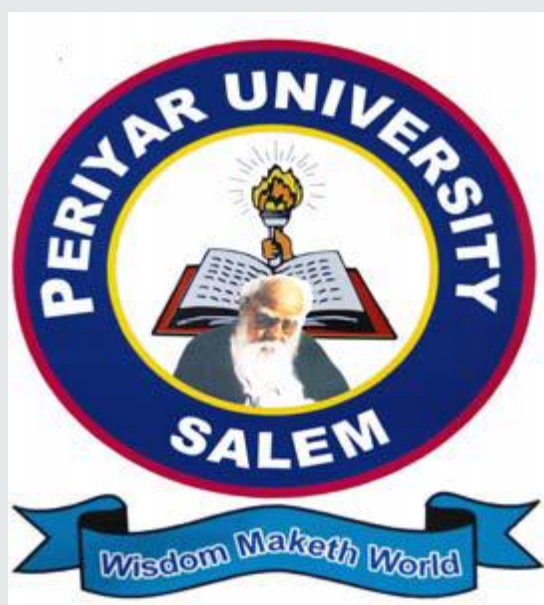


**PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM – 636 011**



**DEGREE OF MASTER OF SCIENCE
CHOICE BASED CREDIT SYSTEM
SYLLABUS FOR M.SC. FOOD PROCESSING**

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2021-2022 ONWARDS**

**M.Sc FOOD PROCESSING
COURSE STRUCTURE**

(Candidates admitted from 2021-2022onwards)

S.N O	SUBJECT	SUBJECT CODE	TITLE OF THE PAPER	L (Lecture)	P (Practical)	T (Tutorial)	C (Credit)
I	CORE PAPER	21PFP01	Core Paper : I Food Chemistry	5	-	-	5
		21PFP02	Core Paper : II Food Processing Technology I	5	-	-	5
		21PFP03	Core Paper : III Food Processing Technology-II	5	-	-	5
		21PFP04	Core Paper : IV Chemical changes in Processing & Preservation	4	-	-	4
		21PFPP01	Core Practical I: Food Processing Practical	-	3	-	2
		21PFPP02	Core Practical II: Food Analysis Practical	-	4	-	-
		21PFP05	Core Paper V : Food Microbiology	5	-	-	5
		21PFP06	Core Paper VI: Instrumentation in Food Processing	5	-	-	5
		21PFPP02	Core Practical II: Food Analysis Practical (Continued from 1 st Semester)	-	5	-	2
		21PFPP03	Core Practical III: Food Microbiology Practical	-	4	-	2
		21PFP07	Core Paper VII : Food Regulations and Quality Control	5	-	-	5
		21PFP08	Core Paper VIII : Food Product Development & Entrepreneurship	5	-	-	5
		21PFP09	Core Paper : IX Research Methodology and Statistics	5	-	-	5
		21PFP10	Core Paper : X Food Packaging Technology	5	-	-	5
		21PFPP04	Core Practical IV: Quality Control and Adulteration Practical	-	5	-	2
		21PFPP05	In plant Training in Food Industry (one month)	--	-	-	3
		21PFP11	Core Paper : XI Food Industrial Waste Management	5	-	-	5
II	ELECTIVE PAPER	21PFPE01	Elective Paper I : Food Production & Agriculture	4	-	-	4

		21PFPE02	Elective Paper II: Food Biotechnology	5	-	-	4
		21PFPE03	Elective Paper III: Animal Feed Formulation	5	-	-	5
		21PFPEP01	Elective Practical Paper I: Computer Application in Food Processing Practical	5	-	-	2
		21PFPPR1	Dissertation (3 months)	20	-	-	6
III	Extra Disciplinary Course Paper			4	-	-	4
IV	Human Rights			2	-	-	2 (Extra)
V	Online course	SWAYAM / MOOC		-	-	-	4(Extra)

M.Sc FOOD PROCESSING SCHEME OF EXAMINATION

(For the Candidates admitted from the year 2021-2022 onwards)

Semester	Code	Course	HRS	CREDIT	Exam (hrs)	University Examination		
						IA *	EA **	Total
I	21PFP01	Core Paper : I Food Chemistry	5	5	3	25	75	100
	21PFP02	Core Paper : II Food Processing Technology I	5	5	3	25	75	100
	21PFP03	Core Paper : III Food Processing Technology-II	5	5	3	25	75	100
	21PFP04	Core Paper : IV Chemical changes in processing & preservation	4	4	3	25	75	100
	21PFPP01	Core Practical I: Food Processing Practical	3	2	-	40	60	100
	21PFPP02	Core Practical II: Food Analysis Practical	4	-	-	-	-	-
	21PFPE01	Elective Paper I : Food Production & Agriculture	4	4	3	25	75	100
II	21PFP05	Core Paper V : Food Microbiology	5	5	3	25	75	100
	21PFP06	Core Paper VI : Instrumentation in Food Processing	5	5	3	25	75	100
	21PFPE02	Elective Paper II: Food Biotechnology	5	4	3	25	75	100
		Core Practical II: Food Analysis Practical (Continued from 1st Semester)	5	2	6	40	60	100
	21PFPP03	Core Practical III: Food Microbiology Practical	4	2	3	40	60	100
		Extra Disciplinary Course Paper	4	4	3	25	75	100
		Mandatory course: Human Rights (HR)	2	2 (Extra)	3	25	75	100
	Online course	SWAYAM / MOOC	-	4 (Extra)	3	-	-	100
III	21PFP07	Core Paper VII : Food Regulations	5	5	3	25	75	100

M.Sc.FOODPROCESSING

		and Quality Control						
	21PFP08	Core Paper VIII : Food Product Development & Entrepreneurship	5	5	3	25	75	100
	21PFP09	Core Paper : IX Research Methodology and Statistics	5	5	3	25	75	100
	21PFP10	Core Paper : X Food Packaging Technology	5	5	3	25	75	100
	21PFPP04	Core Practical IV:Quality Control and Adulteration Practical	5	2	6	40	60	100
	21PFPP05	Inplant Training in Food Industry(one month)	-	3	3	40	60	100
	21PFPEP01	Elective Core Practical I :Computer Applications in Food Processing Practical	5	2	3	40	60	100
IV	21PFP11	Core Paper : XI Food Industrial Waste Management	5	5	3	25	75	100
	21PFPE03	Elective Paper III: Animal Feed Formulation	5	5	3	25	75	100
	21PFPPR1	Dissertation (3 months)	20	6	3	40	60	100
						90 + 6	2400	

*IA = Internal Assessment

** EA = External Assessment

M.Sc. Food Processing**1. PREAMBLE**

Food Processing is the science and art of applying the principles of food processing and technology in various Food Industries. Food processing has been started to meet the demands of the growing food processing sector. This has an immense scope on processing and preservation of food to fulfill the consumer's satisfaction.

OBJECTIVES OF THE COURSE:

1. To prevent the post-harvest losses.
2. To make available wholesome nutritious and appetizing food at economical rates.
3. To improve the quality, nutritive value and minimize loss of essential nutrition's during processing and preservation.
4. Ensuring long – term storage stability.
5. Marketing the processed food of high calorie density in compact and easy to reconstitute form.
6. To prevent food poisoning, contamination and adulteration.
7. To improvise mechanical processing operations to replace or minimize labor.
8. Develop new varieties of instant or convenience food for the customers to go along with the fast moving world.

Program Specific Outcomes

1. Students will apply the knowledge of food chemistry, food preservation, food processing and food packaging for the effective utilization of agricultural commodities to develop healthy and nutritious foods
2. Students will design economically feasible methods for the modernization of traditional food processing methods
3. Students will apply the knowledge of food processing principles from the various aspects of food science and related disciplines to solve practical and real-world problems

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:

M.Sc.FOODPROCESSING

The course for the degree of Master of Food processing shall consist of two academic years divided into 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 Paper IV: Chemical changes in processing & preservation

Core Practical I : Food Processing Practical

Core Practical II: Food Analysis Practical

Elective Paper I: Food Production & Agriculture

SEMESTER II

Core Paper V: Food Microbiology

Core Paper VI: Instrumentation in Food Processing

Core Practical II : Food Analysis Practical (Continued from Semester-I)

Core Practical III : Food Microbiology Practical

Elective Paper II: Food Biotechnology

Extra Disciplinary Course Paper (EDC)

Mandatory Course: Human Rights (HR)

Online course (SWAYAM / MOOC)

SEMESTER III

Core Paper VII: Food Regulations & Quality Control

Core Paper VIII: Food Product Development &
Entrepreneurship

Core Paper IX: Research Methodology and Statistics

Core Paper X: Food Packaging Technology

Core Practical IV: Quality Control & Adulteration Practical

In plant Training in Food Industry (one month)

Elective PracticalII : Computer Application in Food Processing Practical

SEMESTER IV

Core PaperXI: Food Industrial Waste Management

Dissertation (3months)

Elective Paper III: Animal Feed 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 secure 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:

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

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

.....

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. CUMULATIVE GRADE POINT AVERAGE[CGPA]= $\frac{\sum C_n G_n}{\sum C_n}$

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

.....

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. MAXIMUMDURATIONFORTHECOMPLETIONOFTHEPGPROGRAMME

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

9. COMMENCEMENTOFTHISREGULATION

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. TRANSITORYPROVISION

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.

ELIGIBILITY CRITERIA FOR ADMISSION

UG-all life science (Bio-Technology /Microbiology /Bio-Chemistry), Food Technology, Hotel Management & Catering Science , HomeScience, B.Sc.Agriculture, Otherscience(AnyScience degree holder who completed Diploma in FoodProcessing /Food Science & Technology related discipline).

PG PROGRAMME - FOOD PROCESSING

Question Pattern: M.Sc. Food Processing Theory

(External Exam):

Time:3hrs

Max: 75Marks

Part- A (15x1=15 Marks)

I. Answer ALL Questions (Choose the best answer)

Part- B (2X5=10)

II. Answer any TWO Questions

Part- B (5X10=50)

III. Answer ALL Questions (Internal Choice)

IV.

Internal Assessment Mark Distribution

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

Theory

Passing Minimum (EA) = 50% = 38Marks

Practical Mark Distribution

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

*IA = Internal Assessment

** EA = External Assessment

Passing Minimum (EA) = 50% = 30Marks

Dissertation: Evaluation Pattern

Internal : 40 Marks (2 Reviews-(20+20))

M.Sc.FOODPROCESSING

External	:	40 Marks
External Viva-Voce	:	20 Marks
Total	:	100Marks

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

OBJECTIVES

Gain knowledge on the properties & composition of different foods.

COURSE OUTCOME

On the successful completion of the course, the student will be able to:

- Gain knowledge about Physico –chemical properties of foods & water properties.
 - Acquire knowledge about Carbohydrate –classifications, properties & structure.
 - To study the about Protein- classifications, structure, physical & chemical properties on foods.
 - To gain knowledge about Lipids - classifications, physical & chemical properties & structure.
- Vitamins & Minerals- classifications, properties & structure.

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. Physiochemical reactions – Isomeration, 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

1. Coultate, 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-110002 (India).
4. Alais, Lindan, "Food Biochemistry", Ellis Horwood Ltd., New York.
5. Potter, N.N. 1978, Food Science 3rd Ed. AVI, Westport.

WEB SITE LINK

- <https://archive.org/details/in.ernet.dli.2015.549657/page/n3/mode/2up>
- http://154.68.126.6/library/Food%20Science%20books/batch1/Food%20-%20The%20Chemistry%20of%20its%20Components%20Fourth_Edition.pdf

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.

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Know Fruits & vegetable processing, classification, preservation & drying methods.
- Understand Dairy processing- UHT, Pasteurization & homogenization.
- Discuss Fleshy food processing- Egg, Meat, Poultry-Canning, Drying, cooling & storage.
- Illustrate Sea food Processing-types of pre processing& preservation. Types of Confectionery ,Sago & Sugar cane technology

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

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.

WEB SITE LINK

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- http://154.68.126.6/library/Food%20Science%20books/batch1/Food%20-%20The%20Chemistry%20of%20its%20Components%20Fourth_Edition.pdf

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 equipment.

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Understand the outlines of Rice & Wheat –processing & storage conventional methods.
- Appreciate the importance Major & minor millets-types, processing & storage, nutritional losses.
- Comprehend Pulse Technology-processing & methods to remove toxic factors.
- Identify different Oil seed technology –Processing & preservation techniques. Spice technology-processing & extraction of Oleoresin

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-Extractionof 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.

REFERENCE:

1. NIIRBoardofFoodandTechnologist,ModernTechnologyofFoodProcessingandAgro basedindustries,NationalInstituteofIndustrialResearch,Delhi,2005.
2. Peter zeuthenand Leif Bogh- Sorensen, Food Preservation Techniques, Wood Head PublishingLtd.,Cambridge,England,2005
3. SumanBhatti, Uma Varma, Fruit and vegetable processing organizations and institutions,CBSPublishing,NewDelhi,1stEdiion-1995.
4. MirdulaMirajkar, SreelathaMenon, Food Science and Processing Technologyvol-2, Commercialprocessingandpackaging,Kanishkapublishers,NewDelhi-2002.
5. NIIR Board, the complete Technology book on processing, dehydration, canning, preservationoffruitsandvegetables,NationalInstituteofIndustrialResearch,Delhi-2005.

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- <https://www.niir.org/books/book/complete-technology-book-on-processing-dehydration-canning-preservation-fruits-vegetables-processed-food-industries-4th-revised-edition/isbn-9788193733929/zb,,41,a,3,0,a/index.html>
- <https://libro.eb20.net/Reader/rdr.aspx?b=1640043>

M.Sc. FOOD PROCESSING- SEMESTER –I

CORE IV-CHEMICAL CHANGES IN PROCESSING AND PRESERVATION

OBJECTIVES

To understand the chemical changes in food processing & preservation.

COURSE OUTCOME

On the successful completion of the course, the student will be able to understand the:

- Comprehend Physico –chemical properties of foods
- Understand Bio chemical changes in carbohydrates , protein & fats
- Develop the knowledge in Isolation of toxins in foods

UNIT –I

Chemistry of cooking- biochemical changes in carbohydrates, protein and lipids during cooking, Chemical changes in vitamins and minerals during processing.Par boiling of rice, Browning reaction- enzymatic and non- enzymatic reaction. Loss of nutrients during cooking and preservation.

UNIT-II

Chemical changes during storage of food grains, fruits and vegetables. Environmental effects on chemical changes in foods- Environmental effects on rates of chemical reaction.Chemistry of microbial spoilage of food- chemistry and mode of action of microbial toxins.

UNIT- III

Chemical changes during processing and preservation of foods - drying, pickling, baking, malting, canning, cold storage and freezing, chemical changes in natural pigments and flavors during processing.

UNIT –IV

Isolation and purification of starch; starch in food industry, pectins, gums and stabilizers in food industry. Modifications of starch, Sweeteners and sugars in foods- structure activity relationship.

UNIT-V

Isolation of protein from soyabean, milk, egg, protein hydrolysates; modification of protein; storage of proteins and stability of proteins.Enzymatic action of post harvest and post mortem foods.Oxygen

M.Sc.FOODPROCESSING

dependent enzymatic reaction in post harvest foods.

PRACTICAL EXPERIENCE:

Isolation of starch from tubers. Isolation of protein from milk and egg. Hydrolysis of starch and proteins Chromatography.

Aflatoxins - Analysis of effluents from food industry. Rancidity of oils. Isolation and assay of industrial enzymes.

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. Richandson.

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- <https://portlandpress.com/biochemsoctrans/article-abstract/16/4/654/81056/Food-Biochemistry-and-Nutritional-Value?redirectedFrom=PDF>

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

COURSE OUTCOME

On the successful completion of the course, the student will be able to perform

- Preservation of food by sugar.
 - Preservation of food by salt.
 - Preservation of food by fermentation
-
1. Preservation of foods by sugar-Jam, Jelly, Marmalade, Cordial, Squash, Fruit bars, Fruit Preserves-TuityFruity(Papaya),GingerMurabha(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

COURSE OUTCOME

On the successful completion of the course, the student will be able to undertake the nutrient analysis of food- calories, fiber, moisture, ash, calcium, phosphorous, iron, vitamin A &C , fat ,iodine number, lipid content.

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.AndKalyanasundraram,A.(1983)AmanualofLaboratory Techniques,National,InstitureofNutrition,SilverPrints,Hyderabad.
2. Oser, B.L.,(1954) Hawke's Physiological Chemistry, XIV Edition, Tata MC Graw Hill PublishingCompanyLtd,Mumbai.
3. Jayaram.J.(1996), Laboratory Manual In Biochemistry, New Age International Ltd, Publishers,NewDelhi,FifthReprint.
4. Sadasivam,SAndManickam,A(1991)BiochemicalMethods,NewageInternational Pvt.Publishers,NewDelhi,2ndEdition.

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.

COURSE OUTCOME

On the successful completion of the course, the student will be able to understand the:

- Gain understanding on the Scope, branches classification of Agronomic crops.
- Classify Wet, dry and rain fed farming for crop production.
- Apply their knowledge on Methods of irrigation management.
- Relate the overall Types & role of crop manures & fertilizers Types & classification of storage structure & 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. Traditional Agricultural practices Vs Modern Agricultural practices

UNIT II

Crop production- Production trends in world, India and TamilNadu. Factors affecting crop production. Zero budget agricultural 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.Importance of Me-too syndrome in agricultural production.

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. Drawbacks of artificial fertilizers

Nutrient potential of different organic manure Agricultural, Industrial and Urban wastes- preparation enriched Farm Yard Manure (FYM) –Zinc enriched organics, compost making- coir pith, 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 TamilNadu. General aspects of food security in India. Agricultural research schemes in India and TamilNadu. Government subsidy scheme for agricultural farming. Government bodies supporting agriculture – NABARD, SFAC, KVK, Horticulture board, MSME, DIC, SFC, FPO.

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, NewDelhi.
3. Icar. 1996.Handbook of Agriculture.Indian Council of Agricultural Research, New Delhi.
4. Morachan, Y.b.1980.Crop production and Management. Oxford and IBH Publishing Co.Pvt LTD., NewDelhi.
5. Gupts, O.P.1998. Modern weed management. Mrs. Saraswathi for agro botanical, NewDelhi.
6. T.N.A.U. 1999. Crop production guide. T.N.A.U. and Directorate ofAgriculture, Chennai.

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

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Understand the Classification & primary source of microorganism.
- Name and describe Microbial spoilage of cereals & milk products.
- Enumerate Fruits ,vegetables & sugar products – contamination ,spoilage & preventive measures; Fleshy foods- contamination, spoilage& preventive measures.
- Predict the causative agent and pathogenesis of disease causing food-borne pathogens

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, Shigella, 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, NewDelhi.
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, NewYork.
5. George J.Banwart, 1998. Basic Food Microbiology, 2nd edition, CBS Publishers, NewDelhi.

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**M.Sc. FOOD PROCESSING
SEMESTER- II
CORE VI - INSTRUMENTATION IN FOOD PROCESSING**

OBJECTIVES

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

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Understand the general Unit operations-classification, mass & energy, types of evaporations.
- Gain knowledge of Mechanical separation, filtration equipments & size reduction
- Apply the knowledge of Mixing & crushing-energy & power requirements & solar equipments. Refrigerators-types, humidifiers & dehumidifier.

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 separation– 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 colorimeter.

REFERENCES:

1. Coulson, J.M. and J.F. Richardson, 1977. chemical Engineering. Volume I to V the pergamon press New York.
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. McCabe, W.L. and J.C. Smith 1976 unit operations of chemical Engineering. McGraw – 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.

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

CORE PRACTICAL III - FOOD MICROBIOLOGY PRACTICAL

COURSE OUTCOME

On the successful completion of the course, the student will be able to isolate and identify specific microorganisms in foods

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, NewDelhi.
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, NewDelhi.
4. King.R.D and P.S.J.Cheetham 1986. Food Biotechnology, Elsevier Applied Science, NewYork.
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.

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Identify the Media composition & production culture
- Illustrate the Food Fermentation- downstream & alcoholic & non-alcoholic beverages.
- Apply Modification of starch & protein .development of novel sweeteners.
- Appraise Enzyme technology, micro encapsulation.
- Interpret GM Foods production, bio safety & risk management.

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, aminoacids-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. GMOAct2004. (GeneticallyModifiedCropsManagementAct2004).

REFERENCES :

1. Owen pward (1989), Fermentation Biotechnology Principles, Processes And Products, PrenticeHNewJersey.
2. Solomons, G.L.(1983), Single Cell Proteins-Critical Reviews of Biotechnology, Moo Young Compressive Biotechnology Scientists Foundations, Engineering Consideration.
3. Prescott(1987),IndustrialFoodPreservation,JohnWilleyAndSons.
4. Frazier And West Hoff (1995), Food Microbiology, Tata Mcgraw Hill Publishing CompanyLtd,NewDelhi.
5. Dubey,R.C.(2001)TextBookBiotechnologyS.ChandAndCoLtd,NewDelhi.
6. Gupta,P.K.(1996),ElementsofBiotechnology,RostogiAndCo,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.AndMaheswari,D.K.A.TextBookofMicrobiology,S.ChandAndCo,Ltd, NewDelhi.
10. FoodScienceAndFoodBiotechnology,2003,GustaraF.Gutierrez-Lopez.
11. Lee,B.H.FundamentalsofFoodBiotechnology.VCH.2006.

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**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.Foodchemistry.SpringerVerleyBerlinHeidelberg.NewYork.
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, NewYork.
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, NewAgeInternationalPublishers.
6. Poter.H.N:FoodScience,TheAvPublishingCo.,IncWestPoet,Connectcut1973.
7. Desrosier.N.W. The technology of food preservation. The Av Publishing Co., Inc West Poet, Connecticut1973.
8. MeyerL.H:FoodChemistry,VonNostrand
9. ChemicalChangesinfoodduringprocessing.T.Richandson.

**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,BocaRaton(OnReserveinAgr.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 VII - 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

COURSE OUTCOME

On the successful completion of the course, the student will be able to understand the:

- Understand the Principles of quality control & attributes.
- Enumerate Methods of food quality evaluation.
- Name and describe Food adulteration, contamination & nonnutritive food components and its health effects.
- Develop the knowledge Standards for food quality Rules & regulation for setting up a processing unit.

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. Nonnutritive 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, FSSAI, 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 Ed. 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.

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

CORE VIII - FOOD PRODUCT DEVELOPMENT & ENTREPRENEURSHIP

OBJECTIVES:

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

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Know the basic principles, concept of food product development & factors involved in food habit alteration
- Understand the steps in product development & calculate the nutritive value, cost of production
- Formulate of new food products for all age groups
- Apply the Concept of market & marketing efficiency

UNIT I

Basic principles & concept of food product development. Cultural approach to development of dietary pattern of various groups- linguistic, regional, religious (ethnic). 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. Sivaramaprasad.A,1985,Agricultural Marketing in India-Mittal Publications, New Delhi.
2. Acharya.S.S,andN.L.Agarwal,1992,AgriculturalMarketinginIndia-Oxfordand IBH PublishingPvt.,Ltd.,NewDelhi.
3. DevelopingNewFoodProductsForaChangingMarketPlace,2nd Edition,2005,Aaron,L.Brody,JohnB.Lord.
4. NewFoodProductDevelopment,2004,GordonW.Fuller.
5. John Kao , Creativity & Entrepreneurship package Compatibility, toxicity, tainting and corrosion. Packaging andenvironment.

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M.Sc. FOOD PROCESSING SEMESTER- III

CORE IX - RESEARCH METHODOLOGY AND STATISTICS

OBJECTIVES:

To know about research & their types ,coding, report writing , & their probability.

COURSE OUTCOME

On the successful completion of the course, the student will be able to

1. Classify the types of research
2. Apply the methods of data collection.
3. To test the goodness of fit and independence of attributes

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. Nand 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.

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M.Sc. FOOD PROCESSING SEMESTER- III
CORE X - 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.

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Understand the basic concepts of food packaging
- Comprehend on protective packaging of foods
- Study about the packaging materials used for the different food materials
- Comprehend the packaging standards and regulations

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, set up paper cartons, folding paper board 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.

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.BlackieSon's Ltd,London.
3. Sacharow, S.Hand Book of packaging materials, A VI Publishing company, WestPort.
4. Croshy,N.T.Foodpackagingmaterials,AppliedSciencepublicationlimited,London.
5. Paine,F.A.Thepackagingmedia,BlackieandSon'sLtd,London.
6. Sacharow and Grilin, Food Packaging, AVI Publications Hotchikess, Food and Packaginginteractin-AmericanChemicalSociety.
7. Robertson,G.L.FoodpackagingTechnology,NewsPort,MarcellDekkar,Inc.
8. FoodPackagingPrinciplesAndpractice,1998,GordonL.Robertson.
9. NovelFoodPackagingTechniques,2003,RaijaAhvenainen.
10. ActivePackagingForFoodApplications,Aaron,L.Brode,EugeneR.Strupinsky,2001.

Practical/RelatedExperiences:Avisittopackagingunit.

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- <https://books.google.co.in/books?id=OA4szVQvsAC&printsec=frontcover&dq=food+packaging+technology+ppt&hl=en&sa=X&ved=2ahUKEwjP8eD8ss3uAhWD-2EKHdqYDsIQ6AEwAHoECAEQ>
- <https://books.google.co.in/books?id=BizOBQAAQBAJ&printsec=frontcover&dq=food+packaging+tehnology+ppt&hl=en&sa=X&ved=2ahUKEwjP8eD8ss3uAhWD-2EKHdqYDsIQ6AEwAnoECAIQAg>

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

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Establish sensory panels
 - Perform Adulteration test for foods
 - Demonstrate Quality test for milk, ghee and other food materials
-
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 (withoptions), 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 Charactersizing the font dialog box.
 - iii) Formating 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 tap 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 form at painter and Auto Format.
- 2.6. Prepare a MailMerge.

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 MathFunctions

- i) SUM, COUNT, AVERAGE
ii) MAX, MIN
iii) STDDEV, VAR
iv) ABS, EXP, INT
v) LOG10ANDLOG
vi) MOD, ROUND,
SORT
vii) Using autosum

4. MS-POWERPOINT

- 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 PowerPoint.

5. VISUAL BASIC(6.0)

5.1 Arithmetic Calculator

5.2 Create a Access data base 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 XI- FOOD INDUSTRIAL WASTE MANAGEMENT

OBJECTIVES

To learn treatment methods, waste disposal methods from food industry.

COURSE OUT COME

On the successful completion of the course, the student will be able to

- Understand Classification & characterization of food industrial waste.
- Handle Industrial waste disposal methods and economical aspects.
- Apply Treatment methods for liquid waste and solid waste from food industry
- Control environmental pollution by proper treatment of food waste

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, Trickling filters, UASB, Bio gas plant.

UNIT IV

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

UNIT V

Bio filters and bio clarifiers, Ion exchange treatment of waste water, Drinking – water treatment, Recovery of useful materials from effluents by different methods.

REFERENCE

M.Sc.FOODPROCESSING

1. Food Industry Wastes: Disposal and Recovery; Herzka A & Booth RG; 1981, Applied Science PubLtd.
2. Water&WastewaterEngineering;FairGM,GeyerJC&OkunDA;1986,JohnWiley& Sons,Inc.
3. WastewaterTreatment;BartlettRE;AppliedSciencePubLtd.
4. Symposium:ProcessingAgricultural&MunicipalWastes;InglettGE;1973,AVI.
5. FoodProcessingWasteManagement;GreenJH&KramerA;1979AVI.
6. Environmental Biotechnology: Principles and Applications; Rittmann BE &McCarty PL;2001,Mc-Grow-HillInternationaleditions.
7. Environmental Biotechnology; Bhattacharyya B C & Banerjee R; Oxford University Press.

WEB SITE LINK

- <https://books.google.co.in/books?id=W0EqBgAAQBAJ&pg=PA26&dq=Food+Industry+Wastes:+Disposal+and+Recovery;+Herzka+A+%26+Booth+RG;+1981,+Applied++Science+Pub+Ltd&hl=en&sa=X&ved=2ahUKEwi0zLi9ws3uAhVz4XMBHYpfDc8Q6AEwAnoECAEQAg>
- <https://books.google.co.in/books?id=VhdFd0V3H5YC&pg=PA269&dq=Environmental+Biotechnology;+Bhattacharyya+B+C+%26+Banerjee+R;+Oxford+University++Press&hl=en&sa=X&ved=2ahUKEwjo8vLjw83uAhVBIbcAHQf5CmcQ6AEwAHoECAAQAg>

**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.

COURSE OUTCOME

On the successful completion of the course, the student will be able to

- Understand the nutrient requirements of Cattle & Buffalo
- Understand the nutrient requirement for growth in milk production of goats
- To know about the pigs nutrient requirements for growth & milk production
- To know about the nutrient requirements & feeding of sheep & poultry .Understand the leaves, shrub straws crop residues & preparation of feed.

UNIT I

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

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.

WEB SITE LINK

- https://www.researchgate.net/publication/40185239_Feeding_standards_and_feeding_systems
- <https://www.google.com/url?sa=t&source=web&rct=j&url=http://gohardanehco.com/wp-content/uploads/2014/02/Animal->

REFERENCES

1. Hutton,J.B,1962:Proc.NewZealandSc.Anim.Prod.
2. Ranjhan.S.K. 1991. Chemical composition of Indian feeds and feeding of farm animals,ICAR,NewDelhi.
3. Razdan,M.N.,Bhosreker,M.RandRay,SN.,1965.Ind.J.DairyScie.18,96.
4. Ranjhan,.,S.K.2001.AnimalNutritioninthetropic,5threvisededition,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 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 data. It contains less than 200 pages.

Topic of dissertation may be chosen from any broad area of Food Processing. The Dissertation to be submitted should include

1. Abstract
2. Introduction
3. Objectives of the study
4. Materials and Methods employed
5. Results and Discussion
6. Summary and Conclusions and
7. Bibliography

M.Sc. DEGREE EXAMINATION

FOOD PROCESSING

FOOD CHEMISTRY

Time: Three hours

Max. Marks: 75

SECTION A ANSWER ALL THE QUESTIONS

15X1=15

1) Which Is The Orange Colour Pigment

- a) carotenoids b) lycopene
c) lutetin d) sulphur compounds

2) Vitamin K Is _____

- a) kagulation b) riboflavin
c) ascorbic acid d) niacin

3) _____ is the iodine deficiency

- a) goitre b) rickets
c) night blindness d) beriberi

4) Which Is The Water Soluble Vitamin

- a) anthocyanins b) chlorophyll
c) betalaine d) anthoxanthin

5) General Structure Of Amino Acid

- | | | | |
|----|---|----|--|
| a) | $\begin{array}{c} \text{H} \\ \\ \text{R}-\text{C}-\text{COOH} \\ \\ \text{NH}_2 \end{array}$ | B) | $\begin{array}{c} \text{CHO} \\ \\ \text{CHOH} \\ \\ \text{CH}_2\text{OH} \end{array}$ |
| C) | CH_3-CH_2 | D) | $\text{C}_n(\text{H}_2\text{O})_n$ |

6) Total Number Of Naturally Present Amino Acids Is _____

- a) 24 b) 20 c) 16 d) 36

7) Which among the following is the non essential amino acid

- a) serine b) threonine c) lysine d) histidine

8) Which Of The Following Is The Essential Amino Acid

- a) cysteine b) asparagine c) glutamine d) phenyl alanine

9) The Most Abundant Bio Molecule On The Earth

- a) nucleic acid b) protein c) lipids d) carbohydrate

10) The General Formula Of Carbohydrate Is

- a) $\text{C}_n(\text{H}_2\text{O})_n$ b) $\text{C}_4(\text{H}_2\text{O})_n$ c) $\text{C}_6(\text{H}_2\text{O})_n$ d) $\text{C}_2(\text{H}_2\text{O})_n\text{COOH}$

- 11) Glycogen In Animal Are Stored In
 a) liver and spleen b) liver and muscle c) liver and brain
 d) none of these
- 12) The Deficiency Of Vitamin D Is Known As
 a) beriberi b) rickets c) marasmus d) skin allergy
- 13) The Freezing Point Of Water Is _____
 a) 10°C b) -18°C c) 0°C d) -2°C
- 14) The Angle Between H-O-H Bond Of Water Is _____
 a) 104°C -105°C b) 45°C-49°C c) 106°C-108°C d) 105°C-106°C
- 15) The boiling point of water molecule is
 a) 105°C b) 102°C c) 100°C d) 110°C

PART-B (2X5 = 10)**Answer any TWO Questions**

1. Give an brief account about the physical properties of water in foods?
2. Discuss the following:
 - (i). Structure and classification
 - (ii). Physical and chemical reactions of monosaccharide
3. Describe about protein classification.
4. Describe about lipid classification.
5. Explain the structure and properties of calcium.

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

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

SECTION A ANSWER ALL THE QUESTIONS

15X1=15

1.The main metabolic process of all harvested produce is
a. Respiration b. oxygen c. hydrogen d. CO_2 .

2.During changes in the color , flavor and texture occurs
a. Blanching b. Ripening c.Browning d. Enzymatic

3.Normal temperature of perishable foods
a. 20°C b. 40°C c. 23°C d. 43°C

4.UHT expands
a. Ultra heating time b. Ultra homogenized temperature
c. Ultra high treatment d. Ultra high temperature.

5.Pasteurization temperature is
a. 72°C for 15 sec b. 63°C for 30sec c. 112°C for 1 sec
d. 132°C for 0.5 sec

6.Normal chilling temperature of milk
a. 0°C b. 4°C c. 6°C d. -4°C

7.Eviseration means
a. Removal of liver b. Removal of heart
c. Removal of internalorgan d. Removal of veins.

8.Stunning process means
a. Normal stage b. Bleeding stage c. Conscious stage
d. Un conscious stage.

9.Which gas is used to stunning process
a. CO_2 b. Nitrogen c. hydrogen d. Oxygen

10. How many fish species are edible in humans
a. 25000 b. 250 c. 350 d. 35000

11. Classification of fish
a. 5 types b. 3 types c. 2 types d. 4 types

12. Moisture content of brine solution

a. 55 – 60% b. 65-70% c. 25-40% d. 50-55%

13. Which country use as dusting powder in confectionary Industry.

a. India b. England c. USA d. UK

14. Which century to developed in commercial production Of confectionary.

a. 20th century b. 19th century c. 18th century d. 21st century

15. Role of fat

a. Color b. Flavor c. Texture d. Taste

PART-B (2X5 = 10)

Answer any TWO Questions

1. Write about the size reduction of solid and liquid foods?
2. What does the term “high pressure processing” means?
3. Which is the effective method of heat processing? Explain.
4. Give the low temperature processing methods?
5. Write about blanching – the high temperature heat processing method?

PART C(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:
Effect of nutrients during blanching.

M.Sc.FOODPROCESSING

M.Sc., DEGREE EXAMINATION

FOOD PROCESSING

FOOD PROCESS TECHNOLOGY – II

Time :Threehours

Max. Marks :75

PART - A

ANSWER ALL QUESTIONS

(15X1=15)

1. Expansion of FAO
 - a) Food and agriculture organisation
 - b) Food and agronomic organisation
 - c) Feed and agriculture organisation
 - d) Food and analysis organization
2. A major portion of grain is lost due to
 - a) Insects
 - b) Rodents
 - c) pests
 - d) fungus
3. Wheat, corn, rice is known as
 - a) Non -major crops
 - b) major crops
 - c) None of the above
 - d) all of these
4. cous -cous is another product made out at ----- flour
 - a) coco pea flour
 - b) Bengal gram
 - c) lentil flour
 - d) black gram flour
5. A fermented product (tutu) is a popular dish in
 - a) brasil
 - b) Germany
 - c) America
 - d) Argentina
6. The total moisture content range present in flour is
 - a) 10-15%
 - b) 20-25%
 - c) 15-17%
 - d) 25-35%
7. Maize & sorghum are referred as
 - a) coarse
 - b) pulses
 - c) cereal grains
 - d) none of above
8. Among these millet crops, which one is more 'drought to larence'
 - a) rice
 - b) ragi
 - c) sorghum
 - d) ground nut
9. 'Pearl millet' is commonly called as
 - a) kodo
 - b) jowar
 - c) bajra
 - d) finger millet
10. The oleoresin content highly present in
 - a) pepper
 - b) turmeric
 - c) groundnut
 - d) ginger
11. Deodourization means removed of
 - a) odour
 - b) taste
 - c) nutrients
 - d) sugar
12. Expansion of FFA

- a) free fatty acid b) foreign fatty acids c) French food association d) all of these
13. Water retaining usually called
a) degumming b) dehulling c) de husking d) purifying
14. King of spices
a) pepper b) cloves c) cinnamon d) cardamom
15. Which the queen of spices is
a) cardamom b) pepper c) ginger d) chilli

PART-B (2X5 = 10)

Answer any TWO Questions

1. List out the advantages of parboiling
2. Give an outline of the processing of any one major millets.
3. Write about the factors influencing drying of vegetables.
4. Give an brief account about pasteurizations and homogenization ?
5. Write the steps involved in the extraction of oils from oil seeds.

PART C (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 an detail account on the method of preparation of the following:
(i) Chocolate
(ii) Candies
(iii) Marshmelons

M.Sc. DEGREE EXAMINATION

FOOD PROCESSING

FOOD PROCESSING PRACTICAL

Time :3hours

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 :6hours

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 :Threehours

Max. Marks :75

PART - A

ANSWER ALL QUESTIONS

(15 X 1=15)

1. Agriculture means
a. Cultivation of land b. production area c. purchase area d. storage area
2. Optimum temperature for growth of sorghum.
a. 45-50⁰c b. 0-5⁰c c. 26-29⁰c d. 60-70⁰c
3. Yellow revolution for
a. Egg b. meat c. Oil seeds d. Milk
4. Farm means
a. Piece of land b. Production c. Storage d. purchase
5. Process of growing different crops in succession on a piece land.
a. Crop rotation b. Cultivation c. irrigation d. Advanced farming
6. Which internal factors effecting the crop production.
a. Genetic b. Climatic c. Biotic d. Physio graphic
7. Store the moisture in soil is called
a. Irrigation b. Crop rotation c. Weed control d. Organic farming
8. Water is sprayed on surface of standing crop.
a. Drip irrigation b. Sprinkler irrigation c. Micro irrigation
d. Sub surface irrigation
9. Which one is categories of weeds
a. Sedges b. Wheat c. Cereals d. Oat
10. In general farm yard manure K₂O contains
a. 0.74% b. 0.20% c. 0.50% d. 0.95
11. Compost fortified with super phosphate is called.
a. Super compost b. cold manures c. Hot manures d. Compost
12. Fertilizer contains and is used for supplying a single nutrient is called.
a. Straight fertilizer b. Nitrogen fertilizer c. Chemical fertilizer
d. Synthetic fertilizer
13. Non economic plant parts are left in field after harvest is called.
a. Farm waste b. Compost c. Farming d. Sludge
14. Farm yard ratio of carbon and nitrogen.
a. 30:1 b. 20:1 c. 1:30 d. 1:20

15. Bag storage

a. Jute b. Silo c. gudown d. Plastic bag

PART-B (2X5 = 10)

Answer any TWO Questions

1. (a). Write about the scope of agriculture in India and explain its branches.
2. (a). What are the factors affecting crop production?
3. (a). Show the methods of irrigation, its advantages and limitations
4. (a). Highlight the factors affecting manure quantity.
5. (a). Bring down the characteristics of storage structure.

PART C(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 garden 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.
10. (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

CHEMICAL CHANGES IN PROCESSING & PRESERVATION

Time :Threehours

Max. Marks :75

PART A (15x1=15)

ANSWER ALL QUESTIONS

1. If buffers are present, the rate of browning reaction:
a. Decreases b. Increases c. Remains constant d. Cannot be predicted
2. Which of the following is/are the mode of non-enzymatic browning in food?
a. Caramelization b. Maillard reaction c. Ascorbic acid oxidation d. All of the above
3. The enzymatic browning is due to the oxidation of phenols is
a. Phenolase b. Tyrosinase c. Catecholase d. Orthoquinones
4. A substance intentionally added that preserves flavor and improves taste is called _____
a. Food additive b. Food adulterant c. Food contaminant d. Food material
5. Statement 1: Stabilizers, Emulsifiers are certain examples of food additives.
Statement 2: Antioxidant is a class of food additive
a. True, False b. True, True c. False, False d. False, True
6. Statement 1: High temperatures may affect proteins to a large extent.
Statement 2: Carbohydrate loss is _____ the maximum in _____ and may lead to browning or caramelization.
a. True, Fish b. True, Fruits c. False, Meat d. False, Milk
7. The temperatures used for canning foods ranges from _____
a. 0-20 degree C b. 20-60 degree C c. 60-100 degree C d. 100-121 degree C
8. In the high-temperature short-time (HTST) method of pasteurization, milk is exposed to a temperature of _____
a. 132 degree F b. 145 degree F c. 161 degree F d. 120 degree F
9. Which of the following microorganism survive at -9 to -17 degree C?
a. Salmonella b. Staphylococcus c. Bacilli d. Clostridium
10. Phosphatase enzyme present in milk is destroyed in which of the following processes?
a. Sterilization b. Canning c. Dehydration d. Pasteurization

11. Rancidity of lipids of lipid rich food stuffs is due to:
 - a. Hydrogenation of unsaturated fatty acids
 - b. Reduction of fatty acids
 - c. Oxidation of fatty acids
 - d. Dehydrogenation of saturated fatty acids

12. Which of the following statement is true
 - a. Oxidative rancidity is observed more frequently in animal fats than vegetables fats
 - b. Oxidative rancidity is observed more frequently in vegetables fats than animal fats
 - c. Plants fats do not undergo oxidative rancidity
 - d. Oxidative rancidity can be effectively checked by dehydrogenation of fatty acids

13. The principle of adding salt to meat to preserve it is called _____.
 - a. Pickling
 - b. Curing
 - c. Pickling & Curing
 - d. Neither of the mentioned

14. **Which of the following components are major nutrients in our food?**
 - a. Carbohydrates
 - b. Lipids and Proteins
 - c. Vitamins and Minerals
 - d. All of the above

15. **Which of the following statements is false about Ascorbic acid?**
 - a. It shows antioxidant activity
 - b. It is a strong reducing agent
 - c. It can be synthesized in the body
 - d. Involved in the hydroxylation of prolyl- and lysyl- residues of collagen

PART-B (2X5 = 10)

Answer any TWO Questions

1. Define 'medium'. What are the prerequisites for the preparation of a
2. Write about the properties and types of Restriction enzymes.
3. Distinguish about solid substrate fermentation.
4. Outline the methods of immobilizing enzymes.
5. What does the term 'Xenobiotics' means ?

PART C (5X10=50)

Answer All Questions

All questions carry equal marks

1. (a) Explain briefly about industrial organisms . (or)
(b) Enumerate the production of culture medium for food fermentation

M.Sc.FOODPROCESSING

2. (a) Explain the tools and techniques used for Gene cloning. (or)
(b) Write an brief account on single cell proteins.
3. (a) Write an essay on the production of alcoholic and non-alcoholic beverages. (or)
(b) Write a note on the following:
 - (i) Batch and continuous fermentation processes.
 - (ii) Fermentation of meat and bread making.
4. (a) Narrate about novel sweetness. (or)
(b) Write down the recent development in cheese flavor technology.
5. (a) What are the principles an procedure involved in the production of plant and animal tissue culture(or)
(b) Enumerate the overall metabolic fate of Xenobiotics in the body.

M.Sc. DEGREE EXAMINATION

**FOOD PROCESSING
FOOD MICROBIOLOGY**

Time : Three hours

Max. Marks : 75

PART-A (15X1 = 15)

ANSWER ALL QUESTIONS

- 1) What is the fungus known as bread mold
a) *Mucor* b) *penicillium* c) **rhizopus** d) *aspergillus*
- 2) Name the organism used in the amylo – process for the saccharification of yeast
a) *P. digitatum* b) *A. niger* c) *R. stolonifer* d) **M. rouxii**
- 3) State true or false: is water an intrinsic activity or extrinsic activity
a) **True** b) False c) neither a or b d) both a and b
- 4) The pigmented *Propionibacter* causes
a) color defects in breads b) **color defects in cheese** c) color defect in meat d) color defects in fruits
- 5) *Trichothecium* is commonly called
a) **Pink mold** b) Black mold c) Red mold d) Green mold
- 6) *Aeromonas hydrophila* is a
a) Plant pathogen b) spoilage organism of fruit c) **human pathogen** d) both a and b
- 7) Nisin is produced by strains of
a) **Streptococcus lactis** b) *Pseudomonas* c) *E. coli* d) *Clostridium*
- 8) *Pseudomonas* grows well in food containing
a) Vitamins b) organic acids c) antibiotics d) **nitrates**
- 9) Avidin is present in
a) meat b) fish c) **eggs** d) fruits
- 10) Osmophilic organisms like yeasts grow in
a) **Low concentration of sugar** b) high concentration of sugar c) low concentration of salt d) high concentration of salt

M.Sc.FOODPROCESSING

- 11) The following is a extrinsic factor?
a) Water b) nutrient content c) soil **d) relative humidity**
- 12) The following is not an extrinsic factor
a) Soil b) water **c) pH** d) relative humidity
- 13) Science which includes the study of the occurrence and significance of bacteria, fungi, algae is called
a) Entomology b) bacteriology **c) microbiology** d) zoology
- 14) The foods which have cottony or fuzzy appearance is caused by
a) Fungi b) protozoa **c) mould** d) virus
- 15) The mouldthallus consists of mass of branching filaments called _____.
a) Hyphae b) sporangia c) mycelium d) sclerotia

PART-B (2X5 = 10)

Answer any TWO Questions

1. Discuss how microorganisms are important in food processing.
2. Describe the spoilage of cereals..
3. Explain the spoilage of meat and fish..
4. Explain the sewage contamination in food.
5. List out the preventive measures of food borne infections.

PART C(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 foodintoxication
 - (ii) Staphylococcal foodintoxication

(iii) Salmonellosis

(iv) Botulism

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

Time:Threehours

Max. Marks:60

- | | |
|--|----|
| I. Enumerate and identify the microorganism 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

ANSWER ALL QUESTIONS

PART-A (15X1 = 15)

1. Fluid flow belongs to _____
a. **Unit operation** b. Energy operation c. Mass operation d. Dimension
2. Laws involved in unit operation are
a. Energy + Velocity b. Velocity + Mass c. **Energy + Mass** d. Heat transfer + Mass
3. Mass conservation means
a. $\text{Input} \geq \text{Output}$ b. $\text{Input} \propto \text{Output}$ c. **$\text{Input} = \text{Output}$** d. $\text{Input} \leq \text{Output}$
4. Chemical energy in food is converted by body into _____ energy.
a. Heat b. **Mechanical** c. Potential d. Electrical
5. Dimension for time
a. [T] b. **c.[Θ]** d. T
6. Dimension for density
a. [M]/[L] b. [M^3]/[L] c. [M^2]/[L] d. **[M]/[L]³**
7. Units for volume
a. **m^3** b. m c. m^2 d. m/s
8. Newton meter is called as _____
a. kilocalories b. **joule** c. energy d. kilogram
9. Centre of cylinder is _____ section.
a. **steam heating** b. cooling c. calandria section d. vapour section
10. Overall heat transfer co-efficient for evaporators _____
a. $1800-5000 \text{ Jm}^{-2}\text{S}^{-1}\text{ }^\circ\text{C}^{-1}$ b. **$1800-5000 \text{ Jm}^{-2}\text{s}^{-1}\text{ }^\circ\text{C}^{-1}$** c. $1800-5000 \text{ Jm}^{-2}\text{s}^\circ\text{C}^{-1}$ d. $1800-5000 \text{ Jm}^{-2}\text{s}^{-1}\text{ }^\circ\text{C}$
11. In evaporator q_1 represent
a. cooling co-efficient b. sub heat transfer c. sub cooling d. **heat transfer**
12. Length of diameter ratio of evaporator is
a. 14:2 b. **15:1** c. 16:3 d. 13:1

(b) Explain the applications and the use of solar energy in various fields.

M.Sc., DEGREE EXAMINATION

FOOD PROCESSING

FOOD BIOTECHNOLOGY

Time :Threehours

Max. Marks :75

PART-A (15X1 = 15)

Answer All Questions

1. Which kind of microbes are used as bio fertilizers
(a) Fungi (b) Bacteria (c) Molds (d) Virus
2. Industrial microbiology is a branch of
(a) Bio technology (b) entomology (b) immunology (d) food technology
3. Which of the following is used as a solidifying agent for media
(a) Beef extract (b) peptone (c) agar (d) yeast extract
4. Which instrument to use sterilization process
(a) Autoclave (b) laminar air flow chamber (c) hot air oven (c) incubator
5. Basic diagnostic methods used in
(a) Molecular biology (b) virology (c) biochemistry (d) molecular technology
6. Agar is a gelatinous substance derived from
(a) Sea weeds (b) guar gum (c) thermopiles (d) clones
7. A microbiologist may decide to use culture in which state
(a) Liquid culture (b) solid culture (c) raw medium (d) vapor culture
8. Engineered strains of bacteria contains
(a) Antibiotic resistance gene (b) moderated gene(c) resistance gene (d) antibiotic gene
9. Which of the following instrument is used for recovery of yeast cells?
(a) Calorimeter (b) centrifuge (c) filter process (d) mash storage
10. Which one of the following yeast used to produce microbial protein
(a) Cerevisiae (b) Candida milleri (c) eromothium Ashby (d) Candida utilis
11. The number of sets of chromosomes in a dikaryotic cells is
(a) greater than diploid cell (b) lesser than diploid cell
(c) is equal to diploid Cell (d) none of the above
12. The bread mold RHIZOPUS STOLONIFER belongs to which of the following fungal divisions
(a) ascomycota (b) dectromycota (c) oomycota (d) zygomycota

13. Expand EGF

- (a) epidermal growth factor (b) energy growth factor
(c) endo growth factor (d) emmunic growth factor

14. Amino acid is the raw material for the cell to

- (a) synthesis protein (b) histidine (c) leucine (d) tryptophan

15. The suitable pH for most cells is

- (a) 7.2 -7.4 (b) 7.6-7.8 (c) 6.8-7.0 (d) 7.9-8.0

PART-B (2X5 = 10)

Answer any TWO Questions

1. Explain the importance of industrial microorganism?
2. Discuss about the media for industrial fermentation?
3. Discuss the criteria used in media formulation ?
4. Explain the composition of media?
5. Discuss the buffering agent?

PART-C (10X 5 = 50)

Answer All Questions

1. a)Elaborate the media composition? (or)
b) Briefly about important of industrial micro organism?
2. a)Elaborate the culture production maintenance and preparation? (or)
b)Elaborate the antifoaming agents?
- 3.a)Brief note on the bacterial culture? (or)
b)Elaborate the yeast culture?
- 4.a)Brief note on the mold culture? (or)
b)Elaborate the preparation of yeast culture?
- 5.a)Elaborate the importance of industrial microorganism? (or)
b)Elaborate the media for industrial fermentation?

M.Sc., DEGREE EXAMINATION

FOOD PROCESSING

FOOD REGULATION AND QUALITY CONTROL

Time :Threehours

Max. Marks :75

PART-A (15X1 = 15)

Answer All Questions

1. Colour sorting determine the -----
a) ripeness b) softness c) hardness d) lightness
2. Pulling force applied away from material result in-----
a) Tearing b) cutting c) pulling d) squeezing
3. Hardness of food detected by -----
a) Penetrometer b) lactometer c) butyrometer d) silometer
4. Paired comparsion test belongs to -----
a) Difference test b) rating test c) threshold test d) sensitivity test
5. In numerical scoring test 80 refers to -----
a) Excellent b) fair c) good d) poor
6. Admas consistency consists of -----
a) 30 circles b) 20 circles c) 40 circles d) 50 circles
7. Intentional adulteration refers to -----
a) Purposely added b) accidentally added c) metallic d) arsenic
8. Ghee is adulterant by -----
a) Animal fat b) argemone seeds c) chalk powder d) metanil yellow
9. Coffee is adulterated by -----
a) Tamarind seeds b) chalk powder c) brick powder d) milk powder
10. FPO expand-----
a) Fruit product order b) Fruit product offense c) Food product order d) Fruit produce order
11. Prevention of blacking marketing started -----
a) 1980 b)1981 c)1986 d)1967

12. ECA expand-----

- a) Essential Commodities Act b) Essay Commodities Act c) Essential Commission Act d) Essential Commodities Action

13. ELISA test used to detect -----

- a) Microbes b) softness c) colour d) lightness

14. Expand HACCP-----

- a) Hazard Analysis Critical Control Point d) Hazard Analyt Critical Control Point
b) Hazard Analysis Cris Control Point c) Health Analysis Critical Control Point

15. Expand CAS-----

- a) Continuous Assessment System d) Complete Assessment System
b) Continuous Assignment System c) Continuous Assess System

PART-B (2X5 = 10)

Answer any TWO Questions

1. Write briefly on the importance of color and flavor of a food product
2. Define subjective evolution of foods. What are the different types of subjective evolution methods?
3. Write briefly on the causes, signs symptoms and prevention of lathyrism
4. Write the importance of PFA in food industry.
5. Discuss the total quality management and quality assessment system in food industries ?

PART C(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 followingheads.
(i) Factorsaffecting (II)Principle
7. (a)Describethetheobjectivemethodsoffoodqualityevaluation.(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 infood
(ii) Metal and Pesticide contaminant.(Or)
(b)Writeanessayonthehometestingmethodsfortestingadulterantsinspices, oils and milkproducts.
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 foodindustries
(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., DEGRE EXAMINATION FOOD
PROCESSING**

FOOD PRODUCT DEVELOPMENT AND ENTERPRENURSHIP

Time :Threehours

Max. Marks:75

PART-A (15 X1 = 15)

Answer All Questions

1. Which of the following is a basic function of a new product development?
a. product b. labour **c. quality of the product** d. none of the above
2. Factor that is NOT responsible for food habit alteration?
a. Child b. gender c. growth d. none of the above
3. Which of the following is the role of Research and development department of a food company?
a. Generate profit b. create new products c. solves problems that arises during the process **d. all of the above**
4. A way in which Research and Development department works in a company?
a. Does not provide strategic information for decision making b. does not look after the costs required for developing new product **d. prototyping and designing**
5. Food product testing does not include this step?
a. Ideation **b. destroying the product** c. market testing d. all of the above
6. Which of the following is considered as a material for market demand?
a. Labour b. capital c. land **d. All of the above**
7. Standardization can be classified in to _____ parts?
a. 3 b. 5 c. 7 d. 9
8. Intrinsic factors that affect shelf life of a product?
a. Cost b. gender **c. expiration date** d. all of the above
9. Formula to calculate nutritive value for food?
a. calories/fat x100 b. fat/caloriesx1000 c. calories/calories x 1000 d. none of the above
10. Saturated fats must be _____ % ?
a.3% **b.10%** c. 5% d. 7%
11. Type of panel members?
a. Untrained, unprofessional, unethical b. unethical, unprofessional, untrained
c. consumer panel, trained panel, semi-trained panel d. none of the above

12. Score card was developed by?

- a. David Beckham b. David Walter c. Fernandes Philip **d. David Norton**

13. A drawback in advertising of food products?

- a. False information** b. free of cost c. not so appealing d. none of the above

14. A characteristic of an entrepreneur?

- a. Risk taking** b. does not earn profits c. lazy d. all of the above

15. Entrepreneurship means?

- a. setting of commercial enterprises b. setting of food industries **c. setting up of businesses** d. none of the above

PART-B (2X5 = 10)

Answer any TWO Questions

1. What are the factors that are involved in food habit alteration?
2. Give a short note on the role of food additives and preservatives in product development.
3. What are the procedures involved in selection and training of judges.
4. Define market and marketing. Explain its types and functions.
5. Explain the concept of entrepreneurship.

PART C(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?

M.Sc., DEGREE EXAMINATION

FOOD PROCESSING

RESEARCH METHODOLOGY AND STATISTICS

Time :Threehours

Max. Marks :75

PART-A (15X1 = 15)

Answer All Questions

1. _____ is the classical form of research?
a) Experiment b) Case study c) Grounded theory d) Narrative inquiry
2. _____research is the naturalism
a) Field research b) Descriptive research c) Basic research d) Applied research
3. If the researcher is concerned with finding out who, what, when or how much, then the study is _____
a) Descriptive research b) Exploratory research c) Empirical research d) Causal research
4. _____ is referred to as "the father of research on teaching"?
a) N. L. Gage B. b) David Berliner c) EgonBrunswik d)Donald T. Campbell
5. What is a bibliography?
a) A true story written about someoneb) Another name for writing a book.
c) A religious book.d) A list of sources used in a report and where they can be found.
6. Sample size depends on
a) Type of problem investigated b) Resources available c) Required precision d) all of them
7. A set of all possible data values for a subject under consideration is called
a) descriptive statistics b) a sample c) a population d) statistics
8. The number of occurrences of a data value is called
a) the class limits b) the frequency c) the cumulative frequency d) the relative frequency
9. Which of the following *is not* a type of research question?
a) Predicting an outcome b)Evaluating a phenomenon
b) Developing good practice c) hypothesis

10. We review the relevant literature to know:
- What is already known about the topic
 - What concepts and theories have been applied to the topic
 - Who are the key contributors to the topic
 - All of the above**
11. When planning to do social research, it is better to:
- Approach the topic with an open mind
 - Do a pilot study before getting stuck into it
 - Be familiar with the literature on the topic**
 - Forget about theory because this is a very practical undertaking
12. Which of the following is not a major method of data collection?
- Questionnaires
 - Focus groups
 - Correlational method**
 - Secondary data
13. The main purpose of research in education is to _____
- Increase social status of an individual
 - Increase job prospects of an individual
 - Help in the personal growth of an individual
 - Help the candidate become an eminent educationist**
14. What is the purpose of doing research?
- To identify problem
 - To find the solution
 - Both a and b**
 - None of these
15. In a qualitative research proposal you would not expect to see a.....
- Research question
 - Research aim
 - Hypothesis
 - Operational definition

PART-B (2X5 = 10)

Answer any TWO Questions

- Explain the meaning and significance of a research design.(Or)
- Write a brief note on case study method.(Or).
- Mention the rules for constructing a diagram.(Or)
- 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)
- 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 χ^2 and test whether shading on the trees has any effect on its yielding capacity [5% value of χ^2 for 1 degree of freedom = 3.84]. (Or)

PART C(5X 10=50)

Answer All Questions

All questions carry equal marks

1. A) Describe the various types of research. (or)
B) What are various points to be kept in mind while selecting and formulating a research problem?
2. A) Explain about the types of probability and non probability sampling.(or)
B) Differentiate quantitative and qualitative research
3. A) What do you mean by sampling? Discuss the various probabilities sampling with their merits and demerits.(or)
B) What are the good components of a good research design? Discuss in details.
4. A) What are the major activities involved in a research process?(or)
B) Elaborate on the characteristics, meaning and components of good research design.
5. A) Explain any two probability random sampling methods stating clearly their advantages and disadvantages.(or)
B) Define mean, median and mode. Compute the mean and median for the following data of weigh of a species of frog.
Weight in g: 16, 11, 8, 10, 14, 16, 9, 9, 13 and 12.

M.Sc. DEGREE EXAMINATION
FOOD PROCESSING
FOOD PACKAGING TECHNOLOGY

Time : Three hours

Max. Marks: 75

PART -A (15X 1 = 15)

Answer All Questions

1. Expand RCF?
a) Regenerated cellulose film b) Rigid cellulose form c) Rigid cellulose film d) Regenerated cardboard form paper
2. ----- is used for viscous liquids.
a) Collapsible tube b) Retort pouches c) Plastic bottle d) Aluminum foil
3. Paper is produced from an interlaced network of -----
a) Cellulose fibre b) Starch c) cotton d) edible film
4. Vacuum packaging is also known as?
a) Reduced oxygen packaging b) reduced nitrogen packaging c) air packaging d) sealed packaging
5. Moulded pulp is also known as?
a) Moulded fibre b) moulded sheet c) moulded film d) moulded paper
6. Carton box is a type of ----- packaging
a) Semi-rigid packaging b) retort box c) recycle fibre d) flexible packaging
7. Small particles of a liquid or solid suspended in a gas.
a) Aerosol b) cellulose c) plastic d) glass
8. Corrugation box is also known as?
a) Cardboard b) paper box c) cellulose fibre d) cellulose box
9. What is fluting?
a) Corrugated medium b) flexible medium c) paper medium d) cellulose medium
10. Which type of packaging is used to egg packaging?
a) Moulded pulp packaging b) cardboard box c) aluminum foil d) paper

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11. Which type of packaging is used to chewing gum?
a) Blistered pack b) butter paper c) aluminum foil d) paper
12. The substance used for sealing?
a) Sealant b) heat c) gum d) wax
13. Metal is naturally converted to a more stable form?
a) Corrosion b) toxicity c) tainting d) fluting
14. Expand SWMA?
a) The standards weights and measure act b) standard weight and medium act c) standard weight measuring act d) standard weighing and measuring act
15. Expand MFPO?
a) Meat food products order b) milk food products order c) meat and fruit products order c)millet food product order

PART-B (2X5 = 10)

Answer any TWO Questions

1. Define packaging and highlight its significance. (Or)
2. Specify packaging material needed for milk and milk products..
3. Write a short note on rigid packaging.
4. What is aseptic retort packaging?.
5. Howwillyouchooseapackagingmaterialforeggs?.

PART C(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

PRACTICAL - COMPUTER APPLICATION IN FOOD PROCESSING

Time:Threehours

Max. Marks:60

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 workbook
 - (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.

FOOD PROCESSING

FOOD INDUSTRIAL WASTE MANAGEMENT

Time :Threehours

Max. Marks :75

PART -A (15X1 = 15)

Answer All Questions

1. ----- tonnes of fruits waste produce in European countries
a) 150 b) 160 c) 170 d) 180
2. Apple pomace contains ----- % of pectic substance
a) 5% b) 6% c) 7% d) 8%
3. Onion skin contain high concentration of -----
a) Quercetin b) solanine c) lecithin d) flavones
4. Filtration is ----- process
a) Physical b) chemical c) biological d) economical
5. Microorganisms + organic matter = -----
a) $H_2O + CO_2 + \text{heat}$ b) $H_2O + CO_2 + \text{heat}$ c) $H_2O + CO_2 + \text{humus}$ d) $H_2O + CO_2 + \text{heat}$
6. Biogas is an -----
a) Anaerobic method b) Anaerobic method c) Anaerobic method d) Anaerobic method
7. In deep shaft reactor ----- ft of clarifiers is used
a) 400 -500 ft b) 40 -50 ft c) 450 -500 ft d) 400 -550 ft
8. Aeration tank used in -----
a) Trickling Filters b) incineration c) sludge process d) bio gas plant
9. Biogas produces -----
a) Methane b) oxygen c) helium d) alcohol
10. Decomposition of soil is called-----
a) Compost b) landfill c) incineration d) drying
11. Slope method landfill used in-----
a) hilly region b) formal region c) perceptual region d) functional region
12. Temperature used in belt dryer -----
a) 80-150 ° C b) 85-155 ° C c) 90-150 ° C d) 80-155 ° C

13. COD means

- a) Chemical Oxygen Demand b) Chemical Ozone Demand c) Chemical Oxygen Demand d) Chemo Ozone Demand

14. Moisture condition of earthworms in vermin compost -----

- a) 60-70 % b) 70 -80 % c) 80-90 % d)82-95%

15. Meaning of “POMACE”-----

- a) Solid waste b) liquid waste c)oil waste d) milk waste

PART-B (2X5 = 10)

Answer any TWO Questions

1. Write short notes on food industrial waste classification.
2. Write about methods involved in waste disposal.
3. Distinguish about UASB.
4. Outline the landfill digester
5. Explain about Biofilters

PART C(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 sludgeprocess
(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)Ionexchangetreatmentofwastewater?–Explain.(Or)
(b) Enumerate the drinking water treatment

M.Sc., DEGREE EXAMINATION

FOOD PROCESSING

M.Sc. DEGREE EXAMINATION

FOOD PROCESSING

ANIMAL FEED FORMULATION

Time :Threehours

Max. Marks:75

PART -A (15X1 = 15)

Answer All Questions

- 1.What is an example of a non protein nitrogen (NPN) used as a protein source in dairy feeds?
a) nitrogen b) phosphorus c) magnesium d) urea
- 2.What is the process called when a calf is switched from milk or milk replaced to water and dry feed?
a) fertilizationb) cullingc) breedingd) weaning
- 3.The back of a dairy cow is made up of what two parts?
a) chine and loinb) udder and skinc) chine and udderd) loin and bone
- 4.Name the wool processing industry, which uses only strong long stapled wools?
a) Woolenb) Feltingc) Worstedd) Carding
- 5.The ancestral period for a goat is?
a) January and Februaryb) March and Aprilc) May and Juned) September and October
- 6.Which is true about the peak approach period in dogs?
a) It occurs between 5 and 7 weeks of ageb) It comes after the peak avoidance period
c) It is when the puppy learns to come when calledd) Lack of contact with other puppies during this period enhances adult sexual competency
- 7.In swine, heritability of backfat is approximately:
a) .3 to .5b) .15 to .25c) .6 to .7d) .7 to .8
- 8.Which of the following cause tail-biting in a confinement hog operation?
a) Overcrowdingb) Lack of watering devicesc) Lack of adequate ventilationd) All of the above
- 9.Which of the following maximizes the use of heterosis?
a) Linebreedingb) Inbreedingc) Rotational crossbreedingd) Terminal crossbreeding
- 10.Who is the mother of Broiler Poultry Farming.?
A) James HarborB) Wilmer SteelC) William HannaD) Wilkinson
- 11.Which Vitamin deficiency is the main problem for Poultry Farming Birds in Winter.?

A) Vitamin B B) Vitamin C C) Vitamin D D) Vitamin E

12. Chicken is also called _ _ _ meat.?

A) Red Meat B) Black Meat C) White Meat D) None of the above

13. White meat is low in _ _ _ ?

A) Carbohydrates B) Fat C) Calories D) None of the above

14. What is the ideal temperature for hatching eggs.?

A) 90-95 degree Fahrenheit B) 95-98 degree Fahrenheit C) 99-102 degree Fahrenheit
D) 101-103 degree Fahrenheit

15. Where is Chicken dung or manure is used in.?

A) Bio Diesel B) Fertilizer C) A and B D) None of the above

PART-B (2X5 = 10)

Answer any TWO Questions

1. Explain The Nutrient requirements of cattle
2. Short notes on Nutrient requirement for growth, milk production of goats
3. Write briefly feeding of sheep
4. Explain Nutrient requirements of poultry
5. Short notes on agro- industrial by-products

PART C (5X 10=50)

Answer All Questions

All questions carry equal marks

11. (a) Explain briefly about growth pattern in India domestic buffalows (Or)
(b) Explain briefly about Intestine meat production from buffalows

12. (a) Explain Nutrient requirement for growth, milk production of goats. (Or)
(b) Explain the common feeds and Fodders of goats.]

13. (a) Write an essay on Nutrient requirements- reproduction, and weaning pigs
(b) Write an essay. growers rations of sheep

14. (a) Write about formulation of poultry rations. (Or)
(b) Write down. Feed requirement for production, feeding schedule of poultry

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15. (a) write a note on Tree leaves and shrub straws and crop residues(Or)
(b) Enumerate the, rations for feeding during scarcity, preparation of feed.

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