

**NPTEL : NOC:Thermal Processing of Foods (Agriculture)**

**Co-ordinators : Prof. R. Anandalakshmi**

- 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



**NPTEL : NOC:Basic Crop Production Practices (BCPP) (Agriculture)**

**Co-ordinators : Prof. J. R. Yadav, Dr. Vinod Kumar, Dr. Sharwan Kumar Shukla**

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

**NPTEL : NOC:GIS in Ag-Essentials and Applications (GIS) (Agriculture)**

**Co-ordinators : Dr. Venkataraman Balaji, Dr. R. Nagarajan**

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

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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

**NPTEL : NOC:Integrated Pest Management (IPM) (Agriculture)**

**Co-ordinators : Prof. M. Bheemanna, Prof. B.V. Patil, Prof. Prabhuraj A**

- 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](#)

**NPTEL : NOC:Nutrition, Therapeutics and Health (NM) (Agriculture)**

**Co-ordinators : Dr. V. Vijaya Lakshmi (Instructor Incharge)**

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

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

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

**NPTEL : NOC:ICT Basics (Agriculture)**

**Co-ordinators : Prof. T.V. Prabhakar**

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

**NPTEL : NOC:Momentum Transfer in Process Engineering (Agriculture)**

**Co-ordinators : Prof. Tridib Kumar Goswami**

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

**NPTEL : NOC:Farm Machinery (Agriculture)**

**Co-ordinators : Prof. VK Tewari**

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 rotavoator 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

**NPTEL : NOC:Irrigation and Drainage (Agriculture)**

**Co-ordinators : Prof. Damodhara Rao Mailapalli**

- 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

**NPTEL : NOC:Fundamentals of Food Process Engineering (Agriculture)**

**Co-ordinators : Prof. Jayeeta Mitra**

- 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...)

**NPTEL : NOC:Soil and Water Conservation Engineering (Agriculture)**

**Co-ordinators : Prof. Rajendra Singh**

Lecture 1 - Introduction

Lecture 2 - Soilerosion 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 - Acoustical Criteria and Space Design (Continuied...)

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 and Structural Design of Gully Control Structures of Drop Spillway

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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 - Drop Inlet Spillway (Continued...)

Lecture 41 - Drop Inlet Spillway (Continued...)

Lecture 42 - Drop Inlet Spillway (Continued...)

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

**NPTEL : NOC:Dairy and Food Process and Products Technology (Agriculture)**

**Co-ordinators : Prof. Tridib Kumar Goswami**

- 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

**NPTEL : NOC:Organic Farming for Sustainable Agricultural Production (Agriculture)**

**Co-ordinators : Prof. Dilip Kumar Swain**

- 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...)

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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

**NPTEL : NOC:Novel Technologies for Food Processing and Shelf Life Extension (Agriculture)**

**Co-ordinators : Prof. Hari Niwas Mishra**

- 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

**NPTEL : NOC:Soil Science and Technology (Agriculture)**

**Co-ordinators : Prof. Somsubhra Chakraborty**

- 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

**NPTEL : NOC:Thermal Operations in Food Process Engineering: Theory and Applications (Agriculture)**

**Co-ordinators : Prof. Tridib Kumar Goswami**

- 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 Kinetics
- 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