

Institute for Excellence in Higher Education (IEHE), Bhopal

B.Sc.(HONOURS) : PART-I

Semester: I

SUBJECT: FOOD SCIENCE & QUALITY CONTROL

PAPER: SUBSIDIARY

TITLE: Food Chemistry, Basic and Applied Nutrition

SYLLABUS

No. of Periods

1. Introduction to Nutrition

- (a) Food as a source of nutrients, Definition of food, functions of food, Nutrients, Health, Nutrition, Type of Nutrition, Malnutrition. (4)

2. Carbohydrates – Composition, Classification, Properties, and structure.

- I. Difference between ketose and aldose sugar.
- II. **Monosaccharides**- Glucose, Fructose, Galactose.
- III. **Diasaccharides**- Sucrose, Maltose, Lactose.
- IV. **Poly saccharides and complex polysaccharides.**

(a) Starch, amylose, amylopectin, dextrin, pectin, cellulose, hemicellulose, glycogen, and gums.

(b) Gelatinization and Dextrinization of Starch and their applications in food preparations.

(c) Non enzymatic Browning reaction (Millard reaction).

(d) Role of cellulose in human digestion and absorption.

(e) Recrystalization of sugar. (12)

3. Proteins –Classification, structure, physico- chemical properties and sources of protein and amino acid.

(I) Amino acids – Essential, non essential and limiting.

(II) Protein -

(a) Isoelectric point, peptide bond, zwitter ion.

(b) Function of protein in human body.

(c) Deficiency, RDA and biological value.

(d) Denaturation, coagulation, solubility. (12)

Approve for the session 2017-18

4. Lipids-

- (i) Composition, classification, functions, sources, calorific value.
- (ii) Physico chemical properties- melting point, Rancidity- Types, causes and prevention of rancidity.
- (iii) Phospholipids as natural emulsifiers.
- (iv) saturated and unsaturated fatty acids, essential fatty acids. (12)

5. Energy – Unit and definition of energy, Determination of energy value of food- Bomb calorimeter, Total energy Requirement, BMR and Factors affecting BMR.

(4)

6. Vitamins: Classification, sources, structure, functions and losses during processing and cooking. Deficiency and excess of vitamins. (10)

7. Minerals: Classification, functions, sources, daily requirement and deficiency Of - Ca, P, Fe, Na, K and I. (10)

8. Water –

- a. Properties of water
- b. Structure of water and ice
- c. Distribution and Function of Water in human body. Water and electrolyte balance. Water deficiency, prevention and cure for dehydration. (6)
- d. Moisture in food, bound water

9. Basic food groups-

Cereals (Wheat and Rice), Pulses, Vegetables and fruits, Milk, Egg, Meat and fish, Sugar and Jaggary. (14)

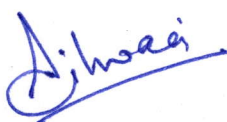
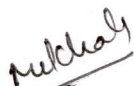
10. Pigments: Structure, physico-chemical properties, Effect of change in PH on pigments and texture. (6)

Total periods = 90

Books Recommended:

- Personal Nutrition by Marile A Boyle.
- Essentials of Human Nutrition: Encompassing Basic Applied and Clinical Aspects by K. Majumdar
- Basic Principles of Nutrition by Yadav Sema.
- Essentials of food and nutrition : An advanced text book by Swaminathan M.
- Fundamentals of food chemistry by Dr. Jasvinders Kaur.
- Food Science and nutrition by Sunetra Roday.
- Foods: Facts and Principles by N. Shakuntala Manay.
- Food Chemistry by Lillian Hoagland Meyer.
- Food Science by B. Srilakshmi.
- Hand book of Food and Nutrition M. Swaminathan.
- Food Chemistry by H.D., Belitz.
- Nutrition Science by B. Srilakshmi.
- Food science by Mudambi Sumati R.
- Food Chemistry by Iqbal S.A.
- Elements of Food Science by Veer Udai.
- Food Chemistry by Yadav Sema.
- Text Book of Agro-Chemistry by H.P. Hegde.
- Source Book of Flavors by Reineccius Gary.
- Food Chemistry by Shalini Saxena.
- Nutrition by Dr. Savitri Ramaiah.
- Food flavours technology Hand Book by Board (NIIR).




Institute for Excellence in Higher Education (IEHE), Bhopal

B.Sc.(HONOURS) : PART-I

Semester: II

SUBJECT: FOOD SCIENCE & QUALITY CONTROL

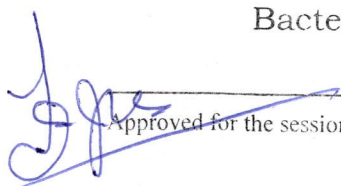
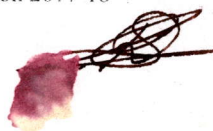
PAPER: SUBSIDIARY

TITLE: FOOD MICROBIOLOGY AND TOXICOLOGY

SYLLABUS

- | A. Food Microbiology | No. of periods |
|---|-----------------------|
| 1. Introduction To Microbiology –
General morphology of micro-organisms, characteristics of bacteria, fungi, virus, protozoa, algae. | (6) |
| 2. Beneficial effects of Microorganism and their importance in food industry. | (10) |
| 3. Microbiology of different food : Spoilage, contamination, sources and types, effect on the following : | (12) |
| a) Cereals and cereal products | |
| b) Vegetable and fruits | |
| c) Meat, fish and poultry | |
| d) Milk and milk products | |
| e) Processed and Preserved foods. | |
| 4. Growth and Control of Micro Organism – Growth curve, effect of environmental factors on growth of micro-organisms, pH, Water activity, Oxygen availability, temperature, Redox potential. | (10) |
| 5. Microbiology of Water, Air, Soil. | (8) |

Microbial Intoxication and Infections: Food borne illnesses-
Bacterial, fungal, viral




Symptoms and method of control of infections of following toxins**Bacterial toxins:** (5)

Important toxins and toxigenic bacteria eg. *Staphylococcus aureus*, *Clostridium botulinum*, (Botulism), *Clostridium perfringes*, *Shigella*, *Salmonella*, *Brucella*, *Vibrio*, *E.coli*, *Bacillus cereus* and *Yersinia*.

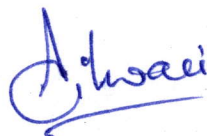
Fungal toxins - (7)

Important fungal toxins and toxin producing fungi such as Citoviridin, Aflatoxins (*Aspergillus*), Luteoskyrin (the yellow rice toxin) Moniliformin, Trichothecenes, Ochratoxins, Ergot. *Penicilium* and *Fusarium*

B. Food Toxicology

1. **Food Toxicology:** Definition and Importance, Toxin potential of foods, factors affecting toxicity of compounds, lethal dose. (6)
2. **Naturally Occurring Toxins In Foods:** fish poisoning – ciguatera, serombiod, tetrodotoxin, sea foods (shell fish poisoning), mushroom (Edible and non edible mushrooms), potato, spices. (8)
3. **Other Food Hazards :** Carcinogens, Cyanogenic glycosides, toxic alkaloids, Dioscorine, Methylxanthins-caffeine, Theophylline, Theobromine, Glucobrassicin, Dicoumarol, Juglone, Ricin, Lectins, Serotorin, Phlorizin, Tyramine, Cyclopropene PAH, PCB, PBB, (10)
4. **Metal Toxicity:** zinc, arsenic, lead, cadmium, cobalt, copper, Tin and Mercury. (8)

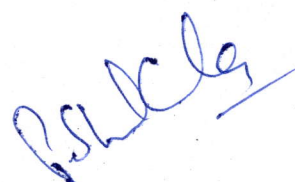
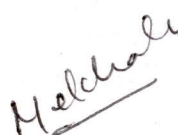
Total =90 Periods



Books Recommended:

1. Food Science : Chemistry and Experimental Foods by M. Swaimnathan
2. Food Microbiology by M. Nithya, Devi
3. Food Microbiology by Dr. Satish Kumar Sinha
4. Food Microbiology Fundamental & Frontiers by Michael P. Doyle
5. Food Hygiene and Sanitation by Sunetra, Reday
6. Modern Food Microbiology by James M. Jay
7. Basic Food Microbiology by George J. Banwartg
8. Food Microbiology by William C. Frazier
9. Texbook of Toxicology by Balram, Pani
10. A Text Book of Microbiology by Dubey R.C.
11. Food Safety : Concept and reality Mahindru S.N.
12. Food Microbiology by Narang S.P.
13. Text book of Human Nutrition by Mahtab S. Bamji
14. Food Contamination and safety by P.V. Patil
15. Food Hazards and Food Hygience by Yadav Senna
16. Food Microbiology by Adams M.R.
17. Essentials of Food Science by Vickie Vaclavif
18. Food Hazards and food Hygiene by Seema Yadav
19. Food Borne Illnesses by Modi, H.A.
20. Food Hygiene and Toxicology by P. Mehrotra
21. Food Hygiene and Toxicology by Vikas Ahlluwalia
22. Food Nutrition and Health by Shashi Goyal and Pooja Gupta



Institute for Excellence in Higher Education (IEHE), Bhopal

B.Sc.(HONOURS): PART-II

Semester: III

SUBJECT: Food Science and Quality Control

PAPER: Subsidiary

TITLE: Sensory Evaluation and Food Preservation Techniques

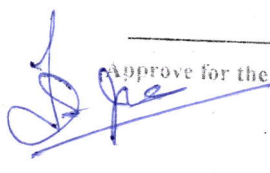
SYLLABUS

Part A: Sensory Evaluation:

1. **Factors Affecting Food Acceptance** – Sensory, Psychological, Physiological.(4)
2. **Sensory Assessment of Food Quality** –(i)Hedonic scaling –Characteristics for perception (visual and organoleptic), colour, odour, smell, texture, taste and flavor. (ii) Flavours in fruits, vegetables, spices. (8)
3. **Sensory Testing of Foods and Evaluation** : Difference between sensory and organoleptic testing :- (12)
 - a) Difference tests
 - b) Ranking tests
 - c) Range test
4. **Designing sensory Testing Laboratory** (3)
5. **Factors Affecting Sensory Evaluation** (3)
6. **Types of Panels** – Trained and consumer panels (3)

PART B: Food Preservation:

1. **Principle of Food Preservation-** Causes of spoilage, importance of preservation. (4)
2. **Preservation of foods:**
 - (a) **By heat:** Blanching, Pasteurization, Sterilization, UHT sterilization (9)
 - (b) **Dehydration:** Principle, simple drying (shade and sun drying), evaporation, Freeze drying, factors affecting dehydration. Merits and demerits. (8)







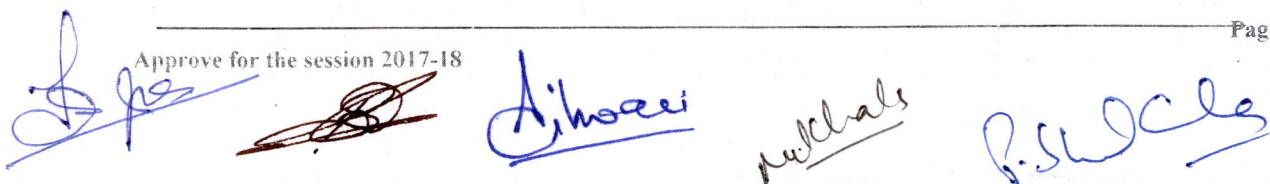
- (c) **Low Temperature:** Refrigeration– Its advantages, factors affecting refrigeration. Freezing, types of freezing – Quick freezing, sharp freezing and freeze drying application. Difference between freezing and refrigeration, (12)
- (d) **Chemicals :** Sugar, salt and other chemical preservatives (9)
- (e) **Irradiation:** Principle, Types and mechanism of irradiations, permitted doses. Advantages and disadvantages. (6)
- (f) **Microwave, Principles and cooking.** (4)
- 3. Nutritional values of preserved food.** (5)

Total Classes=90



Books Recommended:

- Food Preservation by S K Kulshreshtha.
- Entrepreneurship Development by Gordon E.
- Food Preservation by Singh M.K.
- Food Preservation & Processing by M. Kalia.
- Food Storage and Preservation by Bharat Singh.
- Fruit and Vegetable Processing by Suman Bhatti.
- The Technology of Food Preservation by Desrosier V. Norman.
- Food Preservation by Prakash Triveni.
- Food, Nutrition, Food Processing by Vashisht Meera.
- Principles of Fruits Preservation by Morris T.N.
- Entrepreneurship Development by O.S. Shrivastava.
- Preservation of Fruits and Vegetables by Vijaya Khader.
- Food Processing and Preservation by B. Sivasankar.
- Preservation of Fruits and Vegetables by Girdhari Lal.
- Food Processing by Anuradha Roy.
- Fruit & Vegetable Preservation 641.4 by Srivastavs R.P.
- Food Preservation and Irradiation by Mahindru S.N.
- Encyclopedia of Food Analysis Vol-I by Mahindru S.N.
- Sensory Evaluation of Food by Gisela Jellinek.
- Drying and Dehydration of Foods by Loerecke H.W.
- Food Contamination and Safety by Nambior Vanisha.
- Food Additives by S.N. Mahindru.
- Fruit and Vegetable preservation Technologies by R.K. Narang.
- Food Preservation and Irradiation by Mahindru, S.N.
- Food Additives: Characteristics, Detection and Estimation by Mahindru, S.N.
- Women and Food Security Role of Panchayat by Pradeep Chaturvedi.
- Fruit and Vegetable Processing by Mircea Enachescu Dauthy.
- Hand Book of Fruit and Vegetable Products by Syed Mehboob Ashraf.



Institute for Excellence in Higher Education (IEHE), Bhopal

B.Sc. (HONOURS): PART-II

Semester: IV

SUBJECT: FOOD SCIENCE AND QUALITY CONTROL PAPER: SUBSIDIARY

TITLE: POST HARVEST TECHNOLOGY, PROCESSING AND MANUFACTURE

SYLLABUS

Post Harvest Technology:

1. Physical Principles Underlying Food Engineering Operations such as

- (i) Preparative operations, (ii) Conversion operations (iii) Preservation operations (in very brief) (iv) Allied operations. (10)

2. Processing Technology of Cereals and Millets -

- (a)** (i) Difference between cereals and millets
(ii) Role of protein quantity, significance of gluten, soft wheat, hard wheat, water absorption capacity of wheat flour
(iii) Anti nutritional factors (8)

- (b)Rice:** Milling, parboiling of rice, changes during parboiling, advantages and disadvantages. (8)

3. Processing Technology of Legumes:

- (i) Basic processing, anti nutritional factors
(ii) Physico –chemical changes during germination and fermentation to reduce anti nutritional factors (6)

4. Processing Technology of Oil Seeds: Extraction, refining, hardening of fat (hydrogenation), Trans-fats and inter-esterification , winterization ,effect of cooking temperature on fat absorption and texture of food . (6)

5. Processing Technology of Fruits and Vegetables:

- (i) Maturation and ripening
(ii) Storage- Household and commercial
(iii) Processing product development – Formulation, general steps involved in processing. (6)

6. Processing Technology of Milk and Milk Products:

Pasteurized and sterilized Milk – General steps involved in processing-

Cream and Butter: Principle of cream separation

Cheese: Difference between cheese and Paneer (Chhena) and methods of their preparation.

Desiccated Milk products: Definition, method of manufacture of whole and skimmed milk powder.

(10)

7. Meat, Fish, Poultry and Eggs:

Meat Processing: - Ante-mortem inspection, post-mortem inspection, tenderization, curing, smoking, canning, reactions involved colour changes in meat. (6)

Fish Processing: - General steps involved in processing – chilling , smoking curing , freezing ,dehydration . (6)

Eggs processing: - Freezing and drying of egg products. (4)

8. Fortification and Enrichment.

9. Extrusion Technology: - Principle

Single screw extruder-advantages and disadvantages of extrusion technology. (4)

10. Food loss - Post harvest losses of grains, fruits, vegetables and their preventive measure. (5)

11. Food habits and dimensions of food - economic, psychological, anthropological, sociological, role of food and diet on life style. (4)

12. Food available in market- Processed, conventional, convenience, fast food, fabricated food, functional food, functionalized food, Dietetic food, formulated food (5)

13. New Product Innovation- Product life cycle, **SWOT** analysis, Product Design Process, Marketing Aspects. (5)

14. G.M. FOOD (IN BRIEF) (3)

(TOTAL-90 periods)

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Books Recommended:

- Fundamentals of Food Engineering by D.G. Rao.
- Principles and Practices of Post Harvest Technology by P.H. Pandey.
- Post Harvesting Engineering by D.K. Singh.
- Food Processing and Preservation by G. Subbulakshmi.
- Post Harvest Technology of Fruit and Vegetables by Thompson A.K.
- Food Science by Norman Potter.
- Food Grain Process Technology by C.S. Riar.
- A Complete Book on Harvest Technology and Horticultural Crops by Tak Bahadur Subba.
- Chemical Changes in Food during Processing by Thomas Richardsons.
- Experimental Methods in Food Engineering by Syed S.H. Rizvi.
- Food Packaging Technology – Handbook NIIR Board.
- Fundamentals of Food Process Engineering by Romeo T. Toledo.
- Outlines of Food Technology by P. Janki Rao.
- Emerging Trends in Post-Harvest Processing & Utilization of Plant Foods by Khetarpaul N.
- Prevention of Post-Harvest Food Lossess: Fruits, Vegetables and Root Crops - Training Manual.
- Principles and Practices of Post Harvest Technology by P.H. Pandey.

Institute for Excellence in Higher Education (IEHE), Bhopal

B.Sc.(HONOURS) : PART-III

Semester: V

SUBJECT: FOOD SCIENCE AND QUALITY CONTROL

PAPER: SUBSIDIARY

Title - Food Industry Management:

SYLLABUS

Food Industry Management

1. Plant Design, location and Equipment layout- (8)

General Principles, Plant Design, Plant location, plant layout.

2. Cleaning and Sanitation of Process Plant- (12)

Basic Principles of Hygiene and sanitation—

- (i) Various Methods of Cleaning Process—open and closed, CIP, Single Use CIP system, Sanitation methods—chlorine based sanitizers, ammonia compounds, Iodophores, Thermal sterilization. Detergents, Pests proof fumigation methods.
- (ii) Sources of water.
- (iii) water treatment methods: Process plant waste management—physical, chemical, and biological methods.

3. Safety- Accidents, Safety training and Enforcement of Safety. (8)

4. Material Handling and Transportation- (In brief)

- i. Material Conveying Equipment
- ii. Material Lifting Equipments.
- iii. Feeding Equipments

5. Applications of Material Handling and Transportation (In brief) (8)

- i. Animal Products.
- ii. Cereals and Pulses.
- iii. Fruits and Vegetables.
- iv. Spices and Condiments.
- v. Confectionary and Convenience Foods

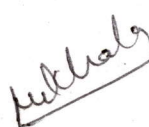
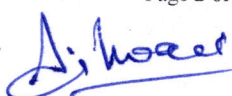
6. Waste Product Handling and management— (8)

- i. Planning for Waste Disposal.
- ii. Fruit waste management.

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- 7. Catering Management** (8)
- i. Principle and functions
 - ii. Tools of management (8)
- 8. Financial Management- Defination and scope.** (6)
- 9. Personnel Management –Personnel Policies.** (6)
- 10. Establishment of Small Scale Industry** (10)
- 11. Costing of Products** (8)

Total Periods= 90



Institute for Excellence in Higher Education (IEHE), Bhopal

B.Sc. (Honours): PART-III

Semester: VI

SUBJECT: Food Science & Quality Control

PAPER: Subsidiary

Title: Food Quality Management, Packaging - Acts And Regulations

SYLLABUS

1. Food Technology Updates:

No. of periods
(12)

- i. Major centers of food research in India – CFTRI, DFRL, CIFT, CIPET, MFP, CIAE, NIN, APEDA, ICMR.

2. Advances in Food Safety and Quality Management

(14)

- (i) GHP, GMP, HACCP,
- (ii) Food safety management system -ISO22000.
- (iii) Qualitative techniques - Common adulterants and their tests: Milk, Vegetable Oil, Spices and condiments, tea and pulses.
- (iv) Intentional Food Additives: N-compounds, anti-oxidants, sweeteners, flavor-enhancer, colors-Natural, synthetic, permitted, and non-permitted.
- (v) Value addition in Agriculture produce

3. Food Laws And Regulations:

(12)

- i. Need for food laws, national and international regulations, Codex Alimentarius, FSSAI and other food laws and orders. Consumer protection act (in brief)

4. Packaging Technology:

a. Definition-

(4)

Functions and requirements for effective packaging.

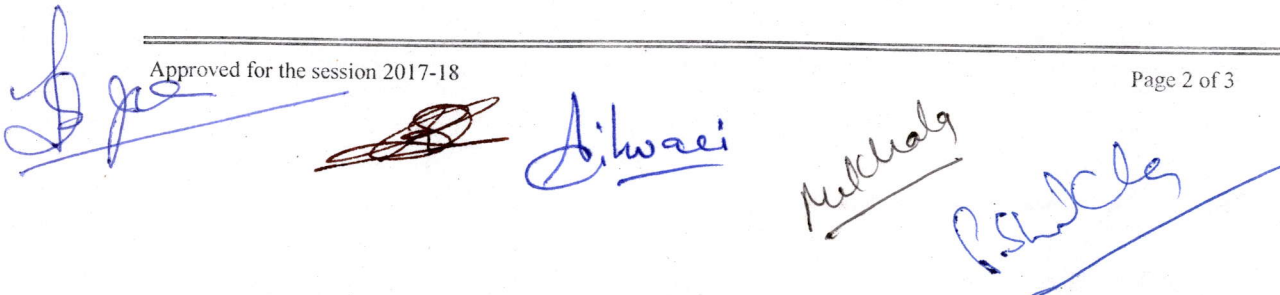
b. Classification of packaging

(6)

Primary, Secondary and Tertiary Packaging, Flexible, rigid and semi-rigid packaging.

- c. **Materials for food packaging:** (6)
Types, various uses, merits and demerits- Paper, Corrugated boxes, Glass, Colour in Glass, Tin, Aluminium and Plastic.
- d. **The influence of packaging on environment .** (6)
- e. **Modern Concepts of Packaging Technology:** (6)
Aseptic packaging, Form-fill seal packaging, edible films, retort pouches, boil-in-box.
- f. **Labelling-** (5)
Importance of labeling, types of labeling, Laws and specifications and consumer information on food pack.
- g. **Quality Testing of Packaging Materials and packaged foods** (6)
Physical and Chemical and microbiological tests, transportation hazards and testing.
- h. **Shelf-Life Testing of Different Packaged Foods.** (5)
- i. **Interaction of Packaging Material with Foods:** (8)
Safe use of plastics in food contact application, Global migration of plastics, tin can corrosion, oxygen interaction, moisture interchange, aroma permeability, Prevention of interaction: Lacquering and its types.

Total = 90 Periods

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Reference:

- Prevention of Food Adulteration Act, 1995 by Eastern Book Company.
- Food Safety and Standards Act, 1986 by Null
- Food Packaging Technology- Handbook NIIR Board
- Food Packaging Technology Hand Book by NIIR Board of Consultant and Engineers
- An Introduction to Food Science, Technology and Quality Management by Devendra Kumar, Bhatt.