

- 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](#)

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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

HTML Links for 1,19,200+ NPTEL Video Lectures, Created by LinuXpert Systems, Chennai

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[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 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

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

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Lecture 29 - Drying Technology

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Lecture 31 - Freezing and Freeze Drying

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

NPTEL : NOC:Soil Fertility and Fertilizers (Agriculture)

Co-ordinators : Prof. Somsubhra Chakraborty

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 Flootation

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)