

B.Sc. (H) Food Technology

THREE-YEAR FULL-TIME PROGRAMME

(Six-Semester Course)



COURSE CONTENTS

(Effective from the Academic Year 2011-2012)

UNIVERSITY OF DELHI

DELHI- 110 007

SEMESTER SYSTEM AT THE UNDERGRADUATE LEVEL

Course of Study: **B.Sc (Honours) Food Technology**

Total number of papers: 24

Majors 18-**BLACK**

Minor -4- **BLUE**

Electives-2- **RED**

Semester I

Paper 1 Introduction to Biology LSPT101	Paper 2 Intro.to Food Technology-I FTHT 101	Paper 3 Mathematics and Statistics FTHT 102	Paper 4 Technical writing in English/Computational Skills ENAT 101/CSAT 101
--	--	--	---

Semester II

Paper 5 Technical writing in English/Computational Skills ENAT 201/CSAT 201	Paper 6 Chemistry FTHT 203	Paper 7 Intro. to Food Technology-II FTHT 204	Paper 8 Principles of Food Science FTHT 205
---	---	--	--

Semester III

Paper 9 Technology of Fruits, Veg. & Plantation crops FTHT 306	Paper 10 Foundations of Food and Nutrition HSHT 110	Paper 11 Food Processing & Engineering FTHT 307	Paper 12 Project Management and Entrepreneurship 502
---	--	--	---

Semester IV

Paper 13 Technology of Cereals, Pulses & Oilseeds FTHT 408	Paper 14 Principles of Food Preparation FTHT 409	Paper 15 Biochemistry BOHT 405	Paper 16 Food Engineering FTHT 410
---	---	---	---

Semester V

Paper 17 Technology of Dairy and Sea food FTHT 511	Paper 18 Food Chemistry-I FTHT 512	Paper 19 Food Microbiology FTHT 513	Paper 20 Food Quality Testing and Evaluation FTHT 514
---	---	--	--

Semester VI

Paper 21 Technology of Meat, Poultry & Eggs FTHT 615	Paper 22 Food Chemistry –II FTHT 616	Paper 23 Food Safety FTHT 617	Paper 24 Food Quality Management FTHT 618
---	---	--	--

SCHEME OF EXAMINATION

(B.Sc (H) Food Technology)

I Year

I Semester

S.No.	Code	Title	Theory		Practical	
			Max. Marks	Duration of Exam	Max. Marks	Duration of Exam
1	L S P T 101	Introduction to Biology	100	3 hours	50	3 hours
2	F T H T 101	Introduction to Food Technology-I	100	3 hours	50	3 hours
3	F T H T 102	Mathematics and Statistics	100	3 hours	50	3 hours
4	E N A T 101	Technical Writing in English* / Computational Techniques*	100	3 hours	-	-
	C S A T 101		100	3 hours	50	3 hours

II Semester

S.No.	Code	Title	Theory		Practical	
			Max. Marks	Duration of Exam	Max. Marks	Duration of Exam
5	E N A T 201	Technical Writing in English* / Computational Techniques*	100	3 hours	-	-
	C S A T 201		100	3 hours	50	3 hours
6	F T H T 203	Chemistry	100	3 hours	50	3 hours
7	F T H T 204	Introduction to Food Technology II	100	3 hours	50	3 hours
8	F T H T 205	Principles of Food Science	100	3 hours	50	3 hours

*** The college will have an option to take either of the two papers in a particular semester for a particular course, while students have to appear in both the papers.**

In addition, there shall be one qualifying paper in self learning mode called Environmental Studies offered in semester-II.

SCHEME OF EXAMINATION

(B.Sc (H) Food Technology)

II Year

III Semester

S.No.	Code	Title	Theory		Practical	
			Max. Marks	Duration of Exam	Max. Marks	Duration of Exam
9	F T H T 306	Technology of Fruits Vegetables and Plantation Crops	100	3 hours	50	3 hours
10	H S H T 110	Foundations of Food & Nutrition	100	3 hours	50	3 hours
11	F T H T 307	Food Processing and Engineering	100	3 hours	50	3 hours
12	502	Project Management and Entrepreneurship	100	3 hours	-	-

IV Semester

S.No.	Code	Title	Theory		Practical	
			Max. Marks	Duration of Exam	Max. Marks	Duration of Exam
13	F T H T 408	Technology of Cereals, Pulses and Oilseeds	100	3 hours	50	3 hours
14	F T H T 409	Principles of Food Preparation	100	3 hours	50	3 hours
15	B O H T 405	Biochemistry	100	3 hours	50	3 hours
16	F T H T 410	Food Engineering	100	3 hours	50	3 hours

SCHEME OF EXAMINATION

(B.Sc (H) Food Technology)

III Year

V Semester

S.No.	Code	Title	Theory		Practical	
			Max. Marks	Duration of Exam	Max. Marks	Duration of Exam
17	FTHT 511	Technology of Dairy and Sea Food	100	3 hours	50	3 hours
18	FTHT 512	Food Chemistry I	100	3 hours	50	3 hours
19	FTHT 513	Food Microbiology	100	3 hours	50	3 hours
20	FTHT 514	Food Quality Testing and Evaluation	100	3 hours	50	3 hours

VI Semester

S.No.	Code	Title	Theory		Practical	
			Max. Marks	Duration of Exam	Max. Marks	Duration of Exam
21	FTHT 615	Technology of Meat, Poultry & Eggs	100	3 hours	50	3 hours
22	FTHT 616	Food Chemistry II	100	3 hours	50	3 hours
23	FTHT 617	Food Safety	100	3 hours	50	3 hours
24	FTHT 618	Food Quality Management	100	3 hours	50	3 hours

B.Sc. (H) Food Technology

PREAMBLE

The ongoing B.Sc. (H) Food Technology course was introduced by the Faculty of Science from the academic year 1989-1990. This course is being offered by two colleges of University of Delhi in annual mode and was last revised in the year 2008. From 2011 onwards, it will follow the semester mode. The course would be of 3 year duration, divided into 3 parts- Part I, Part II and Part III. Each part would consist of 2 semesters. There will be four papers including practical in each semester. Thus, a total of 24 papers with one course in Environmental Studies in self learning mode at the end of 2nd semester.

- The new course has been prepared keeping in view, the unique requirements of B.Sc. (H) Food Technology students. The objectives of the course are-
 - To impart knowledge of various areas related to Food science and technology,
 - To enable the students to understand food composition and its physico-chemical, nutritional, microbiological and sensory aspects,
 - To familiarize the students about the processing and preservation techniques of pulses, oilseeds, spices, fruits and vegetables, meat, fish, poultry, milk & milk products,
 - To emphasize the importance of food safety, food quality ,food plant sanitation, food laws and regulations, food engineering and packaging in food industry.

This course also offers professional edge to the students by providing hands on training at the end of fourth semester for four weeks(non credit) in various food industries and related organizations.The contents have been drawn-up to accommodate the widening horizons of the discipline of Food Technology. They reflect the current changing needs of the students; esp. the subjects like project

management, entrepreneurship and computational skills. On the other hand, basic fundamental subjects like biochemistry, biology, chemistry, maths & statistics have been given due significance.

- There will be 18 major papers, 4 minor papers including 3 from life sciences and 1 from business studies. The remaining 2 papers will be of Technical Writing and Communication in English and Computational Skill .Thus, a total of 24 papers are being offered in this full time program which will commence from the academic session 2011-2012.
- For each paper, the objectives have been listed and the contents divided into units.
- The detailed syllabus for each paper is appended with the list of suggested readings.
- Teaching time allotted for each paper shall be 4 periods for each theory paper and 4 periods for each practical class per week and 1 tutorial period for each paper per week .Each practical batch should ideally be between 15-20 students so that each student receives individual attention.

INTRODUCTION TO BIOLOGY THEORY

Paper No.	:	L S P T 101
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

CONTENT

Unit 1: Biological systems, evolution and biodiversity

a. Introduction to concepts of biology (**Ch 1 Campbell**)

Themes in the study of biology; A closer look at ecosystem; A closer look at cell; The process of Science; Biology and everyday life

b. Evolutionary history of biological diversity (**Ch 25 Campbell**)

Early earth and the origin of life; Major events in the history of life; Mechanism of Macroevolution; Phylogeny and the tree of life

c. Classifying the diversity of life (**Ch 25 Raven**)

Kingdoms of Life –Prokaryotes, Eukaryotes, Archaea

d. Darwinian view of life and origin of species (**Ch22, 24 Campbell**)

Darwin's theory of evolution; The evolution of populations; Concepts of species; Mechanism of speciation

e. Genetic approach to Biology (**Ch 1 Griffiths**)

Patterns of inheritance and question of biology; Variation on Mendel's Law; The molecular basis of

genetic information; The flow of genetic information from DNA to RNA to protein; Genetic

Variation; Methodologies used to study genes and gene activities; Developmental Detecting

macromolecules of genetics; Model organisms for the genetic analysis; Distinction between

Phenotype and Genotype

Unit 2: Chemical context of living systems

a. Chemistry of life (**Ch 2 Campbell**)

The constituents of matter; Structure of an atom; The energy level of electron; The formation and

function of molecules depend on chemical bonding between atoms; Chemical reaction make or

break chemical bonds

b. Water and life (**Ch 3 Campbell**)

The water molecule is polar; Properties of water; Ionization of water

c. Carbon and life (**Ch 4 Campbell**)

Organic chemistry-the study of carbon compounds; What makes carbon special?
Properties of
organic compounds
d. Structure and function of biomolecules (**Ch 5 Campbell**)

SUGGESTED BOOKS

1. Campbell, N.A. and Reece, J. B. (2008) Biology 8th edition, Pearson Benjamin Cummings, San Francisco.
2. Raven, P.H et al (2006) Biology 7th edition Tata McGrawHill Publications, New Delhi
3. Griffiths, A.J.F et al (2008) Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. NY

INTRODUCTION TO BIOLOGY PRACTICAL

Paper No.	:	L S P H 101
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. To learn a) use of microscope b) principles of fixation and staining.
2. Preparation of Normal, molar and standard solutions, phosphate buffers, serial dilutions
3. Use of micropipettes
4. Separation of A) amino acids B) chloroplast pigments by paper chromatography.
5. To perform gram staining of bacteria.
6. To study the cytochemical distribution of nucleic acids and mucopolysaccharides in cells/tissues from permanent slides.
7. To perform quantitative estimation of protein using the Lowry's method. Determine the concentration of the unknown sample using the standard curve plotted.
8. To separate and quantify sugars by thin layer chromatography.
9. To raise the culture of *E. coli* and estimate the culture density by turbidity method. Draw a growth curve from the available data.
10. Isolation of genomic DNA from *E.coli*.

SUGGESTED BOOKS

1. Campbell, N.A. and Reece, J. B. (2008) Biology 8th edition, Pearson Benjamin Cummings, San Francisco.

2. Raven, P.H et al (2006) Biology 7th edition Tata McGrawHill Publications, New Delhi

3. Griffiths, A.J.F et al (2008) Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. Noise

INTRODUCTION TO FOOD TECHNOLOGY –I THEORY

Paper No. : **F T H T 101**
Maximum Marks : **100**
Credits : **4**
Teaching Period : **4 Theory + 1 Tutorial / Week**
Teaching Load : **48 Theory Periods + 12 Tutorials / Semester**

Objectives:

- To understand the history and evolution of food processing.
- To study the structure, composition, nutritional quality and post harvest changes of various plant foods.

CONTENT

UNIT 1 Introduction (10 lectures)

- Historical development of food science and technology (**Martin Eastwood, Chapter 2**)
- Evolution of Food Processing from prehistoric times till date.
- Introduction to various branches of Food Science and Technology

UNIT 2 Compositional, Nutritional and Technological aspects of foods

I. Cereals and Millets (S. Manay, Ch-15)

(16 lectures)

- Introduction, structure, composition and uses and by-products of cereals and coarse cereals
- Wheat- Structure and composition of wheat, types (hard, soft/ strong, weak) Diagrammatic representation of longitudinal structure of wheat grain and process of malting, Gelatinization of starch, types of browning.
- Rice- Composition of rice obtained by different dehusking methods, parboiling of rice- advantages and disadvantages.
- Millets -Varieties, composition and uses of maize, sorghum, barley, rye, oats, triticale, pearl millet and finger millet.

II. Pulses (Ch-17,Manay) (6 lectures)

- Introduction, common names and scientific names of different pulses.
- Chemical composition of pulses, processing of pulses- soaking, germination, decortications, cooking and fermentation. Toxic constituents in pulses and its detoxification processes.

III. Fats and Oils (6 lectures)

- Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids.(**Ch-3, Manay**)
- Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation.(**Ch-2 Meyer**)
- Rancidity - hydrolytic and oxidative rancidity and its prevention.
- Define - margarine, butter, hydrogenated vegetable oil, lard. .(**Ch-2 Meyer**)

IV. Fruits and Vegetables (8 lectures)

- Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre.)

Post harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables. (Ch-8, Srilakshmi)

INTRODUCTION TO FOOD TECHNOLOGY –I PRACTICAL

Paper No.	:	F T H P 101
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Orientation to working in a food analysis lab.
2. Methods of sampling.

3. Identification of different non-perishable commodities-cereals, millets and their by-products.
4. Quality evaluation/inspection of different foods.
 - i. Spices and Condiments
 - ii. Pulses
 - iii. Nuts and oilseeds
 - iv. Tea and coffee
5. Study of different types of browning reactions.
6. Study malting and germination of cereals and pulses.
7. Study of fermentation and dextrinization.
8. Identification of pigments and concept of post harvest changes in fruits and vegetables-climacteric, non climacteric and senescence
9. Introduction to labeling of foods

Recommended Readings

1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004
2. B. Srilakshmi, Food science, New Age Publishers, 2002
3. Meyer, Food Chemistry, New Age, 2004
4. Kenneth F. et al, edited-Vol-1, 2, The Cambridge World History of Food, Cambridge Univ.Press, 2000.
5. Martin Eastwood, Second edition, Principles of Human Nutrition, Blackwell publishing, 2003

MATHEMATICS AND STATISTICS THEORY

Paper No. : **F T H T 102**
Maximum Marks : **100**

Credits : **4**
Teaching Period : **4 Theory + 1 Tutorial / Week**
Teaching Load : **48 Theory Periods + 12 Tutorials / Semester**

CONTENT

Unit I (Calculus)**14 classes**

Successive differentiation, Mean Value Theorems and applications, Indeterminate forms, Introduction to anti-derivatives, Definite Integrals, Ordinary Differential equations.

Unit II (Matrices)**6 classes**

Eigen values, Cayley Hamilton Theorem, Applications of Matrices in solving system of equations.

Unit III (Basic Statistics)**14 classes**

Scope of statistics in food industries, errors, precision and threshold. Descriptive measures-Measures of central tendency, dispersion, skewness and kurtosis. Axiomatic approach to probability, Applications of Bayes Theorem, Random variables, Probability distributions, Mathematical expectation and variance, Binomial, Poisson and Normal distributions.

Unit IV (Applied Statistics)**12 classes**

Correlation and Regression, Sampling distributions, Standard error, Type I and Type II errors, Hypothesis testing- Large sample tests for means and proportions, Student's t-test, F-test, Chi square test, ANOVA (one way and two way).

MATHEMATICS AND STATISTICS PRACTICAL

Paper No.	:	F T H P 102
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

Software labs using mathematical and statistical software such as Mathematical or Matlab, SPSS or Minitab

1. Exploring and sketching functions using derivatives.
2. Finding definite integrals.
3. Analysing the solutions of ordinary differential equations.
4. Presentation of Data by frequency tables, Graphs and Diagrams.

5. Computation of Measures of central tendency.
6. Computation of Measures of Dispersion.
7. Computation of raw and central moments, and measures of skewness and kurtosis.
8. Computation of correlation coefficient and Fitting of lines of Regression (Raw and Frequency data).
9. Analysing and interpreting a given data set by using hypothesis tests.
10. Performing one way and two way ANOVA.

Reference books:

1. Introduction to Mathematics for Life Scientists, by E.Batschelet, Third edition, Springer International Edition.
2. Applied Calculus for the Managerial, Life and Social sciences by S.T.Tan, Fifth edition, Thomson Learning.
3. Biostatistics: a Foundation for Analysis in the Health Sciences, by Wayne W Daniel, Seventh edition, John Wiley and Sons
4. Biostatistical Analysis by J.H. Zar, Fourth edition, Pearson Education.

TECHNICAL WRITING AND COMMUNICATION IN ENGLISH THEORY

Paper No.	:	E N A T 101
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

CONTENT

Unit 1

Communication: Language and communication, differences between speech and writing, distinct features of speech, distinct features of writing.

Unit 2

Writing Skills; Selection of topic, thesis statement, developing the thesis; introductory, developmental, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, expository and argumentative writing.

Unit 3

Technical Writing: Scientific and technical subjects; formal and informal writings; formal

writings/reports, handbooks, manuals, letters, memorandum, notices, agenda, minutes; common errors to be avoided.

SUGGESTED READINGS

1. M. Frank. Writing as thinking: *A guided process approach*, Englewood Cliffs, Prentice Hall Reagents.
2. L. Hamp-Lyons and B. Heasley: *Study Writing; A course in written English*. For academic and professional purposes, Cambridge Univ. Press.
3. R. Quirk, S. Greenbaum, G. Leech and J. Svartik: *A comprehensive grammar of the English language*, Longman, London.
4. Daniel G. Riordan & Steven A. Panley: *“Technical Report Writing Today”* - Biztantra.

Additional Reference Books

5. Daniel G. Riordan, Steven E. Pauley, Biztantra: *Technical Report Writing Today*, 8th Edition (2004).
6. Contemporary Business Communication, Scot Ober, Biztantra, 5th Edition (2004)

COMPUTATIONAL SKILLS

THEORY

Paper No.	:	C S A T 201
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

CONTENT

Computer Fundamentals (12 Periods)

Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers

Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices

User Interface with the Operating System, System Tools

Data Representation (8 Periods)

Binary representation of integers and real numbers, 1's Complement, 2's Complement, Addition and subtraction of binary numbers, BCD, ASCII, Unicode;

Networks terminology (4 Periods)

Types of networks, router, switch, server-client architecture

Multimedia (4 Periods)

Introduction, Characteristics, Elements, Applications

Problem Solving (10 Periods)

Notion of algorithms, stepwise methodology of developing an algorithm, developing macros in spreadsheet

General Awareness (4 Periods)

IT Act, System Security (virus/firewall etc.), *I-Tax, Reservations, Banking.*

COMPUTATIONAL SKILLS

PRACTICAL

Paper No.	:	C S A P 201
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Defined projects will be done by the students and evaluated by the instructor.
2. Document Preparation
3. Presentation Software
4. Familiarizing with the Operating System, Control Panel, Networking Configuration, Firewall setting
5. Spreadsheet Handling, Working with worksheets, Creating a spreadsheet, entering and formatting information, basic functions and formulas, creating charts, tables and graphs.

SUGGESTED BOOKS

[1] V Rajaraman, **Fundamentals of Computers**, Fourth Edition, PHI.

[2] Anita Goel, **Fundamentals of Computers**; Forthcoming title in Pearson-Education

Note: Use of Open Office/Star Office is recommended, as they are freely downloadable.

Reference manual for Open Office available at: <http://www.openoffice.org>

Reference manual for Star Office.

CHEMISTRY THEORY

Paper No.	:	F T H T 203
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

CONTENT

Unit-1 Periodic Table (3 Lectures)

J.D. Lee (Chapters: 6, 12, 29); Shriver and Atkins (Chapters: 1 and 9); James E. Huheey (Chapter 2); Satya Prakash, Tuli, Basu, Madan (Chapters: 3, 4 and 5)

Atomic, ionic and covalent radii, ionization energy, electronegativity and its scales, electron affinity, Lanthanide contraction, Inert pair effect.

Unit-2 Chemical bonds and molecules (5 Lectures)

J.D. Lee (Chapters: 2, 3 and 4); Shriver and Atkins (Chapter 3), James E. Huheey (Chapters: 4, 5 and 7); Satya Prakash, Tuli, Basu, Madan (Chapters: 10, 12, 13 and 14)

General characteristics of ionic & covalent bonds, van der Waal forces of attraction (ion-dipole, dipole-dipole, dipole-induced dipole, and dispersion forces), polar covalent bond, hydrogen bond, effects of hydrogen bonding on physical properties, structure of water, metallic bond, lattice energy, Fajan's rule, bond length, bond angle, concept of resonance, dipole moment.

Unit-3 Organic reactions and their mechanisms (13 Lectures)

Morrison and Boyd (Chapters: 3, 5, 8, 9, 11, 14, 15); I.L. Finar (Chapter: 2); Ahluwalia and Parashar (Chapters: 1, 2 and 5)

Types of reactions - addition, elimination, substitution & rearrangement.

Mechanism of S_N1 and S_N2 reactions (stereochemistry, nature of substrate, nucleophile and leaving group).

Keto-enol tautomerism and its distinction from resonance.

Structure and stability of reactive carbon species - carbonium ion, carbanion, free radical, carbenes.

Electronic effects in molecules (inductive, hyperconjugation and resonance effects); cleavage of covalent bonds – homolysis and heterolysis. Markownikoff and anti-markownikoff orientation

Electrophilic mono and disubstitution in benzene.

Reaction mechanisms of Claisen condensation, Reimer-Tiemann reaction, Aldol condensation, Hoffman bromamide rearrangement, Cannizzaro reaction, Friedel Craft reaction, Pinacol-pinacolone rearrangement, Beckmann rearrangement.

Unit- 4 Chemical equilibrium (6 Lectures)

K.L. Kapoor (Chapter: 4)

Reversible reactions, law of mass action, equilibrium constant, ionic equilibrium, theory of indicators, factors influencing equilibrium states, relation between K_p & K_c , buffer solution, hydrolysis of salt, pH, K_{sp} , common ion effect and its applications in mixture analysis.

Unit- 5 Electrochemistry (4 Lectures)

K.L. Kapoor (Chapter: 8)

Standard electrode potential, electrochemical series, Nernst equation, Indicator & reference electrodes, pH & its measurements by glass electrode. Potentiometric determination of pH.

Unit 6 Stereochemistry (4 Lectures)

D. Nassipuri (Chapters: 1, 2, 3 and 4); P.S. Kalsi (Chapters: 1 and 2)

Optical isomerism: Optical activity, polarimeter, specific rotation, enantiomerism, D & L designation, R & S sequence rules. Diastereoisomers, Isomers of tartaric acid, Geometrical Isomerism: Definition, nomenclature – E and Z

Unit 7 Polynuclear Hydrocarbons and Heterocyclic Compounds (10 Lectures)

I.L. Finar (Chapters: 29 and 30), S.P. Bhutani (Chapters: 1 and 2)

Naphthalene, anthracene and phenanthrene (Structure, Huckel's rule, aromaticity, mechanism of substitution).

Furan, pyrrole, thiophene, pyridine. (Synthesis, aromaticity, mechanism of substitution, acidity and basicity)

CHEMISTRY PRACTICAL

Paper No.	:	F T H P 203
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. To estimate iron(II) ions by titrating with potassium dichromate, using diphenylamine indicator.
2. To estimate copper(II) ions or potassium dichromate iodometrically by titrating with sodium thiosulphate.
3. To determine surface tension of a liquid using a stalagmometer.
4. To determine viscosity of a liquid using an Ostwald viscometer.
5. To analyze the following functional groups in the given organic compound: Carboxylic acids, alcohols, phenols, aldehydes & ketones, carbohydrates (monosaccharides), amides, nitro compounds and primary amines.

Recommended Readings

Theory

1. J.D.Lee, Concise Inorganic Chemistry, ELBS.
2. J.E.Huheey, Inorganic Chemistry-Principles of Structure and Reactivity, Pearson Publication.
3. Shriver and Atkins, Inorganic Chemistry, Oxford Publication.
4. Satya Prakash, G.D. Tuli, S.K. Basu and R.D. Madan, Advanced Inorganic Chemistry, S. Chand Publication.
5. Morrison and Boyd, Organic Chemistry, Prentice-Hall Publication.
6. I.L.Finar, Volume I, II, Organic Chemistry, ELBS.
7. V.K. Ahluwalia and R.K. Parashar, Organic Reaction Mechanisms, Second edition, Narosa Publication.
8. S.P. Bhutani, Selected topics in Organic Chemistry, Volume 1, Vishal Publication.
9. K.L. Kapoor, A textbook of Physical Chemistry Volume 1 and 3, Macmillan Publication.

Practicals

10. Vogel's Textbook of Quantitative Chemical Analysis, G.F. Jeffry, J. Basset, J. Mendham and R.C. Denny, Longman Publication.
11. Comprehensive Practical Organic Chemistry, V.K. Ahluwalia and Sunita Dhingra, University Press.

INTRODUCTION TO FOOD TECHNOLOGY -II THEORY

Paper No.	:	F T H T 204
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

- To study the structure and composition of various animal foods
- To study methods of food processing and preservation

CONTENT

UNIT 1 Compositional, Nutritional and Technological aspects of animal foods

I. Flesh Foods - Meat, Fish, Poultry (12 lectures)

- Meat - Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat. **(Chapter 23, Manay)**
- Fish - Classification of fish (fresh water and marine), aquaculture, composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical. **(Chapter 24, Manay)**
- Poultry - Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers. **(Chapter 22, Manay)**

II. Milk and Milk Products (8 lectures)

- PFA definition of milk, typical chemical composition of milk of different species i.e. buffalo, cow, goat. Composition of milk, its constituents, various steps in processing of milk. An overview of types of market milk and milk products-

cheese, paneer, ice cream, ghee, butter, butter oil, flavoured milk, imitation milk.
(Chapter 1,2,4,5,7,11, De)

UNIT 2 Food Microbiology (8 lectures)

Classification of bacteria based on temperature, pH, water activity, nutrient and oxygen requirements, Typical growth curve of micro-organisms, classification of food based on pH, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods. Food infection, food intoxication **(Chapter 1, Frazier)**

UNIT 3 Introduction to various food processing and preservation technologies (18 lectures)

Freezing- Introduction to refrigeration and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.
(Chapter 9, Potter)

Drying and Dehydration- Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry **(Chapter 10, Potter)**

Food Irradiation- Introduction, kinds of ionizing radiations used in food irradiation, uses of radiation processing in food industry, concept of cold sterilization. **(Chapter 11, Potter)**

Thermal Processing- Concept of pasteurization, sterilization, commercial sterilization, and blanching. **(Chapter 8, Potter)**

INTRODUCTION TO FOOD TECHNOLOGY –II PRACTICAL

Paper No.	:	F T H P 204
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Setting up of sensory evaluation lab and introducing the concept of organoleptic testing.
2. Estimation of pH of different foods
3. Adulteration tests for different foods:
 - i. Milk and milk products
 - ii. Tea and coffee etc
4. To give the concept of shelf life of different foods.(processed and unprocessed)
5. To study blanching and study the concept of Asepsis.
6. To perform pasteurization and sterilization of foods.
7. Standards of identity, standards of minimum quality and standards of fill of container.
8. Identification of different types of packaging materials used in the food industry.

Recommended Readings

1. Potter, Norman. M., Food Science, CBS Publication, 1996
2. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004
3. De Sukumar. , Outlines of Dairy Technology, Oxford University Press, 2007
4. Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004

PRINCIPLES OF FOOD SCIENCE THEORY

Paper No.	:	F T H T 205
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

To impart basic knowledge of:

1. Food Dispersions
2. Sensory science
3. Food Science
4. Food Sanitation
5. Packaging Materials

CONTENT

UNIT 1 Food dispersions (10 lectures)

- Characteristics, sols, gels, pectin gels, colloidal sols, stabilization of colloidal system, syneresis, emulsions, properties of emulsions, formation of emulsion, emulsifying agent, food foams, formation stability and destruction of foam, application of colloidal chemistry to food preparation.

(Ch 11 Manay, Ch 3 Meyer and Ch 2 Deman)

UNIT 2 Sensory evaluation of food (5 lectures)

- Objectives, type of food panels, characteristics of panel member, layout of sensory evaluation laboratory, sensitivity tests, threshold value, paired comparison test, duo-trio test, triangle test, hedonic scale, chemical dimension of basic tastes, Amoore's classification of odorous compounds. Sherman and Szczniak classification of food texture.

(Ch 19 Ranganna and Ch 7, 8 Deman)

UNIT 3 Growth of microorganisms in foods (4 Lectures)

- Food as a substrate for microorganism, factors affecting growth of microbes : pH, water activity, O-R potential, nutrient contents, inhibitory substance and biological structure.

(Ch 1, Frazier)

UNIT 4 Hurdle technology (5 lectures)

- Principles and applications, Hurdle effect in fermented foods, shelf stable products, intermediate moisture foods, application of hurdle technology.

(Miscellaneous, from Journals and internet)

UNIT 5 Minimal processing

(5 lectures)

- Minimal processing of foods with thermal methods and non thermal methods-safety criteria in minimally processed foods-Minimal processing in practice-fruits and vegetables-seafood-effect on quality-Future developments

(Ch 3, Ramaswamy)

UNIT 6 Ohmic heating and High Pressure processing

(5 Lectures)

- Principles, equipment and processing, effect on food.

(Ch 11 Potter and Ch 3 Ramaswamy)

UNIT 7 Water disposal and sanitation

(5 Lectures)

- Waste water ,hardness of water, break point chlorination, physical and chemical of impurities, BOD, COD, waste water treatment, milk plant sanitation, CIP system, sanitizers used in food industry.

(Ch 22 Potter, Ch 1 De)

UNIT 8 Packaging

(9 Lectures)

- Objectives of packaging, flexible packaging, properties of the following packaging materials-low density polyethylene, high density polyethylene, polypropylene ,polyvinyl chloride, polyvinylidene chloride, ethylene vinyl alcohol, polystyrene, polyethylene terephthalate, nylon, ethylene vinyl acetate, ethylene acrylic acid, ethylene methacrylic acid, ionomers.

(Ch 21 Potter, Ch 4 Jenkins and Ch 7 Coles)

**PRINCIPLES OF FOOD SCIENCE
PRACTICAL**

Paper No.	:	F T H P 205
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Estimation of reducing sugar by Fehlings procedure
2. Estimation of salt content in brine
3. Estimation of salt content in butter
4. Preparation of brix solution and checking by hand refractometer
5. Estimation of protein content by formol titration
6. Demonstration of the Soxhlet method for determination of fat content
7. Determination of acidity of water
8. Determination of alkalinity/ hardness of water
9. Demonstration of the Kjeldahl's method for estimation of protein content

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 Publishing Company Inc., USA, 1991
6. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New Age International (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 Vegetable Products, 2nd ed. TMH Education Pvt. Ltd, 1986

TECHNOLOGY OF FRUITS, VEGETABLES AND PLANTATION CROPS THEORY

Paper No. : **F T H T 306**
Maximum Marks : **100**
Credits : **4**
Teaching Period : **4 Theory + 1 Tutorial / Week**

Teaching Load : 48 Theory Periods + 12 Tutorials / Semester

Objectives:

- To impart knowledge of different methods of fruits and vegetable processing.
- To learn about processing of various spices, tea, coffee and cocoa.

CONTENT

Technology of Fruits and Vegetables:

UNIT I Introduction (3 lectures)

Chapter-1, Girdharilal

- Importance of fruits and vegetable ,
- history and need of preservation.
- Reasons of spoilage,
- Method of preservation (short & long term).

UNIT 2 Canning and bottling of fruits and vegetables: (8 lectures)

Chapter-2-7, Girdharilal

- 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 3 Fruits beverages: (7 lectures)

Chapter-9, Girdharilal

- Introduction,
- Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification),
- preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation),
- processing of squashes, cordials, nectors, concentrates and powder.

UNIT 4 Jams, jellies and marmalades: (6 lectures)
Chapter-11,Girdharilal

- Introduction
- Jam: Constituents, selection of fruits, processing & technology
- Jelly: Essential constituents(Role of pectin, ratio), Theory of jelly formation,Processing & technology, defects in jelly
- Marmalade : Types, processing & technology, defects.

UNIT 5 Pickles, chutneys and sauces: (5 lectures)
Chapter-14,Girdharilal

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

UNIT 6 Tomato products: (4 lectures)
Chapter13, Girdharilal

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

UNIT 7 Dehydration of foods and vegetables (4 lectures)
Chapter-16,Girdharilal

- Sun drying & mechanical dehydration
- process variation for fruits and vegetables
- packing and storage

Technology of Plantation Products

UNIT 8 Spices (6 lectures)
Chapter-20,Manay

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

UNIT 9 Tea-Coffee and Cocoa (5 lectures)
Chapter-12, Manay

- Processing
- variety and products

TECHNOLOGY OF FRUITS, VEGETABLES AND PLANTATION CROPS PRACTICAL

Paper No.	:	F T H P 306
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Estimation of total soluble solids(TSS).
2. Estimation of pH and acidity of products.
3. Estimation of 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.
7. Adulteration of spices.
8. Dehydration of fruits and vegetables.

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

FOUNDATIONS OF FOOD AND NUTRITION THEORY

Paper No.	:	H S H T 110
Maximum Marks	:	100
Credits	:	4
Teaching Periods	:	4 Theory + 1 Interactive Period/ week
Teaching Load	:	48 Theory Periods + 12 Interactive Periods/ semester

OBJECTIVES

This course will enable the student to:

1. Understand the relationship between food, nutrition and health.
2. Understand the functions of food.
3. Learn about various food groups, balanced diet and principles of meal planning.
4. Understand digestion, absorption and function of various nutrients and their sources.
5. Learn about the various methods of preparing food.

CONTENT

Unit I: Introduction to Food and Nutrition (Ch 1, Srilakshmi)

- Basic terms used in study of food and nutrition 2
- Understanding relationship between food, nutrition and health

Unit II: Balanced Diet (Chapter 2, Warllaw et al/Chapter Srilakshmi)

5

- Functions of food-physiological, psychological and social.
- Concept of Balanced Diet, Food Groups, Food Pyramid, Food Exchange List
- Principles of Meal Planning

Unit III: Nutrients (Ch 1,2,3,4,5,7,13 Bamji et al)

33

Classification, digestion, absorption, functions, dietary sources, RDA, clinical manifestations of deficiency and excess of the following in brief:

- Energy
- Carbohydrates, lipids and proteins
- Fat soluble vitamins-A, D, E and K
- Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B₁₂ and vitamin C
- Minerals – calcium, iron, iodine, fluorine and zinc

Unit IV: Methods of Cooking (Chapter 1, Srilakshmi) 4

- Dry, moist, frying and microwave cooking
- Advantages, disadvantages and the effect of various methods of cooking on foods

Unit V: Nutrition Improvement of Foods (Chapter 1, Srilakshmi) 4

Nutrient losses in cooking and enhancing the nutritional quality of foods

RECOMMENDED READINGS

- Bamji MS, Krishnaswamy K, Brahmam GNV (2009). *Textbook of Human Nutrition*, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd.
- Srilakshmi (2007). *Food Science*, 4th Edition. New Age International Ltd.

- Wardlaw MG, Paul M Insel Mosby (1996). Perspectives in Nutrition, Third Edition.

FOUNDATIONS OF FOOD AND NUTRITION PRACTICAL

Paper No.	:	H S H P 110
Maximum Marks	:	50
Credits	:	2
Teaching Periods	:	4 / week
Teaching Load	:	12 Practical / semester (4 periods each)

OBJECTIVES

This course will enable the student to:

1. Acquire skill in food preparation techniques.
2. Use appropriate methods of cooking for preparation of specific food products.
3. Observe and understand the principles involved in preparation of different foodstuffs.
4. Understand nutritive contribution of different preparations.
5. Learn rich sources of various nutrients.
6. Understand basic principles of meal planning and the use of food exchange list.

CONTENT

Unit I	1
<ul style="list-style-type: none"> • Working instructions, weights and measures, and table setting 	
Unit II	1
<ul style="list-style-type: none"> • Identification of food sources for various nutrients 	
Unit III	4
<ul style="list-style-type: none"> • Food preparation, understanding the principles involved, nutritional quality and portion size of: 10-12 dishes used in daily diet such as: chapatti, boiled rice, pulse preparation, curry preparation, seasonal vegetables, snacks, desserts etc. 	
Unit IV	3
<ul style="list-style-type: none"> • Introduction to diet planning using food exchange list • Diet Planning of adult male / female 	

Unit V

3

- Record diet of self using 24 hour dietary recall
- Nutritional Analysis of recorded diet and understand lacunae that need to be improved
- Assessment of weight and height of self and calculation of BMI
- Evaluation of own diet and weight status

RECOMMENDED READINGS

- Khanna K, Gupta S, Seth R, Mahna R, Rekhi T (2004). *The Art and Science of Cooking: A Practical Manual*, Revised Edition. Elite Publishing House Pvt Ltd.
- NIN, ICMR (1990). *Nutritive Value of Indian Foods*.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). *Basic sFood Preparation: A Complete Manual*, Fourth Edition. Orient Black Swan Ltd.
- Seth V, Singh K (2005). Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Fourth edition, Elite Publishing House Pvt Ltd.

FOOD PROCESSING AND ENGINEERING THEORY

Paper No.	:	F T H T 307
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

To impart basic knowledge of:

1. Cold Preservation and freezers
2. Dehydration
3. Irradiation
4. Food Packaging
5. Thermal Processing

CONTENT

FOOD PROCESSING OPERATIONS:

UNIT 1 Cold preservation

(4 Lectures)

- Freezing: requirements of refrigerated storage - controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing –concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences

(Ch 9, Potter)

UNIT 2 Freezing- Mechanism and freezers (6 Lectures)

- Freezing methods -direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing.

(Ch 9, Potter)

UNIT 3 Dehydration (10 Lectures)

- Normal drying curve , effect of food properties on dehydration , change in food during drying ,drying methods and equipments air convection dryer, tray dryer, tunnel dryer ,continuous belt dryer , fluidized bed dryer, dryer, drum dryer, vacuum dryer ,freeze drying ,foam mat drying.

(Ch 10, Potter)

UNIT 4 Food Irradiation and Microwave Heating (7 Lectures)

- Ionizing radiation and sources, unit of radiations, direct and indirect radiation effects, safety and wholesomeness of irradiated food. Microwave heating and application.

(Ch 11, Potter)

UNIT 5 Packaging of foods (9 Lectures)

- Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods

(Ch 1, 9-12, Paine and Paine)

UNIT 6 Material handling (2 Lectures)

- Elementary concept of material handling in food industry, equipment and functioning of belt conveyor, screw conveyor, bucket elevator and pneumatic conveyor.

(Ch 26, Rao)

UNIT 7 Thermal processing

(5 Lectures)

- Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations

(Ch 3, Ramaswamy)

UNIT 8 Separation processes

(5 Lectures)

- Principles and methods of: distillation, extraction, washing, filtration, sedimentation, sieving and centrifugation

(Ch 13, 14 Toledo)

FOOD PROCESSING AND ENGINEERING

PRACTICAL

Paper No.	:	F T H P 307
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Comparison of conventional and microwave processing of food
2. Preservation of food by the process of freezing
3. Drying of food using Tray dryer/other dryers
4. Preservation of food by canning(Fruit/Vegetable/meat)
5. Cut-out analysis of canned food
6. Osmotic dehydration
7. Minimal Processing
8. Testing of Packaging material

Recommended Readings

1. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi, 1998

2. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India Pvt Ltd, New Delhi- 1992
3. Potter NH, Food Science, CBS Publication, New Delhi, 1998
4. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press, 2006
5. Rao PG, Fundamentals of Food Engineering, PHI Learning Pvt Ltd, New Delhi, 2010
6. Toledo Romeo T, Fundamentals of Food Process Engineering, Aspen Publishers, 1999

PROJECT MANAGEMENT AND ENTREPRENEURSHIP THEORY

Paper No.	:	502
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objective:

The Course aims to promote the chances of entrepreneurial success and to develop an understanding of the roles of the entrepreneur with an ability to recognize the qualities required to perform these roles. Project Management is a broad multi-level activity. The objectives of this course is to provide a thorough understanding of its various essentials to the student.

CONTENT

Unit -I Concept of Entrepreneurship_

Definition of Entrepreneurship given by various economists - the ideal definition –The conceptual model of Entrepreneurship given by John Kao. Views given by Schumpeter

Walker & Drucker on Entrepreneurship - Entrepreneur and Manager -Enterprise and Entrepreneur. Managing Creativity_Issues to be addressed in working the definition of creativity –Definition -Attributes of a creative person - Creative Thinking and Motivation - Managing Creativity - Organisational Actions that enhance and hinder Creativity - Organisational priorities and Creativity -Managerial responsibilities in a creative organisation.

Unit – II Small Business

Definition of Small Business - Composition of Small Business -Economic Contribution of Small Business. Strategic Planning for Small Business -Steps in Strategic Planning - Develop a clear Mission Statement -Assess Organisation Strengths - Conduct a thorough Market Segment Analysis -Analyse Competitors - Create Company Goals - Formulate Strategic Options and Select appropriate Strategies (Focus, Cost leadership & Differentiation) - Translate Strategic Plans into Action Plans -Establish accurate Controls. Why Strategic Planning fails in Small Business. Forms of Ownership: Sole Proprietorship, Partnership & Corporation form of Organisation -Advantages and Disadvantages , Franchising- What is Franchising -Advantages and Disadvantages to Franchising - Franchise Evaluation Checklist –Franchise contracts -Types of Franchise arrangements.

Unit III

Introduction: Project - definition, features, types, infrastructure creation-a special type of projects, significance of infrastructure in economic development, bottlenecks in the infrastructure creation, Project Identification: Idea generation, Project screening, Feasibility study. The advantages and disadvantages of starting your business –The advantages and disadvantages of buying all existing business – Critical areas to be examined while buying all existing business - Determining the value of a business – Financial Record Keeping – Profit Planning & Cost Control, Project costing : Breakdown structure of the project, cost estimation of the project, factor affecting the cost of the project , Costing with alternative configurations/specifications.

Project Appraisal : technical appraisal, marketing appraisal, legal and environment appraisal, financial appraisal- cost estimation of the project and evaluating project using pay back and NPV, Detailed project report – introduction, Introduction to SCBA

Unit IV

Arrangement of funds : Traditional sources of financing – Equity shares, preference shares, Debentures/bonds, loan from financial institutions- Loan syndication and consortium finance; Alternative sources of financing- Foreign Issue, FDI & FII, ECB, Private equity, Securitization, BOT projects, PPP, Venture capital / Incubation fund, Franchising etc; Role played by various Financial Institutions like IDBI, ICICI and IFCI : Special Role played by SIDBI and Commercial Banks – Approval of term loan applications by Commercial Banks – How to decide about a suitable agency for assistance Role played by SFCR and NSIC; Project Implementation : Project contracts – Principles, practical aspects of contracts, legal aspects of project management, global tender, Negotiation for projects, Project insurance, Human resource management, network analysis .

Reading

1. Scarborough & Zimmerer, Effective Small Business Management
2. Gupta & Srinivasan ,Entrepreneurial Development
3. Pickle & Abrahamson, Small Business Management
4. Vasanth Desai , Dynamics of Entrepreneurial Development & Management
5. John Kao, Creativity & Entrepreneurship
6. P. Chandra, Projects planning analysis selection implementation & review
7. P.Gopalkrishnan & V.E. Ramamoorthy, Text book of Project management
8. N. Singh , Project management & control, (Himalaya pub.)
9. B.M. Patel , Project management , (Vikas Pub.) 2000

TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS THEORY

Paper No.	:	F T H T 408
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

- To teach technology of milling of various cereals
- To impart technical knowhow of pulses and oilseeds refining

CONTENT

UNIT 1 Technology of cereals

- Introduction **(2 lectures)**
Chapter-1-3, Kent
- Wheat --Types , milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, technology of dough development. **(9 lectures)**
Chapter4-7, Kent
- Rice – Physicochemical properties , milling (mechanical & solvent extraction), parboiling, ageing of rice, utilization of by products. **(6 lectures)**
Chap-15, Kent, Chap-7-9, Chakravorty
- Corn – Milling (wet & dry) , cornflakes **(4 lectures)**
Chapter-16, Kent
- Barley- Milling(pearl barley,barley flakes & flour), beer preparation **(4 lectures)**
Chap-12 Kent
- Oats – Milling (oatmeal,oatflour & oatflakes) **(3 lectures)**
Chap-13 Kent

- Sorghum and millets – Traditional & commercial milling (dry &wet) **(4 lectures)**
Chap-17, Kent
- Rye and triticale—milling (flour),uses **(2 lectures)**
Chap-14, Kent

UNIT 2 Technology of Pulses (5 lectures)

Chap-13, Chakravorty

- Milling of pulses
 - Dry milling
 - Wet milling
 - Improved milling method

UNIT 3 Technology of Oilseeds (9 lectures)

Chap-14, Chakravorty

- Introduction
- Extraction of oil and refining
- Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fibre spinning

**TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS
PRACTICAL**

Paper No.	:	F T H P 408
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Physical characteristics of wheat.
2. Moisture content of wheat and products.
3. Estimation of gluten content.
4. Estimation of pelenske value.
5. Yeast fermenting power.
6. Estimation of KBrO .
7. Physical characteristics of rice.
8. Cooking quality of rice.

Recommended Readings

1. Kent, Technology of Cereal, 5th Ed. Pergamon Press, 2003
2. Chakraborty., Post Harvest Technology of Cereals, Pulses and Oilseeds, revised ed., Oxford & IBH Publishing Co. Pvt Ltd, 1988
3. Marshall, Rice Science and Technology, Wadsworth Ed., Marcel Dekker, New York, 1994

PRINCIPLES OF FOOD PREPARATION THEORY

Paper No.	:	F T H T 409
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

- To study various food groups and their importance in nutrition
- To understand technology of various food products
- To study methods of preparation of foods

CONTENT

UNIT 1 Methods of Cooking (2 lectures)

- Basic methods of cooking
- Conduction, convection, radiation, Microwave cooking
- Cooking media- air, water, steam, fat.
- Introduction to cookery terms. (Chapter 27, Manay)

UNIT 2 Beverages (6 lectures)

- Tea, Coffee, Cola drinks
- Types available
- Basic rules and methods of preparation
- Associated health benefits and risks (Chapter 12, Manay)

UNIT 3 Cereals (10 lectures)

- Effect of heat on cereals,

- Bakery foods- Bread, Cakes, types of icings, pizza base, biscuits, cookies, rusk, pastry
- Roles of ingredients, faults and remedies, leavening agents, various methods of making dough
- Breakfast cereals **(Chapter 1,2,3,4, Dubey)**

UNIT 4 Pulses (3 lectures)

- Types of pulses
- Various ways of using pulses- cooking, soaking, germination, fermentation
- Fermented foods like Idli, dhokla, soy products
- Enhancement of nutritive value by these processes. **(Chapter 17, Manay)**

UNIT 5 Vegetables and fruits (3 lectures)

- Quality, care in storage
- Nutritive value of various types of fruits and vegetables,
- Effect of heat, acid and alkali on pigments,
- Effect of cooking on nutritive value of fruits and vegetables,
- Brief description of various fruits and vegetable products and their nutritional quality. **(Chapter 13, 14, Manay)**

UNIT 6 Milk and milk products (8 lectures)

- Effect of heat on milk
- Preparation and nutritive value of milk products- Rabri, malai, khoa, chhanna, paneer
- Examples of milk based desserts, uses in cookery.
- Ice cream- roles of ingredients, method of preparation, defects.
- Cheese- types and method of preparation. **(Chapter 6,7,11, De)**

UNIT 7 Eggs (6 lectures)

- Effect of heat,
- Principles of egg cookery
- Methods of cooking
- Uses of egg as binding, coating, leavening, foams, emulsifying agent
- Egg foams, stages of egg beating, uses of egg foam
- Egg based products and their nutritional importance. **(Chapter 22, Manay)**

UNIT 8 Meat, fish and poultry (4 lectures)

- Kinds, quality selection
- Principles of meat, fish and poultry cookery, methods of cooking
- Effect of cooking on nutritional and sensory aspects. **(Chapter 23-25, Manay)**

UNIT 9 Fats and oils (2 lectures)

- Kinds of fats available in market and their use. **(Chapter 19, Manay)**

UNIT 10 Sugars (2 lectures)

- Types and sources
- Methods of preparation of sugars- khandsari, bura, jaggery etc
- Principles of sugar cookery
- Crystalline and non-crystalline candies
- Uses of sugars
- Health risks like dental caries, obesity etc. **(Chapter 26, Manay)**

UNIT 11 Gelatin dishes (1 lecture)

- Types available and uses. **(Chapter 25, Charley)**

UNIT 12 Novel foods (1 lecture)

- Composition and method of preparation. **(Chapter, 29, Swaminathan)**

UNIT 13 Fast foods (2 lectures)

- Types and nutritive value,
- Health issues associated with fast foods. **(Chapter 19, Anandalakshmi)**

PRINCIPLES OF FOOD PREPARATION

PRACTICAL

Paper No.	:	F T H P 409
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

Preparation of:

1. Cream Cakes
2. Sponge cakes with icing
3. Biscuits
4. Cookies
5. Bread

6. Pizza
7. Egg ice cream
8. Gelatin ice cream

Recommended Readings

- 1) Manay NS & Shadakshaswamy M, Food Facts and Principles, New Age International, 2004
- 2) Anandalakshmi, Basic Food Preparation, Lady Irwin College, 1989
- 3) Dubey, S.C., Basic Baking
- 4) De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford. 2007
- 5) Swaminathan, M. Food Science, Chemistry and Experimental Foods, 2nd ed, 1987
- 6) Charley, H. Food Science, 2nd ed. 1982

BIOCHEMISTRY THEORY

Paper No.	:	B O H T 405
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

CONTENT

- **Biomolecules Chapter 3,4,7,8 and 10: Nelson and Cox) (8 lectures)**

Over view of amino acids, proteins and carbohydrates.

Lipids- Fatty acids, triacyl glycerols; glycerophospholipids, sphingolipids, sterols.

Nucleic acids- Nucleotides, Nitrogenous Bases- Purines and Pyrimidines; tautomers of bases, nucleotide derivatives, nucleotides as regulating molecules, different types of DNA and RNA

- **Enzymes Classification- Kinetics and Control (Chapter 6: Nelson and Cox) (8 Lectures)**

The Michaelis-Menten equation-derivation and physiological significance, the double reciprocal plots, kinetics of multisubstrate reactions, enzyme inhibition, turn over number of enzymes, *Regulatory enzymes*: General properties of allosteric enzymes,

theories of allosteric regulation, regulation by covalent modification, kinetics, multienzyme complexes, negative and positive cooperativity, zymogens, isoenzymes, abzymes, ribozymes. *Mechanisms* of enzymes- catalysis, specificity, reactions rate, equilibrium, interaction between an enzymes and substrate, role of binding energy, acid base and covalent catalysis, lock and key & induced fit theories.

- **Coenzymes (Chapter 6: Nelson and Cox) (2 Lectures)**

Classifications (metabolite derived/vitamin derived) function of various types , structure of NAD⁺, NADP⁺, FAD & FMN,

- **Metabolism and Bioenergetics Chapter 13: Nelson and Cox) (4 Lectures)**

Principles of bioenergetics-Standard free energy change, experimental measurement of ΔG , ATP and other reaction molecules, metabolic roles of ATP-Phosphoryl group transfer, nucleotidyl group transfer, biological oxidation-reduction reactions. General scheme of studying metabolic pathways, their local and global regulatory agents, energetics, disorders associated with the malfunctioning of pathways.

METABOLIC PATHWAYS (Chapter 14,16,17,21,18,22: Nelson and Cox) (32 Lectures)

- **Carbohydrates metabolism: 8 lectures**

Glycolysis, alcoholic and lactic acid fermentation, pasteur effect, gluconeogenesis, cori-cycle, glucose-alanine cycle, futile cycle. TCA cycle, HMP shunt, glycogenolysis & glycogen synthesis.

Disorders associated with defects in carbohydrate metabolism- a brief account on fructose intolerance, lactose intolerance, lactic acidosis, disorders related to glycogen metabolism, genetic deficiency of Glucose-6-phosphate dehydrogenase, Galactosemia, pentosuria, Diabetes Mellitus (NIDDM and IDDM)

- **Lipid metabolism: 8 lectures**

Mobilization of triglycerides, metabolism of glycerol, *-oxidation* of saturated, mono-unsaturated and poly-unsaturated fatty acids, even and odd chain fatty acids. Ketone bodies

Biosynthesis of fatty acids, fatty acid elongation and desaturation, biosynthesis of triacylglycerols.

Disorders associated with defects in Lipid metabolism: Refsum's disease, Gaucher's disease, Niemann Pick's disease, Tay Sach's disease

- **Metabolism of amino acids: 8 lectures**

Assimilation of Ammonia: its incorporation in glutamate, glutamine and alanine as nitrogen carrier, regulation of glutamate dehydrogenase and glutamine synthetase, transamination reactions-role of pyridoxal phosphate, nitrogen excretion and *urea cycle*.

An overview of degradation pathways of amino acids with detailed pathway of phenylalanine and branched chain amino acids.

Disorders associated with defects in protein and amino acid metabolism: disorder associated with deficiency of Urea cycle enzymes, Phenylketonuria, Alcaptonuria, Maple syrup urine disease, tyrosinemia

- **Metabolism of Nucleotides: 8 lectures**

Brief outline of *Denovo* synthesis of purines and pyrimidines, salvage pathway, reduction of ribonucleotides to deoxyribonucleotides, degradation of purines and pyrimidines, nucleotide analogs as chemotherapeutic agents.

Disorders associated with defects in nucleotide metabolism- Gout, Lesch Nyhan Syndrome, SCID, Orotic aciduria.

- **Electron-transport chain (ETC) and oxidative phosphorylation: 6 lectures**

Constituents of ETC & their sequence (Complex I-IV) & location, inhibitors of ETC, chemiosmotic theory, ATP synthase complex- structure and function, dicarboxylic acid shuttle, glycerol phosphate shuttle, P:O ratio, regulation of oxidative phosphorylation.

BIOCHEMISTRY PRACTICAL

Paper No.	:	B O H P 405
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Separation of biomolecules by electrophoresis.
2. Qualitative analysis of sugars.
3. To study the principle of spectrophotometer and verify Beer's law.

4. Quantitative estimation of DNA/RNA.
5. Quantitative estimation of protein using spectrophotometer.
6. To plot absorption spectrum of DNA and protein and find I_{max}.
7. To perform biochemical assay of an enzyme under optimal conditions.
- 8 To study the effect of pH/temperature/heavy metals/ on the activity of enzymes (any one factor).
9. To determine K_m and V_{max} of an enzyme.
10. Case studies related to metabolic disorders (Tay Sach,/Niemann Pick, von Gierke's/Galactosemia, Phenylketonuria/ Maple syrup, Gout/ADA)

References Books

Lehningers Principles of Biochemistry by David L. Nelson and Michel M. Cox. Publisher: WH Freeman; Edition V. is the TEXT BOOK for all the topics covered in the syllabus.

Others:

1.**Biochemistry** by Lubert Stryer. Publisher:WH Freeman; Edition VI.

2.**Harper's illustrated Biochemistry** by Robert K. Murray, David A Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil.

Publisher: McGraw Hill; Edition 28.

3. **Biochemistry** by Donald Voet and Judith Voet. Publisher: John Wiley and sons; Edition: II

Biochemistry by Mary K.Campbell & Shawn O.Farrell. Publisher: Cenage Learning. Edition

FOOD ENGINEERING THEORY

Paper No.	:	F T H T 410
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

- 1) To understand the principle of Unit operation
- 2) To acquaint with fundamentals of food engineering and its process
- 3) To understand the basics of designing of food plant and systems

CONTENT

UNIT 1- Introduction (Singh and Heldman 2003) (Lectures-2)

- Concept of Unit operation,
- Units and dimensions, Unit conversions, dimensional analysis
- Mass and Energy Balance.

UNIT 2- Design of food plant (Rao 2010) (Lectures-2)

- Important considerations for designing of food plants
- Construction and design
- Types of layout

UNIT 3 – Grinding and mixing (Fellow 1988) (Lectures-2)

- Principle and equipments used in food industry

UNIT 4 - Fluid Flow in food Processing (Singh and Heldman 1993)(Lectures-8)

- Liquid Transport systems
- Properties of Liquids
- Newton's Law of Viscosity
- Principle of capillary tube and rotational viscometer
- Properties of Non-Newtonian fluids,
- Flow characteristics, Reynolds Number, Bernoulli's Equation
- Principles of Flow Measurement devices

UNIT 5 – Refrigeration and Freezing(Singh and Heldman 2003) (Lectures- 8)

- Concept and selection of a refrigerant
- Description of a Refrigeration cycle
- Pressure Enthalpy charts and Tables
- Mathematical expressions useful in analysis of vapour compression refrigeration cycle

- Numericals based on VCR system, Freon 12 and R-717, superheating and sub cooling
- Freezing time calculation using Plank's Equation
- Frozen food storage

UNIT 6 – Heat and Mass Transfer (Singh and Heldman 2003) **(Lectures- 12)**

- Systems for heating and cooling food products
- Thermal Properties of Food
- Modes of heat transfer
- Application of steady state heat transfer- estimation of conductive heat transfer coefficient, convective heat transfer coefficient, overall heat transfer coefficient and, design of tubular heat exchanger.
- Fick's Law of Diffusion
- Mass transfer in packaging material
- Membrane separation systems-Electrodialysis system , Reverse Osmosis Membrane System, and Ultrafiltration Membrane System
- Membrane devices used for RO and UF: Plate and Frame, Tubular, Spiral wound and hollow fiber devices.

UNIT 7 - Psychrometrics (Singh and Heldman 2003) **(Lectures -4)**

- Properties of Dry Air
- Properties of Water Vapour
- Properties of air Vapour mixture
- Psychrometric Chart

UNIT 8- Steam, Evaporation and Dehydration (Singh and Heldman 1993, Rao 2006) **(Lectures-10)**

- Generation of steam
- Construction and functions of fire tube and water tube boilers
- Thermodynamics of Phase change
- Steam tables
- Boiling point elevation
- Types of evaporations
- Design of single effect evaporators
- Basic Drying Process
- Moisture content on wet basis and dry basis
- Dehydration systems

- Dehydration system Design.

FOOD ENGINEERING

PRACTICAL

Paper No.	:	F T H P 410
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Plant layout design
2. Determination of drying characteristics
3. Determination of viscosity of Newtonian and non Newtonian fluids
4. Study of effect of temperature on viscosity
5. Boiling point elevation
6. Study of evaporation process
7. Determination of freezing characteristics
8. Psychrometrics- use and application.

Recommended Readings

- 1) Rao DG. 2010. *Fundamentals of food engineering*. PHI learning private ltd.
- 2) Singh RP and Heldman DR.1993, 2003, 2009. *Introduction to food engineering*. Academic press 2nd, 3rd and 4th edition.
- 3) Rao C G 2006 *Essentials of food process engineering*. B S publications
- 4) Fellow P. 1988 *Food processing technology*. VCH Ellis Horwood

TECHNOLOGY OF DAIRY AND SEAFOOD

THEORY

Paper No.	:	F T H T 511
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives

- To know the need and importance of dairy and fishery industry
- To know the compositional and technological aspects of milk and fish.
- To study processed milk and fish products.

CONTENT

UNIT I Introduction

(2 Lectures)

- Status of fishery industry in India.

(Miscellaneous, internet)

UNIT 2 Chilling and Freezing of fish

(3 Lectures)

- Relationship between chilling and storage life, MAP, general aspects of freezing, freezing systems (air blast freezing, plate or contact freezing spray or immersion freezing, freezing on board, onshore processing, changes in quality in chilled and frozen storage, thawing.

(Ch 4 Hall)

UNIT 3 Fish Curing and Smoking

(8 lectures)

- Drying and salting of fish, water activity and shelf-life , salting process, salting methods (brining, pickling, kench curing, gaspe curing), types of salts, dried and salted fish products- pindang, fishwood, dried shrimp. Preservation by smoking, smoke production , smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, pre-smoking processes, smoking process control. Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked and dried products.

(Ch 2 Hall)

UNIT 4 Canning of fish

(4 lectures)

- Principles of canning , classification based on pH groupings, effect of heat processing on fish, storage of canned fish, pre-process operations, post process operations, cannery operations for specific canned products.(Tuna,Mackerel,Sardine) (Ch 5 Hall)

UNIT 5 Fishery by-products (Ch 6 Hall) (6 lectures)

- Surimi- Introduction, fish muscle proteins, the surimi process, traditional and modern surimi production lines, quality of surimi products, comparison of surimi and fish mince products.(Ch- 3 Hall)
- Fish protein concentrates (FPC), fish protein extracts (FPE), fish protein hydrolysis (FPH)

**UNIT 6 Fermented fish (Ch 7 Hall)
(2 Lectures)**

Flowchart of Indigenous products- Fish sauce and Paste

UNIT 7 Concept of other Sea foods (2 lectures)

Crabs, lobsters, prawns, shrimps, shell- fish etc

TECHNOLOGY OF MILK AND MILK PRODUCTS

UNIT 8 Physical properties of milk (2 Lectures)

color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat, OR, electrical conductivity.

(Chapter 1 of Outlines of dairy technology by Sukumar De)

UNIT 9 Lactose (1 Lecture)

- Lactose (alpha and beta forms and their differences)
- Significances of lactose in dairy industry.

(Chapter 6 of Fundamentals of dairy chemistry by Webb & Johnson)

UNIT 10 Milk fat (5 Lectures)

- Composition and structure, factors affecting melting point, boiling point, solubility and Refractive Index, fat constants (saponification value, iodine value, RM value, Polenske value, peroxide value).
- Chemical reactions of fat (hydrolysis, auto-oxidation), condition favouring auto-oxidation, prevention, measurement of auto-oxidation.

(Chapter 4 of Fundamentals of dairy chemistry by Webb & Johnson)

UNIT 11 Protein and Enzymes (5 Lectures)

- General structure, amphoteric nature, difference between casein and serum protein, different types of casein (acid and rennet), uses of casein, fractionation of protein.
- Enzymes- catalase, alkaline phosphatase, lipases and proteases.

(Chapter 3 of Fundamentals of dairy chemistry by Webb & Johnson)

UNIT 12 Market milk industry and milk products (5 Lectures)

- Systems of collection of milk
- Reception, Platform testing
- Various stages of processing
 - Filtration, Clarification
 - Homogenization
 - Pasteurization

Description and working of clarifier, cream separator, homogenizer and plate heat exchanger.6 Lectures

- Flow diagram of following milk products – Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, ice-cream, condensed milk, milk powder, channa, paneer, cheese (cheddar).

(Chapter 1-11 of Outlines of dairy technology by Sukumar De)

TECHNOLOGY OF DAIRY AND SEAFOOD PRACTICAL

Paper No.	:	F T H P 511
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

- 1 To perform platform tests in milk.(Acidity,COB,MBRT,specific gravity,SNF)
- 2 To estimate milk protein by Folin method.
- 3 To estimate milk fat by Gerber method.
- 4 Preparation of flavoured milk/. Pasteurization of milk

- 5 To prepare casein and calculate its yield.
- 6 Quality evaluation of fish/prawn.
- 7 Subjective evaluation of Fresh Fish.
- 8 Cut out examination of canned fish.(Sardine,Mackerel,Tuna)
- 9 Fish product formulation/canning.

Recommended Readings

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford. 2007
2. Hall GM, Fish Processing Technology, VCH Publishers Inc., NY, 1992
3. Sen DP, Advances in Fish Processing Technology, Allied Publishers Pvt.Limited 2005
4. Shahidi F and Botta JR, Seafoods: Chemistry, Processing, Technology and Quality, Blackie Academic & Professional,London,1994
5. Webb and Johnson, Fundamentals of Dairy Chemistry

FOOD CHEMISTRY I THEORY

Paper No.	:	F T H T 512
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

- To understand the chemistry of foods - composition of food, role of each component and their interactions.
- To understand the functional aspects of food components and highlight their role in food processing.

CONTENT

UNIT 1. Introduction to Food Chemistry (1 Lecture)
Chapter-1-3,Potter

- Definition
- Composition of food

UNIT 2. Water

(8 Lectures)

Chapter-1, DeMan

- Definition of water in food
- Structure of water and ice
- Types of water
- Interaction of water with solutes
- Sorption phenomenon
- Water activity and packaging
- Water activity and spoilage

UNIT 3. Lipids

(9 Lectures)

Chapter-2, DeMan

- Classification of lipids
- Characteristics
 - Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point.
 - Chemical properties-reichert meissel value, polenske value, iodine value, peroxide value, saponification value.
- Effect of frying on fats
- Changes in fats and oils- rancidity, lipolysis, flavor reversion
- Auto-oxidation and its prevention
- Technology of edible fats and oils- Refining, Hydrogenation and Interesterification

UNIT 4. Proteins

(10 Lectures)

Chapter-3,DeMan

- Protein classification and structure
- Nature of food proteins(plant and animal proteins)
- Properties of proteins (electrophoresis, sedimentation, amphoterism and denaturation,)
- Functional properties of proteins eg. organoleptic, solubility, viscosity ,binding gelation / texturization , emulsification , foaming.

UNIT5. Carbohydrates

(9 Lectures)

Chapter-4, DeMan

- Classification(mono, oligo and poly saccharides)
- Structure of important polysaccharides(starch, glycogen, cellulose, pectin, hemicellulose, gums)
- Chemical reactions of carbohydrates
- Modified celluloses and starches

UNIT 6. Vitamins

(7 Lectures)

Chapter-9, DeMan

- Structure ,Importance and Stability
 - Water soluble vitamins
 - Fat soluble vitamins

UNIT 7.Flavour

(6 Lectures)

Chapter-7, DeMan

- Definition and basic tastes
- Chemical structure and taste
- Description of food flavours
- Flavour enhancers

FOOD CHEMISTRY I

PRACTICAL

Paper No.	:	F T H P 512
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Preparation of primary and secondary solutions
2. Estimation of moisture content
3. Determination of gelatinization temperature range (GTR) of different starches and effect of additives on GTR.
4. Determination of refractive index and specific gravity of fats and oils.
5. Determination of smoke point and percent fat absorption for different fat

- and oils.
6. Determination of percent free fatty acids
 7. Estimation of saponification value
 8. Estimation of reducing and non-reducing sugars using potassium ferricyanide method.

Recommended Readings:

1. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996
2. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002
3. Wong, Dominic WS, Food Enzymes, Chapman and Hall, New York, 1995
4. Potter, N.N. and Hotchkiss, J.H, Food Science, 5th Ed., Chapman & Hall, 1995
5. DeMan, J.M., Principles of Food Chemistry, AVI, New York, 1980

FOOD MICROBIOLOGY THEORY

Paper No.	:	F T H T 513
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives

- To know the important genera of microorganisms associated with food and their characteristics.
- To understand the role of microbes in fermentation, spoilage and food borne diseases.

CONTENT

UNIT 1. Introduction to Food Microbiology (3 Lectures)

- History and Development of Food Microbiology
- Definition and Scope of food microbiology
- Inter-relationship of microbiology with other sciences
(chapter 1, J M JAY)

UNIT 2. Characteristics of Microorganisms in Food (8 Lectures)

- Types of microorganisms, Classification and Nomenclature ,Morphology and Structure and their importance in food (bacteria, fungi,viruses and prions, protozoans and others)
- Significance of spores
(**chapter 3,5,17,18,19,20, PELCZAR,CHAN & KREIG**)

UNIT3. Microbial Growth in Food (4 Lectures)

- Microbial Growth Characteristics- Bacterial growth curve,microbial reproduction and microbial growth in food
- Factors affecting the growth of micro organisms in food
(**chapter 4, GEORGE J. BANWART**)

UNIT4. Microbial Food Spoilage (8 Lectures)

- Sources of Microorganisms in foods
- Some important food spoilage bacteria
- Changes caused by micro-organisms during spoilage (breakdown of proteins, carbohydrates, fats and other constituents)
- Spoilage of specific food groups- Milk and dairy products, Meat,poultry and seafoods,Cereal and cereal products, Fruits and vegetables and Canned products
(**chapter 5,8,G.J.BANWART ; chapter12,13,14,17,18, W.C.FRAZIER & D.C. WESTHOFF**)

UNIT5. Food Fermentations (8 Lectures)

- Fermentation –definition and types
- Microorganisms used in food fermentations
- Dairy Fermentations-starter cultures ,types and methods of preservation and propagation, Lactic acid and aroma compounds production, Health benefits of LAB, probiotics, prebiotics and synbiotics
- Fermented Foods-types,methods of manufacture for vinegar, sauerkraut, tempeh, miso , soya sauce ,beer,wine and traditional indian foods
(**Chapter 9, BANWART ; chapter 9, M. R. ADAMS & M. O.MOSS**)

UNIT6. Foodborne Diseases (5 Lectures)

- Types – foodborne infections, foodborne intoxications and toxicinfections
- Origin, symptoms and prevention of some commonly occurring foodborne diseases
- Emerging pathogens of concern

(chapter 23,24,25 ,FRAZIER & D.C. WESTHOFF)

UNIT7. Cultivation of Micro-organisms (5 Lectures)

- Pure culture technique
- Methods of isolation and cultivation
- Enumeration of Microorganisms- qualitative and quantitative
(chapter 8 PELCZAR,CHAN & KREIG ; chapter 2, G.J.BANWART)

UNIT8. Control of Microorganisms in Foods (6 Lectures)

- Principles and methods of preservation
- Physical Methods of Food Preservation- Dehydration, Freezing, Cool Storage, Heat Treatment (esp.thermobacteriology), Irradiation,
- Chemical Preservatives
- Biopreservatives esp. Bacteriocins
- New Non Thermal methods
- Introduction to Hurdle concept and Predictive Microbiology
(chapter `10,11,12, G.J.BANWART ; chapter 4, M. R. ADAMS & M. O.MOSS)

UNIT9. Trends in Food Microbiology (2 Lectures)

- Rapid Methods of Detection
- SCP and SCO
- Recent Advances
(chapter 1 TORTORELLO & GENDEL)

FOOD MICROBIOLOGY PRACTICAL

Paper No. : **F T H P 513**
Maximum Marks : **50**
Credits : **2**
Teaching Period : **4 / Week**
Teaching Load : **12 Practical / Semester (4 Periods each)**

CONTENT

1. Introduction to the Basic Microbiology Laboratory Practises and Equipments
2. Fuctioning and use of compound microscope

3. Cleaning and sterilization of glassware
4. Preparation and sterilization of nutrient broth
5. Cultivation and sub-culturing of microbes
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. Negative staining
11. Endospore staining
12. Standard Plate Count Method

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) Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993

FOOD QUALITY TESTING AND EVALUATION

THEORY

Paper No.	:	F T H T 514
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

- To understand basic quality attributes of foods in raw as well as processed form.
- To learn various systems of objective and subjective evaluation and their application in industry.

UNIT 1 Introduction to quality attributes (Ch-6, Potter) (4 Lectures)

- Appearance, flavour, textural factors and additional quality factors.

UNIT 2 Taste (Ch-2, Amerine) (10 Lectures)

- Introduction
- 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 3 Olfaction (Ch-3, Amerine)

(10 Lectures)

- Introduction and definition,
- anatomy of nose,
- 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 4 Colour (Ch-6, DeMan, Ch-7, Pomeranz)

(10 Lectures)

- Introduction to natural and synthetic colours
- functions of colour in foods
- Optical aspect of colour,
- perception of colour,
- objective evaluation, colour measurement using different systems- Munsell colour system, CIE colour system, qualitative and quantitative analysis of colour, reflectance spectrophotometry and Colorimetry.

UNIT 5 Texture (DeMan,Ch-8, Ch-28,Pomeranz)

(14 Lectures)

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

**FOOD QUALITY TESTING AND EVALUATION
PRACTICAL**

Paper No. : **F T H P 514**
Maximum Marks : **50**
Credits : **2**
Teaching Period : **4 / Week**
Teaching Load : **12 Practical / Semester (4 Periods each)**

CONTENT

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 time and 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.

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, 1st Indian ed. CBS Publisher & Distributors, New Delhi, 2002

TECHNOLOGY OF MEAT, POULTRY AND EGG

THEORY

Paper No. : **F T H T 615**
Maximum Marks : **100**
Credits : **4**
Teaching Period : **4 Theory + 1 Tutorial / Week**
Teaching Load : **48 Theory Periods + 12 Tutorials / Semester**

Objectives:

- To understand need and importance of livestock, egg and poultry industry
- To study structure, composition and nutritional quality of animal products.
- To study processing and preservation of animal foods.

- To understand technology behind preparation of various animal food products and by-product utilization.

CONTENT

UNIT 1 Introduction (2 lectures)

- Livestock and poultry population in India, Development of meat and poultry industry in India and its need in nation's economy, Glossary of live market terms for animals and birds. **(Misc. Internet)**

UNIT 2 Meat quality (4 Lectures)

- Effects of feed, breed and environment on production of meat animals and their quality
Meat Quality-color, flavor, texture, Water-Holding Capacity(WHC),Emulsification capacity of meat **Chapter 13,14 Shai Barbut**

UNIT 3 Slaughter process (8 lectures)

Slaughter, inspection and grading, Antemortem examination of meat animals, slaughter of buffalo, sheep/ goat, poultry,pig A GenericHACCP model, dressing of carcasses, post-mortem examination of meat **Chapter 4,12 Shai Barbut**

UNIT 4 Preservation of meat (10 lectures)

- Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, and RTE meat products, meat curing. Sausages-processing, types and defects **Chapter 3,9,15 Pearson and Gillet , Chapter 7,8 Lawrie**

UNIT 5 By-products (3 lectures)

- Importance, classification and uses, Manufacture of Natural casings **Chapter 11,Pearson &Gillet**

UNIT 6 Egg Industry and Egg Production Practices (12 lectures)

- The egg industry, its techniques of working, General management, structure, composition and nutritive value of egg and its products. **Chapter 2, Stadelman**

UNIT 7 Preservation of eggs (6 lectures)

- Refrigeration and freezing, thermal processing, dehydration, coating. **Chapter 11 and 14, Stadelman**

UNIT 8 Quality identification of shell eggs (3 lectures)

- Factors affecting egg quality and measures of egg quality. **Chapter 3, Stadelman**

TECHNOLOGY OF MEAT, POULTRY AND EGG PRACTICAL

Paper No.	:	F T H P 615
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

- 1) Estimation of moisture content of meat
- 2) Cutout analysis of canned meats/retort pouches
- 3) Estimation of protein content of meat
- 4) Analysis of frozen meat/meat emulsion products
- 5) To study shelf-life of eggs by different methods of preservation
- 6) Evaluation of eggs for quality parameters(market eggs,branded eggs)
- 7) To perform freezing of yolk/albumen
- 8) Canning of meat/meat product formulation

Recommended Readings

Recommended Readings

- 1) Lawrie R A, Lawrie's Meat Science, 5th Ed, Woodhead Publisher, England, 1998
- 2) Parkhurst & Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997
- 3) Pearson & Gillet Processed Meats,3 Ed, CBS Publication, New Delhi, 1997
- 4) Shai Barbut,Poultry Products Processing,CRC Press 2005
- 5) Stadelman WJ, Owen J Cotterill Egg Science and Technology, 4th Ed. CBS Publication New Delhi, 2002

FOOD CHEMISTRY II THEORY

Paper No.	:	F T H T 616
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives:

- To understand the chemistry of food components and their interactions.
- To know about the role of enzymes and various processing treatments in food industry.
- To understand the concept of new product development.

CONTENT

UNIT 1 Minerals (4 Lectures)

- Major and minor minerals
- Metal uptake in canned foods
- Toxic metals

(Chap. 5, deMan)

UNIT 2 Natural Food Pigments (8 Lectures)

- Introduction and classification
- Food pigments(chlorophyll, carotenoids, anthocyanins and flavonoids, beet pigments, caramel)

(Chap.9,Fennema)

UNIT 3 Browning Reactions In Food (8 Lectures)

- Enzymatic browning
- Non – Enzymatic browning
 1. Maillard reaction
 2. Caramelization reaction
 3. Ascorbic acid oxidation

(Chap.13, Fennema)

UNIT 4 Enzymes (10 Lectures)

- Introduction, classification

- General characteristics
 - Enzymes in food processing
 - Industrial Uses of Enzymes
 - Immobilized enzymes
- (Chap. 10 deMan and Chap.1 ,Whitehurst and Law)**

UNIT 5 Physico-chemical and nutritional changes occurring during food processing treatments (10 Lectures)

- Drying and dehydration
 - Irradiation
 - Freezing
 - Canning
- (Chap. 1 Desrosier and Desrosier)**

UNIT 6 New product development (8 Lectures)

- Definition
 - Importance
 - Need of product development
 - Steps of product development-
 - Product development tools
 - Reasons for failure
- (Chap. 1, Fuller)**

**FOOD CHEMISTRY II
PRACTICAL**

Paper No.	:	F T H P 616
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Estimation of total ash
2. Estimation of Iron
3. Estimation of Phosphorus
4. Determination of thermal inactivation time of enzymes in fruits and vegetables.
5. Estimation of iodine value
6. Estimation of peroxide value

7. Determination of carotenoids w.r.t flour pigments.
8. Extend of non-enzymatic browning by extraction methods.
9. Introduction of the concept of new product development

Recommended Readings

1. deMan, John M., Principles of Food Chemistry ,3rd Ed., Springer 1999
2. Desrosier, Norman W. and Desrosier.,James N.,The technology of food preservation , 4th Ed.,Westport, Conn. : AVI Pub. Co., 1977.
3. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996
4. Fuller, Gordon W, New Product Development From Concept to Marketplace, CRC Press,2004.
5. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002

FOOD SAFETY THEORY

Paper No.	:	F T H T 617
Maximum Marks	:	100
Credits	:	4
Teaching Period	:	4 Theory + 1 Tutorial / Week
Teaching Load	:	48 Theory Periods + 12 Tutorials / Semester

Objectives

To understand the following:

- Food safety and hygiene
- Types of hazards associated with food
- Food regulations (national as well as international)
- Design and implementation of food safety management systems such as ISO series, HACCP and its prerequisites such as GMP, GHP etc.
- Emerging concerns

CONTENT

UNIT 1 Introduction to Food Safety	(3 Lectures)
<ul style="list-style-type: none"> • Definition • Types of hazards, biological, chemical, physical hazards 	

- Factors affecting Food Safety
- Importance of Safe Foods
(Chap.1, Forsythe)

UNIT2 Food Hazards of Physical and Chemical Origin (5 Lectures)

- Introduction
- Physical Hazards with common examples
- Chemical Hazards(naturally occurring ,environmental and intentionally added)
- Impact on health
- Control measures
(Chap.2, Lawley et.al)

UNIT 3 Food Hazards of Biological Origin (7 Lectures)

- Introduction
- Indicator Organisms
- Food borne pathogens: bacteria
- Food borne pathogens: viruses
- Food borne pathogens: eukaryotes
- Seafood and Shell fish poisoning
- Mycotoxins
(Chap. 5 , Forsythe and Chap.2, Lawley et.al)

UNIT 4 Management of hazards 5 Lectures

- Need
- Control of parameters
- Temperature control
- Food storage
- Product design
(Chap., 7 Forsythe)

UNIT 5 Hygiene and Sanitation in Food Service Establishments 8 Lectures

- Introduction
- Sources of contamination
- Control methods using physical and chemical agents
- Waste Disposal
- Pest and Rodent Control
- Personnel Hygiene
- Food Safety Measures
(Chap. 1 Marriott)

UNIT 6 Food Safety Management Tools

10 Lectures

- Basic concept
- Prerequisites- GHPs ,GMPs, SSOPs etc
- HACCP
- ISO series
- TQM - concept and need for quality, components of TQM, Kaizen.
- Risk Analysis
- Accreditation and Auditing
(Chap.7, Forsythe)

UNIT 7 Microbiological criteria

5 Lectures

- MRA
- Microbiological standards and limits (for processed food, water)
- Microbiological Assessment and categories of food based on microbial quality
- Sampling
- Basic steps in detection of food borne pathogens
- Water Analysis
- Assessment of Surface Sanitation and Personal Hygiene
(Chap. 8, Forsythe)

UNIT 8 Food laws and Standards

4 Lectures

- Indian Food Regulatory Regime
- Global Scenario
- Other laws and standards related to food
(Chap.10, Forsythe and FSSA act)

UNIT 9 Recent concerns

3 Lectures

- New and Emerging Pathogens
- Packaging ,Product labelling and Nutritional labelling
- Genetically modified foods \ Transgenics
- Organic foods
- Newer approaches to food safety
- Recent Outbreaks
(Chap 1, Rawley et. Al and Chap. 1, De Vries)

FOOD SAFETY

PRACTICAL

Paper No. : **F T H P 617**
Maximum Marks : **50**
Credits : **2**
Teaching Period : **4 / Week**
Teaching Load : **12 Practical / Semester (4 Periods each)**

CONTENT

1. Preparation of different types of media (complex, differential and selective)
2. Enumeration of aerial microflora using PDA
3. Microbiological Examination of different food samples
4. Bacteriological Analysis of Water
5. Assessment of surface sanitation by swab/rinse method
6. Assessment of personal hygiene
7. Biochemical tests for identification of bacteria
8. Scheme for the detection of food borne pathogens
9. Implementation of FSMS – HACCP, ISO : 22000

Recommended Readings

1. Lawley, R., Curtis L. and Davis, J. The Food Safety Hazard Guidebook , RSC publishing, 2004
2. De Vries. Food Safety and Toxicity, CRC, New York, 1997
3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985
4. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, Oxford, 2000
& Sons; USA, 1987

FOOD QUALITY MANAGEMENT THEORY

Paper No. : **F T H T 618**
Maximum Marks : **100**
Credits : **4**
Teaching Period : **4 Theory + 1 Tutorial / Week**
Teaching Load : **48 Theory Periods + 12 Tutorials / Semester**

Objectives:

- To learn about quality management in food production chain.
- To learn about physical, chemical contaminants in foods
- To learn about latest trends and techniques in food science
- To understand the significance of safe processing of foods.
- To understand the role of food standards and regulations in maintaining food quality.

CONTENT

UNIT 1 Food Quality (Ch-1,Pieterneel)

(8 Lectures)

- Introduction to food quality management – Definition, quality concepts, quality, quality perception, quality attributes, safety, health, sensory, shelf life, convenience, extrinsic attributes, factors affecting food behavior.
- Quality in the Agri- food production chain-Techno- managerial approach, food quality relationship and food quality management functions.Dynamics on the agri- food production chain, core developments in food quality management.

UNIT 2 Food contamination (Ch-11,DeMan)

(8 lectures)

- Contamination in Food- : Physical, chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants,radionucleides, solvent residues, chemicals) Natural toxins.
- Contaminants formed during processing – nitrosamines, acrylamide etc. natural food contaminants and contaminants from packaging materials.

UNIT3 Food Additives (Ch-11,DeMan, Barren-Ch 1,2, 3,4,5,6,8,9,15,17)

(12 Lectures)

- Chemical, technological and toxicological aspects
- Risk assessment studies- Safety and quality evaluation of additives and contaminants, Acute and chronic studies, NOEL, ADI, LD50
- Introduction, need of food additives in food processing and preservation. Characteristics and classification of food additives.
- Antimicrobial agents. -Nitrites, sulphides, sulphur di oxide, sodium chloride, hydrogen peroxide.
- Antioxidants - Introduction, mechanism of action, natural and synthetic anti-oxidants, technological aspect of antioxidants.
- Sweeteners- Introduction, importance, classification- natural and artificial, chemistry, technology and toxicology, consideration for choosing sweetening agents.
- Colors- Introduction, importance, classification- natural, artificial, and natural identical, FD&C Dyes and Lakes. Use of plant tissue culture, polymeric colors etc for color

UNIT 4 Food Laws, standards and regulations (Ch-12, DeMan-Ch-23, Potter)

(10 Lectures)

- History, National and International laws & Regulations:USFDA, EU, Codex alimentarius, World Trade Organization (Sanitary and Phyto

Sanitary agreement, Technical Barriers in Trade), -Standards of Identity, Standards of Quality, Standards of fill of the container.

UNIT 5 Basic principles and application of processing techniques (10 Lectures)

(Ch-11, Potter)

- Microwave processing, high fructose corn syrup, extrusion cooking, vacuum evaporation, cryogenic freezing, reverse osmosis, electrodialysis, ultrafiltration, supercritical fluid extraction, fat mimetics, flavour encapsulation, use of nano technology in foods etc.

FOOD QUALITY MANAGEMENT PRACTICAL

Paper No.	:	F T H P 618
Maximum Marks	:	50
Credits	:	2
Teaching Period	:	4 / Week
Teaching Load	:	12 Practical / Semester (4 Periods each)

CONTENT

1. Qualitative tests for fats and oils, spices and condiments.
2. Inspection of quality as per National and International standards for various food stuffs- pulses, spices, etc
3. Estimation of residual sulphur dioxide in beverages.
4. Chromatographic estimation of colour.
5. Analysis of edible common salt for MC, MIW and total chlorides.
6. Estimation of ammonia in water.
7. Estimation of RM-PV value in oils.
8. Estimation of pesticide residues in food/water.
9. Estimation of benzoic acid in foods.

Recommended Readings

1. Pieterneel A, Luning, Willem J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen, 2009.
2. Brannen and et al, Food Additives, Marcel Dekker, New York, 1990
3. Shalton, Principles and Practices for the safe processing of Foods.
4. DeMan, 3rd edition, Principles of Food Chemistry, Springer, 2007.