VIKRAMA SIMHAPURI UNIVERSITY :: NELLORE.

Common Framework of CBCS for Colleges in Andhra Pradesh

(A.P. State of Council of Higher Education)

B.Sc. FOOD SCIENCE TECHNOLOGY Course Syllabus under CBCS

(*with effect from the Academic Year 2020-21*)

COURSE STRUCTURE

Structure of FOOD SCIENCE TECHNOLOGY Course Syllabus under CBCS

Sem	Paper	Title of course	Credits	Hrs	Marks		
					Int	Univ	Total
I	I	Principles of Food Chemistry	4	4	25	75	100
		Practical-I : Principles of Food Chemistry	1	2	0	50	50
II	II	Basic Food Micro Biology	4	4	25	75	100
		Practical-II : Basic Food Micro Biology	1	2	0	50	50
III	III	Fundamentals of Food Technology	4	4	25	75	100
		Practical-III : Fundamentals of Food Technology	1	2	0	50	50
IV	IV	Applied Food Chemistry	4	4	25	75	100
		Practical-IV : Applied Food Chemistry	1	2	0	50	50
	V	Fermentation Technology	4	4	25	75	100
		Practical-V : Fermentation Technology	1	2	0	50	50
V	6 (a)	Technology of Fruits, Vegetables and Plantation Crops	4	4	25	75	100
		Practical-VI : Technology of Fruits, Vegetables and Plantation Crops	1	2	0	50	50
	7 (a)	Baking and Confectionery Technologies	4	4	25	75	100
		Practical-VII : Baking and Confectionery Technologies	1	2	0	50	50
		(or)					
	6 (b)	Mathematics & Statistics for Food Technology	4	4	25	75	100
		Practical VI : Mathematics & Statistics for Food Technology	1	2	0	50	50
	7 (b)	Food Additives	4	4	25	75	100
		Practical VII : Food Additives	1	2	0	50	50
		(or)					
	6 (c)	Food Quality Testing and Evaluation	4	4	25	75	100
		Practical VI : Food Quality Testing and Evaluation	1	2	0	50	50
	7 (c)	Food Packaging	4	4	25	75	100
		Practical VII : Food Packaging	1	2	0	50	50
		(or)					
	6 (d)	Food Product Development and Marketing	4	4	25	75	100
		Practical VI : Food Product Development and Marketing	1	2	0	50	50
	7 (d)	Food Quality Control and Analysis	4	4	25	75	100
		Practical VII : Food Quality Control and Analysis	1	2	0	50	50

Note – 1 : For Semester-V, for the domain subject Food Science Technology, any one of the five pairs of SECs shall be course as courses 6 and 7, i.e. 6A&7A or 6B&7B or 6C&7C or 6D&7D. The pair shall not be broken (ABC allotment is random, not one any priority basis).

Note – 2 : One of the main objectives of skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, Teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.

Note – 3 : Faculty eligibility for teaching the course : M.Sc (Food Technology / Bio-Technology / Micro Biology).

Note – 3 : Faculty eligibility for teaching the 6(b): M.Sc (Mathematics).

SEMESTER – I
PAPER-I :: PRINCIPLES OF FOOD CHEMISTRY

Teaching Hours: 4 Hours / Week (Total – 60 Hours) Credits: 4
Mid Sem. Exam: 25 Marks Sem. end exam: 75 Marks

UNIT – I : WATER AND IMPORTANCE

Definition of water in Food, Structure of water and Ice, Types of water, Interaction of water with Solutes.

Definition of Acids and Bases, Ampholytes, P^{OH}, P^{Ka}, Weak and Strong Acids.

Definition of Buffer, Buffer Capacity, Henderson-Hasselbalch equation and its uses-limitations Laboratory use of Buffers, physiological Importance of Buffers in Body.

Definition of P^{H}, Importance, Measurement of P^{H}, P^{H} meter, Emulsions.

UNIT – II : CARBOHYDRATES

Introduction, Classification (Mono, Oligo and Poly Saccharides), Chemical reactions of Mono Saccharides like Glucose and Fructose. Structure and Importance of Mono Saccharides (Glucose, Fructose) Mutarotation, Annomers, Epimers, Killiani Synthesis Lobrey-debruyn-VanEkenstein Rearrangement.

UNIT – III : AMINO ACIDS & PROTEINS

Introduction, Classification, Preparation of Amino Acids – Strecker Synthesis, Melonic Ester Synthesis. Physical Properties - Zwitterion, Iso-Electric point. Proteins – Definition, Structural Determination of proteins and Peptide Synthesis.

UNIT – IV : FOOD ENZYMES

Introduction, Types and classification, Functions and Enzyme Activity, Factors affecting Food enzyme, Applications of Enzymes in Food Industry, Maillard-Browning Reaction and its Importance.

UNIT – V : NUCLEIC ACIDS

Introduction, Types of Nucleic Acid Structure of Nucleic Acids – Primary, Secondary and Teritiary Structure of DNA, Types of RNA, mRNA, tRNA and rRNA,Structure of RNA, Replication, Transcription, Translation and Genetic Code.

RECOMMENDED READINGS

1. Andrew L. Winton and Katebarber Winton, Techniques of food analysis", agrobios, Jodhpur,(2001)
2. Deman JM, "Principles of Food Chemistry", AVI Publishing, 1980.
3. Fennema OR," Food Chemistry", Marcel Dekker Publishers, 1996.
4. Lowe B., "Experimental Cookery", John Wiely & Sons Inc. New York, 1965. Mahindru SN," Food Additives Publishing Company Ltd., New Delhi -2000.
5. Characteristics, Details and Estimation", Tata Mc. Graw-Hill
6. Meyer LH, "Food Chemistry", Affiliated East West Press Pvt. Ltd. Bombay -1987.
7. Norman N Potter Joseph H and Hotchkirs, "Food Science", 5th edition, CBS, Publishers Distributor, NewDelhi, 1996.
8. Oser BL, Hawk's," Physiological Chemistry", TATA, MeGraw-Hill Publishing Co.,Ltd., Bombay -1965.
9. Fennema Owen R, "Principles of Food Science Part - I". "Food, Chemistry", Marcel Dekker Inc, New York, 1976.
10. Ranganna S; "Handbook of Analysis and Quality Control for Fruit and Vegetable Products" 2nd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi 1986.
11. Shakuntala Manay N and Shadakshara Swamy M, "Foods, Facts and Principles", New Age International Publishers (P) Ltd., New Delhi, 1987.

(LABORATORY COURSE-I)
PRACTICAL – I :: PRINCIPLES OF FOOD CHEMISTRY
(At the End of Semester-I)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Determination of Carbonate and Bi-carbonate in Water Samples.
2. Determination of Hardness of Water using by EDTA
a. Permanent Hardness
b. Temporary Hardness
3. Determination of Chloride in Water Sample
4. Identification of Amino Acids by Paper Chromatography

MODEL PAPER
(SEMESTER–I)
PAPER-I : PRINCIPLES OF FOOD CHEMISTRY

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

1. Define water in Food and types of water.
2. Explain Emulsions with example.
3. Write down Annomers and Mutarotation.
4. Explain Killiani synthesis.
5. Write down Peptide synthesis.
6. Explain Zwitter ion and Isoelectric point.
7. Write down Maillard – Browning reaction.
8. Explain factors effecting Food enzymes.
9. Write note on Genetic code and Transcription.
10. Explain the types of Nucleic acid.

PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

11. Explain Henderson equation and its uses, limitations.
12. Write down the physiological importance of Buffers in body and Laboratory use of Buffers.
13. Draw the structure of Glucose.
14. What are Carbohydrates. Write down the classification of Carbohydrates.
15. How is Amino Acids prepared from strecker's synthesis and Melonic ester synthesis.
16. What are Proteins. Write down structural determination of Proteins.
17. What are Enzymes. Write down types and classification of Enzymes.
18. Write down the Applications of Enzymes in Food industry.
19. Write down the detailed structure of DNA.
20. Explain the different types of RNA and structure of RNA.

NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER – II
PAPER-II :: BASIC FOOD MICROBIOLOGY

Teaching Hours: 4 Hours / Week (Total – 60 Hours) Credits: 4
Mid Sem. Exam: 25 Marks Sem. end exam: 75 Marks

UNIT-I : (12 Hours)

INTRODUCTION TO FOOD MICROBIOLOGY : Introduction of microbiology and its relevance to everyday life, Inter-relationship of microbiology with other sciences. History and Development of Food Microbiology. Definition and Scope of food microbiology.
General characteristics of bacteria, fungi, virus, protozoa, and algae. Beneficial effect of microorganisms.

UNIT-II : (12 Hours)

CULTIVATION OF MICRO-ORGANISMS: Methods of isolation and cultivation, Serial dilution method, Pure culture technique. Streaking Methods, Preservation of Micro Organisms.

UNIT-III : (12 Hours)

FOOD SPOILAGE: Microorganisms causing spoilage – Spoilage definition, principles underlying spoilage – Chemical, Physical and physiological changes caused by microorganisms in food due to spoilage.

UNIT-IV : (12 Hours)

CONTAMINATION : Food contamination – sources of contamination of foods, water.
Sources of contaminations in :
a) Cereals and cereal products.
b) Sugars and sugar products.
c) Legumes, nuts and oilseeds.
d) Fruits and Vegetables.
e) Eggs and poultry.
f) Meat and Meat products.
g) Fish and Other sea foods.
h) Milk and Milk products.

UNIT-V : (12 Hours)

FOOD SAFETY : Concept, factor affecting food safety-physical, chemical and biological hazards. Food hazards of microbial orgin-food borne disease, and water borne diseases.

RECOMMENDED READINGS :

1) Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi,2004
2) Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
3) Garbutt, John. Essentials of Food Microbiology, Arnold, London, 1997.
4) Banwartt: Food Microbiology
5) Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993.

(LABORATORY COURSE-II)
PRACTICAL – II :: BASIC FOOD MICROBIOLOGY
(At the End of Semester-II)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Introduction to Microbiology Laboratory, safety Practices
2. Equipment used in microbiology laboratory.
3. Functioning and use of compound microscope
4. Cleaning and sterilization of glassware
5. Preparation and sterilization of nutrient broth
6. Preparation of slant, stab and plates using nutrient agar
7. Morphological study of bacteria and fungi using permanent slides
8. Simple staining
9. Gram's staining
10. Visits (at least two) to food processing units or any other organization dealing with advanced methods in food microbiology.

MODEL PAPER
SEMESTER – II
PAPER-II : BASIC FOOD MICROBIOLOGY

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

1. Beneficial effect of Micro organisms.
2. Pure culture.
3. Food spoilage.
4. Milk products.
5. Water borne diseases.
6. Fungi.
7. Serial Dilution.
8. Contamination of Sea foods.
9. Algae.
10. Contamination of Cereals.

PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

11. Describe the inter relation of microbiology with other science.
12. Give an account on general chareltors of bacteria.
13. Preservation of micro organisms.
14. Explain about microbial isolation techniques.
15. Micro organisms causing food spoilage.
16. Explain chemical and physical changes during food spoilage.
17. Give an account on source of food contamination.
18. Contamination in meet.
19. Write about food Safety.
20. Food Borne Diseases.

NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER – III
PAPER-III :: FUNDAMENTALS OF FOOD TECHNOLOGY

Teaching Hours: 4 Hours / Week (Total – 60 Hours) Credits: 4
Mid Sem. Exam: 25 Marks Sem. end exam: 75 Marks

UNIT-I : NUTRITION :

- **NUTRITION** – Introduction of Nutrition & Food Science, Classification of food groups, Balance diet, Food Pyramids, Classification of nutrients – Macro nutrients (Carbohydrate, Protein, fat), Micro nutrients – (Vitamins & Minerals) Role of Nutrition.

UNIT-II : CEREALS AND MILLETS

- **CEREALS** - Introduction, structure, composition and uses and by-products of cereals. Structure, Composition and types of rice and wheat, Diagrammatic representation of longitudinal structure of wheat grain and rice.
- **MILLETS** -Varieties, composition and uses of maize, sorghum, barley, rye, oats, pearl millet and finger millet.

UNIT-III : PULSES, LEGUMES AND OIL SEEDS

- **PULSES** - Introduction, common names and scientific names of different pulses. Processing of pulses - soaking, germination, decortications, cookingand fermentation.
- **LUGUMES** - Composition, nutritive value, antinutritional factors, changes during cooking. Germination and changes during Germination.
- **OIL SEEDS** - Composition, nutritive value of oil, Processing of oil seeds - Soya bean, coconut.

UNIT-IV : MILK AND MILK PRODUCTS

- **MILK AND MILK PRODUCTS** – Composition, nutritive value, effect of acid, heat enzyme, salt onmilk, Processing of milk – clarification, pasteurization and homogenization, cheese, butter, skim milk powder, whole milk powder, condensed milk, yoghurt.

UNIT-V : MEAT, FISH, EGG AND FRUIITS, VEGETABLES

- **MEAT** – Structure, composition, nutritive value, Changes during cooking, ageing.
- **FISH** – Composition and nutritive value, fish products – fish meal, fish flour and fish oils.
- **EGG** – Structure, composition, nutritive value, grading, changes during storage, role of egg in food industry.
- **FRUITS** - Cliamateric, Non-cliamaetric fruits, ripening of fruits.
- **VEGETABLES** - Classification, composition, nutritive value, changes during cooking ofvegetables,

Recommended Readings :-

1. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press, 2003
2. De S, Outlines of Dairy Technology, Oxford Publishers, 1980
3. Deman JM, Principles of Food Chemistry, 2nd ed. Van Nostrand Reinhold, NY, 1990
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
5. Jenkins WA and Harrington JP, Packaging Foods with Plastics, Technomic PublishingCompany Inc., USA, 1991.
6. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New AgeInternational (P) Ltd. Publishers, New Delhi, 1987.
7. Meyer LH, Food Chemistry, CBS Publication, New Delhi, 1987
8. Potter NH, Food Science, CBS Publication, New Delhi, 1998
9. Ramaswamy H and Marcott M,Food Processing Principles and Applications, CRC Press,
10. Ranganna S, Handbook of Analysis and Quality Control for Fruits and VegetableProducts, 2nd ed. TMH Education Pvt. Ltd, 1986.

(LABORATORY COURSE-III)
PRACTICAL – III :: FUNDAMENTALS OF FOOD TECHNOLOGY
(At the End of Semester-III)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Estimation of reducing sugar by Fehlings procedure
2. Estimation of salt content in butter
3. Estimation of protein content by formol titration
4. Demonstration of the Soxhlet method for determination of fat content
5. Determination of acidity of water
6. Determination of alkalinity/hardness of water
7. Demonstration of the Kjeldahl's method for estimation of protein content

MODEL PAPER
SEMESTER – III
PAPER-III : FUNDAMENTALS OF FOOD TECHNOLOGY

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

1. Finger Millets.
2. Nutritive Value of oil.
3. Yoghurt.
4. Fish oil.
5. Balanced Diet.
6. Oats.
7. Processing of Coconut Oil.
8. Cheese.
9. Meat.
10. Role of nutrition.

PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

11. Classification of Food groups.
12. Write about food pyramids.
13. Describe the structure of wheat.
14. Write about structure. Composition & Type of rice.
15. Give an account of pulses.
16. Process of Soyabean Oil Making.
17. Explain about nutritive value & composition of milk.
18. Describe the processing of Milk.
19. Role of Egg in Food industry.
20. Give an Account on Climatric & Non-Climatric Fruits.

NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER – IV
PAPER-IV :: APPLIED FOOD CHEMISTRY

Teaching Hours: 4 Hours / Week (Total – 60 Hours) **Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT – I
CHEMICAL BONDING AND PERIODIC TABLE

Characteristics of Covalent Bond, Ionic Bond Co-ordinate Covalent Bond (Dative), Hydrogen Bond Shape of orbital's Bond length, Bond order, Bond angle valence bond Theory (Hybridisation) with example Nickel Tetra Carbonyl [Ni(Co)4].

Modern Periodic Table: - Classification of elements in periodic table - General properties of s,p,d and f Block elements. Lanthanide contraction, Inert pair effect

UNIT – II
PRINCIPLES AND TYPES OF ORGANIC REACTIONS

Nomenclature and Isomerism, Homolytic and Heterolytic Fission. Types of reactions- Addition, Elimination, Substiution- Rearrangement with one example. Resonance Vs. Tautomerism.

Aldol condensation,Cannizaros Reactions, Pinacol-Pinacolone Rearrangement. Reactive Intermediates-Carbonium Ion, Carban Ion, Free radicals, Carbenes

UNIT – III
GASES

Introduction deviation of Ideal Gas Equation. Vander Waal's Equation Vander Waal's Constants. Critical Constants, Relation between Critical Constants and Vander Waal's Constants. Law of Corresponding States-Reduced Equation of States, Liquification of Gases Joule –Thomson Effect, One methods of Liquification of Gases.

UNIT – IV
CHEMICAL KINETICS

Basic Terminology - Rate of Reaction, Order, Molecularity, Determination of Rate Constants for Zero, First and Second-Order Reactions, General Methods to determine the Order of a Reaction Effect of Temperature on Rate of Reaction, Concept of Activation Energy and Arrhenius Equation.

UNIT – V
ELECTRO-CHEMISTRY AND PHOTO-CHEMISTRY

EMF of Cell - Galvanic Cell, Standard Electrode Potential – Nernst Equation, Types of Electrodes- Hydrogen Electrode, Calomel Electrode Beer-Lamberts Law of Photochemistry (or) Photochemical Equivalence, Quantum Efficiency and High and Low Quantum Yield of Reactions, Fluorescence and phosphorescence.

TEXT BOOKS
F.A. Cotton, G. Wilkinson and P. Gans, Basic Inorganic Chemistry, 3rd Edition, John Wiley & Sons, 2010.
R.T. Morrison and R.N. Boyd, Organic Chemistry, 6th Edition, Prentice Hall, New Delhi, 2001.
B.R. Puri, L.R. Sharma and Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co, Jalandhar, 2004.
K.K. Rohatgi-Mukherjee, Fundamentals of Photochemistry, Wiley-Eastern Ltd., New Delhi, 2014.

(LABORATORY COURSE : IV)
PRACTICAL – IV :: APPLIED FOOD CHEMISTRY
(At the End of Semester-IV)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Determination of Concentration of **Hcl** Conductometrically using Standard **NaoH** Solution
2. Determination of Concentration of **Acetic Acid** (**CH_3COOH**) Conductometrically using Standard **NaoH** Solution
3. Determination of Rate Constant For Acid Catalysed Ester Hydrolysis

MODEL PAPER
SEMESTER – IV
PAPER-IV : APPLIED FOOD CHEMISTRY

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

1. Write down the characteristics of Covalent bond and Ionic bond.
2. Draw the shapes of Orbitals and Bond order.
3. Explain Homolytic and Heterolytic fission with examples.
4. Write down the mechanism of Cannizaro's reaction.
5. Explain Joule – Thomson effect.
6. Derive the Ideal gas equation.
7. Explain order and Molecularity of the reaction.
8. Write down Arrhenius equation.
9. Derive the Nernst equation.
10. Explain Fluorescence and Phosphorescence.

PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

11. Explain Hybridisation. Draw the structure of $[Ni(CO)_4]$ basing on valence bond theory.
12. Define Lanthanoid contraction. Explain effects of Lanthanoid contraction.
13. Write down types of Organic reactions with examples.
14. Write down the mechanism of Pinacol – Pinacolone rearrangement and carboinum ion.
15. Derive the Relation between critical constants and Vanderwaal constants.
16. Explain critical constants and Law of corresponding states.
17. Derive the rate constant for second order reaction.
18. Write down the three methods to determine an order of reaction.
19. Explain High and Low Quantum yield or reactions.
20. Write note on calomel electrode and Quantum efficiency.

NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER-IV

PAPER-V :: FERMENTATION TECHNOLOGY

Teaching Hours: 4 Hours / Week (Total – 60 Hours) **Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT-I :

INTRODUCTION TO FERMENTATION : Fermentations, Types of Fermentation, processes Rate of microbial growth and death. Batch & Continuous Fermentation, Fermentation media, carbon and nitrogen sources, Types of Fermenters.

UNIT-II :

PRODUCTION OF MICROBIAL METABOLITES : Production of organic acids: citric acid, Acetic acid and lactic acid. Production of amino acids: L-glutamic acid and L-aspartic Acid.

UNIT-III :

PRODUCTION OF MICROBIAL METABOLITES : Production of antibiotics: penicillin and tetracycline. Production of industrial enzymes: Pectinases, Amylases and Proteases.

UNIT-IV :

FOOD FERMENTATIONS : Fermented milk foods: Cheese and Butter. Fermented vegetable foods-Sauerkraut, fermented pickles and soya sauce and Tofu.

UNIT-V :

PRODUCTION OF FERMENTED BEVERAGES : Beer and wine - Mushroom culture. Production of Baker's yeast and Commercial Production of bread.

RECOMMENDED READINGS

1. Stanburry P.P. and Whitaker, A. 1984. Principles of Fermentation Technology.Pergamon Press, Oxford UK.
2. Steinkraus, K.H. 1983. Handbook of Indigenous Fermented Foods. Marcel Dekker, NewYork.

(LABORATORY COURSE-V)
PRACTICAL–V :: FERMENTATION TECHNOLOGY
(At the End of Semester-V)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Isolation and characterization of industrial cultures.
2. Analysis of raw materials.
3. Fermented beverages – Production and analysis of wine and beer
4. Production of fermented pickles.
5. Production of Citric acid
6. Baker's yeast production.
7. Preparation of whey based fermented beverages.
8. Production and analysis of Vinegar

TEXT BOOKS:

1. Fermentation, A Practical approach IRL.

MODEL PAPER

SEMESTER – IV

PAPER-V : FERMENTATION TECHNOLOGY

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

1. Fermentation media.
2. Acetic acid.
3. Pectinases.
4. Soya savce.
5. Baker's Yeast.
6. Wine.
7. Tofu.
8. Tetra Cycline.
9. Glutamic Acid.
10. Growth Curve.

PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

11. Define fermentation and write about batch & continuous fermentation.
12. Give an account on ideal Bio-Ractor.
13. Describe the production of Citric Acid.
14. Explain the process of Aspartic Acid production.
15. Penciline Production.
16. Fermentation of Amylase.
17. Explain the following (a) cheese (b) Butter.
18. Fermented Pickles.
19. Give an account on beer production.
20. Mushroom Culture.

NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER-V

PAPER-6(A) :: TECHNOLOGY OF FRUITS, VEGETABLES AND PLANTATIONCROPS

Teaching Hours: 4 Hours / Week (Total – 60 Hours) **Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT-I :

A. INTRODUCTION

- Importance of production in trends of fruits and vegetable,
- Reasons of spoilage.
- History and need of preservation.
- Need for processing and preservation.

B. CANNING AND BOTTLING OF FRUITS AND VEGETABLES

- Selection of fruits and vegetables,
- Process of canning,
- Factors affecting the process- time and temperature,
- Containers of packing,
- Lacquering,
- Syrups and brines for canning,
- Spoilage in canned foods**.**

UNIT-II : BEVERAGES

- Processing of fruit juices (selection, juice extraction, deaeration, straining, filteration and clarification), exhausting and sealing.
- Preservation of fruit juices.
- Processing of squashes, cordials, nectors, concentrates and powders.

UNIT-III : JAMS, JELLIES AND MARMALADES

- **JAM:** Constituents, selection of fruits, processing & technology
- **JELLY:** Constituents, selection , Role of pectin ratio, Theory of jelly formation,Processing & technology, defects in jelly
- Marmalade: Types, processing & technology, defects.

UNIT-IV

A. PICKLES, CHUTNEYS AND SAUCES

- Processing,
- Types,
- Causes of spoilage in pickling.

B. TOMATO PRODUCTS

- Selection of tomatoes,
- Pulping and processing of tomato juice, tomato puree, paste, ketchup, sauce & soup andsoup powder.

UNIT-V

A. SPICES

- Processing and properties of major and minor spices
- Essential oils & oleoresins

B. TEA-COFFEE AND COCOA

- Processing
- Variety and products

RECOMMENDED READINGS :

1. Girdharilal, Siddappaa, G.S and Tandon, G.L., Preservation of fruits & Vegetables,ICAR, New Delhi, 1998.
2. W B Crusess. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India.
3. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers,2004.

(LABORATORY COURSE-V)

PRACTICAL–6(A) :: TECHNOLOGY OF FRUITS, VEGETABLES AND PLANTATIONCROPS

(At the End of Semester-V)

1. Estimation of total soluble solids (TSS).
2. Estimation of pH and acidity of products.
3. Estimation of brix : acidity ratio
4. Estimation of ascorbic acid and effect of heat treatment on it.
5. To study the steps of can making process.
6. Preparation and evaluation of pectin products.

MODEL PAPER
SEMESTER-V
PAPER-6(A) : TECHNOLOGY OF FRUITS, VEGETABLES AND PLANTATION CROPS

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

1. Spoilage.
2. Process of canning.
3. Filtration of Juices.
4. Marmalade.
5. Pickles.
6. Tea.
7. Spices.
8. Tomato Puree.
9. Jellis.
10. Uses of Preservation.

PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

11. Write about production trends of fruits.
12. Spoilage in canned foods.
13. Describe the processing of Fruit Juices.
14. Advantages of preservation of Fruit Juices.
15. Explain the theory of Jelly Formation.
16. Marma(AI)E types and Processing.
17. Give an Account on Pickie Spoilage.
18. Tomato Products.
19. Write about advantages & Disadvantages of Coffee.
20. Useses of Spices.

NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER-V

PAPER-7(A) :: BAKING AND CONFECTIONERY TECHNOLOGIES

Teaching Hours: 4 Hours / Week (Total – 60 Hours) Credits: 4
Mid Sem. Exam: 25 Marks Sem. end exam: 75 Marks

UNIT I : (12 Hours)

Baking - Definition, Principles of baking, classification of baked foods. Types of equipments in baking industry, cleaning and sanitizing methods of baking equipments, baking temperature of different products, operation techniques of different baking equipments.

UNIT II : (12 Hours)

Ingredients and Their Role in Baking - Flour, Yeast, sugar, egg, butter, salt, baking powder, colouring, flavouring agents. List of standard colouring and flavouring agents.

UNIT III : (12 Hours)

Preparation of baked foods - Quick breads, cakes and its varieties, different types of biscuits, cookies and pastries. Decoration of baked foods - Icing- Types of Icing used in different bakery product. Role of other ingredients used in icing.

UNIT IV : (12 Hours)

Types of packaging materials used for bakery products, method of packaging. Quality control- Quality control of raw material / finished products.

UNIT V : (12 Hours)

Baking unit/ plant layout & design of a baking unit sanitation and hygiene.

Reference Books:

1. Potter, N. Food Science, The AVI Publishing Co., Inc., West Port, Connecticut, 1975.
2. Modern Pastry Chab, Vol.I and II, A VI Publishing Co., Inc., West Port, Connecticut, 1977.
3. Dubey, S.C. (2007). Basic Baking 5th Ed. Chanakya Mudrak Pvt. Ltd.
4. Manay, S. & Shadaksharaswami, M. (2004). Foods: Facts and Principles, New Age Publishers.
5. Raina et.al. (2003). Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd.
6. Barndt R. L. (1993). Fat & Calorie – Modified Bakery Products, Springer US.
7. Samuel A. Matz (1999). Bakery Technology and Engineering, PAN-TECH International Incorporated.
8. Faridi Faubion (1997). Dough Rheology and Baked Product Texture, CBS Publications.
9. Baker"s Handbook on practical Baking .Wheat Associates, USA, New Delhi.

(LABORATORY COURSE-V)
PRACTICAL-7(A) :: BAKING AND CONFECTIONERY TECHNOLOGIES
(At the End of Semester-V)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Preparation of pizza base and assessment of its quality
2. Preparation of bread and assessment of its quality
3. Preparation of buns and assessment of quality
4. Preparation of butter cake and assessment of its quality.
5. Preparation of sponge cake with icing and assessment of its quality.
6. Preparation of cookies and assessment of quality.
7. Preparation of biscuits and assessment of quality.
8. Visit to a baking industry and preparation of report.

MODEL PAPER
SEMESTER-V
PAPER-7(A) : BAKING AND CONFECTIONERY TECHNOLOGIES

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

1. Banking.
2. Yeast.
3. Cakes.
4. Packing.
5. Sanitation.
6. Baking Equipments.
7. Icing.
8. Cookies.
9. Pastries.
10. Flavouring Agents.

PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

11. Define baking and add a note of classification of banked foods.
12. Cleaning of banking Equipment.
13. Effects of Coloring in Food.
14. Ingredients of Banking.
15. Decoration of Baked Food.
16. Types of Biscuits.
17. Give Account on packaging of Bakery Products.
18. Quality Control of Raw-Materials in baking Industries.
19. Design of Banking Unit.
20. Sanitation and Hygiene in Baking Unit.

NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER-V
PAPER-6(B) :: MATHEMATICS & STATISTICS FOR FOOD TECHNOLOGY

Teaching Hours: 4 Hours / Week (Total – 60 Hours) **Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT-I :

SET THEORY : Definition of Set – Types of Sets-Union of sets- Intersection of Sets-Difference of Sets-Complement of Set-Distributive Laws- D'Morgan's Laws.

UNIT-II :

Introduction measures of central tendency, computation of Arithmetic mean, Median and Mode only for ungrouped data and grouped data. (Numerical Applications Only)

UNIT-III :

Measures of Dispersion, Computation of Range – Coefficient of Range – Variance, Standard Deviation – Coefficient of Variation for grouped and ungrouped data. (Numerical Applications Only)

UNIT-IV :

Meaning of Correlation, Types of correlation Karl-pear sons coefficient of Correlation (for individual series only) Spearmans Rank correlation.

UNIT-V :

Finite Differences – Forward Differences – Backwards Differences.
Newton's forward interpolation formula - Newton's backward interpolation formula.

NOTE : **1.** Concentration on numerical problems Only.
2. Proofs of theorems and Derivations of expressions are committed.

TEXT BOOKS :

1. Statistical Methods – Dr. S.P. Gupta – Chand & Sons.
2. Quantitative Techniques by C. Sathyadevi – S. Chand.

REFERENCE BOOKS :

1. Statistical Methods – Snedecor G.W. & Cochran W.G. Oxford & + DII.
2. Elements of Statistics – Mode. E.B. - Prentice Hall.

SEMESTER-V

PRACTICAL-6(B) :: MATHEMATICS & STATISTICS FOR FOOD TECHNOLOGY

(At the End of Semester-V)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. To find Union and intersection of sets for the given data.
2. To verify Distributive Laws and D'Morgan's Laws for the given data.
3. To find Artemetic men for different type for the given data.
4. To find Median and mode for the given data.
5. To find Range and coefficient of range for the given data.
6. To find Standard Deviation, Co-Efficient variation for the given data.
7. To find correlation Karl-pearsons coefficient correlation for the given data.
8. To find Spearman's Rank correlation for the given data.
9. To find y by using forward interpolation for the given data.
10. To find y by using backward interpolation for the given data.

MODEL PAPER
SEMESTER-V
PAPER-6(B) : MATHEMATICS & STATISTICS FOR FOOD TECHNOLOGY

Time : 3 hours **Max. Marks : 75**

PART-A

Answer any FIVE of the following Questions : ***(5 X 5 = 25 Marks)***

1. If $A=\{1,2,3,4,5,6,7,8\}$ and $B=\{2,4,6,8\}$, then find A-B and B-A.

2. If $A=\{2,6,8,10\}$ and $B=\{6,8,10,11,12\}$ then find $A\cup B$ and $A\cap B$.

3. From the following data the monthly income of ten employees in an office. Calculate the Arithmetic mean
Income (Rs) : 4780, 5760, 6690, 7750, 4840, 4920, 6100, 7210, 7050, 6950.

4. Find Median, and Mode to the following data :
4, 5, 6, 4, 5, 4, 10

5. Find the range to the following data 200, 210, 208, 160, 220, 250.

6. If mean of a distribution is 160, Mode 157 Standard deviation is 50. Find co-efficient of Variation.

7. Find Correlation Coefficient to the Following data $\Sigma x^2 = 222$, $\Sigma y^2 = 364$, $\sum xy = 261$

8. Find Coefficient of variation for $\sum x = 100$, n=10, $\sigma = 5$

9. Construct a forward difference table from the following table

x	**0**	**1**	**2**	**3**	**4**
y	**1**	**1.5**	**2.2**	**3.1**	**4.6**

10. Construct a backward difference table for $y=\log x$, given that

x	10	20	30	40	50
y	1.0000	1.3010	1.4771	1.6021	1.6990

Find the value of $\nabla^4 \log 50$

PART-B

Answer Any <u>FIVE</u> Questions each question carries equal marks.: 5 X 10 = 50Marks

11. If $A=\{8,3,2,6,5\}$, $B=\{1,2,7,9\}$, $C=\{4,5,9\}$ then prove that $A\cup(B\cup C)=(A\cup B)\cup C$.

12. If $U=\{1,2,3,4,5,6,7,8\}$, $A=\{1,2,3,4\}$, $B=\{4,5,6,7,8\}$ then verify

(a) $(A\cup B)^T=A^T\cap B^T$ (b) $(A\cap B)^T=A^T\cup B^T$

13. Calculate Arithmetic Mean for the following data :

X	**1**	**2**	**3**	**4**	**5**	**6**	**7**
F	**5**	**9**	**12**	**17**	**14**	**10**	**6**

14. Find Mode to the following data :

Marks	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**
No of students	**3**	**15**	**7**	**10**	**12**

15. The following are the runs scored by two batsmen A and B in 10 Innings. Find out who is better run getter and who is more consistent player

A runs	**90**	**110**	**5**	**10**	**125**	**15**	**35**	**16**	**134**	**10**
B runs	**65**	**68**	**52**	**47**	**63**	**25**	**25**	**60**	**55**	**60**

16. Compute Variance and Standard Deviation for the following data :

C.I	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**
F	**4**	**14**	**22**	**30**	**20**	**8**	**2**

17. Calculate coefficient of correlation of the following data :

X	**10**	**12**	**13**	**16**	**17**	**20**	**25**	**30**	**34**
Y	**20**	**22**	**26**	**27**	**29**	**33**	**37**	**40**	**42**

18. Calculate Rank Correlation for the data given below :

X	**72**	**70**	**46**	**69**	**56**	**65**	**65**	**45**	**35**	**75**
Y	**111**	**110**	**105**	**112**	**115**	**115**	**101**	**118**	**107**	**120**

19. Use Newton's forward interpolation formula and the given following table of values of obtain the value f(x), when x = 1.4

x	:	1.1	1.3	1.5	1.7	1.9
f(x)	:	0.21	0.69	1.25	1.89	2.61

20. The population of a town in the decimal census was given below table. Estimate the population for the year 1925.

Year (x)	**:**	**1891**	**1901**	**1911**	**1921**	**1931**
Population (y)	**:**	**46**	**66**	**81**	**93**	**101**

<u>NOTE:</u> For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER-V
PAPER-7(B) :: FOOD ADDITIVES

Teaching Hours: 4 Hours / Week **(Total – 60 Hours) Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT - I :

Introduction to Food Additives – Types of additives with examples - benefits of additives - risks of additives, Functions and classification of food additives. Food Colors – sources, types with reference to natural & synthetic. Non-permitted colors – risks, health hazards.

UNIT - II :

Nutritional additives (Fortificants / Supplements), requirements (RDA and ADI), occurrence & commercial forms of various vitamins & minerals available. Antimicrobial agents – Application of benzoic acid & benzoates, Sorbic acid & sorbates, short chain acids & salts. Antibrowning agents – food applications.

UNIT - III :

Naturally occurring food additives, classification, role in food processing and health implications. Anti-oxidants and chelating agents, types and examples of anti-oxidants, their role in foods, natural and synthetic anti-oxidents - their mode of action in foods. Food additives and hygiene sensitivity. Applications of antioxidants in food industry.

UNIT - IV :

Toxicology and Safety evaluation of food additives, beneficial/toxic effects, Generally Recognized As Safe (GRAS), tolerance levels and toxic levels in food.

Methods of estimating dietary intake of food additives. Preservatives - Natural and chemical preservatives and their chemical action on foods and human system.

UNIT - V :

Food flavors – natural, nature identical, synthetic. Flavor enhancers, Potentiators & applications. Flavoring materials made by processing. Applications of flavors in food industry.

Books for Reference:

1. AL Branen, Davidson and S. Salminen, *Food Additives*. Marcel Dekker Inc NY 1990.
2. Swaminathan, *Food Science, Chemistry & Experimental Foods*. Bappco Publishers, Bangalore.
3. Mahindra S.N., *Food additives – Characteristics detection and estimation*. Tata Mc Graw Hill Publication Company, New Delhi.
4. Srivastav, R.P. and Sanjeev Kumar, *Fruit and Vegetable Preservation, Principles and Practice*. International Book Distribution Company, New Delhi.
5. Food Facts & Principles by Shakunthala manay & Shadakhraswamy.
6. Food Science by Srilakshmi second edition,2002.
7. Potter, N. Food Science, The AVI Publishing Co., Inc., West Port, Connecticut, 1975.
8. Sunetra Roday, Food Science and Nutrition , 2nd edn. Oxford Hitech printers.

SEMESTER-V

PRACTICAL-7(B) :: FOOD ADDITIVES

(At the End of Semester-V)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Estimation of NaCl in processed foods.
2. Estimation of sulfated ash.
3. Estimation of SO2.
4. Estimation of Benzoate.
5. Estimation of Pectin from Fruits and Vegetables.
6. Determination of Lycopene content in foods.
7. Estimation of Chlorophyll content.
8. Estimation of Carotenoids.
9. Estimation of total soluble solids using refractometer.
10. Effect of NaCl in food preservation.

MODEL PAPER
SEMESTER-V
PAPER-7(B) : FOOD ADDITIVES

Time : 3 hours **Max. Marks : 75**

PART – A

I. ***Answer any FIVE of the following Questions. Each carries FIVE marks.*** ***5 X 5 = 25 Marks***

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PART – B

II. ***Answer any FIVE of the Following Questions. Each Carries TEN Marks.*** ***5 X 10 = 50 Marks***

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NOTE: ***For paper setter choosing two short Questions and two Long Questions from each unit.***

SEMESTER-V

PAPER-6(C) :: FOOD QUALITY TESTING AND EVALUATION

UNIT-I: INTRODUCTION TO QUALITY ATTRIBUTES

- Appearance, flavour, textural factors and additional quality factors.
- Organs involved in taste perception- tongue, papillae, taste buds, salivary glands
- Mechanism of taste perception.
- Chemicals responsible for sweet, salt, sour, and bitter taste their structure and chemical dimensions.
- Factors affecting taste quality, reaction time and factors affecting it.
- Absolute and recognition threshold.
- Taste abnormalities.

UNIT-II : OLFACTION

- Mechanism of odour perception.
- Prerequisites for odour perception.
- Odour classification.
- Chemical specificity of odour.
- Measurement of odour using different techniques – primitive, double tube olfactometer,
- Elseberg techniques, Wenzel's olfactometer, sniffing, merits and demerits of each methods.
- Olfactory abnormalities.

UNIT-III: COLOUR

- Natural and synthetic colours.
- Functions of colour in foods.
- Optical aspect of colour.
- Perception of colour.
- Quantitative & Qualitative analysis of colour.

UNIT-IV: TEXTURE

- Definition and classification of texture profile.
- Subjective evaluation, phases of oral processing.
- Objective analysis, rheological methods of texture measurement including rheologicalmodels.
- Measurement of texture in various food groups viz. cereals, dairy, fruits and vegetables,meat and meat products.

UNIT-V : METHODS FOR DETERMINING QUALITY

- Subjective and objective methods. Sensory assessment of food quality – appearance, color, flavor, texture and taste, different methods of sensory analysis, preparation of score card, panel criteria, sensory evaluation room.

RECOMMENDED READINGS

1. Amerine, Pangborn & Roessler, Principles of sensory evaluation of food, Academic Press, London,1965
2. DeMan, 3rd edition, Principles of Food Chemistry, Springer, 2007.
3. Meilgard, Sensory evaluation Techniques, 3rd ed CRC Press LLC, 1999
4. Yeshajahu Pomeranz & Clifton E. Meloan, Food Analysis & Theory & Practice, 1stIndian ed. CBS Publisher & Distributors, New Delhi, 2002

SEMESTER-V

PRACTICAL-6(C) :: FOOD QUALITY TESTING AND EVALUATION

(At the End of Semester-V)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Training of sensory panel for flavor perception
2. To perform sensitivity tests for four basic tastes
3. To perform difference tests
4. To identify a few chemicals and related odors
5. Sensory evaluation of milk and detection of flavor defects in milk.
6. Extraction of pigments from various fruits and vegetables and influence of heating timeand pH
7. Sensory evaluation of biscuit samples for textural properties
8. Textural evaluation of various food products using texturometer.
9. Simple tests for detection of common adulterants - formaldehyde, starch, cane sugar,hydrogen peroxide, sodium bicarbonate in milk.
10. Colour estimation by Tintometer.

MODEL PAPER
SEMESTER-V
PAPER-6(C) : FOOD QUALITY TESTING AND EVALUATION

Time : 3 hours **Max. Marks : 75**

PART – A

I. ***Answer any FIVE of the following Questions. Each carries FIVE marks.*** ***5 X 5 = 25 Marks***

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PART – B

II. ***Answer any FIVE of the Following Questions. Each Carries TEN Marks.*** ***5 X 10 = 50 Marks***

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NOTE: ***For paper setter choosing two short Questions and two Long Questions from each unit.***

SEMESTER-V
PAPER–7(C) :: FOOD PACKAGING

Teaching Hours: 4 Hours / Week (Total – 60 Hours) **Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT- I

Introduction to food packaging in India, need of packaging, Package requirements, package functions, Hazards acting on package during transportation & Storage, labeling laws.

UNIT-II

A. Package Materials: classification packages, paper as package material its manufacture, types, advantages corrugated and paper board boxes etc. Glass as package material, Manufacture, Advantages, disadvantages. Metal as package material manufacture, Advantages, disadvantages, Aluminum as package material,. Its advantages and disadvantages.

B. Plastic as package material classification of polymers, properties of each plastics, uses of each plastics, chemistry of each plastic such as polyethylene, polypropylene, polystyrene, polycarbonate, PVC, PVDC, Cellulose acetate, Nylon etc.

UNIT-III

Lamination Coating and Aseptic packaging Lamination, need of lamination, types, properties, advantages & disadvantages of each type Coating on paper & films, types of coatings. Need of coating, methods of coatings. Aseptic packaging-Need, Advantages, process, system of aseptic packaging and materials used in aseptic packaging. Machineries used in Packing foods.

UNIT- IV

Packaging of Specific Foods Packaging of specific foods with its properties, Like bread, Biscuits, Coffee, Milk powder, egg powder, carbonated beverages. Snack foods, R.T.S.beverages.

UNIT-V

Mechanical and functional tests on Package Various mechanical and functional testesperformed in laboratories on package boxes and package materials.

RECOMMENDED READINGS

1. Handbook of Package Engineering Joseph F. Hanlon
2. Fundamentals of Packaging F.A. Paine
3. Food Packaging Sacharow and Griffin
4. Principles of Food Packaging R. Heiss
5. Flexible Packaging of Foods A.L. Brody
6. Food Packaging and Preservation M. Mathouthi

SEMESTER-V
PRACTICAL- 7(C) :: FOOD PACKAGING
(At the End of Semester-V)

Teaching Hours: 2 Hours / Week **Credits: 1**
Mid Sem. Exam: 0 Marks **Sem. end exam: 50 Marks**

1. Classification of various packages bared on material and rigidity
2. Measurement of thickness of paper, paper boards
3. Measurement of water absorption of paper, paper boards
4. Measurement of puncture resistance of paper and paperboard
5. Measurement Tear resistance of papers
6. Determination of WVTR of films
7. Identification of plastic films
8. Determination of gas transmission rate of package films
9. Determination of coating on package materials
10. Prepackaging practices followed for packing fruits and vegetables

MODEL PAPER

SEMESTER-V

PAPER-7(C) : FOOD PACKAGING

Time : 3 hours **Max. Marks : 75**

PART – A

I. ***Answer any FIVE of the following Questions. Each carries FIVE marks.*** ***5 X 5 = 25 Marks***

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PART – B

II. ***Answer any FIVE of the Following Questions. Each Carries TEN Marks.*** ***5 X 10 = 50 Marks***

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NOTE: ***For paper setter choosing two short Questions and two Long Questions from each unit.***

SEMESTER-V

PAPER–6(D) :: FOOD PRODUCT DEVELOPMENT AND MARKETING

Teaching Hours: 4 Hours / Week (Total – 60 Hours) **Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT-I :
INNOVATIONS IN PRODUCT DEVELOPMENT

- Introduction to the Product development and formulation - Need for Product development
- New Food Products - Definition, Classification, General characteristics of New food product - Classes of new Food products - Line extensions - Repositioning of existing products - New form of existing product - Reformulation - New packaging - Innovative products and Creative products and Value added products
- Factors affecting food product development - Corporate factors - Market place factors, technological pressures - Governmental issues and legislations

UNIT-II :
STAGES/PHASES OF NEW PRODUCT DEVELOPMENT

- Idea generation- Internal and External sources of ideas, Screening, Feasibility studies, Consumer research, Financial review, Product design and Formulation, Process development – Recipe development and scale up, Consumer trials, Test market, Quality assessment of new developed products - Sensory Evaluation, Shelf life Testing, Costing/pricing and economic evaluation of the product, Product launch.

UNIT-III :
FOOD PACKAGING AND LABELING:

- Concepts, Definition, Significance, Principles - Functions - Requirements - Packages with special features of environmental safety, Packaging Materials – Classification, Packaging of foods -Fresh and processed, Primary Packaging Media – Properties andapplications
- Labeling procedures and protocols

UNIT-IV :
STANDARD AND SPECIALIZED NUTRITION PRODUCTS

Product development with reference to nutritional and health needs - Health foods, Sports drinks, Infant foods, Baby foods, Geriatric foods, Value added foods, Functional foods, Neutraceuticals, Pre-biotics and Pro-biotics, Herbal foods, Convenience foods.

UNIT-V :
PRODUCT COMMERCIALIZATION AND MARKETING

- Test Marketing; Evaluating results and analyzing
- Entrepreneurship: Plant location, investment, Financing the project
- Ethics in food product development
- Intellectual property/Patents

RECOMMENDED READINGS

1. Fuller, G.W.(1994) New Food Product Development: From Concept to Market place CRC Press, New York.

2. Man, C.M.D. and Jomes A.A.(1994) Shelf life Evaluation of Foods. Blackie Academic and Professional, London.

3. Shapton, D.A. and Shapton, N.F. (1991) Principles and Practices for the Safe Processingof Foods, Butterworth Heinemann Ltd, Oxford.

4. Graf, E. and Saguy, I.S. 91991), Food Product Development: From Concept to theMarket Place, Van Nostrand Reinhold New York.

5. Oickle, J.G. (1990) New Product Development and Value Added. Food DevelopmentDivision Agriculture, Canada.

6. Proc. Food Processors Institute: A key to Sharpening your Competitive Edge. FoodProcessors Institute, Washington, DC.

7. Mike Stringer and Colin Dennis, "Chilled foods A comprehensive guide" 2nd edition :Woodhead publishing limited, Cambridge, England, 2000.

8. Andrew J. Taylor, "Food Flavour Technology", Sheffield Academic Press, 2002.

9. Debashri Ray "Nutritional Challenge and Total Quality Management" 1st edition; Sarupand Sons, New Delhi, 2002.

10. Rita Singh "Food Biotechnology" Volume 1, 1st edition, Global Vision PublishingHouse, Delhi, 2004.

11. Rita Singh "Food Biotechnology" volume 2, 1st edition, Global Vision Publishing House,Delhi, 2004.

SEMESTER-V

PRACTICAL-6(D) :: FOOD PRODUCT DEVELOPMENT AND MARKETING

(At the End of Semester-V)

1. Market Survey, Consumer survey to identify new products in terms of :

a) Line Extension

b) Repositioning Existing Products

c) New form/Reformulation

d) New packaging of existing products

e) Innovative products Creative Products.

2. Identification of product for development

a) Concept

b) Market research concerned product development

3. Development and Screening the products, developing criteria for screening scaling up

4. Designing score card for sensory evaluation

5. Test Marketing

6. Development of a new Food Product, evaluation – Research Project.

MODEL PAPER
SEMESTER-V
PAPER-6(D) : FOOD PRODUCT DEVELOPMENT AND MARKETING

Time : 3 hours **Max. Marks : 75**

PART – A

I. Answer any FIVE of the following Questions. Each carries FIVE marks. 5 X 5 = 25 Marks

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PART – B

II. Answer any FIVE of the Following Questions. Each Carries TEN Marks. 5 X 10 = 50 Marks

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NOTE: For paper setter choosing two short Questions and two Long Questions from each unit.

SEMESTER-V

PAPER–7(D) :: FOOD QUALITY CONTROL AND ANALYSIS

Teaching Hours: 4 Hours / Week (Total – 60 Hours) **Credits: 4**
Mid Sem. Exam: 25 Marks **Sem. end exam: 75 Marks**

UNIT - I :
FOOD QUALITY, ASSESSMENT AND EVALUATION

- Definition and Physico Chemical attributes.
- Sensory perception; subjective/ organoleptic evaluation.
- Objective methods of evaluation.
- Chemical methods of evaluation.
- Microbial methods of evaluation.

UNIT - II :
FOOD SAFETY

- Definitions
- Undesirable constituents-Naturally occurring contaminants. Heavy metals, pesticide residues, products of microbial growth etc., Health hazarads.
- Desirable constituents-chelating agents, acids, bases, buffer systems and salts; stabilizers, thickners, polyhydrocalcinols, anticaking, firming, clarifying and bleaching agents; antioxidants, non-nutritional sweeteness, antimicrobial agents.
- Gases and propellants.

UNIT - III :
FOOD SAFETY STANDARDS AUTHORITY OF INDIA (FSSAI)

- Current rules and regulations
- Definitions of standards of identity and quality
- Food licensing and registration system
- International food safety measures

UNIT - IV :
FOOD CONTAMINANTS AND STANDARDS OF QUALITY

- Contaminants in milk and milk products
- Contaminants in fruit and vegetable products
- Contaminants in meat, poultry, eggs and fish
- Contaminants in fats and oils
- Contaminants in spices and condiments.
- Contaminants in Water and Beverages.
- Contaminants in Food grains and flours
- Contaminants in sugars

UNIT - V :
FOOD STANDARDS AND FOOD LAWS

- Sanitation and hygiene, GMP, GLP, Statistical quality control.
- Food laws and standard, PFA, AGMARK.
- Sampling and specification of raw materials and finished products,
- Concept of Codex Almentarious / USFDA/ISO 9000 series,
- Rules and regulations for waste disposals.
- Food adulteration and food safety. HACCP

RECOMMENDED READINGS

1. S.N. Mahindru," Food Safety – Concept and Reality", APH Publishing Corporation, 5 Ansari Road, Darya Ganj, New delhi-2004
2. Rajesh Mehta and J. George – "Food Safety Regulation Concerns and Trade – The Developing Country Perspective, Mac Millan India Ltd., 2005.
3. Vanisha Nambiar, A Text book on "Food Contamination and Safety" ANMOL Publications Pvt. Ltd., New Delhi -2004.
4. Amerine, M.A., Pangborrn RM, and Roessler BB, "Principles of Sensory Evaluation of Foods", Academic press New York, 1965.
5. The prevention of food adulteration Act, 1954 and Prevention of food adulteration Rules, 1955. (1998). Federation of Indian Industry, New Delhi.
6. Swaminathan.M., "Food Science and Eperimental foods" (1979) Ganesh and Company –Chennai.
7. Development in Milling and Baking Technology (1991) Association of food scientists and Technologists, Mysore.
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SEMESTER-V
PRACTICAL-7(D) :: FOOD QUALITY CONTROL AND ANALYSIS
(At the End of Semester-V)

1. Survey of different foods in market
2. Study the nutritional label information, adulterants, food standards etc
3. Fats and oils – saturation , Rancidity
4. Fruit and vegetable products – Maturity , acidity , TSS, sugars
5. Coffee and tea , spices , Honey – Adulterants
6. Milk and milk products
7. Meat products
8. Determination of different preservatives
9. Determination of different colors
10. Document preparation for the approval of FSSAI.

MODEL PAPER
SEMESTER-V
PAPER-7(D) : FOOD QUALITY CONTROL AND ANALYSIS

Time : 3 hours **Max. Marks : 75**

PART – A

I. ***Answer any FIVE of the following Questions. Each carries FIVE marks.*** ***5 X 5 = 25 Marks***

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

PART – B

II. ***Answer any FIVE of the Following Questions. Each Carries TEN Marks.*** ***5 X 10 = 50 Marks***

11.
12.
13.
14.
15.
16.
17.
18.
19.
20.

NOTE: ***For paper setter choosing two short Questions and two Long Questions from each unit.***