurement

Lecture 11 - Bunds - Introduction

Lecture 12 - Contour Bunds

Lecture 13 - Problems on Contour Bunds

Lecture 14 - Graded Bunds

Lecture 15 - Problems on Graded Bunds

Lecture 16 - Terrace - Introduction

Lecture 17 - Bench Terraces

Lecture 18 - Problems on Bench Terraces

Lecture 19 - Broad-base Terraces

Lecture 20 - Problems on Broad-base Terraces

Lecture 21 - Grassed Waterways

Lecture 22 - Problems on Grassed Waterways

Lecture 23 - Parabolic Grassed Waterways

Lecture 24 - GATE Questions on Various Topics Covered

Lecture 25 - Introduction-Gully Control Measures

Lecture 26 - Gully Control Measures (Permanent Structures)

Lecture 27 - Design Considerations- Permanent Gully Control Structures

Lecture 28 - Basics of Open Channel Hydraulics - 1

Lecture 29 - Basics of Open Channel Hydraulics - 2

Lecture 30 - Hydraulic Design of Drop Spillway

Lecture 31 - Hydraulic Design of drop Spillway in different Flow Conditions

[Lecture 32 - Hydraulic Design Components](#)

[Lecture 33 - Structural Design of Drop Spillway - 1](#)

[Lecture 34 - Structural Design of Drop Spillway - 2](#)

[Lecture 35 - Structural Design of Drop Spillway - 3](#)

[Lecture 36 - Structural Design of Drop Spillway - 4](#)

[Lecture 37 - GATE Question](#)

[Lecture 38 - Drop Inlet Spillway](#)

[Lecture 39 - Drop Inlet Spillway \(Continued...\)](#)

[Lecture 40 - Introduction-Drop Inlet Spillway](#)

[Lecture 41 - Drop Inlet Spillway Design - I](#)

[Lecture 42 - Numerical Problems](#)

[Lecture 43 - Ogee Spillway](#)

[Lecture 44 - Chute Spillway](#)

[Lecture 45 - Chute Spillway Design - I](#)

[Lecture 46 - Chute Spillway Design - II](#)

[Lecture 47 - Energy Dissipation](#)

[Lecture 48 - Wind Erosion and Control Basics](#)

[Lecture 49 - Design of Wind Breaks](#)

[Lecture 50 - Design of Shelterbelts](#)

[Lecture 51 - Formation of Sand Dunes](#)

[Lecture 52 - Stabilization of Sand Dunes](#)

[Lecture 53 - Land Capability Classes](#)

[Lecture 54 - Improving Land Capability](#)

[Lecture 55 - Sediment and Its Transportation](#)

[Lecture 56 - Sediment Sampling](#)

Lecture 1 - Preamble of the Subject

Lecture 2 - What is Food and Nutrients

Lecture 3 - Nutritional Value of the Nutrients

Lecture 4 - Best Way of Storage of Food Materials

Lecture 5 - Preservation Techniques

Lecture 6 - Temperature Quotient and Its Impact

Lecture 7 - Food Additives

Lecture 8 - Quality of Food

Lecture 9 - Quality of Food (Continued...)

Lecture 10 - Emerging Technology

Lecture 11 - Emerging Technology (Continued...)

Lecture 12 - Food Laws - Why?

Lecture 13 - Food Laws of India

Lecture 14 - Standards in India

Lecture 15 - Hygiene and Other Controls in India

Lecture 16 - Physico-Chemical Properties of Milk

Lecture 17 - Milk - What is it

Lecture 18 - Milk - How it looks?

Lecture 19 - Milk - Constituents

Lecture 20 - Constituents of Milk

Lecture 21 - Milk Fat

Lecture 22 - Milk Fat (Continued...)

Lecture 23 - Milk Fat (Continued...)

Lecture 24 - Milk Fat (Continued...)

Lecture 25 - Protein

Lecture 26 - Protein (Continued...)

Lecture 27 - Amino Acids

Lecture 28 - Amino Acids (Continued...)

Lecture 29 - Milk Protein

Lecture 30 - Casein Micelle

Lecture 31 - Whey Protein

- Lecture 32 - Whey Protein (Continued...)
- Lecture 33 - Lactoferrin
- Lecture 34 - Carbohydrates in Milk
- Lecture 35 - Small Constituents of Milk
- Lecture 36 - Enzymes in Milk
- Lecture 37 - Chemical and Microbial Spoilage of Milk and Milk Products
- Lecture 38 - Extrinsic Factors for Microbial Growth
- Lecture 39 - Natural or Other Type of Spoilage
- Lecture 40 - Packaging
- Lecture 41 - Milk Pasteurization
- Lecture 42 - Thermal Death Time
- Lecture 43 - Pasteurization Effectiveness
- Lecture 44 - Milk Pasteurization and Homogenization
- Lecture 45 - Milk Pasteurization and Homogenization (Continued...)
- Lecture 46 - Milk Homogenization
- Lecture 47 - Milk Centrifugation
- Lecture 48 - Types of Available Milk
- Lecture 49 - Types of Available Milk in the Market
- Lecture 50 - New Technologies in Dairy Industries
- Lecture 51 - Cheese
- Lecture 52 - Cheddar Cheese
- Lecture 53 - Ice Cream
- Lecture 54 - Process of Ice Cream Preparation
- Lecture 55 - Ice Cream Lolies
- Lecture 56 - Over Run and Calculation for Preparing Ice Cream Mix
- Lecture 57 - Transportation of Ice Cream vis a vis Frozen Foods
- Lecture 58 - Packaging of Food Materials
- Lecture 59 - Modified Atmosphere Packaging
- Lecture 60 - Flow Chart for Manufacturing Some Dairy and Food Products

- Lecture 1 - Organic Farming: Introduction and Status
- Lecture 2 - Organic Farming: Introduction and Status (Continued...)
- Lecture 3 - Organic Farming and its Components
- Lecture 4 - Organic Farming Concepts and Principles
- Lecture 5 - Organic Farming Concepts and Principles (Continued...)
- Lecture 6 - SWOT Analysis of Organic Farming
- Lecture 7 - Sustainable Agriculture
- Lecture 8 - Key Indicators of Sustainable Agriculture
- Lecture 9 - Organic Farming and Climate Change
- Lecture 10 - Organic Farming and Climate Change (Continued...)
- Lecture 11 - Principles of Compost Production
- Lecture 12 - Vermicompost Production Technology
- Lecture 13 - Vermicompost Production Technology (Continued...)
- Lecture 14 - Vermicompost Production Technology (Continued...)
- Lecture 15 - Enriched Vermicompost Production Technology
- Lecture 16 - Vermicompost Quality and Marketing
- Lecture 17 - Introduction to Pest and Disease Management
- Lecture 18 - Pest and Disease Management in Organic Farming
- Lecture 19 - Level C Pest and Disease Management
- Lecture 20 - Level C Pest and Disease Management (Continued...)
- Lecture 21 - Introduction to Organic Crop Management
- Lecture 22 - Introduction to Organic Crop Management (Continued...)
- Lecture 23 - Organic Vegetable Crop Management
- Lecture 24 - Organic Vegetable Crop Management (Cereals)
- Lecture 25 - Organic Vegetable Crop Management (Cereals) (Continued...)
- Lecture 26 - Organic Field Crop Management (Pulse and Oilseed Crop)
- Lecture 27 - Organic Plantation Crop Management
- Lecture 28 - Organic Meat Production
- Lecture 29 - Introduction on transition to organic crop production
- Lecture 30 - Crop planning and rotation design in organic system
- Lecture 31 - Crop planning and rotation design in organic system (Continued...)

[Lecture 32 - Integrated Farming System and Urban Agriculture](#)

[Lecture 33 - Quality of Organic Food](#)

[Lecture 34 - Natural Sources of Antioxidants for Health Defense](#)

[Lecture 35 - Antioxidant Capacity of fruits and vegetables](#)

[Lecture 36 - Organic Food and Human Health](#)

[Lecture 37 - Organic Standard](#)

[Lecture 38 - Organic Certification Process](#)

[Lecture 39 - Operational Structure of Organic Certification](#)

[Lecture 40 - Marketing of Organic Products](#)

Lecture 1 - Course Introduction; Food Constituents and Functions

Lecture 2 - Quality and Safety Aspects of Food

Lecture 3 - Factors Affecting Quality During Processing and Storage

Lecture 4 - Role of Water in Food and its Shelf Life

Lecture 5 - Gelatinization and Retrogradation of Starch

Lecture 6 - Browning Reactions

Lecture 7 - Food Proteins

Lecture 8 - Principles of Food Preservation

Lecture 9 - Traditional Food Preservation Technologies - Part 1

Lecture 10 - Traditional Food Preservation Technologies - Part 2

Lecture 11 - High Pressure Processing of Food - Part 1

Lecture 12 - High Pressure Processing of Food - Part 2

Lecture 13 - Membrane Technology - Part 1

Lecture 14 - Membrane Technology - Part 2

Lecture 15 - Food Irradiation - Part 1

Lecture 16 - Food Irradiation - Part 2

Lecture 17 - Microwave Heating

Lecture 18 - Radio Frequency Drying

Lecture 19 - Super Critical Fluid Extraction - Part 1

Lecture 20 - Super Critical Fluid Extraction - Part 2

Lecture 21 - Freeze Drying - Part 1

Lecture 22 - Freeze Drying - Part 2

Lecture 23 - Food Extrusion Technology - Part 1

Lecture 24 - Food Extrusion Technology - Part 2

Lecture 25 - Textured Vegetable Protein (TVP)

Lecture 26 - Aseptic Processing and Packaging

Lecture 27 - Hurdle Technology

Lecture 28 - Natural Antimicrobials

Lecture 29 - Food Lipids: Nature and Occurrence

Lecture 30 - Extraction of Oil - Part 1

Lecture 31 - Extraction of Oil - Part 2

- Lecture 32 - Refining of Oil - Part 1
- Lecture 33 - Refining of Oil - Part 2
- Lecture 34 - Modified Fats
- Lecture 35 - Rancidity
- Lecture 36 - Natural Antioxidants
- Lecture 37 - Microencapsulation - Part 1
- Lecture 38 - Microencapsulation - Part 2
- Lecture 39 - Food nanotechnology
- Lecture 40 - Respiration and Ripening
- Lecture 41 - Modified Atmospheric Storage (MAP)
- Lecture 42 - Active Packaging Technology
- Lecture 43 - Edible coating technology
- Lecture 44 - Multiproduct CA/MA Storage Unit
- Lecture 45 - Grain Storage
- Lecture 46 - Ozonation of Food Grains
- Lecture 47 - Hyper Spectral Imaging for Quality Analysis of Food Grains
- Lecture 48 - Non-Destructive Methods for Analysis of Grain Quality
- Lecture 49 - Detection of Spoilage in Grains using Biosensors
- Lecture 50 - Food Fortification
- Lecture 51 - Iron Fortified Rice (IFR)
- Lecture 52 - Nutri Dal and Fortified Noodles
- Lecture 53 - High Energy RTE Food Paste - Part 1
- Lecture 54 - High Energy RTE Food Paste - Part 2
- Lecture 55 - Functional Foods and Nutraceuticals
- Lecture 56 - Algae Based Health Foods
- Lecture 57 - Gluten Free Bread and Pasta
- Lecture 58 - Food Powder and Premixes
- Lecture 59 - GMP/GHP in Food Industry
- Lecture 60 - FCTL R&D and Course Summary

Lecture 1 - Basic Overview of Soil

Lecture 2 - Weathering and Soil Formation

Lecture 3 - Weathering and Soil Formation (Continued...)

Lecture 4 - Weathering and Soil Formation (Continued...)

Lecture 5 - Weathering and Soil Formation (Continued...)

Lecture 6 - Soil Taxonomy and Classification

Lecture 7 - Soil Taxonomy and Classification (Continued...)

Lecture 8 - Soil Taxonomy and Classification (Continued...)

Lecture 9 - Soil Orders, Soil Colour and Texture

Lecture 10 - Soil Texture and Structure

Lecture 11 - Soil Tillage and Soil Density

Lecture 12 - Soil Porosity and Consistency

Lecture 13 - Soil Consistency and Soil Water

Lecture 14 - Soil Water

Lecture 15 - Tutorial

Lecture 16 - Soil Water Movement

Lecture 17 - Qualitative Description of Soil Wetness

Lecture 18 - Soil Air

Lecture 19 - Soil Temperature

Lecture 20 - Tutorial

Lecture 21 - Silicate Clays

Lecture 22 - Silicate Clays (Continued...)

Lecture 23 - Sources of Charges in Soil

Lecture 24 - Cation Exchange Capacity (CEC)

Lecture 25 - Sorption of Pesticides

Lecture 26 - Diffuse Double Layer

Lecture 27 - Adsorption Isotherms

Lecture 28 - Soil Acidity

Lecture 29 - Soil Salinity and Alkalining

Lecture 30 - Submerged Soils

Lecture 31 - Essential Plant Nutrients

[Lecture 32 - Soil N](#)

[Lecture 33 - Biological N Fixation](#)

[Lecture 34 - Soil P and K](#)

[Lecture 35 - Fertilizers](#)

[Lecture 36 - Soil Testing - I](#)

[Lecture 37 - Soil Testing - II](#)

[Lecture 38 - Soil Organic Matter](#)

[Lecture 39 - Soil Organisms](#)

[Lecture 40 - Compost](#)

[Lecture 41 - Land Degradation and Soil Erosion](#)

[Lecture 42 - Universal Soil Loss Equation](#)

[Lecture 43 - Conservation Tillage](#)

[Lecture 44 - Wind Erosion and Tillage Erosion](#)

[Lecture 45 - Organic Pollutants in Soil](#)

[Lecture 46 - Remediation of Organic Pollutant](#)

[Lecture 47 - Toxic Inorganic Substances in Soil](#)

[Lecture 48 - Removal of Toxic Inorganic Substances](#)

[Lecture 49 - Soil Survey](#)

[Lecture 50 - Remote Sensing in Soil Survey](#)

[Lecture 51 - GIS and GPS](#)

[Lecture 52 - Geostatistics](#)

[Lecture 53 - Basics of VisNIR - DRS](#)

[Lecture 54 - VisNIR-DRS Applications for Soil](#)

[Lecture 55 - PXRF Soil Applications](#)

[Lecture 56 - Basic Overview of DSM](#)

[Lecture 57 - Modeling Continuous Variables](#)

[Lecture 58 - Modeling Continuous Variables \(Continued...\)](#)

[Lecture 59 - Modeling Categorical Variables](#)

[Lecture 60 - Pedotransfer Functions and Uncertainty of DSM](#)

- Lecture 1 - Fundamentals of Food Processing and Preservation
- Lecture 2 - Fundamentals of Food Processing and Preservation (Continued...)
- Lecture 3 - Preservation Techniques
- Lecture 4 - Fundamentals of Food Processing and Preservation (Continued...)
- Lecture 5 - Fundamentals of Food Processing and Preservation (Continued...)
- Lecture 6 - Fundamentals of Food Processing and Preservation why and how do food spoil
- Lecture 7 - One Dimensional Conduction Heat Transfer in Cartesian Coordinate
- Lecture 8 - One Dimensional Conduction Heat Transfer in Cartesian Coordinate (Continued...)
- Lecture 9 - One Dimensional Steady State Heat Conduction
- Lecture 10 - One Dimensional Steady State Heat Conduction (Continued...)
- Lecture 11 - One Dimensional Heat Transfer Through Cylinders
- Lecture 12 - One Dimensional Heat Transfer Through Cylinders (Continued...)
- Lecture 13 - One Dimensional Heat Transfer Through Cylinders (Continued...)
- Lecture 14 - One Dimensional Heat Transfer
- Lecture 15 - Thermal Resistance
- Lecture 16 - Thermal contact Resistance and Finned Surface
- Lecture 17 - Finned Surface
- Lecture 18 - Finned Surface (Continued...)
- Lecture 19 - Finned Surface (Continued...)
- Lecture 20 - Heat Transfer in Finned Surfaces
- Lecture 21 - Transient Heat Transfer
- Lecture 22 - Transient Heat Transfer (Continued...)
- Lecture 23 - Transient Heat Transfer (Continued...)
- Lecture 24 - Transient Heat Transfer (Continued...)
- Lecture 25 - Heister Chart
- Lecture 26 - Heister Chart (Continued...)
- Lecture 27 - Heat Transfer by Convection
- Lecture 28 - Heat Transfer by Convection(Continued...)
- Lecture 29 - Heat Transfer by Convection(Continued...)
- Lecture 30 - Heat Transfer by Convection(Continued...)
- Lecture 31 - Heat Transfer by Convection(Continued...)

- [Lecture 32 - Heat Transfer by Convection\(Continued...\)](#)
- [Lecture 33 - Heat Transfer by Convection\(Continued...\)](#)
- [Lecture 34 - Heat Transfer by Radiation](#)
- [Lecture 35 - Heat Transfer by Radiation \(Continued...\)](#)
- [Lecture 36 - Heat Transfer by Convection \(Continued...\)](#)
- [Lecture 37 - Heat Transfer by Radiation \(Continued...\)](#)
- [Lecture 38 - Heat Transfer by Radiation \(Continued...\)](#)
- [Lecture 39 - Boiling and Condensation](#)
- [Lecture 40 - Boiling \(Continued...\)](#)
- [Lecture 41 - Condensation](#)
- [Lecture 42 - Condensation \(Continued...\)](#)
- [Lecture 43 - Heat Exchangers](#)
- [Lecture 44 - Heat Exchangers \(Continued...\)](#)
- [Lecture 45 - Heat Exchangers \(Continued...\)](#)
- [Lecture 46 - Heat Exchangers \(Continued...\)](#)
- [Lecture 47 - Log mean Temperature Difference](#)
- [Lecture 48 - Heat Exchangers \(Continued...\)](#)
- [Lecture 49 - Heat Exchangers \(Continued...\)](#)
- [Lecture 50 - Heat Exchangers \(Continued...\)](#)
- [Lecture 51 - Heat Exchangers \(Continued...\)](#)
- [Lecture 52 - Heat Exchangers \(Continued...\)](#)
- [Lecture 53 - Heat Exchangers \(Continued...\)](#)
- [Lecture 54 - Thermal Death Reaction Kinectics](#)
- [Lecture 55 - Preservation by High Temperature Processing](#)
- [Lecture 56 - Preservation by High Temperature Processing \(Continued...\)](#)
- [Lecture 57 - Distillation](#)
- [Lecture 58 - Distillation \(Continued...\)](#)
- [Lecture 59 - Distillation \(Continued...\)](#)
- [Lecture 60 - Drying and Multiple Effect Evaporator](#)

- Lecture 1 - Micro-Irrigation: Introduction and Scope
- Lecture 2 - Fundamentals of Fluid Mechanics and its Application in MI
- Lecture 3 - Soil Water Concept
- Lecture 4 - Soil Water Constants and Infiltration
- Lecture 5 - Tutorial 1 - Numerical Examples on Fluid Mechanics and Soil water
- Lecture 6 - Evapotranspiration
- Lecture 7 - Determination of Evapotranspiration
- Lecture 8 - Crop Coefficients and Crop Water Requirement
- Lecture 9 - Demonstration of Agro Metrological Instruments
- Lecture 10 - Demonstration of Lysimeter
- Lecture 11 - Tutorial 2 - Numerical Examples on Crop Water Requirement
- Lecture 12 - Irrigation Scheduling
- Lecture 13 - Soil and Plant Water Monitoring Instruments
- Lecture 14 - Measurement of Irrigation Water
- Lecture 15 - Irrigation Efficiency
- Lecture 16 - Tutorial 3 - Numerical Examples on Irrigation water Management
- Lecture 17 - Introduction of Water Lifts and Pumps
- Lecture 18 - Variable Displacement Pumps
- Lecture 19 - Irrigation Water Quality
- Lecture 20 - Tutorial 4 - Numerical Examples on Water Measurements and Pumps
- Lecture 21 - Irrigation methods
- Lecture 22 - Micro Irrigation System: Concept and Types
- Lecture 23 - Drip Irrigation: Introduction and Types
- Lecture 24 - Drip Irrigation: Design Considerations and System Layout
- Lecture 25 - Types and Selection of Emission Devices
- Lecture 26 - Hydraulics Drip Irrigation System Pipe Network
- Lecture 27 - Tutorial 5 - Numerical Example on Design of Drip Irrigation System
- Lecture 28 - Fertigation
- Lecture 29 - Fertigation Application Methods
- Lecture 30 - Drip Irrigation: Filtration System
- Lecture 31 - Tutorial 6 - Numerical Examples on Emission Devices and Fertigation

- Lecture 32 - Installation and Operation of Drip Irrigation System
- Lecture 33 - Maintenance of Drip Irrigation System
- Lecture 34 - Demonstration of Drip Irrigation Components and Evaluation of Drip Emitter
- Lecture 35 - Soil Water Movement under Drip Emitter
- Lecture 36 - Design and Development of Drip Emitter
- Lecture 37 - Tutorial 7- Numerical Examples on Drip Irrigation System
- Lecture 38 - Micro Sprinkler Irrigation System
- Lecture 39 - Bubbler Irrigation System
- Lecture 40 - Sprinkler Irrigation System
- Lecture 41 - Sprinkler Irrigation System Design
- Lecture 42 - Performance Evaluation of Sprinkler Irrigation System
- Lecture 43 - Tutorial 8 - Numerical Examples on Sprinkler Irrigation System
- Lecture 44 - Tutorial 9 - Numerical Examples on Design of Sprinkler Irrigation System
- Lecture 45 - Sprinkler Irrigation System: Layout, Installation, Operation and Maintenance
- Lecture 46 - Standards and Quality Assurance of MIS Components
- Lecture 47 - Standards and Quality Assurance of Sprinkler Irrigation System Components
- Lecture 48 - Solar Photovoltaic System for Irrigation - Part 1
- Lecture 49 - Solar Photovoltaic System for Irrigation - Part 2
- Lecture 50 - Tutorial 10 - Numerical Examples on Solar PV Irrigation System
- Lecture 51 - Automation of Micro Irrigation System - Part 1
- Lecture 52 - Automation of Micro Irrigation System - Part 2
- Lecture 53 - Automation of Micro Irrigation System - Part 3
- Lecture 54 - Automation of Micro Irrigation System - Part 4
- Lecture 55 - Economic Analysis of Micro Irrigation System - Part 1
- Lecture 56 - Economic Analysis of MIS - Part 2
- Lecture 57 - Economic Analysis of MIS - Part 3
- Lecture 58 - Tutorial 11- Numerical Examples on Economics of Micro Irrigation System
- Lecture 59 - Precision Agriculture
- Lecture 60 - Micro Irrigation Engineering: Epilogue

Lecture 1 - Introduction to Process Control

Lecture 2 - Laplace Transform Review - I

Lecture 3 - Laplace Transform Review - II

Lecture 4 - Zero and First Order Instruments

Lecture 5 - First Order Instruments

Lecture 6 - Second Order Instruments - I

Lecture 7 - Second Order Instruments - II

Lecture 8 - Food Instrumentation

Lecture 9 - Chromatography

Lecture 10 - Mass Spectrometry - I

Lecture 11 - Mass Spectrometry - II

Lecture 12 - Model Development

Lecture 13 - PID Controller Response Analysis

Lecture 14 - Block Diagram Representation of CSTR Systems

Lecture 15 - Transient Response of Controlled Systems/Solved Examples

Lecture 16 - Solved Examples on Controlled System

Lecture 17 - Complex Variables as Roots of Characteristic Equation

Lecture 18 - Routh Tests for Stability of Systems

Lecture 19 - Poles and Zeros of the OLTF

Lecture 20 - Plotting of Root Loci

Lecture 21 - Root Loci of PI Controlled Systems

Lecture 22 - Root Loci of PID Controlled Systems

Lecture 23 - First and Second Order Systems Responses

Lecture 24 - A Control Problem

Lecture 25 - PI/PD/PID Controllers and Worked Out Example 1

Lecture 26 - Linear Lag/Transportation Systems/First Order/Second Order Systems- Sinusoidal Input

Lecture 27 - PI/PD/PID Controllers

Lecture 28 - Linear Lag/Transportation system/ First order/ Second order system

Lecture 29 - Worked Out Example 2

Lecture 30 - Concepts of Gain Margin and Phase Margins

Lecture 31 - Worked Out Examples

[Lecture 32 - Z-Transforms of Sampled Functions](#)

[Lecture 33 - Functions Reconstruction and Manipulation](#)

[Lecture 34 - Open Loop Z-Transfer Functions](#)

[Lecture 35 - Neuro - Fuzzy Logic Controller](#)

[Lecture 36 - Auto - Pilot Control Algorithm](#)

[Lecture 37 - Fuzzy logic controller algorithm for Soan Papri Manufacture](#)

[Lecture 38 - Appendices - Set Theory](#)

[Lecture 39 - Fuzzy Sets Theory](#)

[Lecture 40 - Worked Out Examples](#)

[Lecture 41 - Temperature Standards, Calibration and sensor](#)

[Lecture 42 - Vacuum Measurement](#)

[Lecture 43 - Viscometer and Cream Separator](#)

[Lecture 44 - Spray Dryer and Plate Freezer](#)

[Lecture 1 - General Overview of ML and DL Applications in Agriculture](#)

[Lecture 2 - General Overview of ML and DL Applications in Agriculture \(Continued...\)](#)

[Lecture 3 - General Overview of ML and DL Applications in Agriculture \(Continued...\)](#)

[Lecture 4 - General Overview of ML and DL Applications in Agriculture \(Continued...\)](#)

[Lecture 5 - General Overview of ML and DL Applications in Agriculture \(Continued...\)](#)

[Lecture 6 - Basics of Multivariate Data Analytics](#)

[Lecture 7 - Basics of Multivariate Data Analytics \(Continued...\)](#)

[Lecture 8 - Basics of Multivariate Data Analytics \(Continued...\)](#)

[Lecture 9 - Basics of Multivariate Data Analytics \(Continued...\)](#)

[Lecture 10 - Basics of Multivariate Data Analytics \(Continued...\)](#)

[Lecture 11 - Principal Component Analysis and Regression Applications in Agriculture](#)

[Lecture 12 - Principal Component Analysis and Regression Applications in Agriculture \(Continued...\)](#)

[Lecture 13 - Principal Component Analysis and Regression Applications in Agriculture \(Continued...\)](#)

[Lecture 14 - Principal Component Analysis and Regression Applications in Agriculture \(Continued...\)](#)

[Lecture 15 - Principal Component Analysis and Regression Applications in Agriculture \(Continued...\)](#)

[Lecture 16 - Applications of Classification and Clustering Methods in Agriculture](#)

[Lecture 17 - Applications of Classification and Clustering Methods in Agriculture \(Continued...\)](#)

[Lecture 18 - Applications of Classification and Clustering Methods in Agriculture \(Continued...\)](#)

[Lecture 19 - Applications of Classification and Clustering Methods in Agriculture \(Continued...\)](#)

[Lecture 20 - Applications of Classification and Clustering Methods in Agriculture \(Continued...\)](#)

[Lecture 21 - Diffuse Reflectance Spectroscopy: Basics and Applications for Crop and Soil](#)

[Lecture 22 - Diffuse Reflectance Spectroscopy: Basics and Applications for Crop and Soil \(Continued...\)](#)

[Lecture 23 - Diffuse Reflectance Spectroscopy: Basics and Applications for Crop and Soil \(Continued...\)](#)

[Lecture 24 - Diffuse Reflectance Spectroscopy: Basics and Applications for Crop and Soil \(Continued...\)](#)

[Lecture 25 - Diffuse Reflectance Spectroscopy: Basics and Applications for Crop and Soil \(Continued...\)](#)

[Lecture 26 - Use of ML for Portable Proximal Soil and Crop Sensors](#)

[Lecture 27 - Use of ML for Portable Proximal Soil and Crop Sensors \(Continued...\)](#)

[Lecture 28 - Use of ML for Portable Proximal Soil and Crop Sensors \(Continued...\)](#)

[Lecture 29 - Use of ML for Portable Proximal Soil and Crop Sensors \(Continued...\)](#)

[Lecture 30 - Use of ML for Portable Proximal Soil and Crop Sensors \(Continued...\)](#)

[Lecture 31 - ML and DL for Soil and Crop Image Processing](#)

- [Lecture 32 - ML and DL for Soil and Crop Image Processing \(Continued...\)](#)
- [Lecture 33 - ML and DL for Soil and Crop Image Processing \(Continued...\)](#)
- [Lecture 34 - ML and DL for Soil and Crop Image Processing \(Continued...\)](#)
- [Lecture 35 - ML and DL for Soil and Crop Image Processing \(Continued...\)](#)
- [Lecture 36 - UAV and ML Applications in Agriculture](#)
- [Lecture 37 - UAV and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 38 - UAV and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 39 - UAV and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 40 - UAV and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 41 - Hyperspectral Remote Sensing and ML Applications in Agriculture](#)
- [Lecture 42 - Hyperspectral Remote Sensing and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 43 - Hyperspectral Remote Sensing and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 44 - Hyperspectral Remote Sensing and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 45 - Hyperspectral Remote Sensing and ML Applications in Agriculture \(Continued...\)](#)
- [Lecture 46 - Digital Soil Mapping - General Overview](#)
- [Lecture 47 - Digital Soil Mapping - General Overview \(Continued...\)](#)
- [Lecture 48 - Digital Soil Mapping - General Overview \(Continued...\)](#)
- [Lecture 49 - Digital Soil Mapping - General Overview \(Continued...\)](#)
- [Lecture 50 - Digital Soil Mapping - General Overview \(Continued...\)](#)
- [Lecture 51 - Digital Soil Mapping With Continuous Variables](#)
- [Lecture 52 - Digital Soil Mapping With Continuous Variables \(Continued...\)](#)
- [Lecture 53 - Digital Soil Mapping With Continuous Variables \(Continued...\)](#)
- [Lecture 54 - Digital Soil Mapping With Continuous Variables \(Continued...\)](#)
- [Lecture 55 - Digital Soil Mapping With Continuous Variables \(Continued...\)](#)
- [Lecture 56 - Digital Soil Mapping With Categorical Variables](#)
- [Lecture 57 - Digital Soil Mapping With Categorical Variables \(Continued...\)](#)
- [Lecture 58 - Digital Soil Mapping With Categorical Variables \(Continued...\)](#)
- [Lecture 59 - Digital Soil Mapping With Categorical Variables \(Continued...\)](#)
- [Lecture 60 - Digital Soil Mapping With Categorical Variables \(Continued...\)](#)

Lecture 1 - Introduction

Lecture 2 - Aquaculture systems and input factors

Lecture 3 - Important species in aquaculture

Lecture 4 - Propagation; Water budget

Lecture 5 - Conservation strategies

Lecture 6 - Transformation of open culture to closed high-tech technologies

Lecture 7 - Intensive farming in high-tech tanks

Lecture 8 - Re-circulatory system

Lecture 9 - Flow-through system

Lecture 10 - Raceway culture

Lecture 11 - Polyculture, IMTA

Lecture 12 - Coastal aquaculture

Lecture 13 - Mariculture

Lecture 14 - Algal Culture

Lecture 15 - Seaweed Culture; Pearl Culture

Lecture 16 - Introduction to freshwater prawn culture

Lecture 17 - Introduction to shrimp culture

Lecture 18 - Introduction to shrimp culture (Continued...)

Lecture 19 - Introduction to crab culture

Lecture 20 - Introduction to crab culture (Continued...)

Lecture 21 - Larval rearing and hatcheries

Lecture 22 - Design of hatchery for Carps

Lecture 23 - Design of prawn hatchery

Lecture 24 - Design of Shrimp hatchery

Lecture 25 - Maintenance of optimum conditions

Lecture 26 - Balanced diet

Lecture 27 - Balanced diet and Feed formulation

Lecture 28 - Feed formulation: Linear Programming

Lecture 29 - Feed additives

Lecture 30 - Feed additives, Food conversion ratio (FCR)

Lecture 31 - Important water quality parameters and criteria

- [Lecture 32 - Aeration](#)
- [Lecture 33 - Aerator performance](#)
- [Lecture 34 - Important calculations on aerators](#)
- [Lecture 35 - Chemical treatment](#)
- [Lecture 36 - Overview of Wastewater Treatment Methods](#)
- [Lecture 37 - Overview of Wastewater Treatment Methods \(Continued...\)](#)
- [Lecture 38 - Bio-electrochemical system based wastewater treatment](#)
- [Lecture 39 - Bio-electrochemical system-based wastewater treatment \(Continued...\)](#)
- [Lecture 40 - Bio-electrochemical system-based wastewater treatment \(Continued...\)](#)
- [Lecture 41 - Organic Aquaculture Standards](#)
- [Lecture 42 - Wastewater-fed aquaculture](#)
- [Lecture 43 - Integrated farming](#)
- [Lecture 44 - Integrated farming \(Continued...\)](#)
- [Lecture 45 - Bio-floc Technology](#)
- [Lecture 46 - Green aquaculture](#)
- [Lecture 47 - Smart Aquaponic system](#)
- [Lecture 48 - Bioremediation](#)
- [Lecture 49 - Biofiltration](#)
- [Lecture 50 - Eco-labelling](#)
- [Lecture 51 - Fish and fish products preservation](#)
- [Lecture 52 - Fish and fish products preservation \(Continued...\)](#)
- [Lecture 53 - Fish by-products](#)
- [Lecture 54 - Fish by-products \(Continued...\)](#)
- [Lecture 55 - Zero waste recycling](#)
- [Lecture 56 - Impact of Climate Change on aquaculture](#)
- [Lecture 57 - Impact of Climate Change on aquaculture \(Continued...\)](#)
- [Lecture 58 - Mitigation and adaptive strategies](#)
- [Lecture 59 - Mitigation and adaptive strategies \(Continued...\)](#)
- [Lecture 60 - Mitigation and adaptive strategies \(Continued...\)](#)
- [Lecture 61 - Opportunities in Aquaculture sectors for the entrepreneurs from the coastal regions](#)

**NPTEL : NOC:Post Harvest Operations and Processing of Fruits, Vegetables, Spices and Plantation Crop Products
(Agriculture)**

Co-ordinators : Prof. Hari Niwas Mishra

Lecture 1 - Course Introduction

Lecture 2 - Fruits and Vegetables

Lecture 3 - Fruits and Vegetable (Part II : Respiration, Ripening and Senescence)

Lecture 4 - Indian Spices

Lecture 5 - Plantation Crops

Lecture 6 - Post Harvest Losses: Causes and Preventive Measures

Lecture 7 - Post Harvest Operations

Lecture 8 - Handling and Transportation

Lecture 9 - Supply Chain Management and Storage

Lecture 10 - Quality Assurance and Control (QA/QC)

Lecture 11 - Basics of Processing and Preservation

Lecture 12 - Processing by Removal of Water

Lecture 13 - Processing by Addition of Heat

Lecture 14 - Processing by Removal of Heat

Lecture 15 - Irradiation of Fruits, Vegetables and Spices

Lecture 16 - Cleaning and Washing

Lecture 17 - Sorting and Grading

Lecture 18 - Peeling, Coring, Slicing

Lecture 19 - Containers and Packaging Materials for Fresh Produce

Lecture 20 - Packaging Methods and Equipment

Lecture 21 - Minimal Processing

Lecture 22 - Hurdle Technology Concepts

Lecture 23 - Intermediate and High Moisture Fruit Products

Lecture 24 - Cut Fruits and Vegetables - Part I

Lecture 25 - Cut Fruits and Vegetables - Part II

Lecture 26 - Juice Extraction and Clarification

Lecture 27 - Concentrates and Pastes

Lecture 28 - Aseptic processing and packaging

Lecture 29 - RTS and RTD beverages

Lecture 30 - Quality and Safety Aspects

[Lecture 31 - Techniques and Equipment](#)

[Lecture 32 - Powders and Premixes - Part I](#)

[Lecture 33 - Powders and Premixes - Part II](#)

[Lecture 34 - RTE Fruit Products](#)

[Lecture 35 - Dehydrated and Instant Cooking Vegetables](#)

[Lecture 36 - Tea and Tea Products](#)

[Lecture 37 - Coffee Processing](#)

[Lecture 38 - Cocoa and Chocolate Technology](#)

[Lecture 39 - Processing of Vanilla Beans and Production of Vanilla Flavour](#)

[Lecture 40 - Coconut and Cashew Processing](#)

[Lecture 41 - Processing of spices](#)

[Lecture 42 - Spice powders](#)

[Lecture 43 - Spice Pastes, Sauces and Gravies](#)

[Lecture 44 - Essential Oil and Oleoresin](#)

[Lecture 45 - Condiments Technology](#)

[Lecture 46 - Fermentation Technology](#)

[Lecture 47 - Fruit Wines and Ciders](#)

[Lecture 48 - Probiotic / Fermented Vegetable Products](#)

[Lecture 49 - Carbonated Fruit Juices and Premixes](#)

[Lecture 50 - Quality Characteristics](#)

[Lecture 51 - Packaging Technology](#)

[Lecture 52 - Smart Packaging](#)

[Lecture 53 - Edible Coatings and Films](#)

[Lecture 54 - Modified Atmosphere Packaging](#)

[Lecture 55 - Controlled Atmosphere Storage](#)

[Lecture 56 - Green Technologies and Near Zero Waste Processing](#)

[Lecture 57 - Extraction of Bioactive and Pigments from Processing Waste](#)

[Lecture 58 - Valorisation of Waste into Value-added Products](#)

[Lecture 59 - FSSAI Regulations and FSMS Guidelines for Fruits, Vegetables, Spices and Plantation Crops](#)

[Lecture 60 - Course Summary and Summing-up](#)

- Lecture 1 - Importance of Soil Nutrient Management and Basic Soil-Plant Relationship
- Lecture 2 - Importance of Soil Nutrient Management and Basic Soil-Plant Relationship (Continued...)
- Lecture 3 - Importance of Soil Nutrient Management and Basic Soil-Plant Relationship (Continued...)
- Lecture 4 - Importance of Soil Nutrient Management and Basic Soil-Plant Relationship (Continued...)
- Lecture 5 - Importance of Soil Nutrient Management and Basic Soil-Plant Relationship (Continued...)
- Lecture 6 - Soil Nitrogen for Plant Nutrition
- Lecture 7 - Soil Nitrogen for Plant Nutrition (Continued...)
- Lecture 8 - Soil Nitrogen for Plant Nutrition (Continued...)
- Lecture 9 - Soil Nitrogen for Plant Nutrition (Continued...)
- Lecture 10 - Soil Nitrogen For Plant Nutrition (Continued...)
- Lecture 11 - Soil P and K for Plant Nutrition
- Lecture 12 - Soil P and K for Plant Nutrition (Continued...)
- Lecture 13 - Soil P and K for Plant Nutrition (Continued...)
- Lecture 14 - Soil P and K for Plant Nutrition (Continued...)
- Lecture 15 - Soil P and K for Plant Nutrition (Continued...)
- Lecture 16 - Soil Secondary Nutrients and their role in Plant Nutrition
- Lecture 17 - Soil Secondary Nutrients and their role in Plant Nutrition (Continued...)
- Lecture 18 - Soil Secondary Nutrients and their role in Plant Nutrition (Continued...)
- Lecture 19 - Soil Secondary Nutrients and their role in Plant Nutrition (Continued...)
- Lecture 20 - Soil Secondary Nutrients and their role in Plant Nutrition (Continued...)
- Lecture 21 - Soil Micronutrients and their role in Plant Nutrition
- Lecture 22 - Soil Micronutrients and their role in Plant Nutrition (Continued...)
- Lecture 23 - Soil Micronutrients and their role in Plant Nutrition (Continued...)
- Lecture 24 - Soil Micronutrients and their role in Plant Nutrition (Continued...)
- Lecture 25 - Soil Micronutrients and their role in Plant Nutrition (Continued...)
- Lecture 26 - Soil Testing and Soil Fertility Evaluation Methods
- Lecture 27 - Soil Testing and Soil Fertility Evaluation Methods (Continued...)
- Lecture 28 - Soil Testing and Soil Fertility Evaluation Methods (Continued...)
- Lecture 29 - Soil Testing and Soil Fertility Evaluation Methods (Continued...)
- Lecture 30 - Soil Testing and Soil Fertility Evaluation Methods (Continued...)
- Lecture 31 - Soil Health and Quality, Problem Soil, Land Capability Classification

- Lecture 32 - Soil Health and Quality, Problem Soil, Land Capability Classification (Continued...)
- Lecture 33 - Soil Health and Quality, Problem Soil, Land Capability Classification (Continued...)
- Lecture 34 - Soil Health and Quality, Problem Soil, Land Capability Classification (Continued...)
- Lecture 35 - Soil Health and Quality, Problem Soil, Land Capability Classification (Continued...)
- Lecture 36 - Organic Manures, Manufacturing, Properties, and fate of N, P, K and Micronutrient
- Lecture 37 - Organic Manures, Manufacturing, Properties, and fate of N, P, K and Micronutrient (Continued...)
- Lecture 38 - Organic Manures, Manufacturing, Properties, and fate of N, P, K and Micronutrient (Continued...)
- Lecture 39 - Organic Manures, Manufacturing, Properties, and fate of N, P, K and Micronutrient (Continued...)
- Lecture 40 - Organic Manures, Manufacturing, Properties, and fate of N, P, K and Micronutrient (Continued...)
- Lecture 41 - Fertilizer Quality Control, Fertilizer Adulteration and Fertilizer Testing
- Lecture 42 - Fertilizer Quality Control, Fertilizer Adulteration and Fertilizer Testing (Continued...)
- Lecture 43 - Fertilizer Quality Control, Fertilizer Adulteration and Fertilizer Testing (Continued...)
- Lecture 44 - Fertilizer Quality Control, Fertilizer Adulteration and Fertilizer Testing (Continued...)
- Lecture 45 - Fertilizer Quality Control, Fertilizer Adulteration and Fertilizer Testing (Continued...)
- Lecture 46 - Biofertilizers and Management of fertilizers and manures in Soil
- Lecture 47 - Biofertilizers and Management of fertilizers and manures in Soil (Continued...)
- Lecture 48 - Biofertilizers and Management of fertilizers and manures in Soil (Continued...)
- Lecture 49 - Biofertilizers and Management of fertilizers and manures in Soil (Continued...)
- Lecture 50 - Biofertilizers and Management of fertilizers and manures in Soil (Continued...)
- Lecture 51 - Fertilizer Recommendation Approaches and Integrated Plant Nutrient Management
- Lecture 52 - Fertilizer Recommendation Approaches and Integrated Plant Nutrient Management (Continued...)
- Lecture 53 - Fertilizer Recommendation Approaches and Integrated Plant Nutrient Management (Continued...)
- Lecture 54 - Fertilizer Recommendation Approaches and Integrated Plant Nutrient Management (Continued...)
- Lecture 55 - Fertilizer Recommendation Approaches and Integrated Plant Nutrient Management (Continued...)
- Lecture 56 - Agricultural Productivity and Environmental Quality
- Lecture 57 - Agricultural Productivity and Environmental Quality (Continued...)
- Lecture 58 - Agricultural Productivity and Environmental Quality (Continued...)
- Lecture 59 - Agricultural Productivity and Environmental Quality (Continued...)
- Lecture 60 - Agricultural Productivity and Environmental Quality (Continued...)

Lecture 1 - Introduction to Cooling

Lecture 2 - Why Cooling is required ?

Lecture 3 - Definitions

Lecture 4 - How to produce Safe Foods

Lecture 5 - How to produce Safe Foods ? (Continued...)

Lecture 6 - Cooling Load Calculation

Lecture 7 - Cooling Load Calculation (Continued...)

Lecture 8 - Cooling Load Calculation (Continued...)

Lecture 9 - Cooling Load Calculation (Continued...)

Lecture 10 - Basics of Thermodynamics

Lecture 11 - Basics of Thermodynamics (Continued...)

Lecture 12 - Basics of Thermodynamics (Continued...)

Lecture 13 - Basics of Thermodynamics (Continued...)

Lecture 14 - Basics of Thermodynamics (Continued...)

Lecture 15 - Basics of Thermodynamics (Continued...)

Lecture 16 - Basics of Thermodynamics (Continued...)

Lecture 17 - Basics of Thermodynamics (Continued...)

Lecture 18 - Psychrometrics

Lecture 19 - Psychrometrics (Continued...)

Lecture 20 - Psychrometrics (Continued...)

Lecture 21 - Psychrometrics (Continued...)

Lecture 22 - Psychrometrics (Continued...)

Lecture 23 - Psychrometrics (Continued...)

Lecture 24 - Psychrometrics (Continued...)

Lecture 25 - The Carnot Cycle

Lecture 26 - Carnot Cycle (Continued...)

Lecture 27 - Carnot Cycle (Continued...)

Lecture 28 - Carnot Cycle (Continued...)

Lecture 29 - Carnot Refrigeration Cycles

Lecture 30 - Carnot Refrigeration Cycles (Continued...)

Lecture 31 - Practical Difficulties with Carnot Cycle

- Lecture 32 - Dry Compression
- Lecture 33 - Problem Solving with Carnot System
- Lecture 34 - Pure Substance as Refrigerant
- Lecture 35 - Pure Substance as Refrigerant (Continued...)
- Lecture 36 - Gas as Refrigerant
- Lecture 37 - Gas as Refrigerant (Continued...)
- Lecture 38 - Gas as Refrigerant (Continued...)
- Lecture 39 - Basics of Refrigeration and Air Conditioning
- Lecture 40 - Basics of Refrigeration and Air Conditioning (Continued...)
- Lecture 41 - Selection of Condenser
- Lecture 42 - Compressor
- Lecture 43 - Reciprocating Compressor
- Lecture 44 - Reciprocating Compressor (Continued...)
- Lecture 45 - Reciprocating Compressor (Continued...)
- Lecture 46 - Centrifugal Compressor
- Lecture 47 - Rotary, Positive Displacement Type Compressors
- Lecture 48 - Condenser
- Lecture 49 - Condenser (Continued...)
- Lecture 50 - Evaporator and Expansion Device
- Lecture 51 - Freezing
- Lecture 52 - Crystallization in Freezing
- Lecture 53 - Freezing Curve
- Lecture 54 - Freezers
- Lecture 55 - Control Atmosphere Storage
- Lecture 56 - Use of Phase Change Materials (PCM)
- Lecture 57 - Cold Chain and Cold Storage
- Lecture 58 - Cold Storage
- Lecture 59 - Ice Cream
- Lecture 60 - Ice Cream (Continued...)

Lecture 1 - Concept of Traction and Traction Devices

Lecture 2 - Classification of wheels, Forces and moments acting on wheel

Lecture 3 - Tyre constructions and its specification

Lecture 4 - Tractive performance parameters

Lecture 5 - Tutorial 1

Lecture 6 - Mechanics of wheel and its tractive performance

Lecture 7 - Measurement of soil strength, cohesion and angle of internal friction

Lecture 8 - Measurement and characterization of terrain response

Lecture 9 - Characterization of shear stress and shear strength in different soil conditions

Lecture 10 - Tutorial 2 - Measurement of shear strength, modulus of sinkage and cone index

Lecture 11 - Rolling resistance of a rigid towed wheel

Lecture 12 - Rolling resistance of a pneumatic wheel

Lecture 13 - Motion resistance of a track

Lecture 14 - Tractive effort and slip of a powered rigid wheel

Lecture 15 - Tutorial 3 - Computation of rolling resistance of rigid wheel and pneumatic wheel

Lecture 16 - Tractive effort and slip of a track

Lecture 17 - Tractive effort and slip of a pneumatic wheel

Lecture 18 - Tractive performance prediction models - Wismer and Luth

Lecture 19 - Tractive performance prediction models - Brixius

Lecture 20 - Tutorial 4 - Tractive Performance Estimation Using Brixius Model

Lecture 21 - Effect of tyre parameters on tractive performance of tyre

Lecture 22 - Selection of tyre

Lecture 23 - Comparison of single tyre with dual tyres

Lecture 24 - Performance evaluation of a walking tractor fitted with track

Lecture 25 - Tutorial 5

Lecture 26 - Measurement of Cone Index

Lecture 27 - Pressure Sinkage Relationship in a Sandy Clay Loam Soil

Lecture 28 - Measurement of Theoretical Velocity, Actual Velocity and Slip for a Pneumatic Wheel

Lecture 29 - Measurement of Contact Area of a Pneumatic Tyre on a Hard Surface

Lecture 30 - Measurement of Tractive Efficiency

Lecture 31 - Performance comparison of track with wheel

[Lecture 32 - Traction Aids for Tractors](#)

[Lecture 33 - Ballasting of Wheeled Tractors to achieve Maximum Power Output in Frictional-Cohesive soils](#)

[Lecture 34 - Optimum ballasting of a front wheel assisted tractor](#)

[Lecture 35 - Tutorial 7](#)

[Lecture 36 - Cornering Properties of tyres](#)

[Lecture 37 - Lateral force developed by an unpowered tractor wheel](#)

[Lecture 38 - Steering of wheeled vehicles and steady state handling of front wheel steered vehicles](#)

[Lecture 39 - Classification of steady state handling characteristics and handling diagram](#)

[Lecture 40 - Tutorial 8](#)

Lecture 1 - Oil and Fats Processing Industry - Current Status, Issues and Challenges

Lecture 2 - Plant Sources of Edible Oils and Fats

Lecture 3 - Composition, Nutrition and Health Values of Plant Oils

Lecture 4 - Animal Sources of Edible Oils and Fats

Lecture 5 - Composition, Nutrition and Health Values of Animal Fats and Oils

Lecture 6 - Lipids and Their Classification

Lecture 7 - Fatty acids and their types

Lecture 8 - Glycerides - Type, Structure and Function

Lecture 9 - Triglycerides - Function in Nutrition and Food Processing

Lecture 10 - Phospholipids and Sterols

Lecture 11 - Engineering Properties of Edible Oils

Lecture 12 - Chemical Properties of Edible Oils

Lecture 13 - Rancidity and Reversion

Lecture 14 - Oxidative Rancidity

Lecture 15 - Antioxidants in Edible Oil

Lecture 16 - Pre-Treatment Techniques

Lecture 17 - Physical Methods for Oil Extraction - Concept and Mechanism

Lecture 18 - Expression - Pressing

Lecture 19 - Screw Expelling

Lecture 20 - Recent Developments in Oil Expression Technology

Lecture 21 - Extraction principles and mechanisms

Lecture 22 - Factors affecting extraction process

Lecture 23 - Solvent Extraction Technology and Equipment

Lecture 24 - Miscella Distillation and Meal Desolventization

Lecture 25 - Novel techniques of oil extraction

Lecture 26 - Crude Oil Characteristics and Processing

Lecture 27 - Clarification and Degumming

Lecture 28 - Chemical Refining and Neutralization

Lecture 29 - Bleaching

Lecture 30 - Physical Refining and Deodorization

Lecture 31 - Hydrogenation

- Lecture 32 - Interesterification and Winterization
- Lecture 33 - Fractionation and Plasticization
- Lecture 34 - Margarine and Shortenings
- Lecture 35 - Trans-free modifications
- Lecture 36 - Animal fats
- Lecture 37 - Fish oil and Algal oil
- Lecture 38 - Dairy Cream
- Lecture 39 - Butter
- Lecture 40 - Ghee (Butter Oil)
- Lecture 41 - Characteristics and specifications
- Lecture 42 - Frying Technology
- Lecture 43 - Seed Oils
- Lecture 44 - Fruit and Nut Oils
- Lecture 45 - Rice Bran Oil
- Lecture 46 - Tree Nut Oils
- Lecture 47 - Tropical Exotic Oils and Butter
- Lecture 48 - Essential Oil
- Lecture 49 - Cocoa/Shea Butter and Structured Triacylglycerols
- Lecture 50 - Oil powder and liposomes
- Lecture 51 - Major by-Products, Their Composition and Uses
- Lecture 52 - By-Products Utilization - I
- Lecture 53 - By-Products Utilization - II
- Lecture 54 - Lecithin Production
- Lecture 55 - Biodiesel Production from Waste Cooking Oil
- Lecture 56 - Edible Oil Blending and Fortification
- Lecture 57 - Packaging materials and methods
- Lecture 58 - Handling and Storage
- Lecture 59 - Quality Analysis and Control
- Lecture 60 - Regulatory Requirements and Course summary

Lecture 1 - Introduction

Lecture 2 - Precipitation

Lecture 3 - Rainfall data analysis - I

Lecture 4 - Rainfall data analysis - II

Lecture 5 - Rainfall Frequency Analysis

Lecture 6 - Hydrological Abstractions

Lecture 7 - Evaporation

Lecture 8 - Evapotranspiration

Lecture 9 - Infiltration - I

Lecture 10 - Infiltration - II

Lecture 11 - Streamflow Processes

Lecture 12 - Streamflow Measurement - 1

Lecture 13 - Streamflow Measurement - 2

Lecture 14 - Streamflow Measurement - 3

Lecture 15 - Flow Duration Curve and Flow Mass Curve

Lecture 16 - Runoff

Lecture 17 - Estimation of Runoff

Lecture 18 - Estimation of Runoff - Rational Method

Lecture 19 - Estimation of Runoff - SCS-Curve Number Method

Lecture 20 - Numerical on Estimation of Runoff

Lecture 21 - Hydrograph - I

Lecture 22 - Hydrograph - II

Lecture 23 - Derivation of Unit Hydrograph - I

Lecture 24 - Derivation of Unit Hydrograph - II

Lecture 25 - Numerical on Hydrograph

Lecture 26 - Synthetic Unit Hydrograph - I

Lecture 27 - Synthetic Unit Hydrograph - II

Lecture 28 - IUH and Distribution Graph

Lecture 29 - Numerical on Synthetic UH, IUH and Distribution Graph - I

Lecture 30 - Numerical on Synthetic UH, IUH and Distribution Graph - II

Lecture 31 - Drainage Basin Characteristics

- Lecture 32 - Drainage Basin Geomorphology
- Lecture 33 - Morphometric analysis using RS and GIS
- Lecture 34 - Watershed Management - I
- Lecture 35 - Watershed Management - II
- Lecture 36 - Hydrological Modelling: Introduction and Protocol
- Lecture 37 - Hydrological Models: Classification
- Lecture 38 - Hydrological Model: Calibration, Validation and Evaluation
- Lecture 39 - Sensitivity Analysis and Machine Learning in Hydrology
- Lecture 40 - Machine Learning in Hydrology - II
- Lecture 41 - Floods
- Lecture 42 - Design Flood
- Lecture 43 - Flood Frequency Analysis
- Lecture 44 - Flood Control and Management
- Lecture 45 - Floodplain Zoning and Numerical on Floods
- Lecture 46 - Flood Routing: Introduction
- Lecture 47 - Hydrologic Reservoir Routing
- Lecture 48 - Hydrologic Channel Routing
- Lecture 49 - Hydraulic Channel Routing - Hydraulic routing
- Lecture 50 - Numerical on Flood Routing
- Lecture 51 - Drought: Introduction
- Lecture 52 - Classification of Drought
- Lecture 53 - Agricultural Drought - I
- Lecture 54 - Agricultural Drought - II
- Lecture 55 - Drought Management
- Lecture 56 - Hydrological Model Demonstration
- Lecture 57 - Miscellaneous Topics
- Lecture 58 - Objectives on Watershed Hydrology
- Lecture 59 - Objectives on Watershed Hydrology
- Lecture 60 - Solution of Numerical Problems in Assignments

Lecture 1 - Introduction to Water Quality

Lecture 2 - Classification of Major Water Pollutants

Lecture 3 - Emerging Concerns in Wastewater Treatment in Global Scenario

Lecture 4 - Environmental Legislation and Regulatory Standards

Lecture 5 - Commonly used terminologies and definitions

Lecture 6 - Collection and Preservation of Samples and the Measurement of pH, Acidity, Alkalinity

Lecture 7 - Measurement of DO and Solids in wastewater (TSS/VSS/TDS), Turbidity

Lecture 8 - Determination of BOD, COD and TOC

Lecture 9 - Modelling of BOD and its relation with COD and TOC

Lecture 10 - Determination of Nitrogen, Phosphorus and Microbial Counts

Lecture 11 - Wastewater Treatment Classification and Plant Analysis

Lecture 12 - Order of Reaction and Types of Reactors Used in Wastewater Treatment

Lecture 13 - Concept of Mass Balance

Lecture 14 - Overview of Sewage Treatment Plant

Lecture 15 - Self-Purification and its Factors

Lecture 16 - Screens

Lecture 17 - Grit Chamber and its Classification - I

Lecture 18 - Grit Chamber and its Classification - II and Skimming Tank

Lecture 19 - Theory of Sedimentation and Introduction to Primary Sedimentation Tank and its Types

Lecture 20 - PST: Performance factors affecting efficiency and design recommendations

Lecture 21 - Equalization

Lecture 22 - Neutralization, Dissolved Air Floatation

Lecture 23 - Coagulation

Lecture 24 - Flocculation

Lecture 25 - Pre-aeration and other advanced primary treatment units

Lecture 26 - Bacterial Metabolism and Their Use in Wastewater

Lecture 27 - Factors Affecting Bacterial Growth and Wastewater Treatment Using Bacteria

Lecture 28 - Role of enzymes and algae in biological wastewater treatment

Lecture 29 - Important nomenclature on aerobic treatment units

Lecture 30 - Types of aeration used in aerobic treatment units and Analysis of Gas Transfer

Lecture 31 - Activated Sludge Process: Description and Types

Lecture 32 - Bacterial growth kinetics in ASP: Biomass mass balance and substrate mass balance

Lecture 33 - Equalization Estimation of values of other operating parameters in ASP

Lecture 34 - Numericals on ASP

Lecture 35 - Sequencing Batch Reactor

Lecture 36 - Trickling Filter- Physical Overview, Types and Process Description

Lecture 37 - Aerated Lagoon, Fluidised Bed Bioreactor, Biological Active Filter

Lecture 38 - Aerated Lagoons, Fluidized Bed Bioreactors, Biological Active Filters

Lecture 39 - Rotating Biological Contactor and Hanging Sponge Reactor

Lecture 40 - Membrane Bioreactor (MBR)

Lecture 41 - Principles of Anaerobic process for wastewater treatment and Methane Production

Lecture 42 - Types of Anaerobic Treatment Systems

Lecture 43 - Factors Affecting Anaerobic Treatment Systems

Lecture 44 - Designs of Anaerobic Reactors: UASB reactor - I

Lecture 45 - Designs of Anaerobic Reactors: UASB reactor - II

Lecture 46 - Pond System, Components, Factors and Terminologies

Lecture 47 - Constructed Wetlands

Lecture 48 - Bio-electrochemical Systems: Types and Definition

Lecture 49 - Hybrid Bio-electrochemical Systems

Lecture 50 - Modular Designs for Smart Cities

Lecture 51 - Nitrification and Denitrification: Major factors

Lecture 52 - Systems used for Nitrification and Denitrification, Anammox Process

Lecture 53 - Biological Phosphorus Removal and Factors affecting it

Lecture 54 - Advanced Oxidation Processes

Lecture 55 - Other Tertiary treatment systems

Lecture 56 - Disinfection of Wastewater

Lecture 57 - Sludge Management

Lecture 58 - Life-Cycle Costing

Lecture 59 - Case studies

Lecture 60 - Future of Sustainable Wastewater Treatment Technologies

Lecture 1 - Introduction to Food Packaging

Lecture 2 - Introduction to Food Packaging (Continued...)

Lecture 3 - Introduction to Food Packaging (Continued...)

Lecture 4 - Introduction to Food Packaging (Continued...)

Lecture 5 - Introduction to Food Packaging (Continued...)

Lecture 6 - Introduction to Food Packaging (Continued...)

Lecture 7 - Type of Packaging Materials (Paper)

Lecture 8 - Type of Packaging Materials (Paper) (Continued...)

Lecture 9 - Type of Packaging Materials (Paper) (Continued...)

Lecture 10 - Testing of Paper and Paperboard

Lecture 11 - Types of Packaging Materials (Glass)

Lecture 12 - Types of Packaging Materials (Glass) (Continued...)

Lecture 13 - Types of Packaging Materials (Glass) (Continued...)

Lecture 14 - Types of Packaging Materials (Glass) (Continued...)

Lecture 15 - Types of Packaging Materials (Plastic 1)

Lecture 16 - Types of Packaging Materials (Plastic 1) (Continued...)

Lecture 17 - Types of Packaging Materials (Plastic 1) (Continued...)

Lecture 18 - Types of Packaging Materials (Plastic 1) (Continued...)

Lecture 19 - Types of Packaging Materials (Plastic 2)

Lecture 20 - Types of Packaging Materials (Plastic 2) (Continued...)

Lecture 21 - Properties of Plastic Polymers

Lecture 22 - Properties of Plastic Polymers (Continued...)

Lecture 23 - Coating, Printing and Labeling of Plastic Films

Lecture 24 - Retort Pouches

Lecture 25 - Metals as a Packaging Material

Lecture 26 - Metals as a Packaging Material (Continued...)

Lecture 27 - Metals as a Packaging Material (Can Making Process)

Lecture 28 - Metals as a Packaging Material (can end making process)

Lecture 29 - Metals as a Packaging Material (Aluminium Container)

Lecture 30 - Metals as a Packaging Material (Corrosion of Metal Packaging)

Lecture 31 - Testing and Regulatory Aspects of Food Packaging

- Lecture 32 - Testing and Regulatory Aspects of Food Packaging (Continued...)
- Lecture 33 - Testing and Regulatory Aspects of Food Packaging (Continued...)
- Lecture 34 - Special Packaging Methods (form-fill-seal machine)
- Lecture 35 - Special Packaging Methods (controlled atmospheric packaging)
- Lecture 36 - Special Packaging Methods (modified atmospheric packaging)
- Lecture 37 - Special Packaging Methods (aseptic packaging)
- Lecture 38 - Special Packaging Methods (active and intelligent packaging)
- Lecture 39 - Packaging of Food Products (meat and poultry products)
- Lecture 40 - Packaging of Food Products (meat and poultry products) (Continued...)
- Lecture 41 - Packaging of Food Products (meat and poultry products) (Continued...)
- Lecture 42 - Packaging of Food Products (dairy and dairy based products)
- Lecture 43 - Packaging of Food Products (dairy and dairy based products) (Continued...)
- Lecture 44 - Packaging of Food Products (dairy and dairy based products) (Continued...)
- Lecture 45 - Packaging of Food Products (fruits and vegetables)
- Lecture 46 - Packaging of Food Products (fruits and vegetables) (Continued...)
- Lecture 47 - Packaging of Food Products (cereals and flours)
- Lecture 48 - Packaging of Food Products (bakery and rte products)
- Lecture 49 - Packaging of Food Products (confectionery products)
- Lecture 50 - Packaging of Food Products (beverages)
- Lecture 51 - Overview to Modern Food Packaging
- Lecture 52 - Challenges and Variations in Packaging Industries
- Lecture 53 - Recent Trends in Packaging Materials - Biodegradable
- Lecture 54 - Recent Trends in Packaging Materials - Edible
- Lecture 55 - Recycling and Disposal of Plastic Waste and Environmental Concern
- Lecture 56 - Packaging Processes and Machinery
- Lecture 57 - Packaging Processes and Machinery (Continued...)
- Lecture 58 - Packaging Processes and Machinery (Continued...)
- Lecture 59 - Packaging Laws and Regulation
- Lecture 60 - FSSAI Regulations on Packaging and Labelling Requirements

Lecture 1 - Mendelian Genetics

Lecture 2 - Mendelian Genetics

Lecture 3 - Mendelian Genetics

Lecture 4 - Concept of Gene and Experiments on Plant Hybridization

Lecture 5 - Concept of Gene and Experiments on Plant Hybridization

Lecture 6 - Pureline Selection

Lecture 7 - Pedigree Method

Lecture 8 - Backcross Breeding

Lecture 9 - Back Cross Method (Recessive Gene Transfer)

Lecture 10 - Merits and Demerits of Backcross Breeding and Cytoplasm Transfer Through BB

Lecture 11 - Mass Selection

Lecture 12 - Modifications of Mass Selection

Lecture 13 - Recurrent Selection

Lecture 14 - Reciprocal Recurrent Selection

Lecture 15 - Heterosis and Inbreeding Depression

Lecture 16 - Degree of Inbreeding and Genetic Basis of Heterosis and Inbreeding Depression

Lecture 17 - Genetic Basis of Heterosis and Inbreeding Depression

Lecture 18 - Population Genetics - Part I

Lecture 19 - Population Genetics - Part II

Lecture 20 - Population Genetics - Part III

Lecture 21 - Polyploidy - Introduction

Lecture 22 - Autopolyploidy

Lecture 23 - Features and Limitations of Autopolyploids

Lecture 24 - Allopolyploidy

Lecture 25 - Introduction to Reverse Breeding

Lecture 26 - Applications of Reverse Breeding

Lecture 27 - Introduction to Markers

Lecture 28 - RFLP

Lecture 29 - RAPD

Lecture 30 - AFLP

Lecture 31 - ISSR, SSR, CAPS

- Lecture 32 - Backcross breeding through molecular marker - Part I
- Lecture 33 - Backcross breeding through molecular marker - Part II
- Lecture 34 - Enzymatic tools used in Molecular Biology
- Lecture 35 - Vectors and Plasmids used in Molecular Biology
- Lecture 36 - Types of Vectors used in Plant Transformation and Selectable Marker Gene
- Lecture 37 - Scorable Marker Gene and Plant Tissue Culture
- Lecture 38 - Gene Cloning
- Lecture 39 - Promoters and Preparation of Over expression Construct
- Lecture 40 - Preparation of Gene Silencing Construct
- Lecture 41 - Unidirectional and Bidirectional Promoter, Numerical Question on Promoter Analysis
- Lecture 42 - Application of Plant Tissue Culture - Part I
- Lecture 43 - Application of Plant Tissue Culture - Part II
- Lecture 44 - Haploids and Artificial Seeds
- Lecture 45 - Gene Transfer Methods
- Lecture 46 - Agrobacterium Mediated Transformation in Tobacco and Rice
- Lecture 47 - PCR Screening
- Lecture 48 - Southern and Northern Blot
- Lecture 49 - Western Blot
- Lecture 50 - Microarray and Other Screening Methods
- Lecture 51 - Molecular Analysis of Transgenic Plants - I
- Lecture 52 - Molecular Analysis of Transgenic Plants - II
- Lecture 53 - Double Integration - Part I
- Lecture 54 - Double Integration - Part II
- Lecture 55 - Golden Rice, Bt Cotton, FLAVR SAVR
- Lecture 56 - Characterisation of OsGLP1 Gene from Rice - Part I
- Lecture 57 - Characterization of OsGLP1 Gene from Rice - Part II
- Lecture 58 - Seed Sterilisation and Transformation (Rice and Tobacco)

Lecture 1 - Moldboard plow

Lecture 2 - Forces acting on moldboard plow

Lecture 3 - Draft of moldboard plow

Lecture 4 - Disk plow

Lecture 5 - Disk Harrow

Lecture 6 - Design of Disk Harrow

Lecture 7 - Numericals related to design of tractor drawn disk harrow

Lecture 8 - Design of a Tractor drawn Disk Harrow

Lecture 9 - Design of spike tooth harrow

Lecture 10 - Cultivator

Lecture 11 - Forces and moments acting on the shank and frame of a cultivator

Lecture 12 - Design of tractor drawn cultivator

Lecture 13 - Rotavator

Lecture 14 - Soil resistance and specific work of the rotavator

Lecture 15 - Design of components of a rotavator

Lecture 16 - Design of a tractor drawn rotavator

Lecture 17 - Design of a tractor drawn rotavator (reversed mode)

Lecture 18 - Combination tillage implements

Lecture 19 - Draft and power requirement of combination tillage implements

Lecture 20 - Design of a passive-passive combination tillage implement

Lecture 21 - Design of an active-passive combination tillage implement

Lecture 22 - Computation on design of active-passive tillage implement

Lecture 23 - Performance parameters

Lecture 24 - Performance parameters (Continued...)

Lecture 25 - Tillage performance index

Lecture 26 - Seed drill/planter

Lecture 27 - Components of seed drill and its calibration

Lecture 28 - Performance evaluation of metering unit and design of hopper

Lecture 29 - Designs of fluted roller metering unit and ground wheel

Lecture 30 - Design of single seed metering unit

Lecture 31 - Designs of feed roll shaft, furrow openers and frame

- Lecture 32 - Design calculations for fluted roller metering unit and hopper
- Lecture 33 - Seed tube and furrow closer
- Lecture 34 - Seed flow sensing in a seed drill
- Lecture 35 - Design of drum seeder
- Lecture 36 - Design of multi-crop drum seeder
- Lecture 37 - Deciding the dimensions of a multi-crop dryland drum seeder
- Lecture 38 - Design of a remote controlled drum seeder for wetland
- Lecture 39 - Granular chemical applicators
- Lecture 40 - Liquid chemical applicators
- Lecture 41 - Low pressure liquid chemical applicators
- Lecture 42 - Selection of pumps for liquid chemical applicators
- Lecture 43 - Atomizers
- Lecture 44 - Performance evaluation of sprayers
- Lecture 45 - Droplet size determination
- Lecture 46 - Factors affecting droplet size
- Lecture 47 - Solar Energy operated unmanned sprayer
- Lecture 48 - Working principle of harvesters
- Lecture 49 - Components of harvesting equipment with shear cutting
- Lecture 50 - Geometry of knife section and model for estimating load causing failure of stem
- Lecture 51 - Design of a self-propelled vertical conveyor reaper
- Lecture 52 - Numericals related to cutting by impact and shear
- Lecture 53 - Design of an electric-vertical conveyor reaper (E-VCR)
- Lecture 54 - Power requirement and field performance of an electric vertical conveyor reaper
- Lecture 55 - Onion topper cum digger
- Lecture 56 - Classification, working principle and factors influencing performance of threshing equipment
- Lecture 57 - Power requirement of threshing equipment and design informations
- Lecture 58 - Performance parameter for evaluation of threshers
- Lecture 59 - Design of a spike tooth thresher
- Lecture 60 - Solar energy operated thresher

- Lecture 1 - Course Introduction, Food and Health
- Lecture 2 - Food Production and Processing Challenges
- Lecture 3 - Energy and Nutritional Value of Foods
- Lecture 4 - Balanced Diets
- Lecture 5 - Sustainability in Food Industry
- Lecture 6 - Food Quality Characteristics
- Lecture 7 - Physical Properties of Foods
- Lecture 8 - Textural and Rheological Properties of Foods
- Lecture 9 - Thermal Properties Relationships
- Lecture 10 - Food Structure and Quality Relationships
- Lecture 11 - Major Chemical and Biochemical Reactions in Foods
- Lecture 12 - Oxidative Reactions in Foods
- Lecture 13 - Hydrolytic Reactions in Foods
- Lecture 14 - Factors Affecting Chemical Changes in Foods
- Lecture 15 - Enzymatic processes in food
- Lecture 16 - Significance of Sensory Organs
- Lecture 17 - Anatomy and Functions of Taste and Smell
- Lecture 18 - Sensory Evaluation Methods
- Lecture 19 - Psychophysics of Sensory Perception
- Lecture 20 - Novel Techniques in Sensory Evaluation
- Lecture 21 - Water and Ice
- Lecture 22 - Sugars and Oligosaccharides
- Lecture 23 - Starch, Cellulose and Pectin
- Lecture 24 - Proteins and Polypeptides
- Lecture 25 - Triglycerides and Phospholipids
- Lecture 26 - Vitamins
- Lecture 27 - Minerals
- Lecture 28 - Phytochemicals and Bioactives
- Lecture 29 - Pigments and Colours
- Lecture 30 - Flavouring Compounds
- Lecture 31 - Food Microorganisms

- Lecture 32 - Microbial Growth
- Lecture 33 - Microbial Spoilage of Foods
- Lecture 34 - Prevention of Food Poisoning and Spoilage
- Lecture 35 - Beneficial Microorganisms
- Lecture 36 - Chemical Food Additives
- Lecture 37 - Functional Food Additives
- Lecture 38 - Food Adulteration
- Lecture 39 - Toxins and Allergens
- Lecture 40 - International Regulations on Food Additives
- Lecture 41 - Traditional Food Preservation Technologies
- Lecture 42 - Chemical and Bio Preservation of Foods
- Lecture 43 - Non-Thermal Technologies for Food Preservation
- Lecture 44 - Alternate Thermal Technologies for Food Preservation
- Lecture 45 - Low-Temperature Preservation of Foods
- Lecture 46 - Food Process Principles and Operations
- Lecture 47 - Food Formulation and Design
- Lecture 48 - Mathematical Tools for Food Formulation
- Lecture 49 - Functional and Designer Foods
- Lecture 50 - 3D Printed foods for personalized nutrition
- Lecture 51 - Concepts in Food Manufacturing and Industry 4.0
- Lecture 52 - AI/ML Applications in Food Processing
- Lecture 53 - Advanced Instrumentation and Sensors
- Lecture 54 - Process Control and Automation
- Lecture 55 - Robotics and Future Trends in Food Manufacturing
- Lecture 56 - Concept of Circular Economy
- Lecture 57 - Grain Processing by-products and Waste Utilization
- Lecture 58 - Fruits and Vegetables Processing Industry Waste utilization
- Lecture 59 - Fish, Meat and Poultry Processing Waste Utilization
- Lecture 60 - Dairy Industry Waste Utilization and Course Summing-up

- Lecture 1 - Introduction to Food Process Engineering
- Lecture 2 - Preservation of Food
- Lecture 3 - Food Processing Operations
- Lecture 4 - Preservation By Removal of Water
- Lecture 5 - Introduction to Equation of Continuity
- Lecture 6 - Equation of Continuity (Continued...)
- Lecture 7 - Equation of Continuity in Different Forms
- Lecture 8 - Derivation of Equation of Continuity
- Lecture 9 - Equation of Continuity in Cylindrical and Spherical Coordinates
- Lecture 10 - Equation of Motion in Cartesian Coordinate
- Lecture 11 - Equation of Motion (Continued...)
- Lecture 12 - Navier Stokes Equations
- Lecture 13 - Navier Stokes Equations (Continued...)
- Lecture 14 - Problems and Solutions with the help of Navier Stokes Equation
- Lecture 15 - Problems and Solutions with the help of Navier Stokes Equation
- Lecture 16 - Problems and Solutions with the help of Navier Stokes Equation
- Lecture 17 - Flow Through Pipes
- Lecture 18 - Hagen Poiseuille Equation
- Lecture 19 - Navier Stokes Equation Using Boundary Conditions
- Lecture 20 - Friction Factor
- Lecture 21 - Laminar Flow Through Parallel Plates
- Lecture 22 - Vertical Flow Through Parallel Plates
- Lecture 23 - Flow of Fluid Through inclined Or Horizontal Solid Surface
- Lecture 24 - Reynolds Number of Falling Film
- Lecture 25 - Flow of Fluid Through Annular Space
- Lecture 26 - Measurement of Viscosity with the help of Drop of A Ball
- Lecture 27 - Flow Behaviour Throgh Narrow Slit
- Lecture 28 - Problems and Solutions of Moving Surface Flow
- Lecture 29 - Problems and Solutions of Moving Surface Flow (Continued...)
- Lecture 30 - Problems and Solutions On Poiseuille Flow and Couette Flow
- Lecture 31 - Problems and Solutions On Spinning

[Lecture 32 - Compressible Gas Flow](#)

[Lecture 33 - Pressure Drop Relation For Compressible Gas](#)

[Lecture 34 - Problem and Its Solutions of Pressure Drop For Compressible Gas Flow](#)

[Lecture 35 - Use of Trial and Error Method to Find Pressure Drop](#)

[Lecture 36 - Flow Through Packed bed](#)

[Lecture 37 - Hydraulic Radius](#)

[Lecture 38 - Problems and Solutions of Packed Bed](#)

[Lecture 39 - Pressure Drop in Pipes For Compressible Liquids](#)

[Lecture 40 - Fluidization](#)

[Lecture 41 - Problems and Solution of Fluidization](#)

[Lecture 42 - Flow Through Nozzles](#)

[Lecture 43 - Bernoulli's Equation Used in Nozzle Flow](#)

[Lecture 44 - Discharge Rate Through Nozzles](#)

[Lecture 45 - Adiabatic Flow Through Refrigeration Unit](#)

[Lecture 46 - Problems and Solutions of Nozzle Flow](#)

[Lecture 47 - Sonic Velocity](#)

[Lecture 48 - Diatomic Gas With Sonic Velocity](#)

[Lecture 49 - Variable Flow](#)

[Lecture 50 - Pneumatic Conveying](#)

[Lecture 51 - Non-Newtonian Fluid Flow](#)

[Lecture 52 - Non-Newtonian Fluid Flow \(Continued...\)](#)

[Lecture 53 - Non-Newtonian Fluid Flow \(Continued...\)](#)

[Lecture 54 - Non-Newtonian Fluid Flow \(Continued...\)](#)

[Lecture 55 - Non-Newtonian Fluid Flow \(Continued...\)](#)

[Lecture 56 - Flow Through Filter Medium](#)

[Lecture 57 - Flow Through Filter Medium \(Continued...\)](#)

[Lecture 58 - Flow Through Filter Medium \(Continued...\)](#)

[Lecture 59 - Flow Through Filter Medium \(Continued...\)](#)

[Lecture 60 - Flow Through Filter Medium \(Continued...\)](#)

Lecture 1 - Introduction

Lecture 2 - Development in Food Microbiology and Current Status

Lecture 3 - Classification of Microorganisms

Lecture 4 - Classification of Microorganisms (Eukaryotic cell, algae, fungi and molds)

Lecture 5 - Classification of Microorganisms (Molds, Yeasts, Protozoa and Viruses)

Lecture 6 - Sources of Microorganisms

Lecture 7 - Biochemistry of some beneficial traits

Lecture 8 - Food Fermentation

Lecture 9 - Starter culture

Lecture 10 - Intestinal beneficial bacteria (Probiotics)

Lecture 11 - Contamination of foods (Chemical Contaminations)

Lecture 12 - Contamination of foods (Biological Contaminations)

Lecture 13 - Contamination of foods (Physical and crosscontamination Contaminations)

Lecture 14 - Various stages of contamination of foods

Lecture 15 - Minimization of food contamination

Lecture 16 - Microbial growth characteristics

Lecture 17 - Nature of microbial growth in food

Lecture 18 - Factors affecting microbial growth (intrinsic factors)

Lecture 19 - Factors affecting microbial growth (extrinsic factors)

Lecture 20 - Measurement of microbial growth

Lecture 21 - Overview

Lecture 22 - Spoilage of fruits and vegetables

Lecture 23 - Spoilage of meat, poultry, egg and sea foods

Lecture 24 - Spoilage of dairy and dairy based product

Lecture 25 - Spoilage of cereal product, beverages and canned based Product

Lecture 26 - Food-borne Illnesses

Lecture 27 - Food-borne Intoxication

Lecture 28 - Food-borne Infection

Lecture 29 - Food-borne Toxicoinfections

Lecture 30 - Food-borne diseases and food safety in India

Lecture 31 - Thermal Processing of Food (Blanching, Pasteurization and Appertization)

[Lecture 32 - Thermal Processing of Food \(Sterilization\)](#)

[Lecture 33 - Thermal Processing of Food \(Thermal Death Rate Kinetics \)](#)

[Lecture 34 - Irradiation](#)

[Lecture 35 - Chemical methods](#)

[Lecture 36 - Food Sanitation and Safety](#)

[Lecture 37 - Food Sanitation and Safety \(Continued...\)](#)

[Lecture 38 - Microbiological Considerations in Food Packaging](#)

[Lecture 39 - Microbiological Considerations in Food Packaging \(Continued...\)](#)

[Lecture 40 - Food Laws and Standards](#)

Lecture 1 - OR - Introduction

Lecture 2 - OR and Systems Approach

Lecture 3 - Mathematical Modelling Process and Linear Programming

Lecture 4 - Linear Programming - Problem Formulation

Lecture 5 - Linear Programming - Problem Formulation

Lecture 6 - Linear Programming - Graphical Solution - I

Lecture 7 - Linear Programming - Graphical Solution - II

Lecture 8 - Linear Program in Standard form

Lecture 9 - Linear Programming - Simplex Method - I

Lecture 10 - Linear Programming - Simplex Method - II

Lecture 11 - Linear Programming - Simplex Method

Lecture 12 - Big-M Simplex Method

Lecture 13 - Big_M_Practice Problems

Lecture 14 - Two-Phase Simplex Method

Lecture 15 - Two-Phase_Practice Problems

Lecture 16 - Revised Simplex Method - I

Lecture 17 - Revised Simplex Method - II

Lecture 18 - Duality Theory

Lecture 19 - Dual Simplex Method

Lecture 20 - Practice Problems

Lecture 21 - Sensitivity Analysis - I

Lecture 22 - Sensitivity Analysis - II

Lecture 23 - Sensitivity Analysis Practice Problems

Lecture 24 - Case Studies - I

Lecture 25 - Case Studies - II

Lecture 26 - Goal Programming

Lecture 27 - Weighted Goal Programming

Lecture 28 - Weighted Goal Programming Examples

Lecture 29 - Lexicographic Goal Programming

Lecture 30 - Example and Case Study

Lecture 31 - Transportation - Introduction and Mathematical Formulation

- Lecture 32 - Finding an Initial Basic Feasible Solution
- Lecture 33 - Degeneracy and Initial Basic Feasible Solution Examples
- Lecture 34 - Practice Problems
- Lecture 35 - Finding the Optimal Solution
- Lecture 36 - Practice Problems
- Lecture 37 - Practice Problems - Solution Demo
- Lecture 38 - Practice Problems
- Lecture 39 - Case Study Examples
- Lecture 40 - Assignment Problem
- Lecture 41 - Assignment Problem - Practice Problem and Special Cases
- Lecture 42 - Assignment Problem - Special Cases
- Lecture 43 - Assignment Case Study and Inventory Control
- Lecture 44 - EOQ Models
- Lecture 45 - EOQ Practice Problems
- Lecture 46 - Replacement Theory
- Lecture 47 - Sequencing Problem
- Lecture 48 - Queuing Theory - I
- Lecture 49 - Queuing Theory - II
- Lecture 50 - Case Study
- Lecture 51 - Project Management - Introduction to Network Analysis
- Lecture 52
- Lecture 53 - Solution by Network Analysis
- Lecture 54 - CPM: Enumerative method
- Lecture 55 - Practice Problems
- Lecture 56 - CPM: Mathematical Programming Models - I
- Lecture 57 - CPM: Mathematical Programming Models - II
- Lecture 58 - Introduction to PERT
- Lecture 59 - Problem Examples on PERT and CPM
- Lecture 60 - Project Management - Case study

Lecture 1 - Introduction to crop production system: Crop Production System and its Components, Objectives of crop production

Lecture 2 - Production Situations, Crop classification and Agroclimatic Zon

Lecture 3 - Crop Ecosystem and Agro-Climatic Zones

Lecture 4 - Crop Growth and Development Phases for Input Management

Lecture 5 - Crop Growth Factors and Growth Laws

Lecture 6 - Effect of Climatic Factors on Crop Growth

Lecture 7 - Solar Radiation Interception Concept for Biomass Production

Lecture 8 - Growing Degree Days Concept for Growth Duration and Yield Prediction

Lecture 9 - Introduction to Crop Modeling and Simulation

Lecture 10 - Decision Support System (DSS) in Agricultural Production

Lecture 11 - Types of Crop Model

Lecture 12 - Type of Experiment and Data Requirement in Crop Modeling

Lecture 13 - Terminologies Used in Crop Modeling and Simulation

Lecture 14 - Hierarchy of Models Used and Goals of Crop Modeling and Simulation

Lecture 15 - Historical Chronology of Crop Yield Prediction System

Lecture 16 - Crop System Model Development

Lecture 17 - Crop Modeling Concepts and Compartment Model Symbols

Lecture 18 - State Variables Working Principle

Lecture 19 - State Variables Working Principle

Lecture 20 - Crop Systems Model For Different Production Situations

Lecture 21 - Potential Production Simulation Input Factors

Lecture 22 - Simulation Flow Chart with State and Rate Variables

Lecture 23 - Crop Biomass and Growth Rate Simulation

Lecture 24 - Crop Yield Simulation

Lecture 25 - DSSAT Model Overview, Application and Crops Involved

Lecture 26 - Modules in DSSAT

Lecture 27 - Description of CERES-Rice of DSSAT

Lecture 28 - Biomass and Yield Simulation Process in CERES-Rice

Lecture 29 - Description of CROP GRO of DSSAT - I

Lecture 30 - Description of CROP GRO of DSSAT - II

Lecture 31 - Description of SUBSTOR of DSSAT - I

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

- Lecture 32 - Description of SUBSTOR of DSSAT - II
- Lecture 33 - File system of DSSAT: Input file, File naming, and Input data
- Lecture 34 - Statistical technique for model calibration and validation
- Lecture 35 - Model Application for Agricultural Risk Management and Uncertainty Analysis - I
- Lecture 36 - Model Application for Agricultural Risk Management and Uncertainty Analysis - II
- Lecture 37 - Climate Risk Management (CRM) Tools - I
- Lecture 38 - Climate Risk management (CRM) Tools - II
- Lecture 39 - Climate Risk management (CRM) Tools - III
- Lecture 40 - Climate Risk management (CRM) Tools - IV
- Lecture 41 - Crop Modeling Support for Agro-advisory and Insurance Schemes
- Lecture 42 - Hands on DSSAT: Experimental and Management Data Inputs
- Lecture 43 - Hands on DSSAT: Experimental and Management Data Inputs
- Lecture 44 - Hands on DSSAT: Soil Data Inputs
- Lecture 45 - Hands on DSSAT: Weather Data Inputs - I
- Lecture 46 - Hands on DSSAT: Weather Data Inputs - II
- Lecture 47 - Hands on DSSAT: Model Performance and Genotype Coefficient of CERES-Rice
- Lecture 48 - Hands on DSSAT: Experimental and Management Data Inputs of SUBSTOR-Potato
- Lecture 49 - Hands on Exercises: Rice Yield Simulation for Varying Inputs (Soil and Nutrients)
- Lecture 50 - Hands on Exercises: Rice yield simulation for varying inputs (Weather and water management)
- Lecture 51 - Hands on Exercises: Potato Yield simulation for varying inputs (Weather and water management)
- Lecture 52 - Hands on Exercises: Effect of elevated CO₂ and temperature on rice production
- Lecture 53 - Hands on Exercises: Effect of elevated CO₂ and temperature on potato production
- Lecture 54 - Hands on Exercises: Identification of temperature stress sensitive crop growth phases
- Lecture 55 - Hands on Exercises: Climatic risk assessment on crop yield
- Lecture 56 - Application of Crop Modeling for Management Decision (Input Management and Climate Risk Management)
- Lecture 57 - Errors in Simulation Exercises
- Lecture 58 - Hands on Exercises (Assignment Group-A): Climate risk assessment on rice production
- Lecture 59 - Hands on Exercises (Assignment Group-B): Optimum planting time for potato production
- Lecture 60 - Hands on Exercises (Assignment Group-C): Elevated CO₂ and temperature effects on rice production

Lecture 1 - Introduction to Precision Agriculture

Lecture 2 - Introduction to Precision Agriculture (Continued...)

Lecture 3 - GPS Receiver - I

Lecture 4 - GPS Receiver - II

Lecture 5 - Hands on Handheld GPS Receiver

Lecture 6 - Geographical Information System (GIS)

Lecture 7 - Data structure - I

Lecture 8 - Data structure - II

Lecture 9 - Data Structure - III

Lecture 10 - Open GIS and Internet GIS

Lecture 11 - Introduction to Remote Sensing

Lecture 12 - Earth resource satellites - I

Lecture 13 - Earth resource satellites - II

Lecture 14 - Microwave remote sensing

Lecture 15 - Hyperspectral remote sensing

Lecture 16 - Hands on QGIS

Lecture 17 - Hands on QGIS software - I

Lecture 18 - Hands on QGIS software - II

Lecture 19 - Hands on QGIS software - III

Lecture 20 - Hands on SNAP software

Lecture 21 - Site specific management zone (SSMZ)

Lecture 22 - Crop scouting - I

Lecture 23 - Crop scouting - II

Lecture 24 - Variable rate technology (VRT) - I

Lecture 25 - Variable rate technology (VRT) - II

Lecture 26 - Advance GIS

Lecture 27 - Land Suitability With AHP

Lecture 28 - Artificial Intelligence

Lecture 29 - Machine Learning Application

Lecture 30 - Handson Google Earth Engine

Lecture 31 - Green Seeker

[Lecture 32 - Chlorophyll Meter and Moisture meter](#)

[Lecture 33 - Hands on with Moisture meter](#)

[Lecture 34 - Hands on with Chlorophyll meter and Green Seeker](#)

[Lecture 35 - Wireless Sensor Network](#)

[Lecture 36 - Laser Land Leveller](#)

[Lecture 37 - Yield Monitor](#)

[Lecture 38 - IOT in Agriculture](#)

[Lecture 39 - Farm Robots](#)

[Lecture 40 - Drones](#)