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 Food Science, Food Chemistry and Nutrition.

(a) Definition of food, Food as a source of nutrients, functions of food, Basic food groups, Health and Nutrition, Types of Nutrition, Relation between Health and Nutrition, Malnutrition.

(b) Food habits and dimensions of food – Physiological, psychological, anthropological, sociological, economical, role of food and diet on life style.

(8)

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

I. **Monosaccharide-** Glucose, Fructose, Galactose.
II. **Disaccharides-** Sucrose, Maltose, Lactose.
III. **Polysaccharides 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 – structure, sources and Classification of protein and amino acid.

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

(II) Protein Properties and functions-

(a) Isoelectric point, peptide bond, zwiter ion.
(b) Denaturation, coagulation, solubility.
(b) Function of protein in human body.
(c) Biological value.

(12)

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4. Lipids-

(i) Composition, sources, functions and classification.

(ii) Physico chemical properties- melting point, Rancidity- Types, causes and prevention of rancidity.

(iii) Phospholipids as natural emulsifiers. (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. (9)

7. Minerals: Classification, functions, sources, daily requirement and deficiency and excess Of - Ca, P, Fe, Na, K and I. (9)

8. Water – (8)

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.

d. Moisture in food, bound water, free water

9. Food commodities – structure, composition and types.

Cereals (Wheat and Rice), Pulses, Vegetables and fruits, Milk, Egg, Meat and fish, Sugar and Jaggary. (10)

10. Pigments: Chlorophyll, Anthocyanine, Carotinoids, Flavinoids - Structure, physico-chemical properties, Effect of change in pH on pigments and texture. (6)

Total periods = 90

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

No. of Periods

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 flavour. (ii) Flavours in fruits, vegetables and spices.

(8)

3. **Sensory Testing of Foods and Methods of their Evaluation :** Difference between sensory and organoleptic testing, **Factors Affecting Sensory Evaluation, Types of Panels –** Trained and consumer panels

(18)

   a) Difference tests
   b) Ranking tests
   c) Range test
   d) t-test

4. **Designing sensory Testing Laboratory** (3)

PART B: Food Preservation:- 1. Definition and Need of food preservation

2. Principle of Food Preservation And Causes of Spoilage (5)

3. Methods of food Preservation:

(a) **By heat:** Blanching, Pasteurization, Sterilization, UHT sterilization (10)

(b) **By Dehydration:** Principle, simple drying (shade and sun drying), evaporation, factors affecting dehydration. Merits and demerits. (8)

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(c) **By Low Temperature:** Refrigeration– Its advantages, factors affecting refrigeration.

(d) **By Very Low Temperature** Freezing, types of freezing – Quick freezing, sharp freezing and freeze drying application. Difference between freezing and refrigeration, chill injury (12)

(e) **By Chemical Preservatives :** Natural and Synthetic (10)

(f) **Irradiation:** Principle, Types and mechanism of irradiation, permitted doses. Advantages and disadvantages. (6)

1. Nutritive value of preserved food. (6)

Total Classes=90

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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-** (10)
   General Principles, Plant Design, Plant location, plant layout.

2. **Cleaning and Sanitation of Process Plant-** (11)
   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.
   (iv) Boilers.
3. **Safety-** Accidents, Safety training and Enforcement of Safety. (9)
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) (10)
   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—** (9)
   i. Planning for Waste Disposal-solid and liquid
   ii. Fruit waste management.

7. **Catering Management** (13)
   i. Principle and functions
   ii. Tools of management
   iii. Management of Resources
8. **Personnel Management –Personnel Policies.** (8)
9. **Establishment of Small Scale Industry** (10)
10. **Advanced Trends in Food Industries–** Microwave cooking–principle and method, Ohmic heating ,pulsed electric field processing , (10)

Total Periods= 90

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 and characterization of micro-organisms: Bacteria, Fungi, Virus, Protozoa, Algae. (6)

2. Beneficial Effects of Microorganism and their Importance in Food Industry. (10)

3. Spoilage and Contamination of Food Commodities by Microorganisms – sources, types and 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 Organisms – 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 and Soil. (4)

6. Microbial Intoxication and Infections: Food borne illnesses- Bacterial, Fungal, Viral, Protozoal. (4)

P. Shukla 11.5.19 Mehrotra 11/5 11/5/19

B. Food Toxicology

7. Symptoms and Method of Control of Infections of Following Toxins:-

I Bacterial Toxins: (5)

Important toxins and toxicogenic bacteria eg. *Staphylococcus aureus* , *Clostridium botulinum,* (Botulism), *Clostridium perfringens, Shiegella, Salmonella, Brucella, Vibrio, E.coli, Bacillus cereus* and *Yersinia* .

II. Fungal toxins – (7)

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

8. Food Toxicology: Definition and Importance, Toxin in food, lethal dose. (6)

9. Naturally Occurring Toxins In Foods: fish poisoning – ciguatera, scromboid, tetrodotoxin, sea foods (shell fish poisoning), mushrooms (Edible and non edible mushrooms), potato, spices Carcinogens, Cyanogenic glycosides, toxic alkaloids, Dioscorine, Methylxanthins-caffeine, Theophylline, Theobromine, Glucobrassicin, Dicoumarol, Juglone, Ricin, Lectins, Serotorin, Phlorizin, Tyramine, (in very brief)

(18)

10. Metal Toxicity: zinc, arsenic, lead, cadmium, cobalt, copper, Tin and Mercury. (8)

Total =90 Periods

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. **Food loss -** Post harvest losses of grains, fruits, vegetables, data and their preventive measure. **(3)**

2. **Physical Principles Underlying Food Engineering Operations** such as (i) Preparative operations, (ii) Conversion operations (iii) Preservation operations (in very brief) (iv) Allied operations. **(8)**

3. **Physical, Mechanical Properties of food:-** Size, shape, texture, angle of repose, terminal velocity, density, porosity-Instruments for measurement.

4. **Processing Technology of Cereals and Millets –**

(a)Rice: Milling, parboiling of rice, changes during parboiling, advantages and disadvantages.

(b) Other Cereals and Millets:

(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)**

4. **Processing Technology of Legumes:**

(i) Basic processing, anti nutritional factors

(ii) Physico-chemical changes during germination and fermentation to reduce anti nutritional factors **(6)**

5. **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)**

6. **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)**

7. **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.

Dehydrated Milk products: Definition, method of manufacture of whole and skimmed milk powder. **(10)**

8. **Meat, Fish, Poultry and Eggs:**

Meat Processing: - Ante-mortem inspection, post-mortem inspection, tenderization, curing, smoking, canning, reactions involved color changes in meat , use of Nitrogenous compounds as curing agents. **(6)**

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

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

9. **Food available in market-** Processed, conventional, convenience food, fast food, fabricated food, functional food, Dietetic food, formulated food **(3)**

10. **Methods of cooking.** **(3)**

11. **Nutritive Value of cooked and processed foods.** **(2)**

12. **Fortification and Enrichment.** **(2)**

13. **Extrusion Technology: - Principle and Methods** **(2)**

Single screw extruder- advantages and disadvantages of extrusion technology.

14. **New Product Innovation-** Product life cycle, **SWOT/ SWOC** analysis, Product Design Process, Marketing Aspects, non-dairy milk. **(13)**

15. **G.M. FOOD (IN BRIEF)** **(2)**

(TOTAL-90 periods)

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

No. of periods

1. **Food Technology Updates:**
   i. Major centers of food research in India – CFTRI, DFRL, CIFT, NIN, APEDA, ICMR, CIAE, CIPET. (06)
2. **Advances in Food Safety and Quality Management** (14)
   (i) Food adulteration- Definition and types.
   (ii) Qualitative techniques - Common adulterants and their tests: Milk, Vegetable Oil, ghee , Spices and condiments, tea, pulses and honey.
   (iii) Intentional Food Additives:, anti-oxidants, sweeteners, flavor-enhancer, colors-Natural, synthetic, permitted, and non-permitted.
   (iv) Value addition in Agriculture produce
3. **Food Laws And Regulations:** GHP, GMP, HACCP (14)
   i. Need for food laws, national and international regulations, Codex Alimentarious, FSSAI and other food laws and orders. Consumer protection act (in brief)
   ii. Food safety management system -ISO22000.

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:** Types, various uses, merits and demerits- Paper, Corrugated boxes, Glass, Colour in Glass, Tin, Aluminum and Plastic. (6)

d. **Modern Concepts of Packaging Technology:** (6)
Aseptic packaging, Form-fill seal packaging, edible films, retort pouches, boil-in-box.

e. **Labeling-** (6)
Importance of labeling, types of labeling, Laws and specifications and consumer information on food pack, Nutritional labeling.

f. **Quality Testing of Packaging Materials and packaged foods** (12)

Physical test- drop test, vibration test, impact test, compression test, migration test,

Chemical test- migration test water vapour transmission rate test, gas transmission rate test,

Testing of plastic packages- compatibility, hot tack method, layer gauge method, testing of plastic films- gloss, haze, see through (clarity), machinability, slip, curl, rigidity,

Mechanical test- tensile strength, elongation, tear strength, impact strength, burst strength, corrugated board testing- strength tests, bursting strength, edge crush test (ECT), flat crush test (FCT), box compression test (BCT) and

Microbiological tests- can swell- hydrogen swell test, carbon-di-oxide swell test, maximum probable number (MPN)
transportation hazards and testing.

h. **Shelf-Life Testing of Different Packaged Foods.** (6)

i. **Interaction of Packaging Material with Foods:** (10)
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 Period