



PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 636011

**DEGREE OF MASTER OF SCIENCE
CHOICE BASED CREDIT SYSTEM**

**SYLLABUS FOR
M.SC. FOOD PROCESSING
(SEMESTER PATTERN)**

**(For Candidates admitted in the Colleges affiliated to
Periyar University from 2017-2018 onwards)**

REGULATIONS

1. ELIGIBILITY FOR ADMISSION

UG -Life science (Bio- Technology/ Microbiology/ Bio-Chemistry), Food Technology, Hotel Management & Catering Science, Home Science related subjects, B.Sc. Agriculture, Other science (Any Science degree holder who completed PG Diploma in Food Processing / Food Science & Technology related discipline).

2. DURATION OF THE COURSE:

The course for the degree of Master of Food processing shall consist of two academic years divided in to four semesters. Each semester consist of 90 working days.

3. COURSE OF STUDY

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

SEMESTER I

Core Paper I : Food Chemistry

Core Paper II :Food Processing Technology I

Core Paper III: Food Process Technology-II

Core Practical I : Food Processing Practical

Core Practical II: Food Analysis Practical

Elective Paper I: Food Production & Agriculture

SEMESTER II

Core Paper IV: Food Microbiology

Core Paper V: Instrumentation in Food Processing

Core Practical II : Food Analysis Practical (Continued from Ist Semester)

Core Practical III : Food Microbiology Practical

Elective Paper II: Food Biotechnology

Extra Disciplinary Course Paper (EDC)

Mandatory Course: Human Rights (HR)

SEMESTER III

Core Paper VI: Food Regulations & Quality Control

Core Paper VII: Food Industrial Waste Management

Core Paper VIII: Research Methodology and statistics

Core Paper IX: Food Packaging Technology

Core Practical IV: Quality Control & Adulteration Practical

Inplant Training in Food Industry(one month)

Elective Practical I: Computer Application in Food Processing Practical

SEMESTER IV

Core Paper X: Food Product Development &Entrepreneurship

Dissertation (3 months)

Elective Paper III : Animal Food Formulation

4. EXAMINATIONS

The examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

Extra Disciplinary Course (EDC) is introduced in the second semester. The Students should select any one EDC paper offered by other departments. Practical examinations for PG course should be conducted at the end of the odd/ even semester.

At the end of third and fourth semester viva-voce will be conducted on the basis of the internship report/dissertation / project report submitted by the student. The Viva – voce will be conducted by one internal and one external examiner jointly

Requirement to appear for the examination

A candidate shall be permitted to appear for the university examinations for any Semester (practical/theory) if He / She secures not less than 75% of attendance in the number of working days during the semester.

5. PASSING MINIMUM

A candidate who secures not less than 50% in the university (external)

Examination and 50% marks in the external examination and continuous internal assessment put together in any course of Major/elective/NMEC shall be declared to have passed the examination in the subject (theory or Practical). For practical, the minimum for a pass includes the record notebook marks also. There is no passing minimum for the record notebook. However submission of a record notebook is a must.

6. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First Class.

All other successful candidates shall be declared to have passed in the Second Class. Candidates who obtain 75% of the marks in the aggregate shall be declared to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

Grading:

Conversion of marks to Grade points and letter grade (Performance in a course/paper)

Range of marks	Grade Points	Grade Points	Description
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

C_i = Credits earned for course i in any semester

G_i = Grade point obtained for course i in any semester

n = refers to the semester in which such course were credited

Grade point average (for a Semester):

Calculation of grade point average semester-wise and part-wise is as follows:

$$\text{GRADE POINT AVERAGE [GPA]} = \frac{\sum_i C_i G_i}{\sum_i C_i}$$

Sum of the multiplication of grade points by the credits of the courses

$$\text{GPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the courses}}{\text{Sum of the credits of the courses under each part in a semester}}$$

Sum of the credits of the courses under each part in a semester

Calculation of grade point average (CGPA) (for the entire programme):

A candidate who has passed all the examinations under different parts is eligible for the following part wise computed final grades based on the range of CGPA.

$$\text{CUMULATIVE GRADE POINT AVERAGE [CGPA]} = \frac{\sum_n \sum_i C_{ni} G_{ni}}{\sum_n \sum_i C_{ni}}$$

Sum of the multiplication of grade points by the credits of the entire programme

$$\text{CGPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

Sum of the credits of the courses of the entire programme

CGPA	GRADE	Classification of Final Result
9.5-10.0	O+	First Class - Exemplary*
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction*
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
0.0 and above but below 5.0	U	Re-appear

* The candidates who passed in the first appearance and within a prescribed semester of the PG Programme.

7. RANKING

Candidates who pass all the examinations prescribed for the course in the first appearance and within a period of two academic years from the year of admission to the course only are eligible for University Ranking.

8. MAXIMUM DURATION FOR THE COMPLETION OF THE PG PROGRAMME

The maximum duration for completion of the PG Programme shall not exceed eight semesters.

9. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2017-18, i.e., for students who are to be admitted to the first year of the course during the academic year 2017-2018 and thereafter.

10. TRANSITORY PROVISION

Candidates who were admitted to the PG course of study before 2017 shall be permitted to appear for the examinations under these regulations for a period of three years i.e., upto and inclusive of the examinations of May 2020. Thereafter, they will be permitted to appear for the examination only under the regulation then in force.

COURSE OF STUDY AND SCHEME OF EXAMINATION

S.No.	Paper Code	Subject Title	Hours	Credits	Exam Hrs	University Examination		
						Internal (25%)	External (75%)	Total
I SEMESTER								
1.	Core I	Food Chemistry	6	5	3	25	75	100
2.	Core II	Food Processing Technology I	6	5	3	25	75	100
3.	Core III	Food Processing Technology-II	6	5	3	25	75	100
4.	Core Practical - I	Food Processing Practical	3	2	3	40	60	100
5.	Core Practical - II	Food Analysis Practical	4	-	-	-	-	-
6.	Elective I	Food Production and Agriculture	5	5	3	25	75	100
II SEMESTER								
7.	Core IV	Food Microbiology	5	5	3	25	75	100
8.	Core V	Instrumentation in Food Processing	5	5	3	25	75	100
9.	Core : Practical I	Food Analysis Practical (Continued from Ist Semester)	6	4	6	40	60	100
10.	Core Practical III	Food Microbiology Practical	3	2	3	40	60	100
	Elective II	Food Biotechnology	5	5	3	25	75	100
11.	EDC	Extra Disciplinary Course Paper	4	4	3	25	75	100
	Common Paper	Human Rights	2	2	3	25	75	100

S.No.	Paper Code	Subject Title	Hours	Credits	Exam Hrs	University Examination		
						Internal (25%)	External (75%)	Total
III SEMESTER								
12.	Core VI	Food Regulations and Quality Control	6	5	3	25	75	100
13.	Core VII	Food Industrial Waste Management	6	5	3	25	75	100
14.	Core VIII	Research Methodology and statistics	6	5	3	25	75	100
15.	Core IX	Food Packaging Technology	6	5	3	25	75	100
16.	Core Practical IV	Quality Control and Adulteration Practical	3	2	6	40	60	100
17.		Inplant Training in Food Industry(one month)	-	4	-	40	60	100
18.	Elective Practical I	Computer Application in Food Processing	3	2	3	40	60	100
IV SEMESTER								
19.	Core X	Food Product Development & Entrepreneurship	5	5	3	25	75	100
20.		Dissertation (3 months)	20	5	-	40	60	100
21.	Elective III	Animal Feed Formulation	5	5	3	25	75	100
Total			90+2			2200		

ELIGIBILITY CRITERIA FOR ADMISSION

UG - all life science (Bio- Technology/ Microbiology/ Bio-Chemistry), Food Technology, Hotel Management & Catering Science, Home Science, B.Sc. Agriculture, Other science (Any Science degree holder who completed Diploma in Food Processing / Food Science & Technology related discipline).

PG PROGRAMME - FOOD PROCESSING

Question Pattern: M.Sc. Food Processing

Theory (External Exam):

Time: 3 hrs

Max: 75 Marks

Part- A (5x5=25) Marks

I. Answer ALL Questions (Internal Choice)

Part- B (5X10=50)

II. Answer ALL Questions (Internal Choice)

Internal Assessment

Mark Distribution

Test	=	10
Assignment	=	5
Seminar	=	5
Attendance	=	5
Total	=	25

Theory

Passing Minimum (EA) = 50% = 38 Marks

Practical Mark Distribution

External	:	60 marks
Internal	:	40 marks
Total	:	100 marks

*IA = Internal Assessment

** EA = External Assessment

Passing Minimum (EA) = 50% = 30 Marks

Dissertation: Evaluation Pattern

Internal	:	40 Marks (2 Reviews- (20+20))
External	:	40 Marks
External Viva-Voce	:	20 Marks
Total	:	100 Marks

**M.Sc. FOOD PROCESSING
SEMESTER –I
CORE I - FOOD CHEMISTRY**

OBJECTIVES

Gain knowledge on the properties & composition of different foods.

UNIT I

Properties of Foods: Physico-Chemical properties of foods – Organic food components, Colloids- definition, types & properties & uses in food system.

Water- Structure, Water content in foods, physical properties, Hydrogen bonding, Types of water in foods, Water activity- Water activity and food spoilage. Interaction of water with food components, Moisture determination.

UNIT II

Carbohydrate- classification, occurrence, structure, properties, physico-chemical reactions- Hygroscopicity & solubility, optical rotation, Maillard reaction, caramelisation, gelatinization, dextrinisation, retrogradation. Fibre- classification, food sources, functional properties and uses.

UNIT III

Proteins- classifications, structure, physical and chemical properties of proteins. Reaction of protein in Food system- Dissociation, denaturation, hydration, swelling, foam formation & Stabilisation, emulsification. Amino acid in Maillard reaction. Nature of protein in meat, milk, egg and cereals, pulses, Reactions of protein in food system.

UNIT IV

Lipids- Classification, physical and chemical properties, Fatty acid – Classification, structure and properties. Physicochemical reactions – Isomerisation, hydrogenation, unsaturation, inter-esterification, emulsification, auto-oxidation, rancidity.

UNIT V

Vitamins- Structure & properties of A, D, E, K, folic acid, thiamine, niacin, ascorbic acid, cholecalciferol in foods.

Minerals- Structure & Properties of Calcium, Phosphorus, Iron, Zinc, Copper & Iodine.

Phytonutrients & Bioactive component in foods

REFERENCES :

1. Coultatte,.T.O., “Food – The Chemistry of Components”, Rsc, Royal Society of Chemistry.
2. Iqbal.s.a., Mido.Y,” Food Chemistry” Discovered Publishing Houses, New Delhi, 2005.
3. Lilian hoagland Meyer,” Food Chemistry”, CBS Publishers and Distributors, 4596/1-A, 11 Darya Ganj, New Delhi- 110 002 (India).
4. Alais, Lindan,”Food Biochemistry”, Ellishorunros LTD., New York.
5. Potter, N.N.1978, Food Science 3rd Ed. AVI, Westport.

**M.Sc. FOOD PROCESSING
SEMESTER -I
CORE II - FOOD PROCESS TECHNOLOGY - I**

OBJECTIVES

To enable students

1. To know the principles and methods involved in the processing of Perishable foods
2. To develop skills in the perishable food processing equipments.

UNIT I

Fruit & Vegetable Processing- Classification, Pre- Processing, Processing & Preservation- Size reduction, Mixing, Separation, Concentration, Freezing & Refrigeration, Drying & Dehydration, Chemicals, Processing by using Pulsed Light and Irradiation ; Nutritional losses during Processing, Fruit & Vegetable Intermediate moisture products, Storage.

UNIT II

Dairy Processing- Milk Pre-Processing; Processing & Preservation - Separation, Homogenization, Pasteurization, Standardization, Sterilization (UHT), Evaporation (Spray Drying), Chilling, Freezing & Refrigeration ; Nutritional losses during Processing; Milk Product & By Products; Storage.

UNIT III

Fleshy Food Processing – Meat, Poultry& Egg - Pre-Processing; Processing & Preservation- Smoking, Canning, Drying, Cooling, Canning Pulsed Electric Field processing; Nutritional losses during Processing; Storage.

UNIT IV

Sea Food Processing – Types; Pre-Processing; Processing & Preservation- Dielectric, Ohmic and Infra-red heating- Nutritional losses during Processing; Storage.

UNIT V

Miscellaneous Perishable Food:

Confectionery- Types Confectionery & Method of Preparation

Sugarcane & Sago Technology – By-Product & Its Utilization

REFERENCES:

1. P.J.Fellows, Food Processing Technology. Principles and Practices, Second Edition, Woodland Publishing Ltd, Cambridge, England, 2002.
2. Avantina Sharma, Text Book of Food Science and Technology, International Book Distributing Co, Lucknow, UP, 2006.
3. Sivasankar, Food Processing and Preservation, Prentice hall of India Pvt Ltd, New Delhi. IIIrd Printing, 2005.
4. Peter Zeuthen and Leif Bogh-Sorenson, Food Preservation Techniques, Woodland Publishing Ltd, Cambridge, England, 2005.

**M.Sc. FOOD PROCESSING
SEMESTER –I
CORE III - FOOD PROCESSING TECHNOLOGY – II**

OBJECTIVES

To enable students

1. To know the principles and methods involved in the processing of Non-Perishable foods
2. To develop skills in the Non-perishable food processing equipments.

UNIT I

Cereal Technology- Rice- Parboiling and milling methods, High-Pressure Processing, by products of rice milling and their utilization; Wheat- Milling, by- products of milling, Nutritional losses during Processing; Storage. Conventional and non-conventional foods- Breakfast, Extruded products.

UNIT II

Millets Technology- major and minor millets- Types, Pre- Processing, Processing & methods to remove toxic factors; Nutritional losses during Processing; Storage.

UNIT III

Pulse Technology - Types, Pre- Processing, Processing & methods to remove toxic factors; Nutritional losses during Processing; Storage.

UNIT IV

Oil seed Technology-Types; Pre-Processing; Processing & Preservation- Extraction of oils, meal concentrates and Value Addition; Nutritional losses during Processing; Storage.

UNIT V

Spice Technology (Indian) - Classification, Anti-Microbial & Antioxidant Properties, Processing, By-Products of Spices – Extraction of Oleoresin, Essential oil & Spice Blends, Medicinal Value of Spices; Nutritional losses during Processing; Storage.

REFERENCES :

1. NIIR Board of Food and Technologist, Modern Technology of Food Processing and Agro based industries, National Institute of Industrial Research, Delhi, 2005.
2. Peter zeuthena nd Leif Bogh- Sorensen, Food Preservation Techniques, Wood Head Publishing Ltd., Cambridge, England, 2005
3. Suman Bhatti, Uma Varma, Fruit and vegetable processing organizations and institutions, CBS Publishing, New Delhi, 1st Ediion- 1995.
4. Mirdula Mirajkar, Sreelatha Menon, Food Science and Processing Technology vol-2, Commercial processing and packaging, Kanishka publishers, New Delhi- 2002.
5. NIIR Board, the complete Technology book on processing, dehydration, canning, preservation of fruits and vegetables, National Institute of Industrial Research, Delhi- 2005.

**M.Sc. FOOD PROCESSING
SEMESTER -I
CORE PRACTICAL I - FOOD PROCESSING PRACTICAL**

1. Preservation of foods by sugar-Jam, Jelly, Marmalade, Cordial, Squash, Fruit bars, Fruit Preserves-Tuity Fruity (Papaya), Ginger Murabha (Ginger).
2. Preservation of foods by salt and acid-Vathal, Vadagam, Tomato ketchup and Squash, Pickles-Lemon, Mango, Mixed vegetable, Garlic.
3. Preservation by fermentation- Wine, Vinegar.

M.Sc. FOOD PROCESSING
SEMESTER -I
CORE PRACTICAL II - FOOD ANALYSIS PRACTICAL

Analysis of food for:

- a) Calories (Demo)
- b) Crude fiber
- c) Moisture
- d) Nitrogen (Demo)
- e) Ash
- f) Calcium
- g) Phosphorus
- h) Iron
- i) Vitamin A
- j) Vitamin C
- k) Fat (Demo)
- l) Saponification value
- m) Iodine number
- n) Acid number
- o) Lipid content in egg yolk
- p) Carbohydrate by anthrone method
- q) Estimation of total sugar in honey by phenol sulphuric acid
- r) Protein by Lowry's method
- s) Thiamine (Demo)
- t) Riboflavine (Demo)

REFERENCES :

1. Raghuramulu, N. Nair, K. A. and Kalyanasundaram, A. (1983) A manual of Laboratory Techniques, National Institute of Nutrition, Silver Prints, Hyderabad.
2. Oser, B. L., (1954) Hawke's Physiological Chemistry, XIV Edition, Tata MC Graw Hill Publishing Company Ltd, Mumbai.
3. Jayaram, J. (1996), Laboratory Manual In Biochemistry, New Age International Ltd, Publishers, New Delhi, Fifth Reprint.
4. Sadasivam, S and Manickam, A (1991) Biochemical Methods, New age International Pvt. Publishers, New Delhi, 2nd Edition.

**M.Sc. FOOD PROCESSING
SEMESTER -I**

ELECTIVE I - FOOD PRODUCTION AND AGRICULTURE

OBJECTIVES

1. To learn about scope of Agriculture and production of crop in India and Tamilnadu.
2. To improve the knowledge about post harvesting techniques of food grains.

UNIT I

Agriculture- scope in India and Tamil Nadu, Branches of Agriculture, Agronomic classification of crops and their economic importance, Major crops of India and Tamil Nadu-Adaptation and distribution. Agro-climatic norms of major field crops, Development of scientific agriculture in world and India.

UNIT II

Crop production- production trends in world, India and Tamil Nadu. Factors affecting crop production.

Systems of farming-wet, irrigated, dry and rain fed farming. Factors governing the choice and varieties, Cropping patterns and systems in India and Tamil Nadu, crop rotation -advantages of crop rotation followed in India and Tamil Nadu.

UNIT III

General procedure for cultivation of wetland crops and garden land crops-field preparation, sowing/ planting, maintenance/ field sanitation, cost of cultivation and economics.

Irrigation management – methods of irrigation suitability, advantages and limitations, irrigation systems of India and Tamil Nadu.

Weeds classification and its characteristics, principles and methods of weeds control (outline only).

UNIT IV

Manures and fertilizers- Types and its role in crop production, factors affecting quantity of manures and fertilizers for different crops.

Nutrient potential of different organic manure Agricultural, Industrial and Urban wastes- preparation enriched Farm Yard Manure (FYM) –Zinc enriched organics, compost making- coirpith, sugar cane trash, farm waste, farm weeds and vermin composting.

UNIT V

Storage of food grains - Types and characteristics of storage structures, grain storage and distribution system in India and Tamil Nadu. General aspects of food security in India. Agricultural research schemes in India and Tamil Nadu.

REFERENCES:

1. Dharma, A.K.1996. Organic Farming for sustainable Agriculture. Agri Botanical Publishers (India), Bikaner.
2. Gopal Chandra De .1997. Fundamentals of Agronomy. Oxford and IBH publishing Co.Pvt Ltd, New Delhi.
3. Icar. 1996.Handbook of Agriculture.Indain Council of Agricultural Research, New Delhi.
4. Morachan, Y.b.1980.Crop production and Management. Oxford and IBH Publishing Co.Pvt LTD., New Delhi.
5. Gupts, O.P.1998. Modern weed management. Mrs. Saraswathi for agro botanical, New Delhi.
6. T.N.A.U. 1999. Crop production guide. T.N.A.U. and Directorate of Agriculture, Chennai.

**M.Sc. FOOD PROCESSING
SEMESTER- II**

CORE IV - FOOD MICROBIOLOGY

OBJECTIVES

1. To list the major food spoilage microorganisms
2. To analyze methods used to control or destroy microorganism commonly found in food.
3. To understand the role of beneficial microorganisms in food processing and preservation.

THEORY

UNIT I

Introduction to Food Microbiology, Classification of micro- organism, importance of micro-organisms in food- primary sources of micro-organisms in food- intrinsic and extrinsic parameters of food affecting microbial growth. Isolation and detection of micro organisms in food.

UNIT II

Spoilage of foods - principles and types of spoilage. Microbial spoilage of cereal and cereal products and its prevention. Microbiology of milk and milk products - kinds of microorganism, sources of contamination and prevention,.

UNIT III

Contamination, spoilage and preventive measures of sugar and sugar products, fruits and vegetables - kinds, sources, prevention.

UNIT IV

Microbiology, spoilage and preventive measures of meat, poultry, fish, egg.

UNIT V

Food in relation to diseases- Food poisoning and intoxication- Bacterial- Bacillus, Clostridium botulinum, clostridium perfringens, E.coli, Salmonella, Shigelle, Staphylococcus aureus, Non bacterial- protozoa, fungi, virus, algae – characteristics and preventive measures. Indicators of water and food safety and quality.

REFERENCES :

1. Frazier, W.C and Westoff, 1995. Food Microbiology, Tata McGraw Hill Publishing Co.Ltd, New Delhi.
2. Gould, G.G. 1996. New methods of Food Preservation, Blackie Academic & Professional, Chennai.
3. Jay, J.M. 1996. Modern Food Microbiology. CBS Publishers & Distributors, New Delhi.
4. King. R.D and P.S.J. Cheetham 1986. Food Biotechnology, Elsevier Applied Science, New York.
5. George J. Banwart, 1998. Basic Food Microbiology, 2nd edition, CBS Publishers, New Delhi.

**M.Sc. FOOD PROCESSING
SEMESTER- II**

CORE V - INSTRUMENTATION IN FOOD PROCESSING

OBJECTIVES

1. To develop the skill about operation techniques in food processing equipments.

UNIT I

Unit operations – classification – conservations of mass and energy- Dimensions and units – Dimensional and unit consistency – dimensionless ratios – Evaporators- Single and multiple effect evaporator- Vacuum evaporator- - Forced circulation evaporators.

UNIT II

Mechanical separations- Filtration- Filter cake compressibility- Filtration equipment- Sedimentation, Gravitational sedimentation of particles in fluid and gas. Setting under combined forces- Centrifugal and liquid – Liquid separatoin – Centrifuge – Size reduction.

UNIT III

Principles of combination in Crushing and Mixing – Characteristics- Particle size distribution – Energy and power requirements – Crushing efficiency- Mixing of solids, pastes, dry powders- Criteria of mixer effectiveness- Mixing index.

Solar equipments – Heaters, driers, cookers, distillators for food products.

UNIT IV

Refrigerators – Types of refrigeration system- Mechanical vapour compression – Vapour absorption system – Components of mechanical refrigeration- Refrigerants- Properties- Comparison of Freon and ammonia systems- cold storages- Design of cold storages- Defrosting- Humidifiers and dehumidifiers.

UNIT V

Principles and uses of Gas chromatography, Gas liquid chromatography, Electrophoresis, High performance liquid chromatography and Atomic Absorption Spectrophotometry, pH meter, Photoelectric calorimeter.

REFERENCES :

1. Coulson, J.M. and J.F. Richardson, 1977. chemical Engineering. Volume I to V the pergamon press New Yor.
2. Earle, R.L. 1985 unit operations in Food Processing Pergamon Press. Oxford. U.K.
3. Henderson, S.M. and R.L. Perry 1955. Agricultural process Engineering, John Wiley and sons, New York.
4. Mc Cabe, W.L. and J.C. Smith 1976 unit operations of chemical Engineering. Mc Graw – Hill Inc. Kosaido printing Ltd. Tokyo, Japan.
5. Pande, P.H. 1994 Principles of Agricultural Processing –A Text Book, Kalyan Publishers, Ludhiana.
6. Sahay, K.M. and K.K. Singh, 1994. Unit operation of Agricultural Processing, Vikas Publishing House Pvt., Ltd., New Delhi.
7. W.W. Ewing, 1970, Instrumental Methods of Chemical Analysis, McGraw Hill Book Company, New Delhi.

**M.Sc. FOOD PROCESSING
SEMESTER- II**

CORE PRACTICAL III - FOOD MICROBIOLOGY PRACTICAL

PRACTICALS

1. Isolation and identification of specific microorganisms of normal and spoiled.
 - a. Fruits
 - b. Vegetables
 - c. Canned foods
 - d. Bottled drinks
 - e. Fleshy foods
 - f. Fermented foods
2. Methylene Blue Reductase test for milk microbiological survey.

REFERENCE:

1. Frazier, W.C and Westoff, 1995. Food Microbiology, Tata McGraw Hill Publishing Co.Ltd, New Delhi.
2. Gould, G.G.1996. New methods of Food Preservation, Blackie Academic & Professional, Chennai.
3. Jay, J.M.1996. Modern Food Microbiology. CBS Publishers & Distributors, New Delhi.
4. King.R.D and P.S.J.Cheetham 1986. Food Biotechnology, Elsevier Applied Science, New York.
5. George J.Banwart, 1998. Basic Food Microbiology, 2nd edition, CBS Publishers, New Delhi.

M.Sc. FOOD PROCESSING
SEMESTER- II
ELECTIVE PAPER II: FOOD BIOTECHNOLOGY

OBJECTIVES

- i) To develop students knowledge, understanding and skills in food biotechnology.
- ii) To enhance students ability to identify current and future research directions in food biotechnology.

THEORY :

UNIT I

Important Industrial micro organism. Media for industrial fermentations, criteria used in media formulation, medium composition – energy, carbon, nitrogen and other growth factors – buffering and antifoam agents. Production of culture, maintenance and preparation, bacterial culture, yeast culture and mold culture.

UNIT II

Food Fermentation –Batch and continuous process, Fermentor design – solid substrate fermentation, downstream processing, instrumentation and control. Alcoholic beverages: Beer, wine: Non alcoholic beverages: tea, coffee, cocoa, Dairy products.

UNIT III

Fermented vegetables-sauerkraut, soya based foods – tofu, temphe, yogurt; meat fermentation- sausage; Vinegar. Development of novel sweeteners, production of fats-Lard, amino acids- L-aspartate, Development and formulation of probiotic foods. Isolation & purification of starch, Starch in food industry, Modification of starch. Isolation of protein from soyabean, milk, egg; Protein hydrolysates; Modification of protein.

UNIT IV

Enzyme technology in food industry: industrial enzymes and its applications(with respect to food processing industry). Micro encapsulation, List of industrial enzymes and their applications in food industry, Production of food industrial enzymes, Immobilization of enzymes- method of immobilization, advantage and disadvantages of immobilization. Uses of immobilized enzymes- High fructose corn syrup preparation.

UNIT V

Ethical issues concerning GM foods; testing for GM foods; current guidelines for the production, release and movement of GM foods; labeling and traceability; trade related aspects; biosafety; risk assessment and risk management. Public perception of GM foods. IPR. GMO Act 2004. (Genetically Modified Crops Management Act 2004).

REFERENCES :

1. Owen pward (1989), Fermentation Biotechnology Principles, Processes And Products, Prentice H New Jersey.
2. Solomons, G.L.(1983), Single Cell Proteins-Critical Reviews of Biotechnology, Moo Young Compressive Biotechnology Scientists Foundations, Engineering Consideration.
3. Prescott (1987), Industrial Food Preservation, John Willey And Sons.
4. Frazier And West Hoff (1995), Food Microbiology, Tata Mcgraw Hill Publishing Company Ltd, New Delhi.
5. Dubey, R.C.(2001) Text Book Biotechnology S.Chand And Co Ltd, New Delhi.
6. Gupta, P.K.(1996), Elements of Biotechnology, Rostogi And Co, Meerut.
7. Paul, P.C. and Palmer (1972) Food Theory And application John Wiley Sons, New Youk
8. Gary Walsh And Denis R.Headen, Protein Biotechnology, S.Chand And Co,Ltd, New Delhi.
9. Dubey, R.C. And Maheswari, D.K.A. Text Book of Microbiology, S.Chand And Co, Ltd, New Delhi.
10. Food Science And Food Biotechnology,2003, Gustara F.Gutierrez-Lopez.
11. Lee, B.H. Fundamentals of Food Biotechnology. VCH. 2006.

M.Sc. FOOD PROCESSING
SEMESTER- II
EXTRA DISCIPLINARY COURSE (EDC)
FOOD PROCESSING

UNIT I

Functions of Food- Food Groups- Food Science, objectives of cooking- Preliminary preparation- cooking methods.

UNIT II

Processing of pulses, composition and nutritive value, processing methods, toxic constituents.

UNIT III

Processing of cereals- structure, composition and nutritive value, Processing methods- fermented and unfermented products.

UNIT IV

Processing of milk, composition, physical properties, nutritive value and effect of salt, enzymes, acid and heat, Fermented and Non -fermented milk products.

UNIT V

Processing of meat and poultry- processing, composition, nutritive value, preservation and storage.

REFERENCES

1. Belitz.W.Grosch.1986. Food chemistry. Springer Verley Berlin Heidelberg. New York.
2. David S. Robinson. 1987. Food Biochemistry and Nutritive value. Longman Group, UK.
3. Leslie Hart, F and Harry Johnstone Fisher. 1971, Modern Food Analysis, Springer-Verlag, New York.
4. Dauthy, M.E. 1995. Fruit and Vegetable processing, FAO Agricultural Services Bulletin, 119,Rome.
5. Sadasivam, S and Manickam, 1996. Biochemical methods for Agricultural sciences, New Age International Publishers.
6. Poter. H.N: Food Science, The Av Publishing Co., Inc West Poet, Connecticut 1973.
7. Desrosier.N.W. The technology of food preservation. The Av Publishing Co., Inc West Poet, Connecticut 1973.
8. Meyer L.H: Food Chemistry, Von Nostrand
9. Chemical Changes in food during processing. T. Richardson.

**M.Sc. FOOD PROCESSING
SEMESTER- II**

**EXTRA DISCIPLINARY COURSE
FOOD PRODUCT DEVELOPMENT**

UNIT I

Definition and classification, Characterization and factors shaping new product development. Role of ingredients and processing in defining attributes.

UNIT II

Shelf life requirements and factors affecting shelf life and product attributes.

UNIT III

Process of flow sheet development, preparation of concept testing documentation .

UNIT IV

Concept testing approaches sampling methods, role of sensory evaluation. Preparation of concept testing documentation.

UNIT V

Research and new product development- patents- patent laws- International code for Intellectual Property Rights

REFERENCES:

1. Fuller, G. W. New Food Product Development From Concept to Marketplace. CRC Presds, Boca Raton (On Reserve in Agr. Library
2. Baker, R. C. 1988. Fundamentals of New Food Product Development
3. Dickinson&Stainsby. 1988. Advances in food emulsions and foams. Elsevier Applied Sciences
4. Gould, W. A. 1991. Research and Development Guidelines for the Food Industry
5. Lewis, R. J. 1989. Food Additives Handbook. Van Nostrand Reinhold
6. Lyon, D. H. 1992. Guidelines for Sensory Analysis in Food Product Development and Quality Control. Chapman and Hall Modified starches properties and uses. CRC Press Press, Inc. San Diego

M.Sc. FOOD PROCESSING
SEMESTER- III
CORE VI - FOOD REGULATIONS AND QUALITY CONTROL

OBJECTIVES

To enable the students

1. To standardize food products through sensory evaluation.
2. To understand the fundamental food quality control procedures.
3. To know about Food standards and Laws

UNIT I

General principles of quality control – quality attributes size, shape, colour, consistency, viscosity, texture, taste and flavor.

UNIT II

Methods of evaluation of food quality – sensory, objective technique, microbiological methods of quality evaluation, shelf life assessment

UNIT III

Common adulterants, tests to detect adulterants contaminants, naturally occurring toxins in food metallic pesticide and preservative contaminants. Non nutritive food components and their potential health effects, phoyphenols, tannins, phyto oestrogens, cyanogenic compounds, lecithin, saponins.

UNIT IV

Government and trade standards for quality – food laws and regulations – PFA , FPO and Food Safety Act 2006. BIS standards, Agmark standards, Compulsory National legislation Act, Essential Commodities Act, Consumer protection Act. International Standards for export, Codex Alimentarius, WTO, ISO, WHO and FAO, FSSA, APEDA and MPEDA.

UNIT V

Rules and regulations for setting up of a processing unit. Criteria for ingredients and finished products. Aspects of microbiological safety in food preservation technologies, Establishment and implementation of HACCP, Continuous Assessment System, Total quality management and quality audits in food industries.

PRACTICAL EXPERIENCE

Examination of food products in relation to different standards PFA. Agmark, Visit to BIS centre, AGMARK Centre. District level quality control laboratory and food processing industries, market survey of foods for quality.

REFERENCES :

1. BIS Standards
2. Giridarillal Sidappa G.S., and Tandon, G.L. (1979) Preservation of fruits and vegetables, ICAR, New Delhi.
3. FPO (1955) Quality control.
4. Horace D.Graham. 1980 The safety of foods, 2nd End. AVI Publishing Co. Inc. Westport.
5. Julie Miller Jones. 1992 Food Safety, Enagan Press, USA.
6. Lewis M.J. 1987 Physical Properties of Food and processing system. Ellis Horwood Ltd., England.
7. Picgott, J.R.1984. Sensory analysis of Foods Elsevier . Applied Science Publisher, New York.
8. Principles and practices for the safe processing foods, David Ashapton.
9. Early. R. (1995): Guide to Quality Management Systems for the Food Industry.

M.Sc. FOOD PROCESSING
SEMESTER- III
CORE VII - FOOD INDUSTRIAL WASTE MANAGEMENT

UNIT I

Introduction; Classification & characterization of food industrial wastes from fruit and vegetable processing industry, beverage industry, fish, meat and poultry industry, sugar industry and dairy industry.

UNIT II

Waste disposal methods- physical, chemical and biological; Economical aspects of waste treatment and disposal.

UNIT III

Treatment methods for liquid wastes from food process industries; Design of activated sludge process, Rotating biological contactors, Tricking filters, UASB, Biogas plant.

UNIT IV

Treatment methods of solid wastes; Biological composting, drying and incineration; Design of solid waste management system; Landfill digester, Vermicomposting pit.

UNIT V

Biofilters and bioclarifiers, Ion exchange treatment of waste water, Drinking – water treatment, Recovery of useful materials from effluents by different methods.

REFERENCE

1. Food Industry Wastes: Disposal and Recovery; Herzka A & Booth RG; 1981, Applied Science Pub Ltd.
2. Water & Wastewater Engineering; Fair GM, Geyer JC & Okun DA; 1986, John Wiley & Sons, Inc.
3. Wastewater Treatment; Bartlett RE; Applied Science Pub Ltd.
4. Symposium: Processing Agricultural & Municipal Wastes; Inglett GE; 1973, AVI.
5. Food Processing Waste Management; Green JH & Kramer A; 1979 AVI.
6. Environmental Biotechnology: Principles and Applications; Rittmann BE & Mc Carty PL; 2001, Mc-Grow-Hill International editions.
7. Environmental Biotechnology; Bhattacharyya B C & Banerjee R; Oxford University Press.

**M.Sc. FOOD PROCESSING
SEMESTER- III**

CORE VIII - RESEARCH METHODOLOGY AND STATISTICS

UNIT I

Meaning of Research, Role of Statistics and research in Home Science Discipline, objectives of research, Types of research and their application, selection and formulation of research problem, Hypothesis, Designing a research – different types, census and sample method, Theoretical basis of sampling, Sampling methods- Random sampling methods, size of sample, sampling and Non- sampling errors.

UNIT II

Methods of collecting primary data- Questionnaire, preparation of schedules, interview method, case- study method, Experimentation method, sources of secondary data, precautions while using secondary data. Editing and coding the data, Organization of data, classification- meaning and objectives, types of classification, formation of discrete and continuous frequency distribution, Tabulation – role, parts of a table, general rules of tabulation, types of tables.

UNIT III

Representation of data- Diagrammatic and graphical representation- significance of diagrams and graphs, general rules for constructing diagrams, Types of diagrams, graphs of time series, graphs of frequency distribution.

Interpretation and report writing- meaning of interpretation technique, precautions, format of research report, types, steps and stages, mechanism and style, essential of good report, footnotes and bibliographical citations. Scale of measurements.

UNIT IV

Measures of central tendency- mean, median, mode, their relative advantages and disadvantages, measures of dispersion- mean deviation, standard deviation, quartile deviation, co-efficient of variation, percentile and percentile ranks. Association of attributes, contingency tables, correlation, coefficient of correlation and its interpretation, rank correlation, regression equations and predictions.

UNIT V

Probability- Rules of probability and its applications. Distribution- Normal, binomial, their properties, importance of these distributions in statistical studies. Tests of significance, large and small samples, “t” and F test, tests for independence using chi-square test. Analysis of variance – One- way and two-way classification.

REFERENCES :

1. Kothari,C.R.(2002), Research Methodology
2. Gupta,S.P.(2002), Statistical Methods, Sultana Chand and sons, 31st revised edition
3. Devadas, R.P.(1989), A Handbook on Methodology of Research, Sri Ramakrishna Vidhyalaya, Coimbatore.
4. Ramakrishnan,P.(2001), Biostatistics, Saras publication.
5. Donald, H.M.C.Burney (2002), Research Methods, Fifth edition, Thomson and Wadsworth Publications
6. Shanthi,P., Sophia and Bharathi (2000), Computer oriented statistical methods/ probability and statistics, charulatha publications, second edition.
7. Pillai, R.S.N and Bagavathi,V(2001), Statistics, Chand and company limited.

Practical /Related Experiences:

1. Identifying the research problems under each type
2. Formulation of Questionnaires and schedules.
3. Consolidating data and forming tables.
4. Drawing graphs and diagrams appropriately.
5. To understand and select a suitable saying methods for a given situation.
6. Working out numerical sums for all statistical analysis and interpret.
7. Demonstration of SPSS.

M.Sc. FOOD PROCESSING
SEMESTER- III
CORE IX - FOOD PACKAGING TECHNOLOGY

OBJECTIVES:

1. To understand the various properties of food packaging materials.
2. To Select suitable packaging material for different food substances.
3. To understand the concept of canning of food products.

THEORY :

UNIT I

Packaging-Concepts, definition, significance, classification, Flexible packaging materials and packaging forms-paper, regenerated cellulose, film, aluminum foils, and lamination, wrappers, bags, pouches and collapsible tubes.

UNIT II

Spiral packaging methods-vacuum packaging, gas packaging and shrink packaging. Packaging of milk and milk products –milk, condensed milk, evaporated milk, milk powder, cream, butter & cheese.

Semi rigid packaging materials & forms –Aluminum Containers, setup paper cartons, folding paperboard cartons, moulded pulp containers and plastic containers.

UNIT III

Rigid packaging materials-glass containers and Composite Containers. Rigid packaging materials and package forms-Aerosol containers, Solid & Corrugated fiber board Containers, wooden boxes & crates. Cylindrical shipping containers and problems in packaging dehydrated foods.

Packaging requirements & materials for chocolate and Confectionaries-chocolate, candy, confectionary peanut butter, chewing gum, jams & jellies. Packaging requirements and materials for beverages, vegetables and fruits juices, carbonated soft drinks.

UNIT IV

Packaging requirements and materials for fish- fresh, frozen, salted, smoked fish meal. Packaging of egg products.

Packaging equipment, principles of weighing filling, sealing, wrapping, cartooning, capping, labeling, coding, marking including bar coding and strapping.

UNIT V

Packaging –Laws and regulations. Aseptic and retort packaging. Testing and evaluation of packaging media-retail packs and transport packages. Produce package Compatibility, toxicity, tainting and corrosion. Packaging and environment.

REFERENCES :

1. Stainley Sacharous, Roger.C.Griffin, Principles of food packaging 2nd edition, AVI. Publishing.Co., Westport.
2. Paine, F.A. & Paine, H.Y.A.hand book jof food packaging Leonard Hill.Blackie Son's Ltd, London.
3. Sacharow, S.Hand Book of packaging materials, A VI Publishing company, West Port.
4. Croshy, N.T.Food packaging materials, Applied Science publication limited, London.
5. Paine, F.A.The packaging media, Blackie and Son's Ltd, London.
6. Sacharow and Grilin, Food Packaging, AVI Publications Hotchikess, Food and Packaging interactin-American Chemical Society.
7. Robertson, G.L.Food packaging Technology, News Port, Marcell Dekkar, Inc.
8. Food Packaging Principles And practice, 1998, Gordon L.Robertson.
9. Novel Food Packaging Techniques, 2003, Raija Ahvenainen.
10. Active Packaging For Food Applications, Aaron, L.Brode, Eugene R.Strupinsky, 2001.
Practical / Related Experiences :A visit to packaging unit.

**M.Sc. FOOD PROCESSING
SEMESTER- III
CORE PRACTICAL IV - QUALITY CONTROL AND
ADULTERATION PRACTICAL**

1. Establishing Sensory Panels- Designing Sensory Testing Facilities- Analytical Test- Conduct a Sensory Evaluation Test- Designing Score card, objective evaluation, Instruments used for texture evaluation
2. Adulteration test- for adulterants in milk. Fat and oil, spices and Condiments.
3. Quality test for milk and ghee.
4. Quantitative test:
 - a. Titrable acidity
 - b. Gluten content (wet & dry)
 - c. Total Soluble Solids
 - d. Bulk Density
 - e. Water absorption capacity
 - f. Oil absorption capacity
 - g. Foaming stability.

M.Sc. FOOD PROCESSING
SEMESTER- III
ELECTIVE PRACTICAL I: COMPUTER APPLICATION
IN FOOD PROCESSING

Windows (2007)

1. a. DOS Commands
 - I. Internal Commands.
 - II. External Commands.
1. b. Windows (2007).
 - I. Windows Explorer.
 - II. Main & Accessories.

MS-OFFICE

2. MS.WORD:
 - 2.1.a. Starting MS-WORD, Creating, Saving, Printing (with options), Closing and Exiting.
 - b. Study of Word – Menu / toolbars.
 - 2.2. Create a document, save it and edit the document as follows:
 - i) Find and Replace options.
 - ii) Cut, Copy, Paste options.
 - iii) Undo and Redo options.
 - 2.3. Format the document:
 - i) Using Bold, Underline and Italic.
 - ii) Change Character size using the font dialog box.
 - iii) Formatting paragraph: Center, Left aligns & Right align
 - iv) Changing paragraph and line spacing, Using Bullets and Numbering in Paragraphs.
 - v) Creating Hanging Paragraphs.
 - 2.4. Using tab settings enhancing the documents (Header, Footer, Page Setup, Border, Opening & Closing Toolbars, Print Preview).
 - 2.5. Creating Tables in a document, Selecting Rows & Column sort the record by using tables format painter and Auto Format.
 - 2.6. Prepare a Mail Merge.
 - 2.7. Create a Macros

3. MS-EXCEL

- 3.1 Create a worksheet, moving/ copying/ inserting/ deleting rows and columns (usage of cut, paste, commands, copying a single cell, copying a range of data, filling up a cell. Undo command, inserting a row, column, deleting rows and columns).
- 3.2.
 - i) Formatting numbers (Selection Command, Currency format).
 - ii). Drawing border around cells.
 - iii). Printing a work sheet (Print preview, Margin Setting, Header, Footer).
- 3.3. Creating charts
 - i) Using chart wizard
 - ii) Changing the chart type (Pie, Bar, Line)
 - iii) Inserting titles for the axes X. Y
 - iv) Changing colors.
 - v) Printing charts.
- 3.4 Math Functions
 - i) SUM, COUNT, AVERAGE
 - ii) MAX, MIN
 - iii) STDDEV, VAR
 - iv) ABS, EXP, INT
 - v) LOG 10 AND LOG
 - vi) MOD, ROUND, SORT
 - vii) Using auto sum

4. MS-POWER POINT

- a. Creating a presentation using auto content wizard.
- b. Different views in power point presentation.
- c. Setting animation effects / grouping / ungrouping / cropping power / point objects.
- d. Printing a presentation / Importing – Exporting file.
- e. Creating an organization chart in Power Point.

5. VISUAL BASIC (6.0)

- 5.1 Arithmetic Calculator
- 5.2 Create a Access database for student mark list and generate a data report.
- 5.3 Create a database for reservation (Bus, Train & Air) and generate a data report

M.Sc. FOOD PROCESSING
SEMESTER- IV
CORE X - FOOD PRODUCT DEVELOPMENT &
ENTREPRENEURSHIP

OBJECTIVES:

To know about principle and steps involved in new food product development & Marketing Strategy.

UNIT I

Basic principles & concept of food product development. Cultural approach to development of dietary pattern of various groups- linguistic, regional, religious(ethic). Factors involved in food habit alteration, availability, importance & role of different research & development departments in food production industry.

UNIT II

Steps in product development –material resources based on market demand, standardization methods involved in product development. Portion size & portion control, Calculation of nutritive value & cost of production, Shelf life & storage stability evaluation procedure of developed food products.

UNIT III

Formulation of new food products for infants, preschool children, adolescents, pregnant & nursing mothers, old age, sports persons. Selection & training of judges, Development of score card analysis of data. Role of advertisement & technologies in promotion of new products.

UNIT IV

Concept of market & marketing- Approaches of study marketing & marketing functions, market structure, marketing efficiency. Role of government in promoting agricultural marketing. Conditions for sale, license & identification & quality of processing. Studying the global market status, economic feasibility of new products.

UNIT V

Entrepreneurship- concept definition of entrepreneurship, Types of entrepreneurship, women entrepreneur, growth, prospects & problems.

Small business: Definition & composition of small business- Economic contribution of small business. Strategic planning for small business – Steps in strategic planning.

REFERENCES :

1. Sivarama prasad.A, 1985,Agricultural Marketing in India-Mittal Publications,New Delhi.
2. Acharya.S.S,and N.L.Agarwal,1992,Agricultural Marketing in India- Oxford and IBH Publishing Pvt., Ltd., New Delhi.
3. Developing New Food Products For a Changing Market Place, 2nd Edition, 2005,Aaron, L.Brody,John B.Lord.
4. New Food Product Development, 2004,Gordon W.Fuller.
5. John Kao , Creativity & Entrepreneurship package Compatibility, toxicity, tainting and corrosion. Packaging and environment.

M.Sc. FOOD PROCESSING
SEMESTER- IV
ELECTIVE PAPER III - ANIMAL FEED FORMULATION

OBJECTIVES:

1. To provide the students with knowledge on feed composition, their digestion process, and nutrient metabolism.
2. To learn to evaluate the nutritional value of the different components, through the application of various systems.

UNIT I

Nutrient requirements of cattle and buffalo, growth pattern in India domestic buffalos, Intestine meat production from buffalos.

UNIT II

Nutrient requirement for growth, milk production, feeding of goats, natural common feeds and Fodders of goats.

Nutrient requirement & feeding of Dogs & Ducks.

UNIT III

Nutrient requirements- reproduction, feeding of sheep and weaning pigs, feeding schedule, growers rations.

UNIT IV

Nutrient requirements of poultry, formulation of poultry rations, feed requirement for production, feeding schedule.

UNIT V

Tree leaves and shrub straws and crop residues- agro- industrial by-products, rations for feeding during scarcity, preparation of feed.

REFERENCES

1. Hutton,J.B, 1962: Proc. New Zealand Sc. Anim. Prod.
2. Ranjhan.S.K. 1991. Chemical composition of Indian feeds and feeding of farm animals, ICAR, New Delhi.
3. Razdan,M.N., Bhosreker,M.R and Ray,SN., 1965. Ind. J.Dairy Scie. 18,96.
4. Ranjhan,.S.K.2001.Animal Nutrition in the tropic, 5th revised edition, P; 288-490.

M.Sc. FOOD PROCESSING

SEMESTER- IV

PROJECT

Each student shall be required to prepare a training report on the basis of a training undergone by the candidate in Food Industrial Organization, suggesting a possible solution for a problems of current interest in the area of processing. The Report should demonstrate the capability of the student for some creative potential and original approach to solve the practical problems in today's Business or Industry. The report should include industrial research, experiments, interpretations, planning and design of an improved and integrated processing, management systems, presented in a comprehensive manner with recommendations for solutions based on scientifically worked out date. It contains less than 200 pages.

M.Sc. DEGREE EXAMINATION
FOOD PROCESSING
FOOD CHEMISTRY

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

- (a). Give an brief account about the physical properties of water in foods? (Or)
(b). Explain the interaction of water with food components.
- (a). Discuss the following :
 - Structure and classification
 - Physical and chemical reactions of monosaccharide (Or)
(b). Write about the classification of fiber.
- (a). Describe about protein classification. (Or)
(b). Explain about denaturalization of protein.
- (a). Describe about lipid classification. (Or)
(b). Outline auto-oxidation of lipids.
- (a). Explain the structure and properties of vitamin D (Or)
- (b). Explain the structure and properties of calcium.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

- (a). Give a detail account about colloids. (Or)
(b). Define water activity. Explain the relationship of water activity with food spoilage and packaging?
- a). write about physico-chemical reactions of carbohydrate (Or)
(b). Give an detailed account on functional properties and uses of fiber?
- a). Discuss protein under following headings.
 - Classification
 - properties
 - Denaturation (Or)
(b). How to determine protein quality in meat, milk and egg.
- a). classify fatty acid & list out the physical and chemical properties of fatty acids. (Or)
(b). Explain physico-chemical reactions of lipid.
- a). High light the structure and properties of vitamin A. (Or)
(b). High light the structure and properties of iron

M.Sc DEGREE EXAMINATION
FOOD PROCESSING
PAPER – I FOOD PROCESS TECHNOLOGY – I

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)
Answer All Questions
All questions carry equal marks

1. (a). Write about the size reduction of solid and liquid foods? (Or)
(b). What are the procedures of preparing raw materials for processing?
2. (a). What does the term “high pressure processing” means? (Or)
(b). Explain about processing of food products using pulsed light and ultrasound?
3. (a). Which is the effective method of heat processing? Explain. (Or)
(b). Write a short note on Intermediate Moisture Foods.
4. (a). Give the low temperature processing methods? (or)
(b). How will you modify the environment of a food product to extend its shelf life?
5. (a). Write about blanching – the high temperature heat processing method? (or)
(b). Bring details on pasteurization.

PART B (5X 10=50)
Answer All Questions
All questions carry equal marks

6. (a). Explain the principles of food processing and preservation. (Or)
(b). Write details on the following operations of food processing
 - (i). Mixing and forming
 - (ii). Centrifugation
 - (iii). Filtration.
7. (a). Write about heat processing by means of chemical methods.(Or)
(b). Outline the processing method using pulsed light, ultrasound and Pulsed electronic field processing.
8. (a). Elaborate heat processing using hot oils.(Or)
(b). Distinguish the heat processing method by dielectric, ohmic and infrared heating.
9. (a). Explain in detail about low temperature methods of heat processing with example.(Or)
(b). Give an account on freeze drying and freeze concentration.
10. (a). Compare high temperature heat processing methods with low temperature heat processing methods. (Or)
(b). Explain the following :
 - (i). Effect of nutrients during blanching.
 - (ii). Draw a flowchart on canning process with example and explain.

M.Sc., DEGREE EXAMINATION
FOOD PROCESSING
FOOD PROCESS TECHNOLOGY – II

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a) List out the advantages of parboiling. (Or)
(b) Differentiate between conventional and non conventional foods.
2. (a) Give an outline of the processing of any one major millets. (Or)
(b) Discuss the various methods to remove toxic factors from pulses.
3. (a) Write about the factors influencing drying of vegetables. (Or)
(b) Bring out the utilization of various by – products from sugarcane.
4. (a) Give a brief account about pasteurizations and homogenization ? (Or)
(b) Explain the methods of preservation of fish.
5. (a) Write the steps involved in the extraction of oils from oil seeds. (or)
(b) Explain the method of preparation of confectionaries.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a) Describe the traditional and modern methods of rice milling ? (Or)
(b) Explain the different types and processing of breakfast cereals.
7. (a) Write a note on the processing of any three minor pulses ? (Or)
(b) Explain in detail the Traditional methods of pulse milling.
8. (a) Define freezing and canning. Explain its types and effects on fruits. (Or)
(b) How the sage is processed and mention the by products out of this.
9. (a) Explain the manufacturing steps involved in cream. (Or)
(b) Outline the processing steps of meat and explain the post mortem changes in meat.
10. (a) List out the importance of essential oils in foods and how it is extracted? (Or)
(b) Give a detail account on the method of preparation of the following:
 - (i) Chocolate
 - (ii) Candies
 - (iii) Marsh melons

M.Sc. DEGREE EXAMINATION

FOOD PROCESSING

FOOD PROCESSING PRACTICAL

Time : 3 hours

Max. Marks : 60

I.	Process and present one available fruit by addition of sugar and pickling of vegetable by using oiling method	50
II.	Viva voce	10

	Total	60

M.Sc., DEGREE EXAMINATION

FOOD PROCESSING

FOOD ANALYSIS PRACTICALS

Time : 6 hours

Max. Marks : 100

- | | | |
|-----|---|----|
| I. | Explain the effect of processing methods on the nutritive value of meat. & Estimate the amount of phosphorus content in the given sample. | 50 |
| II. | Viva voce | 10 |

M.Sc. DEGREE EXAMINATION
FOOD PROCESSING
FOOD PRODUCTION AND AGRICULTURE

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a). Write about the scope of agriculture in India and explain its branches. (Or)
(b). Give an short account on adaptation and distribution of major crops in India and Tamilnadu.
2. (a). What are the factors affecting crop production? (Or)
(b). Write shortly about the systems of farming.
3. (a). Show the methods of irrigation, its advantages and limitations (Or)
(b). Explain the methods of controlling weeds.
4. (a). Highlight the factors affecting manure quantity. (Or)
(b). Write about vermicomposting.
5. (a). Bring down the characteristics of storage structure. (Or)
(b). Show the general aspect of food security systems in India.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a). Discuss the principles behind the classification of agronomic crops and their economic importance. (Or)
(b). Explain about the introduction of scientific methods in agriculture and its development in India.
7. (a). Describe briefly about the new trends in the crop production in India and explain farming techniques. (Or)
(b). Define crop rotation. Outline the methods involved in it with advantages.
8. (a). Write down the procedure for the production of wetland crops and gardenized crops. (Or)
(b). Discuss the following terms.
 - (i). Field sanitation
 - (ii). Field economics
9. (a). Enumerate the types of manures and fertilizers and their role in crop production with example. (Or)
(b). Give an detailed account on the nutritive potential of different organic manures.
5. (a). Write an essay on grain storage and distribution system in India and Tamil Nadu. (Or)
(b). Elaborate the agricultural research schemes in India and Tamil Nadu.

M.Sc. DEGREE EXAMINATION
FOOD PROCESSING
FOOD MICROBIOLOGY

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a) Discuss how microorganisms are important in food processing. (Or)
(b) Explain the primary sources of microorganisms in food.
2. (a) Describe the spoilage of cereals. (Or)
(b) Discuss the microbiology of milk and milk products.
3. (a) Explain the spoilage of meat and fish. (Or)
(b) Discuss the microbial spoilage of fruits.
4. (a) Explain the sewage contamination in food. (Or)
(b) Discuss the soil contamination in food.
5. (a) List out the preventive measures of food borne infections. (Or)
(b) Explain the necossicities to investigate the outbreak of food borne diseases.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a) Classify the microorganisms associated with food. (Or)
(b) Give an account on the factors affecting microbial growth.
7. (a) Write an essay on principles and types of spoilage in food. (Or)
(b) Give an account on spoilage and preventive measures of sugar and sugar products.
8. (a) Discuss in elaborate on Microbiology of egg. (Or)
(b) Explain in detail about sources and preventive measures of vegetable spoilage.
9. (a) Write in detail about the water contamination in food. (Or)
(b) Describe the air contamination during food poisoning.
10. (a) Give an account on Non-bacterial food borne infection. (Or)
(b) Explain the followings :
 - (i) Staphylococcal food intoxication
 - (ii) Staphylococcal food intoxication
 - (iii) Salmonellosis
 - (iv) Botulism

M.Sc., DEGREE EXAMINATION
FOOD PROCESSING
FOOD MICROBIOLOGY PRACTICAL

Time : Three hours

Max. Marks : 60

- | | |
|---|----|
| I. Enumerate and identify the micro organism which is present in surface swab Meat. | 50 |
| II. Microscopic presentation | 10 |

M.Sc., DEGREE EXAMINATION
FOOD PROCESSING
INSTRUMENTATION IN FOOD PROCESSING

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a) Define :
(b) Units and Dimension. Give an example.
(c) Dimensional ratio
(d) Law of conservation of mass and energy. (Or)
(b) Give units and dimension of the following:
(i) Power (iv) Pressure (ii) Specific gravity
(v) Momentum (iii) Surface tension (vi) Viscosity
(vii) Reynolds number
2. (a) Give the unit operations involved in Food Processing of milk and manufacture of fruit juice. (Or)
(b) Explain the principle of size reduction and its equipment with neat diagram.
3. (a) Write down the properties of refrigerants. (Or)
(b) Explain the mechanism of Vapour Absorption System.
4. (a) Solar energy is more economical. How? (Or)
(b) Describe solar equipments.
5. (a) Explain the insulation material in details. (Or)
(b) Enumerate the principles of combination and its characteristics.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a) Explain single and multiple effect evaporator with neat diagram. (Or)
(b) Explain the mass and energy balance using law of conservation of mass and energy.
12. (a) Discuss in detail
(i) Principle involved in Sedimentation
(ii) Gravitation sedimentation of particles in gas and combined forces (Or)
(b) Write about the filtrate flow through filter cake and its application.
13. (a) What is mixing index ? Explain mixing of solids, pastes and dry powders. (Or)
(b) Role of mixing in food industries – Explain.
14. (a) Explain air conditioning systems and their applications. (Or)
(b) How will you calculate a cooling load? Describe cold storage system.
15. (a) Explain the parts of solar heater and its processing. (Or)
(b) Explain the applications and the use of solar energy in various fields.

M.Sc., DEGREE EXAMINATION
FOOD PROCESSING
FOOD REGULATION AND QUALITY CONTROL

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a) Write briefly on the importance of color and flavor of a food product. (Or)
(b) Discuss about the principles of quality control.
2. (a) Define subjective evolution of foods. What are the different types of subjective evolution methods ? (Or)
(b) With suitable illustration, explain the working of the spectrophotometer.
3. (a) Write briefly on the causes, signs symptoms and prevention of lathyrism. (Or)
(b) Write short notes on adulterants in spices.
4. (a) Write the importance of PFA in food industry. (Or)
(b) Write the importance of AGMARK in food industry.
5. (a) Discuss the total quality management and quality assessment system in food industries ? (Or)
(b) What are the steps in evaluating the microbiological quality of food processing equipments ?

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a) Write an essay on the importance of quality control in meat industry. (Or)
(b) Discuss food quality control under the following heads.
 - (i) Factors affecting
 - (ii) Principle
7. (a) Describe the objective methods of food quality evaluation. (Or)
(b) Differentiate the subjective and objective evaluation of food outlining the advantages of each.
8. (a) Give an detailed account on the following :
 - (i) Naturally occurring toxins in food
 - (ii) Metal and Pesticide contaminant. (Or)
(b) Write an essay on the home testing methods for testing adulterants in spices, oils and milk products.
9. (a) Write an essay on the international standards for food quality control. (Or)
(b) Discuss the importance of food laws and standards in the food industry.
10. (a) Write short notes on :
 - (i) HACCP in food industries
 - (ii) Sanitation of equipment in food industries. (Or)
(b) What are the precautions to be followed while setting up the food processing unit?

M.Sc. DEGREE EXAMINATION
FOOD PROCESSING
FOOD INDUSTRIAL WASTE MANAGEMENT

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a) Write short notes on food industrial waste classification. (Or)
(b) Write short notes on food industrial waste characterization.
2. (a) Write about methods involved in waste disposal. (Or)
(b) Enumerate the economical aspects of waste treatment.
3. (a) Distinguish about UASB. (Or)
(b) What do you mean by bio gas plant? Explain.
4. (a) Outline the landfill digester. (Or)
(b) Explain vermin composting fit?
5. (a) Explain about Biofilters? (Or)
(b) Write down the bioclassifiers.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a) Explain briefly about classification of food industrial waste from beverage industry. (Or)
(b) Explain briefly about classification of food industrial waste from fish industry.
7. (a) Explain the physical waste disposal method. (Or)
(b) Explain the biological waste disposal method.
8. (a) Write an essay on design of activated sludge process
(b) Write an essay on design of rotating biological contactors.
9. (a) write about treatment methods of solid waste. (Or)
(b) Write down the design of solid waste management system.
10. (a) Ion exchange treatment of waste water? – Explain. (Or)
(b) Enumerate the drinking water treatment.

M.Sc., DEGREE EXAMINATION
FOOD PROCESSING
RESEARCH METHODOLOGY AND STATISTICS

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)**Answer All Questions****All questions carry equal marks**

1. (a) Explain the meaning and significance of a research design. (Or)
 (b) What do you mean by research? Explain the role of statistics in research.
2. (a) Write a brief note on case study method. (Or)
 (b) Draw a specimen table and explain the parts of a table.
3. (a) Mention the rules for constructing a diagram. (Or)
 (b) Write a short note on 'Bibliography and its importance in context of research report'.
4. (a) From the following data, compute the Arithmetic mean. (Or)

Fruits	:	0-10	10-20	20-30	30-40	40-50	50-60	
number of plants	:	5	10	25	30	20	10	(Or)

 (b) The ranking of 10 students in two subjects A and B are as follows.
 Calculate the rank correlation

A :	6	5	3	10	2	4	9	7	8	1
B :	3	8	4	9	1	6	10	7	5	2
5. (a) In an Orchard of 60 trees, a record was taken of the number of shaded and unshaded trees, and in each of these classes, the frequency of high and low yielding trees was noted below :

Yield type	Shaded	Un shaded
Low yielding	12	26
High yielding	16	6

 Calculate X^2 and test whether shading on the trees has any effect on its yielding capacity [5% value of X^2 for 1 degree of freedom = 3.84]. (Or)
 (b) The following table represents the yield of wheat in bushels per acre for trail plots of land treated with four different levels of fertilizer. Each level was applied to five plots randomly chosen over a field.

Plot number		Treatment		
	1	2	3	4
1	21	24	34	40
2	25	33	26	47
3	31	34	38	39
4	17	39	32	41
5	26	35	33	33

M.Sc., DEGREE EXAMINATION

FOOD PROCESSING

COMPUTER APPLICATION IN FOOD PROCESSING

1. Prepare the business letter for more than one company using mail merge?
 1. In a shop, there are 10 items to be sold. The information (Date, item, Quantity sold, price, total, amount)
 - (i) Create a work book
 - (ii) Count the number of transactions
 - (iii) Find the total sales
 - (iv) Find the average sales
2. Create a Power Point Presentation giving animation and sound effects.
3. Create a staff db file with the following information (Name, Staff number, Post and Salary). Use all the commands.

M.Sc. DEGREE EXAMINATION
FOOD PROCESSING
FOOD PACKAGING TECHNOLOGY

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a). Define packaging and highlight its significance. (Or)
(b). Classify packaging type with examples.
2. (a). Specify packaging material needed for milk and milk products.(Or)
(b). Gas packaging – Explain with suitable examples.
3. (a). Write a short note on rigid packaging. (Or)
(b). Give a brief note on packaging requirements for beverages.
4. (a). What is aseptic retort packaging?. (Or)
(b). Write details on the laws and regulations of packaging.
5. (a). How will you choose a packaging material for eggs?. (Or)
(b). Explain about labeling of food products after packaging.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a). Discuss the various types of packaging. (Or)
(b). Enumerate the effect of packaging on food product.
7. (a). Discuss the following terms
(i). Vacuum packaging.
(ii). Gas packaging
(viii). Shrink Packaging (Or)
(b). Define “Semi rigid packaging”. Show its forms in detail.
8. (a). Write an essay on problems in packaging dehydrated foods. (Or)
(b). Give an detailed account on packaging requirements and materials needed for confectionaries.
9. (a). Explain the equipments needed for packaging. (Or)
(b). Show details on principles of weighing.
10. (a). Elaborate the testing and evaluation of packaging media. (Or)
(b). Discuss about environmental insanitation due to packaging materials.

M.Sc., DEGREE EXAMINATION
FOOD PROCESSING
FOOD BIOTECHNOLOGY

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a) Explain the media used for cooking and the methods adopted? (Or)
(b) Give an brief account on the loss of nutrients during cooking.
2. (a) Write about the factors affecting quality of food during cold storage. (Or)
(b) Define microbial toxins and explain types and mode of action.
3. (a) Write down the chemical changes in natural pigments during processing. (Or)
(b) How do processing methods bring out changes during baking?
4. (a) How to isolate starch from the foods ? (Or)
(b) Discuss about the modified starches?
5. (a) Explain the storage and stability of proteins ? (Or)
(b) Write the application of protease in food processing.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a) Explain the biochemical changes of carbohydrates and proteins. (Or)
(b) Define browning reactions. Explain the reactions involved in enzymatic and non enzymatic browning.
7. (a) Give an detailed account on the biochemical storage of food grains. (Or)
(b) How do the foods affected by microbial spoilage.
8. (a). Describe the effect of freezing on foods. (Or)
(b). Explain the biochemical changes of vitamins and minerals during processing.
9. (a). Discuss the pectin's and gums under the following headings.
(vi). Isolation and purification.
(vii). Its importance in food industry (Or)
(b). Describe the structure and activity relationship of sweetness in food.
5. a). Give an detailed account on SCP Production. (Or)
(b). Explain in detail about the enzymatic action of
(i). Post harvest foods.
(ii). Post mortem foods.

**M.Sc., DEGREE EXAMINATION
FOOD PROCESSING**

FOOD PRODUCT DEVELOPMENT AND ENTERPRENURSHIP

Time : Three hours

Max. Marks : 75

PART-A (5X5 = 25)

Answer All Questions

All questions carry equal marks

1. (a) What are the factors that are involved in food habit alteration? (Or)
(b) Write a note on cultural approach to development of dietary pattern of various groups?
2. (a) Give a short note on the role of food additives and preservatives in product development. (Or)
(b) what are the steps involved in product development.
3. (a) What are the procedures involved in selection and training of judges. (Or)
(b) How will you formulate new food products for armed sources personnel?
4. (a) Define market and marketing. Explain its types and functions. (Or)
(b) Discuss the classification of market structure.
5. (a) Explain the concept of entrepreneurship. (Or)
(b) Write a note on definition & composition of small business.

PART B (5X 10=50)

Answer All Questions

All questions carry equal marks

6. (a) Discuss about the basic principle and concept of food product development? (Or)
(b) Explain the factors to be considered in the food product development.
7. (a) How will you calculate the nutritive value, cost of production of food products? (Or)
(b) Give an detailed account on
 - (i) Storage stability and
 - (ii) Evaluation procedure of developed food products.
8. (a) What are the procedures involved in selection and training of judges? How will you develop a score card and analysis of data for a food product ? (Or)
(b) Explain the role of advertisement and technologies in promotion of new products?
9. (a) Discuss the following :
 - (i) Marketing channel
 - (ii) Marketing cost
 - (iii) Margin – price spread.

(or)

(b) Write an essay on the types of marketing institutions
10. (a) write about women entrepreneur. (Or)
(b) What are steps in strategic planning?

