

**Swami Ramanand Teerth Marathwada University, Nanded.**

**Syllabus**

**for**

**B.Sc. (Food Technology)**

**V Semester**

**June 2013**

### 301 FOOD INDUSTRIAL BY –PRODUCT AND WASTE UTILIZATION

#### Theory

Number of Units	Topics
1	Industrial by products and waste
2	Potentials and prospects of developing by-products industry in India
3	Agricultural waste and agro based industrial waste management.
4	By products of cereals, legumes and oilseeds
5	By products of dairy industry
6	By products of fruit and vegetables processing industries
7	By products of meat, poultry, and eggs processing industries
8	By products of fish processing industries
9	By products of plantation crops and spices
10	Uses of byproducts of agro based industries in various sectors
11	By products of alcoholic beverages industries.
12	By products of sugar and bakery industries

#### Practicals

Number of Units	Topics
1	Study of extraction of banana fiber
2	Study of extraction of leaf proteins
3	Study of alcohol production from molasses
4	Study of utilization of crop residues for the production of cellulose
5	Study of use of mango kernels for starch isolation
6	Study of isolation and purification of pectin from organic waste.
7	Study of extraction of volatile oils from organic waste

#### REFERENCE BOOKS

- 1 Food from waste Warvan
- 2 Food protein sources Pirie
- 3 Technology of fish utilization Ed. Kreuyer

## 302 CARBONATED AND ALCOHOLIC BEVERAGE TECHNOLOGY

### Theory

Number of Units	Topics
1	History and types of carbonated and alcoholic beverages
2	Water treatment and quality
3	Specifications for beverage water
4	Alkalinity reduction, filtration of water, water softening
5	Methods of production of carbonated beverages, wines and distilled liquors
6	Sweeteners used in soft drinks and their properties, non nutritive sweeteners
7	Natural and synthetic colorants used in carbonated and alcoholic beverages
8	Acidulants, clouding agents, flavouring agents used in carbonated and alcoholic beverages
9	Carbon dioxide and carbonation for soft drink
10	Equipments and machineries used in carbonated and alcoholic beverages
11	Packaging aspects in carbonated and alcoholic beverages
12	Quality control in soft drink – Chemical and sensory and microbiological quality

### Practicals

Number of Units	Topics
1	Physical properties of water
2	Study of Determination of Determination of hardness of water
3	Preparation of carbonated beverages, wines and distilled liquors
4	Study of Determination of colours in carbonated beverages by wool technique
5	Study of Determination of saccharine in beverages
6	Study of Determination of benzoic acid in beverages
7	Study of Determination of sulphurdioxide in beverages
8	Determination of alcohol content in alcoholic beverages
9	Study of Determination of brix value, gas content, PH and acidity of beverages
10	Microbial total plates count of water and beverages
11	Microbial analysis of water for <i>E- coli</i>
12	Visit to carbonation Unit and distillery
13	Visit to water treatment plant
14	Visit to the drinking water/mineral water plant

## REFERENCE BOOKS

- 1 Preservation of fruit and Vegetable products Gridharilal Siddappa G.S. and Tondan G.D.
- 2 Fruit and Vegetable Juices Tressler D.K. Joslyn M.A. and Marsh G.C. AVI publishing company New York.
- 3 Food Engineering Operations Brennan, Butter, Crowell and Lilly

## 303 FOOD BIO – TECHNOLOGY

### Theory

Number of Units	Topics
1	Prospectus of Bio-Technology
2	Molecular genetics i.e. fundamentals of molecular biology with special reference to chemistry & biology & DNA (Primary secondary & tertiary) structures
3	Biological role of DNA in cell metabolism
4	Genetic recombination mechanisms & technique used for improvement in microbial strains
5	Applications of genetical control mechanism in industrial fermentation process (Induction, manipulation & recombination)
6	Recombinant - DNA technology (plasmids & cloning)
7	Cell & tissue culture
8	Continuous cultures
9	Secondary metabolites synthesis
10	Expression of foreign genes. Promoter (Enzyme), biomass production by using various micro organisms
11	Application of Biotechnology in food, pharmaceuticals and industries
12	Bio-gas plant
13	Bio technological approach for the exploitation of food and industrially important micro-organism

### Practicals

Number of Units	Topics
1	Study of auxotroph
2	Micro propagation through tissue culture
3	Strain improvement through U. V. mutation for lactose utilization
4	Chemical mutagenesis using chemical mutagens (Ethidium bromide)
5	Study of determination of survival curves using physical & chemical mutagens

6	Study of Isolation & analysis of chromosomal / genomic DNA from <i>E.coli</i> & <i>Bacillus cereus</i>
7	Study of separation of protoplast using cellulytic enzymes
8	Study of introduction of ELISA / Southern blot / DNA finger printing etc
10	Study of pesticide degradation by pseudomonas spp

## REFERENCE BOOKS

1. Advances in Biotechnology Vol.1  
(Scientific & Engineering Principles) Murayy Moo-Young  
C.W. Gambell & C. Vezina
2. Advances in Biotechnology Vol-II  
(Fuels, chemicals, foods & waste treatments) Murayy Moo-Young  
C.W. Gambell & C. Vezina
3. Advances in Biotechnology Vol-II  
(Fermentation Products) Muray Moo-Young
4. VIIth International Biotechnology Symposium (Feb 19-25 1984)  
held at New Delhi - Part - I
5. VII th International Biotechnology Symposium (Feb. 19-25 1984)  
held at New Delhi Part - II
6. Microbial Technology - Vol - I (Microbial Process) Pepler &  
Perlman
7. Microbial Technology - Vol - II (Fermentation Technology) Pepler &  
Perlman

### 304 REFRIGERATION ENGINEERING AND COLD CHAIN

Theory

Number of Units	Topics
1	Definition of refrigeration and air conditioning, necessity of refrigeration and air conditioning History of refrigeration
2	Refrigerants, definition, classification, nomenclature, methane and ethane series. Desirable properties of refrigerants-physical chemical, safety, thermodynamic and economical, Azeotropes
3	Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve
4	Ice manufacture, principles of ice production, different systems Treatment of water for making ice, Brines, Freezing tanks, ice cans, air agitation quality of ice
5	Applications of refrigeration in different food products - fruit and vegetable products, meat products, fish and poultry products, dairy products
6	Food Freezing - Freezing systems: Indirect contact systems, plate freezers, air blast freezers, and freezers for liquid foods. Direct contact systems, air blast immersion, frozen food properties, density, thermal conductivity enthalpy, apparent specific heat and thermal diffusivity, freezing time, factors influencing freezing time, freezing rate, thawing time
7	Frozen food storage : changes in foods during frozen storage <span style="float: right;">Quality</span>

### Practicals

Number of Units	Topics
1	Standard refrigeration symbols
2	To study vapour compression refrigeration system
3	Solving problems on cooling load calculations / Refrigeration load
4	To study the properties and performance characteristics of some commonly used refrigerants
5	To study the components of the refrigeration system
6	Study of freezing of foods by different methods
7	Determination of freezing time of a food material

### REFERENCE BOOKS

1. Refrigeration & air-conditioning
2. Introduction to food engineering
3. A course in refrigeration and air conditioning

Manohar Prasad  
R.P. Singh and  
D. R. Heldman  
S. C. Arora and  
S. Domkundwar

### 305 BIOCHEMICAL ENGINEERING

#### Theory

Number of Units	Topics
1	Biochemical Engineering and their scope : Definition, necessity, value engineering, good manufacturing practices. Standard operating procedures, good laboratory practices
2	Instrumentation and control of physical and chemical parameters.
3	Role of biochemical engineering in development of modern fermentor : Scale up, Management of cellular process, design, operation and their problems.
4	Basis for biochemical engineering in fermentation industry : Unit operation, unit process, process design, chemical reaction kinetics, process variables, biochemical properties, process control
5	Kinetics of microbial growth and death: Definition, fermentation kinetics rate of cell syntheses, product formation and effect of environment. Types of kinetics, batch and continuous type, control measures
6	Study of Simple and complex enzyme kinetics: Simple kinetics model for enzyme substrate interaction. Derive the equation of Michelin Menton, for reaction rate, product formation, calculation of Km and V max values
7	Media and air sterilization: Definition, thermal death time, media heat sterilization, advantages of continuous sterilization.
8	Aeration and agitation
9	Product recovery of different process : Mass transfer resistance extraction, leaching, drying and evaporation, sorption and storage, permeability law
10	Product formation for value added products using bioconversions techniques production of single cell protein, alcohol, raw material required for product formation, production of antibiotics, economic process, utilization of damaged grain through bioconversion, present mode of utilization and their nutritional value



## Practical

Number of Units	Topics
1	Instrumentation and their control in fermentation industry - physical parameter
2	Study of instrumentation and their control in fermentation industry - chemical parameter, metabolic parameters and biosensors in food industry
3	To study the different parts of 30 lit. Laboratory and 1 lakh lit. capacity fermentors
4	Comparative study of one lakh liter laboratory fermentor
5	To study the thermal stability of peroxidase enzyme in potato
6	Study of to assess the amylase activity from given food sample
7	To measure the microbial growth after fermentation (fermentation thermal death time)
8	To study the time - temperature relationship for destruction of microorganisms
9	To study the time - temperature relationship for destruction of microorganisms
10	To study the ethyl/ alcohol production through bioconversion
11	To study the vitamin production through bioconversion
12	Visit to Distillery plant

## REFERENCE BOOKS

1. Biochemical Engineering  
Shuichi Alba, Arthur E. Humphre & Nancy F. Millis
2. Biochemical Engineering Fundamentals  
Bailer J. E. & Ollis D.F.

## 306 CO – OPERATION, MARKETING AND FINANCE

### Theory

Number of Units	Topics
1	Co- operation – Philosophy and principles. History of Indian Co – operative movement
2	Co – Operative credit structures in regional level and their study and single window systems
3	Marketing – importance in economic development. Classification of Markets, Marketing functions and Market functionaries
4	Marketable and Marketed surplus, Marketing costs, margins and price spread, problems in marketing of agricultural commodities – perishables, grains, oilseeds and processed foods
5	Agricultural marketing institutions, Regulated
6	MARKFED, NAFED, Ware Housing Corporation of Food Corporation of India
7	Nature of agricultural product prices, Agricultural Price policy and need for price stabilization
8	Methods of fixation of MSP for agricultural commodities
9	Commission on agricultural costs and prices
10	Finance – nature and scope, Credit – meaning definition and classification
11	Role of MOFPI, Export and Inspection Authority of India
12	Commercial banks – Nationalization of Commercial banks, Lead Bank scheme and Regional Rural Banks
13	Scale of finance, Higher financing agencies – RBI, NABARD, AFC, ADB , World Bank
14	Insurance and credit guarantee corporation of India and Crop Insurance
15	Contract farming – strategy and scope

## Practicals

Number of Units	Topics
1	Study of a regulated market
2	Study of a vegetable and fruit market
4	Study of a cattle market
5	Computation of market costs, margins and price spread
7	Study of Central Warehousing Corporation
8	Study of Food Corporation of India
9	Study of MARKFED
10	Study of functioning of a commercial bank
11	Study of a regional rural bank
12	Study of food processing enterprise
13	Formulation of project reports for financing food industry
15	Study of Primary Agricultural Credit Society
16	Study of Farmers cooperative Association

### REFERENCE BOOKS

1. Co-operation in India  
Kitab  
Mamoria C B and Saxena R D  
Mahal, Allahabad
2. Indian Food Grain Marketing  
Khasro A  
Moore John R John S S and  
M Prentice Hall of India, New Delhi
3. Agricultural Marketing in India  
&  
Acharya S S & Agarwal N L Oxford  
JBH New Delhi. Publishing Co.,
4. Farm Finance for Development  
Muni Raj R Oxford & IBH Publishing  
Co. New Delhi
5. Co-operation and Cooperative  
Patnaik U C & Roy A K Kalyani  
Publishers, Ludian Management

## 307 BUSINESS MANAGEMENT AND INTERNATIONAL FOOD TRADE

### Theory

Number of Units	Topics
1	Business Management : Introduction, theories and functions Food industry management : Purchase management and production management Financial management and marketing management – retail management Human resource development and personnel management, Sectors in food industry and scale of operations in India.
2	International trade : Basics, Classical theory, Theory of absolute advantage, Theory of comparative advantage, Modern theory, Free trade – protection, methods of protection quotas, bounties, exchange control, devaluation, commercial treaties, terms of trade balance of payments, exim policy, foreign exchange, mechanics of foreign exchange, GATT and WTO. world trade agreements related with food business export trends and prospects of food products in India
3	World Consumption of Food Patterns and Types of Food Consumption across the Globe Developed Nations Developing Nations Under Developed Nations Ethnic Food Habits of Different Regions
4	Govt. institutions related to international food trade APEDA, Tea Board, Spice Board, MFPI, etc
5	Management of export import organization Registration, documentation, export import logistics
6	Case Studies

### REFERENC E BOOKS

1. Principles of Agri business Management D. David and S. Erickson  
Mc Graw Hill Book Co.
2. Agricultural Mrketing in India New York Acharya SS and Agarwal NL Oxford and IBM Publishers, New Delhi.
3. Marketing in the international Environment Cundiff Higler, P H 1 New Delhi.
4. GATT implications of Dankel proposals G. S. Batr a & Narindev kumar Azmol publications Pvt. Ltd. New Delhi.
5. Market Management Philip Kotler
6. Marketing Management Prentice Hall of India, New Delhi, Dr. P. K. Shrivastava

### 308 FOOD QUALITY

Theory

Number of Units	Topics
1	<b>Food quality</b> –its role in industry, Need of quality control, factors affecting quality control
2	<b>Quality attributes</b> - dominant and hidden attributes
3	<b>Colour</b> - role of colour in quality spectra, different types of colour measuring instruments
4	<b>Viscosity</b> -types of fluids, different viscometers to measure viscosity
5	<b>Consistency</b> -Methods used to measure consistency of product Difference between viscosity and consistency
6	<b>Size and shape</b> –Its role, method to find shape and size of food and food products
7	<b>Defects:</b> Classifications genetic- physiological defects- structural, off color, character Entomological defects : holes, scars, lesions, off coloring, curled leaves, Pathological defects Mechanical defects, Extraneous or foreign material defects. Measurement of defects:
8	<b>Texture</b> classification role of firmness, yielding quality, juiciness, chewiness, fibrousness, grittiness, mealiness, stickiness, measurement of texture /kinesthetic characteristics
9	<b>Flavour</b> - definition and its role in food quality Taste classification, taste qualities, relative intensity, reaction time effect of disease temperature and taste medium on taste, basic taste interaction of taste <b>Odour</b> – classification neutral ,mechanisms olfactory abnormalities odor testing techniques thresholds, odor Intensities.
10	Factors influencing sensory measurements Attitudinal factors, motivation psychological errors in judgment Relation between stimulus and perception adaptation. Correlation of sensory and instrumental analysis.
11	<b>Quality Measurements</b> -1 By Laboratory and consumer measurements
12	<b>Quality of raw materials:</b> Physical, Chemical and Microbial quality. Quality of products during processing after processing color, taste, texture, flavor appearance.

13	<b>Factors influencing the food qualities:</b> Soil field practices, harvesting practices, procedures, packaging, transportation storage, conditions processing conditions, packaging and storage conditions of finished products.
14	Recording and reporting of quality.

#### Practicals

Number of Units	Topics
1	Study of quality evaluation of raw materials
2	Study of quality evaluation of product for size, shape
3	Study of determination of Viscosity of food products
4	Study of determination of texture
5	Study of sensory evaluation of product for taste and flavour
6	Market testing of products
7	Study of evaluation of food standards
8	Study of determination of color by using Lovibond
9	Visit to Food factory to know sensory evaluation problems
10	Consumer study for food quality
11	Visit to fruit and vegetable market for quality assessment.

#### REFERENCE BOOKS

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|----|--|-----------------------|---|
| 1. | Principles of Sensory Evaluation of Food<br>Rose | Maynard               | A-Amerine,<br>Marie<br>Pangborn,<br>Edward. |
| 2  | Quality Control for Food Industry                | Karmmer Twigg.        |   |
| 3  | Quality Control in Food Industry                 | S.N. Herchdogfer      |   |
| 4  | Advances in Food Research                        | Academic Press. Vol.I |   |