UG PROGRAM (4 Years Honors)

CBCS - 2020-21

B. Sc
FOOD TECHNOLOGY

Syllabus and Model Question Papers

TABLE OF CONTENTS

Note: BOS is to provide final soft copy in PDF and word formats and four copies of hard copies in bounded form to the office of Dean Academic affairs.

1. Resolutions of the Board of Studies:

Meeting heldon:08/07/2021..... Time: 10 AM – 4 PM
At: ANUR Convention Centre,
Adikavi Nannaya University
Rajahmahendravaram

Agenda:

As per the directions and guidelines/modalities issued by the APSCHE for revising the curriculum framework and updating the syllabus as out-come based B. Sc food technology programme to be effect from 2020-21 academic year under CBCS for implementing in all affiliated colleges of AKNU

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Resolutions:

1. It was resolved to adopt revised common programme structure as per the guidelines issued by APSCHE.

2. Resolved to adopt regulations and scheme of examinations and marks/grading system of the university UGprograms.

3. Resolved to prepare model question Courses in the given prescribedformat.

4. Resolved to prepare a list of equipments/software required for eachlab/practicals.

5. Resolved to give the eligibility criteria of students for joining thecourse.

6. Resolved to give the eligibility criteria of faculty for teaching thecourse.

7. Resolved to prepare a list of Course setters/Course evaluators/project evaluators in the given prescribedformat.

UG Program (4 years Honors) Structure (CBCS)
2020-21 A. Y., onwards
BACHLOR OF SCIENCE
(3rd and 4th year detailed design will be followed as per APSCHE GUIDELINES)

Subjects/ Semesters		I		II		III		IV		V		VI			
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/W	C		
Languages												THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester		FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).	
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Core Papers															
M-1	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-2	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-3	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-1	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-2	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-3	SEC (C6,C7)									4+2 4+2	4+1 4+1				
Hrs/ W (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	12	4	4
Project Work															
Extension Activities (Non Academic Credits)															
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30	0	12	4	4

M= Major; C= Core; SEC: Skill Enhancement Courses

Marks & Credits distribution: UG-Sciences

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	S.Lang	3	4	3	9	25	75	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -II	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -III	5+2	4+2	4+1	35	25	75+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ on the job training	1		12	12		200	200	200
		38			**159**				**4550**
8	**Extension Activities (Non Academic Credits)**								
	NCC/NSS/Sports/ Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits								
	Total	**40**			**142**				

DETAILS OF COURSES AND CREDITS

Sem	Course No	Course Name	Course Type (L/T/P)	Hrs/Week	Credits	Max. Marks	Max. Marks Sem- End Exam
				Sciences: 4+2	Sciences :4+1	Internal/ Conti./ Mid Assessment	
I	1	Food Production Trends	T	4	4	25	75
		Food Production TrendsLab	L	2	1	-	50
II	2	Food Preservation Techniques and ItsMicrobial Studies	T	4	4	25	75
		Food Preservation Techniques and Its Microbial Studies – Lab	L	2	1	-	50
III	3	Unit Operations and ItsMaterial handling	T	4	4	25	75
		Unit Operations and ItsMaterial handling –Lab	L	2	1	-	50
IV	4	Food Additives	T	4	4	25	75
		Food Additives-Lab	L	2	1	-	50
	5	Food QualityManagement	T	4	4	25	75
		Food Quality Management- Lab	L	2	1	-	50
V	6A	Technology of Fruits, Vegetables and Plantation Crops	T	4	4	25	75
		Technology of Fruits, Vegetables and Plantation Crops Lab	L	2	1	-	50
	7A	Technology of Cereals, Pulses and Oil Seeds	T	4	4	25	75
		Technology of Cereals, Pulses and Oil Seeds Lab	L	2	1	-	50
	OR						
	6B	Nutraceuticals and Functional Foods	T	4	4	25	75
		Nutraceuticals and Functional Foods Lab	L	2	1	-	50
	7B	Food Plant Sanitation	T	4	4	25	75
		Food Plant Sanitation Lab	L	2	1	-	50
	OR						
	6B	Entrepreneurship Development and Food Product Development	T	4	4	25	75
		Entrepreneurship Development and Food Product Development Lab	L	2	1	-	50
	7B	Technology of Food Preservation	T	4	4	25	75
		Technology of Food Preservation Lab	L	2	1	-	50

Note: * Course Type Code : T-Theory, L - Lab, P: Problem solving.

Note 1: For Semester–V, for the domain subject **FOOD TECHNOLOGY**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills

related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

- **First internship (After 1st Year Examinations):** Community Service Project. To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project (the detailed guidelines are enclosed).
- **Credit For Course: 04**

- **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).
- **Credit For Course: 04**

- **Third internship/Project work (6th Semester Period):**
  During the entire 6th Semester, the student shall undergo Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work (the detailed guidelines are enclosed).
- **Credit For Course:12**

a. Proposed combination subjects: **Chemistry, Microbiology, Food Technology.**

b. Student eligibility for joining in the course: + 2/ Intermediate with Bi.P.C. , M.P.C. andAgriculture

c. Faculty eligibility for teaching the course: M.Sc. (Minimum Qualification)
M.Tech ,Ph.D,are desirable.

d. Required instruments/software/ computers for the course (Lab/Practical course-wise required i.e., for a batch of 15students).

Sem. No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
1	Food technology	Tray drier Cabinet drier Food Mixer Ribbon blender Juice machine Peeling m achines Vegetable slicer Food chopper Ice making machines Rice Milling machines	Mettler Toledo Coleparmer Kemi Coleparmer IKA Remi Remi Labline Accumax India Labman	2 2 2 2 2 2 2 2 2 2 2 2
2	chemistry	Weighing balance digital and Non digital PH Meter Water bath Vortex mixture Magnetic stirrer Hot plate Hot air oven Autoclave Distillation unit UVSpectrophoto meter	Remi Thermo scientific Thermo Fisher Major science Equiptronic Shimadzu	2 1 1 2 2 2 1
3	Food chemistry	Soxhlet extractor Rotary evaporator Dessicator Mortar and pestle Glass and micro pipettes Millipore unit	Borosilicate Heidolph Borosil Thermo scientific Borosil Thermo scientific Merck	1 1 1 2 15 1
4	Microbiology	Simple microscope Compound microscope	Olympus Leica	2 2
5	Food microbiology	BOD Incubator COD Incubator Orbital shakers Laminar air flow Fume hood	Kemi Thermo Fisher Coleparmer Bionics Scientific Coleparmer Biorad Merck	1 1 1 1 1 1 2

e. List of Suitable levels of positions eligible in the Govt/Pvt organizations Suitable levels of positions for these graduates either in industry/govt organization like., technical assistants/ scientists/ school teachers., clearly define them, with reliable justification.

S.No	Position	Company/ Govt organization	Remarks	Additional skills required, if any
1	Scientific assistant	Food Corporation of India	Upgrade their skills and get promoted	Communication skills Language skills Computational skills
2	Scientific assistant	Central ware house corporation	Upgrade their skills and get promoted	Communication skills Language skills Computational skills
3	Food safety officers	State and central government organizations	Upgrade their skills and get promoted	Communication skills Language skills Computational skills
4	Technicians	State and central government institutes and labs	Upgrade their skills and get promoted	Communication skills Language skills Computational skills

f. List of Govt. organizations / Pvt companies for employment opportunities or internships or projects

S.No	Company/ Govt organization	Position type	Level of Position
1	Food Corporation of India	Scientific assistant	Basic (can be upgraded)
2	Central ware house corporation	Scientific assistant	Basic (can be upgraded)
3	State and central government organizations	Food safety officers	Basic (can be upgraded)
4	State and central government institutes and Labs	Lab Technicians	Basic (can be upgraded)
5	National Institute of Nutrition	Lab assistant/project assistant	Basic (can be upgraded)
6	Central Food Technological Research Institute	Lab assistant/project assistant	Basic (can be upgraded)
7	International Crops Research Institute for the Semi-Arid Tropics	Lab assistant/project assistant	Basic (can beupgraded)
8	Indian Institute of Spices Research	Lab assistant/project assistant	Basic (can be pgraded)

3. Program objectives, outcomes, co-curricular and assessment methods

B.Sc.	Food Technology

1. Aim and objectives of UG program in Subject:

Food technology is the study of food processing in detail Its aim is to understand the fundamental chemical principles of foods. The program aims to provide an advanced understanding of the core principles and topics of foods and their experimental basis to enable students acquire a specialized chemical knowledge. The program also develops a foundation in the concepts and facts in modern food processing, food chemistry,food microbiology and familiar with various ways of organizing and accessing scientific knowledge.

2. Learning outcomes of Subject:

1. To study about various concepts of food structure ,composition and qulity aspects
2. To study about preservation methods and microbial spoilage
3. To learn about handling of equipment and its principles and specifications
4. To study about various food preservations, colorants and its applications
5. To study about various standards applied in food industry
6. To study about packaging helps and to increases shelf life of foods
7. To study about the composition of food and their microbial studies
8. Analyze, interpret, and participate in reporting to their peers on the results of their laboratory experiments;
9. Participate in and report orally on team work investigations of problem-based assignments;
10. Build knowledge and understanding in tackling more advanced and specialised courses, and more widely to pursue independent, self-directed and critical learning.
11. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

A. Measurable:

1. Assignments
2. Student seminars (Individual presentation of Courses) on topics relating to: Immunology
3. Quiz Programmes on: Food Technology.
4. Individual Field Studies/projects
5. Group discussion
6. Group/Team Projects

B. General:

1. Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus**.**
2. Group Discussions on: New scientific approaches and Discoveries**.**
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers

1. Any similar activities with imaginative thinking.

Organizing exhibitions
Preparation of charts and models Science fairs
Science
clubs Essay
writing

12. Recommended Continuous Assessment methods:

Slip test, Oral test, Assignments, Seminars

B. Sc	Semester – I	Credits: 4
Course: 1	Food Production Trends	Hrs/Wk:4

UNIT-I:
Status of food processing industry in India & Abroad, Indian Food Industry, Reasons for slow growth, Scope for Expansion, future priorities in food production need, magnitude and inter dependence of food production and processing agencies.

UNIT-II:
Dairy, Bakery, Confectionery, Beverage and Snack foods and their growth, popularity of Indian foods, National and International Projects and their food products.

UNIT-III:
Ministry of food processing industries (MOFPI), objectives and functions, APEDA - its objectives and functions, food characteristics, classification of foods, types of foods, convenience foods - Recent Trends for processing of foods, genetically modified foods.

UNIT-IV:
Functional foods and their advantages and disadvantages, Food Demand and Supply, Factors affecting Food Demand, Food Laws, Factors affecting food laws.

UNIT-V:
Global demand for food, World Food Day- its importance and action plan, classification of food crops, food losses, production and estimation of post harvest losses, Development programmes and strategies to eliminate food losses, Employment generation through post harvest operations.

BOOKS FOR REFERENCE:

1. N.N. Potter, Food Science, III edition,. AVI Publishing Co. Inc., West Port, USA, 1978.
2. K. VijayaRaghavan, Agricultural Administration in India.
3. Chidda Singh, Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co, New Delhi.
4. Graft and Saguy, Food Product Development, CBS Publishers, New Delhi.
5. M. Swaminathan, Food and Nutrition, Vol I &II, The Bangalore Printing & Publishing Co. Ltd, Bangalore.
6. Mahatab, S.Banji, N. Prashad Rao and Vinodini Reddy. Text Book of Human Nutrition, Oxford &IBH PublishingCo.Ltd. New Delhi

B. Sc	Semester – I	Credits: 1
Course: 1(L)	Food Production Trends Lab	Hrs/Wk:2

Practical's: Food Production Trends and Human Nutrition Lab

1. Drying of fruit slices pineapple slices, apple slices in cabinet drier.
2. Demonstration of various perishable food items and degree of spoilage.
3. Demonstration of various perishable food items and degree of spoilage.
4. To study IQF processing of fruits/ vegetable.
5. Demonstration of preserving foods under cold vs. freezing process.
6. Visit to food processing industry.

MODEL QUESTION PAPER (Sem -End)

B.Sc DEGREE EXAMINATIONS

SEMESTER -I

Course 1: FOOD PRODUCTION TRENDS

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

SECTION – A

Answer any FIVE questions **5 X 5= 25 M**

1. What are the objectives of Food Science and Food Technology
2. What are the international and national projects of food.
3. write a short note on food losses and factors effecting on food losses.
4. Write a short note on criteria for success of food processing industry
5. Write a short note on APEDA.
6. Explain the classification of foods on the basis of pH.
7. What are the factors which effecting food demands?
8. Give a short note on Employment generation through post harvest operations

SECTION – B

Answer ALL the following questions **5 X 10 = 50 M**

9. a) Explain the Status of Food Processing industry in India and Abroad

   OR

   b) What are the objectives and Sub-disciplines of Food Science and Food Technology

10. a) Explain the growth of food processing industries

    OR

    b) Explain brief the history of the world food processing industry.

11. a) Explain the food characteristics and it sources.

    OR

    b) Explain briefly about MOFPI.

12. a) What are the factors which effecting food demand

    OR

    b) Explain in detail about Functional foods.

13. a) Explain in detail about classification of food crops

    OR

    b) Explain in detail about Global demand for food, World Food Day- its importance and action plan.

B. Sc	Semester – II	Credits: 4
Course:2	Food Preservation Techniques and Its Microbial Studies	Hrs/Wk:4

UNIT-I:
Food Spoilage: Definition, types of spoilage - physical, enzymatic, chemical and biological spoilage. Mechanism of spoilage and its end products, shelf life determination. Use of preservative in foods: chemical preservative, bio preservatives, antibiotics, lactic acid bacteria.

UNIT-II:
Preservation by using Preservatives: Food preservation: Definition, principles, importance of food preservation, traditional and modern methods of food preservation. Food additives – definition, types, Class I and Class II preservatives. Preservation by fermentation: curing and pickling; Hurdle technology, Non- thermal (e.g. high pressure processing) and minimal processing technologies Ionization radiation.

UNIT-III:
Preservation by use of high Temperature: Pasteurization: Definition, types, Sterilization, Canning - history and steps involved, spoilage encountered in canned foods, types of containers used for canning foods. Food irradiation – Principles, merits and demerits, effects of irradiation and photochemical methods.

UNIT-IV:
Preservation by use of Low Temperature: Refrigeration - advantages and disadvantages, freezing: Types of freezing, common spoilages occurring during freezing, difference between refrigeration and freezing. cold storage, cold chain, freezing, IQF methodology (including cryogenic freezing)

UNIT-V:
Preservation by Removal of Moisture: Drying and dehydration - merits and demerits, factors affecting, different types of drying, Water activity of food and its significance in food preservation; Concentration: principles and types of concentrated foods.

REFERENCE BOOKS:

1. Gould, G. W. (2012), "New Methods of food preservation", Springer Science & Business Media.
2. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.
3. Srilakshmi, B.(2003), "Food Science", New Age International Publishers, New Delhi.
4. Subalakshmi, G and Udipi, S.A.(2001),"Food processing and preservation". New Age International Publishers, New Delhi.

B. Sc	Semester – II	Credits: 1
Course:2(L)	Food Preservation Techniques and Its Microbial Studies – Lab	Hrs/Wk:2

Practical's: Food Preservation Techniques and Its Microbial Studies lab

1. Market survey of raw processed and preserved foods their costs
2. Weights and measurements
3. Various methods of cooking
4. Freeze drying
5. Preservation of reduction in moisture level by drying and dehydration
6. Study of different preservation techniques
7. Visit to the food processing industry

MODEL QUESTION PAPER (Sem -End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -II

Course 2: Food Preservation Techniques and Its Microbial Studies

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

SECTION – A

Answer any FIVE Questions. **5 X 5= 25 M**

Draw Labeled diagram wherever necessary

1. Write a short note on food spoilage**.**
2. Explain about principles of food preservation**.**
3. Write a short note on Pasteurization**.**
4. Write a short note on freezing**.**
5. Explain about dehydration**.**
6. Write a short note on Class I & Class II Preservatives**.**
7. Write a short note on Chemical Preservatives**.**
8. Explain in detail about food preservation.

SECTION – B

Answer A L L the following Questions. **5 X 10 = 50 M**

9. a) Explain in detail about food spoilage**.** Physical, enzymatic, chemical and biological spoilage**.**

(OR)

b) Explain about food preservatives & types of food preservatives**.**

10. a) Explain in detail about modern & traditional methods of food preservation**.**

(OR)

b) Explain about food additives**.**

11. a) Write about history of canning & steps involved in canning**.**

(OR)

b) Explain about food Irradiation**.**

12. a) What are the difference between refrigeration and freezing**.**

(OR)

b) Explain about types of freezing**.**

13. a) Explain in detail about dehydration**.**

(OR)

b) Explain about water activity and its significance in food preservation**.**

B. Sc	Semester – III	Credits: 4
Course: 3	Unit Operations and Its Material Handling	Hrs/Wk:4

UNIT-I:

Unit Operations –Classifications-conservation of mass and energy.SI, FPS and MKS system of **UNIT**s-Evaporations-single effect evaporation and multiple effect evaporation ,vacuum evaporation-Short tube and long tube evaporators ,its applications in food industry.

UNIT- II:

Introduction and importance of Physical properties –Shape and size of grains ,Shape and size of Fruits ,Bulk density of grains , Cleaning ,Sorting and Grading ,peeling , Dehulling ,Dehusking ,Mixing Definition ,Mixing Equipment-Double cone mixer , Ribbon mixer ,Mixing- mixing of solids, liquids, pastes. Blending , emulsification.

UNIT- III:

Distillation- stage of distillation- Steam , vacuum and batch distillation. .Drying and Dehydration types of dryers – Tray dryer , tunnel dryer ,LSU dryer, Freeze dryer, osmatic dehydration , foam mat drying and their working principles and applications in food industry.

UNIT-IV :

Baking, principles of baking, different types of ovens Roasting and Frying equipment- principles, different types of equipments involved in roasting, different types of fryers. Extraction and Leaching, extraction equipment, supercritical fluid extraction, Leaching equipment. Crystallization and Distillation: Basic principles involved.

UNIT-V:

Mechanical Separations: Screening and Screening equipment, Centrifugation- principle, equipment involved in centrifugation, liquid-liquid centrifugation, liquid- solid centrifugation, clarifiers, desludging and decanting machines. Filtration: Principles involved in filtration, membrane separation, Pressure and vacuum filtration. Expression: batch and continuous type.

BOOKS F REFERENCE:

1. Chakravarthy A, Post Harvest Technology of Cereals, Pulses and Oilseeds, Oxford and IBH Publications Company Limited, Calcutta, 1988.
2. Charm S.E, Fundamentals of Food Engineering, The AVI Publishing Company, USA, 1971.
3. Dennis R.H, Food Process Engineering, The AVI Publishing Company, 1971.
4. Earle R.L, Unit Operations in Food Processing, Pergamaon press, New Delhi, 1983.
5. Mc Cabe and Smith J.C, Unit Operations of Chemical Engineering, Tata Mc Graw Hill Publishing Book Company, New Delhi, 1993.
6. 6.C.P. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill Company, New Delhi, 2000.
7. . Fellows, Food Processing Technology, Principles and Practice, CRC Press. 2000.
8. Nuri N. Mohsenin, Physical Properties of Plant and Animal Materials, Ed.2009
9. Earle R.L, **UNIT** Operations in Food Processing. Pergamon Press, 1983.
10. K.M. Sahay and K.K Singh, **UNIT** Operations of Agricultural Processing, Vikash Publication House, New Delhi.

B. Sc	Semester – III	Credits: 1
Course:3(L)	Unit Operations and Its Material Handling- Lab	Hrs/Wk:2

Practical Paper: Unit Operations and Its Material Handling- Lab

1. Determination of separation efficiency of centrifugal separator.
2. Determination of energy requirement in size reduction using ball mill.
3. Experiments on tray dryer
4. Determination of engineering properties of food materials
5. Determination of viscosity of different food materials.
6. Shelf life calculations for food products
7. Determination of gas transmission rate.
8. Visit to an industry (extruder).

MODEL QUESTION PAPER(Sem -End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -III

Course 3: Unit Operations and it's Material Handling

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

SECTION – A

Answer any FIVE Questions **5 X 5= 25 M**

1. Write a short note on mass and energy
2. Write about vacuum evaporators
3. Give a brief note on physical properties of grains.
4. List out different mixing equipment**.**
5. Differentiate between Drying and dehydration with an appropriate examples
6. Define Distillation and list out types involved in it
7. What is Baking ,Roasting and Frying methods.
8. What is Centrifugation and give examples involved in food products**.**

SECTION – B

Answer ALL the following Questions. **5 X 10 = 50 M**

9. a) Explain detail about single effect and Multiple effects evaporations with a neat diagram.

(OR)

b) Write about short and long tube evaporators with a neat diagram and its applications in food industry**.**

10. a) Write about any two grain separation equipment with neat diagram.

(OR)

b) Write about Mixing equipment of any two with a diagram

11. a) What is Distillation and Explain in detail about batch distillation with a neat diagram

(OR)

b) What is Freezing and list out freezing equipment with working principle and its applications.

12. a)What is Baking and list out Various equipment involved in it along with Working principles

(OR)

b) Differentiate between Extraction and Leaching and Explain each with neat sketch with principles

13. a) Define centrifugation and types of centrifugation and Explain any one centrifugation involved in food industry

(OR)

b) What is Filtration principles and its application in food industry**.**

B. Sc	Semester – IV	Credits: 4
Course: 4	FOOD ADDITIVES	Hrs/Wk:4

UNIT-I:

Introduction to Food Additives: Definition of Food Additives - Need of food additives in food processing – Types of additives with examples - benefits of additives - risks of additives, Functions and classification of food additives. Safety evaluation of food additives, Generally Recognized As Safe (GRAS) tolerance levels and toxic levels of additives in foods.

UNIT-II:

Major Food Additives: Food colours- types-natural & artificial food colours- risks of artificial food colours, Preservatives - class I&II preservatives, natural preservatives- chemical preservatives, Sweeteners- types-natural & artificial sweeteners- risks and benefits of sweeteners, Flavours- types- natural and artificial, flavour enhancers and their benefits.

UNIT-III:

Minor Food Additives: Anti-oxidants-types- natural and artificial anti oxidants - toxic effects of antioxidants-their role in foods, chelating agents- types and examples , Emulsifiers- types- natural and artificial emulsifiers- mechanism of action of emulsifiers in foods. Curing agent- examples and their role in Foods.

UNIT-IV:

Stabilizers and thickeners: Stabilizers and thickeners - examples - their role in Foods-mechanism of action in Foods - application of stabilizers and thickeners, leavening agents-examples- their role in Foods bleaching and maturing agents - examples- their role in Foods, Anti caking agents - examples and their role in Foods.

UNIT-V:

Nutritional Additives: Nutritional additives(fortificants/supplements), requirements (RDA and ADI), occurrence & commercial forms of various vitamins & minerals avaiLable. Antimicrobial agents – examples and Applications- benzoic acid & benzoates, Sorbic acid . Anti browning agents – food applications.

BOOKS FOR REFERENCE:

1. AL Branen, Davidson and S. Salminen, Food Additives. Marcel Dekker Inc NY 1990.
2. Swaminathan, Food Science, Chemistry & Experimental Foods. Bappco Publishers,Bangalore.
3. Mahindra S.N., Food additives – Characteristics detection and estimation. Tata Mc Graw Hill Publication Company, New Delhi.
4. Srivastav, R.P. and Sanjeev Kumar, Fruit and Vegetable Preservation, Principles and Practice. International Book Distribution Company, New Delhi.

B. Sc	Semester – IV	Credits: 1
Course:4(L)	FOOD ADDITIVES LAB	Hrs/Wk:2

Practicals : FOOD ADDITIVES

1. Estimation of chlorophyl
2. Estimatuon of carotenoids
3. Estimation of toral solible solids by refractometer
4. Estimation of nacl in butter
5. Estimation of nacl in pickles
6. Estimation of so2
7. Estimation of benzoatates

MODEL QUESTION PAPER(Sem -End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -IV

Course 4: FOOD ADDITIVES

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

SECTION – A

Answer any FIVE Questions **5 X 5= 25 M**

1. What is the need of food additives .
2. What are the natural sweeteners.
3. Write a short note on antioxidants.
4. Write a short note on anti caking agents.
5. Explain about anti Browning agent's .
6. Write a short note on food additives.
7. Write a short note on artificial food colours.
8. What are the nutritional additives.

SECTION – B

Answer A L L the following Questions. **5 X 10 = 50 M**

9. a).Explain in detail about classification of food additives

(OR)

b).Explain about functions and need of food additives in food processing

10. a). Explain in detail about food colours

(OR)

b). Explain in detail about food Preservatives

11. a).Explain in detail about antioxidants

(OR)

b). Explain in detail about emulsifiers

12. a).Explain in detail about stabilizers and thickeners

(OR)

b).Explain in detail about anti caking agents and leavening agents

13. a).Explain in detail about benzoates and sorbates

(OR)

b). Explain in detail about antimicrobial agents

B. Sc	Semester – IV	Credits: 4
Course: 5	FOOD QUALITY MANAGEMENT	Hrs/Wk:4

UNIT-I:

Quality Management System: Quality Management System- ISO 9000, Management Principles, Process Model, ISO 9000 Family, principles and requirements of ISO 9001. Food Safety Management System- Key role, Principles of FSMS, ISO-22000

UNIT-II:

Plant Sanitation: Sanitation - Personal hygiene - Sanitizers - Sanitation principles – Sanitizing methods - Sanitation agents. Risk assessment and management during food preparation. Definition, importance of sanitation, application of sanitation to food industry and food service establishments. Important principles in food hygiene and safety.

UNIT-III:

Cleaning, Pest Control, Recall Procedures, GMP/GHP, GLP, GAP. Food safety, Objectives (FSO), Microbiological criteria, definitions, sampling plans.

UNIT-IV:

HACCP: HACCP – prerequisite programs, definitions, HACCP principles, Flow diagrams, Application of HACCP principles, Limitations of HACCP, Hazard Identification, Risk assessment Risk communication with communication agencies and Hazard analysis, CCP Decision Tree, HACCP Plan.

UNIT-V:

Food laws & Standards: Food laws & Standards - FAO, Codex Alimentations, ISO, Indian food laws and standards, FSSAI Prevention of Food Adulteration (PFA) act, Fruit Products order(FPO), Meat Product order(MPO), Cold St(OR)age order (CSO), SWMA, BIS, AGMARK, APEDA, MPEDA, EIC,NABL.

REFERENCE BOOKS:

1. Early R.1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.
2. Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ.
3. FSSAI Book
4. Food Quality Certification 2002 Quality Control in Food Industry Vol. I, II AVI Publications.
5. Parker,R. (2003) Introduction to Food Science, 5th Edition, Chapman & Hall Publishres Inc, New York.

B. Sc	Semester – IV	Credits: 1
Course: 5(L)	FOOD QUALITY MANAGEMENT LAB	Hrs/Wk:2

Practical's: Food Quality Management

1. Testing of different foods for adulterants.
2. Determination of threshold value for basic tastes and odours (Pare Comparison)
3. Grading of food products (Fruites and Vegtables).
4. Candliing food products (Egg).
5. Sensory evalution of Food.
6. Visit to a certification agency.
7. Visit to fruits and vegetables market for quality assessment.

MODEL QUESTION PAPER(Sem -End)

B. Sc DEGREE EXAMINATIONS

SEMESTER-IV

Course 5: FOOD QUALITY MANAGEMENT

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

SECTION – A

Answer any FIVE Questions **5 X 5= 25 M**

1. Write a short note on quality management system
2. Importance of sanitation.
3. Explain about GMP.
4. Applications of HACCP
5. NABL.
6. Write a short note on ISO
7. Write about CCP decision tree
8. Give a short note on CSO

SECTION – B

Answer A L L the following Questions **5 X 10 = 50 M**

9. a) Explain in detail about FSMS**.**

(OR)

b) Describe about ISO 9000**.**

10. a) Write an account on sanitizing methods

(OR)

b) Write about sanitizing agents**.**

11. a) Write an essay on detail about GMP**.**

(OR)

b) Describe in detail about GLP**.**

12. a) What are the HACCP principles

(OR)

b) Explain about definition, application's and limitations of HACCP**.**

13. a) Give an account on PFA**.**

(OR)

b) Describe the FPO**.**

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 4
Course: 6A	Technology of Fruits, Vegetables and Plantation Crops	Hrs/Wk:4

Out comes

1. To impart knowledge of different methodsof fruits and vegetable processing.
2. To learn about processing of various spices, tea, coffee and cocoa.

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

UNIT I: Introduction

Importance of Fruits and Vegetable, History and need of preservation reasons of Spoilage, Method of Preservation (Short & Long Term).

UNIT II:

Canning and Bottling of Fruits and Vegetables. Selection of Fruits and Vegetables, Process of Canning, Factors affecting the process time and temperature, containers of Packing, (acquiring, Syrups and Brines for canning, Spoilage in canned foods.

UNIT III:

Fruits Beverages

Introduction, Processing of Fruits Juices(Selection, Juice extraction, descration, staining, Flirtation & Classification), preservation of Fruit Juices (Pasteurisation, chemically preserved with sugars, freezing, drying, tew packing, carbonation), Processing of squasties, cordials Nectars, concentrates and powder.

UNIT IV:

Jams, Jelles and Marmalades, Introduction, Jam Constituents, Selection of Fruits, processing & technology, Jelly: Essential continents (Role of pectin, Ratio) Theory of Jelly formation processing & Technology defects in Jelly, Marmalade: types, processing and technology, defects.

UNIT V:

Pickles, Chutney and Sauces Tomatos products.

Processing: Types, causes of spoiling in pickling. Selection of tomato puree, paste, ketchup, sauce and soup. Sun and mechanical drying of Fruits and Vegetables, packing and Storage. Spices and plantation crops – processing of Major and Minor, spices, oils and Oleoresins – Adulteration.

RECOMMENDED READINGS:

1. Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & Vegetables,ICAR,NewDelhi
2. W B Crusess.2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agro bios India
3. Manay, S.&Shadaksharaswami,M.2004.Foods:Factsand Principles, New Age Publishers
4. Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products, TataMc Graw-Hill publishing company limited, Second edition.
5. Srivastava, R.P. and Kumar, S. 2006. Fruits and Vegetables Preservation- Principles andPractices.3rd Ed. International Book Distributing Co.

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 1
Course: 6A	Technology of Fruits, Vegetables and Plantation Crops Lab	Hrs/Wk:2

PRACTICAL:

1. Estimation of total soluble solids (TSS).
2. Estimation of pH and acidity of products.
3. Estimation of brix: acidity ratio
4. Estimation of as corbicacid and effect of heat treatment on it.
5. To study the steps of comma king process.
6. Preparation and evaluation of pectin products.
7. Adulteration of spices.
8. Dehydration of fruits and vegetables.
9. Rehydration of fruits and vegetables.

Co-Curricular Activities:

a) Mandatory:*(Training of students by teacher on field related skills: 15hrs)*

1. **For Teacher**: Training of students by teacher in laboratory and field for a total of 15hours on processing of canning, processing of fruit juices, pickles, pasteurization techniques, preservation techniques like freezing drying and making of jams and jellies
2. **For Student**: Individual visit to a local processing centers or related field or to a laboratory in a university/research organization/private sector and study of processing practices. Submission of a hand-written Fieldwork Report not exceeding 10 pages in the given format.
3. Max marks for Field Work Report: 05.
4. Suggested Format for Field work: *Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements*.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in processing, drying of vegetables, fruits and spices with safety and security. Plant biotechnology and their handling, operational techniques with safety and security, IPR)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in processing of vegetables, fruits and spices
5. Collection of material/figures/photos related to technology of fruits, vegetables and crop plants, writing and organizing them in a systematic way in a file.
6. Visits to fruit and vegetables processing centers research organization etc. plant tissue culture/biotechnology facilities, firms, research organizations etc.
7. Invited lectures and presentations on related to pics by field/industrial experts.

MODEL QUESTION PAPER(Sem-End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -V(Skill Enhancement Course -Elective)

Course 6A : Technology of Fruits, Vegetables and Plantation Crops

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

SECTION – A

Answer any FIVE Questions. **5 X 5= 25 M**

1). What is A Spoilage ?
2). Define Preservation.
3). What is Canning ?
4). Differentiate between Syrup and Brine .
5). What is a Nectar ?
6). What is a Marmalade ?
7). What is a Sauce ?
8). Define Adulteration

SECTION – B

Answer ALL the following Questions. **5 X 10 = 50 M**

9).a) What is preservation and write about History and need of Preservation.

(or)

b) Write about classification of Foods based on pH.

10).a) What is Freezing and different types Freezing.

(or)

b) Define Thawing and changes occur during thawing and its effect on Food.

11.a) What is Thermal processing and Explain about Sterilization I detail.

(or)

b) What is pasteurization and give processing steps with respond to Dairy Industry.

12. a) What is Drying? Write about different drying methods. List out different dries uses in Food Industry.

(or)

b) Define Evaporation? Factors affecting evaporation and list out different evaporation used in Food Industry.

13 a) What is Irradiation. What are the different kinds of Ionizing Radiation used in Food Industry.

(or)

b) What is Sterilization. Write in details about Cold Sterilization.

Suggested Question Paper Model for Practical Examination
Semester–V Food Technology–6 (Skill Enhancement Course)
Technology of Vegetables, Fruits, and Plantation Products

Max.Time: 3Hrs. **Max. Marks: 50**

1. Demonstration of a sterilization technique **'A'** 8 M
2. Preparation of MS medium**'B'** 8M
3. Demonstration of call us culture technique/growth measurements**' C'** 12 M

4. Scientific observation and data analysis 4 x 3 =12 M
   A. Tissue culture equipment/photograph
   B. Morphogenesis or organogenesis-photograph
   C. Bioreactor/Secondary metabolite
   D. Transgenic plant/photograph
5. Record+Viva-voce 6+4 =10M

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 4
Course: 7A	Technology of Cereals, Pulses and Oil Seeds	Hrs/Wk:4

UNIT I: Introduction

Wheat – Types of milling, Flour, Grade Flour Treatments (Bleaching, Maturing) Flour for various purposes, products and by products.

Rice – Physicochemical properties, milling

(mechanical solvent extraction) parboiling, Ageing of Rice, Utilization and by products.

UNIT II :

Corn – Milling (Wet & Dry), Cornflower, Corn, Flour.

Barley – Milling (Pear Barley, Barley flakes and Flour)

Oats – Milling (Oatmeal, Oat flour , Flour & Oat flakes) Sorghum and millets – Traditional & Commercial milling (Dry & Wet)

Rye and Triticale – milling (flour) uses.

UNIT III: Technology of Pulses.

Milling of pulses, Dry milling, Wet milling Improved milling method.

UNIT IV: Technology of Oil Seeds.

Introduction, Extraction of Oil and Refining sources of protein (Defaulted Flour, protein concentrates and Isolates), Properties and uses, protein Texturization,Fibre spinning.

UNIT V: Alcoholic Beverages

Beer, wine, Distilled Spirits.

RECOMMENDED READINGS:

1. Kent, N.L.2003. Technology of Cereal, 5th Ed.Pergamon Press.
2. Chakraverty.1988.Post Harvest Technology of Cereals, Pulses and Oil seeds, revised Ed., Oxford & IBH Publishing Co. Pvt Ltd.
3. Marshall, Rice Science and Technology.1994.Wadsworth Ed., Marcel Dekker, New York.
4. Manay.S. and Sharaswamy, M.1987. Food Facts and Principles. Wiley Eastern Limited.

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 1
Course: 7A	Technology of Cereals, Pulses and Oil Seeds Lab	Hrs/Wk:2

PRACTICAL

1. Physical characteristics of Wheat.
2. Estimation of Gluten Content of flour.
3. Estimation of Pelenske Value of flour.
4. Estimation of Potassium Bromate in flour.
5. Fermenting power of yeast.
6. Physical Characteristics of Rice and paddy.
7. Cooking characteristics of rice.
8. Determination of sedimentation power of flour

Co-Curricular Activities:

a) Mandatory:*(Training of students by teacher on field related skills: 15hrs)*

1. **For Teacher**: Training of students by teacher in laboratory and field for a total of 15hours on physical characteristics of cereals, pulses, procedures of milling, fermentation of yeast, oil extraction and refining procedures, Etc
2. **For Student**: Individual visit to a local plant tissue culture facility or related field or to a laboratory in a university/research organization/private sector and study of different techniques in technology of cereals, pulses and oil seeds and submission of a hand-written Fieldwork Report not exceeding 10 pagesin the given format.
3. Max marks for Field Work Report: 05.
4. Suggested Format for Field work: *Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements*.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in milling
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in milling of different millets
5. Collection of material/figures/photos related to technology of cereals, pulses and oil seeds,writing and organizing them in a systematic way in a file.
6. Visits to oil extraction and refining industries and beer and wine manufacturing industries
7. Invited lectures and presentations on related topics by field/industrial experts.

MODEL QUESTION PAPER(Sem-End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -V(Skill Enhancement Course -Elective)

Course 7A : Technology of Cereals, Pulses and Oil Seeds

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

SECTION – A

Answer any FIVE Questions. **5 X 5= 25 M**

1). What is Milling ?

2). Define Ageing of Rice.

3). What is Dry milling ?

4). Define Parboiling .

5). Write about different types of milling.

6). What is Extraction ?

7). Give some example of Protein rich foods.

8). Define a Beverage and its types.

SECTION – B

Answer ALL the following Questions. **5 X 10 = 50 M**

9. a) Define wheat and explain in detail about Flour Treatments..

(or)

b) Write about parboiling of Rice and Ageing of Rice.

10. a) Explain in detail about corn milling

(or)

b) Define millet and explain about Traditional and commercial milling.

11. a) Define pulse? and milling of pulses.

(or)

b) Write about Improved milling method of pulses.

12. a) Write about extraction refining of oil.

(or)

b) What is a protein, Sources of protein explain about protein texturization.

13. a) What is a Beverage? Explain about processing of Beer and Wine

(or)

b) Write about Alcoholic Beverage and explain any two alcoholic Beverages.

Suggested Question Paper Model for Practical Examination
Semester–V Food Technology–6 (Skill Enhancement Course)
TECHNOLOGY OF CEREALS, PULSES AND OIL SEEDS

Max.Time: 3Hrs. **Max. Marks: 50**

1. Demonstration of a sterilization technique **'A'** 8 M
2. Preparation of MS medium**'B'** 8M
3. Demonstration of callus culture technique/growth measurements **'C'** 12 M
4. Scientific observation and data analysis 4 x 3 =12 M
   a. Tissue culture equipment/photograph
   b. Morphogenesis or organogenesis-photograph
   c. Bioreactor/Secondary metabolite
   d. Transgenic plant/photograph
5. Record+Viva-voce 6+4 =10M

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 4
Course: 6B	Nutraceuticals and Functional Foods	Hrs/Wk:4

Outcomes:

- To develop comprehensive understanding of different nutraceuticals and functional foods
- To understand the potential of various functional foods in promoting human health

UNIT I: Introduction

Background : Status of Nutraceuticals and Functional Food Market, Definitions, Difference between Nutraceuticals and Functional Foods, Types of Nutraceuticals , Compounds and their health benefits Current Scenario.

UNIT II: Nutraceuticals

Types of Nutraceutical Compounds – Phytochemicals phytosterols and other bioactive compounds peptides and proteins, carbohydrates (Dietary fiber, disaccharides and Resistant Starch), prebiotics, probiotics, and symbiotic Lipids (Conjugated linoleic acid, omega.3 Fatty acids, fat replacers), vitamins and minerals, their sources and role in promoting human health.

UNIT III: Functional Foods.

Cereal and Cereal products, milk and milk products, egg, oils, meat and meat products, sea foods, nuts and oil seed. Functions, fruits and vegetables, Herbs and Spices Beverage.

UNIT IV: Fermented Foods.

Health Benefits – Role in conditions like cardio vascular disease, hypertension, Diabetes etc. Future prospects of Functional, Foods and Nutraceuticals and their potential for use in Improving Health Development in processing of Functional Foods. Formulation and Fabrication of Functional Foods.

UNIT V: Legal Aspects.

Stability of Nutraceutical Safety consumer acceptance and Assessment of Health claims labeling, marketing and Regulatory issues related to Nutraceuticals and Functional Foods.

RECOMMENDED READINGS:

1. Wildman REC, Handbook of Nutraceutical and Functional Foods, CRC Press 2001
2. Ghosh D et al, Innovations in Healthy and Functional Foods, CRC Press 2012
3. Pathak YV, Handbook of nutraceuticals Volume 2, CRC Press 2011
4. 4. Various journals of food technology, food science and allied subjects.

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 1
Course: 6B	Nutraceuticals and Functional Foods Lab	Hrs/Wk:2

PRACTICAL

1. Identification of various nutraceuticals and functional foods available in the market
2. Estimation of chlorophyll content of green vegetable
3. Determination of lycopene in fruit/vegetable
4. Determination of total pectin in plant material
5. Estimation of crude fiber/dietary fibre content in cereals and their products
6. Estimation of anthocyanins in food sample
7. Preparation and evaluation of probiotic/prebiotic foods

RECOMMENDED READINGS

Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products, Tata McGraw-Hill publishing company limited, Second edition.

Co-CurricularActivities:

a) Mandatory:*(Training of students by teacher on field related skills: 15hrs)*

1. **For Teacher**: Training of students by teacher in laboratory and field for a total of 15hours on identification of different nutraceuticals and functional foods, preparation of probiotics or prebiotic food, Development in processing of functional foods. Formulation and fabrication of functional foods. sterilization
2. **For Student**: Individual visit to a local plant tissue culture facility or related field or to a laboratory in a university/research organization/private sector and study nutraceuticals and functional foods. Submission of a hand-written Fieldwork Report not exceeding 10 pagesin the given format.
3. Max marks for Field Work Report: 05.
4. Suggested Format for Field work: *Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements*.
5. Unittests (IE).

b) Suggested Co-Curricular Activities

1. Trainingofstudents byrelatedindustrialexperts.
   Assignments (including technical assignments like identifying tools in different types of nutraceutical compounds and functional foods and identifying their importance
2. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
3. Preparation of videos on tools and techniques in nutraceuticals and functional foods.
4. Collection of material/figures/photos related to nutraceuticals and functional foods, writing andorganizing them in a systematic way in a file.
5. Visits to market and super markets
6. Invited lectures and presentations on related topics by field/industrial experts.

MODEL QUESTION PAPER(Sem-End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -V(Skill Enhancement Course -Elective)

Course 6B : Nutraceuticals and Functional Foods

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

SECTION – A

Answer any FIVE Questions. **5 X 5= 25 M**

1. Define Functional Foods and Nutraceuticals.
2. Write Health benefits of Functional Foods.
3. Write a note on phytosterols .
4. What is a Prebiotic and Probiotic?
5. Give Some examples of Functional Fruits.
6. Define Fermented Foods and its applications.
7. Give examples of Functional Fruits.
8. Write about Labelling aspects related to Nutraceuticals.

SECTION – B

Answer ALL the following Questions. **5 X 10 = 50 M**

9. a) Explain about Nutraceuticals in detail & its Status in India Market.

(or)

b) Write about types of Nutraceuticals and its Health benefits.

10. a) Write a note on Prebiotics and Probiotics with Suitable examples.

(or)

b) Give a brief note on Vitamin and Minerals and their sources and their sources and Role in promoting Human Health.

11. a) Write about Cereals and Cereal products as a Functional Foods.

(or)

b) Explain about Functional Foods with respect to Fruits, Vegetables and Spices.

12. a) Explain in detail about fermented foods and its health benefits.

(or)

b) Write about Formulation and Fabrication of Functional Foods.

13. a) Write about Safety and consumer acceptance of Nutraceuticals.

(or)

b) Explain Labelling, Marketing and regulator Issues related to Functional Foods.

Suggested Question Paper Model for Practical Examination
Semester–V Food Technology–6 (Skill Enhancement Course)
NUTRACEUTICALS AND FUNCTIONAL FOODS

Max.Time: 3Hrs. **Max. Marks: 50**

1. Demonstration of a sterilization technique **'A'** 8 M
2. Preparation of MS medium**'B'** 8M
3. Demonstration of callus culture technique/growth measurements **'C'** 12 M
4. Scientific observation and data analysis 4 x 3 =12 M
   a. Tissue culture equipment/photograph
   b. Morphogenesis or organogenesis-photograph
   c. Bioreactor/Secondary metabolite
   d. Transgenicplant/photograph
5. Record+Viva-voce 6+4 =10M

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 4
Course: 7B	Food Plant Sanitation	Hrs/Wk:4

Objectives

- To study design of plant and processing equipment.
- To develop comprehensive understanding of waste product handling and management.

UNIT I: Food Plant Layout and equipment design.
General principals of Food Plant design and layout, Design of Food processing, equipments Size reducing, mining, separation, extraction, filtration, centrifugation, Distillation and Gas absorption equipments.

UNIT II:
Ware Housing and Cold Chain Management, Food hygiene's and Safety in transportation, with a focus on ware house storage and refrigerated ships – safe food storage at shopping outlets use of coolers / Chillers/ Freezers, length of time in storage, design of are house, scope of cold chin for enhancing marketing potentials of perishables in Domestic and International markets principals of cold chain creation and management.

UNIT III: Food Storage structures.
Physics Chemical Changes in stored products during storage, Air fight, non-air fight underground, conventional & modern storage structures of fruits, vegetables, meet and marine products, aerated, refrigerated and controlled atmospheric storage layout and Design of storage structure economics of storage structures.

UNIT IV: Food Plant Hygiene and sanitation
Food plant Hygiene and Sanitation. Waste Disposal, control methods using physical, chemical agents, pest and rodent control; ETP design and layout. Food Storage sanitation, transport sanitation and water sanitation..

UNIT V:
Byproduct utilization obtained from dairy plant, egg and pouring. Process industry and meat industry. Waste Water and solid waste treatment. Waste types – Solid and liquid waste. Characterization, physical, chemical, biological, aerobic, anerobic, primary secondary and territory (Advanced) Treatments.

RECOMMENDED READINGS:

1. Norman G. Marriott and Robert B. Gravani. (2006). Principles of Food Sanitation,5th edition
2. Rao, D. G. (2010). Fundamentals of Food Engineering, PHI learning Private Ltd.
3. Fellows P. (2000). Food Processing Technology, 2nd Edition. Woodhead Publishing Limited and CRC Press LLC
4. James A (2013) The supply chain handbook, distribution group.
5. FAO, US (1984) Design and operations of cold store in developing

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 1
Course: 7B	Food Plant Sanitation Lab	Hrs/Wk:2

PRACTICAL

1. Design and layout of various food processing systems and food service areas.
2. Design and layout of cold storage and warehouse.
3. Determination of physico-chemical properties of wastewater.
4. Preparation of a sanitation schedule for food preparation area.
5. Testing of sanitizers and disinfectants.
6. Study of Phenol coefficient of sanitizers.
7. Determination of BOD (biological oxygen demand)/ COD in wastewater.
8. Study of wastewater treatment system/ETP.

RECOMMENDED READINGS:

1. Norman G. Marriot and Robert B. Gravani. 2006, 5th Ed., Principles of Food Sanitation
2. Forsythe, S.J. and Hayes, P.R. (1998). Food Hygiene, Microbiology and HACCP. Gaitersburg, Maryland: Aspen.
3. Hui, Y.H., Bruinsma, B., Gorham, R., Nip, W.-K. (2003). Food Plant Sanitation. New York: Marcel Dekker.
4. Rees, N. and D. Watson. (2000). International Standards for Food Safety. Gaitersburg, Maryland: Aspen

Co-Curricular Activities:

a) Mandatory:*(Training of students by teacher on field related skills: 15hrs)*

1. **For Teacher**: Training of students by teacher in laboratory and field for a total of 15hours on Design and layout of various food processing systems and food service areas, cold storage and water house, sanitation of food processing area and waste water system study.
2. **For Student**: Individual visit to a local plant tissue culture facility or related field or to alaboratory in a university/research organization/private sector and study of food plant sanitation. Submission of a hand-written Field work Report not exceeding 10 pages in the given format.
3. Max marks for Field Work Report: 05.
4. Suggested Format for Field work: *Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements*.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in food plant and processing centers and their sanitation handling, operational techniques with safety and security
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in sanitation of food plant and processing centers
5. Collection of material/figures/photos related to products of plant tissue culture, writing and organizing them in a systematic way in a file.
6. Visits to food processing centers facilities, firms, research organizations etc.
7. Invited lectures and presentations on related topics by field/industrial experts.

MODEL QUESTION PAPER(Sem-End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -V(Skill Enhancement Course -Elective)

Course 7B : Food Plant Sanitation

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

SECTION – A

Answer any FIVE Questions. **5 X 5= 25 M**

1. Define Food Plants Layout.
2. What is Distillation ?
3. Write about Design of Ware House.
4. What is Food Storage ?
5. Write about storage structures .
6. How Food waste is Disposed ?
7. What is ETP ?
8. Define Byproduct Utilization.

SECTION – B

Answer ALL the following Questions. **5 X 10 = 50 M**

9. a) Write about Principles of Food Plant Design and Layout.

(or)

b) Explain about Distillation and Gas absorption Equipment's.

10. a) Write a note on Ware House and Cold Chain Management

(or)

b) Explain about market potentials of perishables in Domestic and International Markets.

11. a) Write about Physico chemical charges in stored products.

(or)

b) Write in detail about Conventional and modern storage structure of Fruits and Vegetables.

12. a) Write about Food Plant Hygiene and Sanitation.

(or)

b) What is Sanitation? Write in detail about Transport and Water Sanitation.

13. a) Write about by product Utilization of Dairy, Egg., and poultry processing areas.

(or)

b) Describe in detail about different types of Waste Treatments.

Suggested Question Paper Model for Practical Examination
Semester–V: Food Technology–6 (Skill Enhancement Course)
FOOD PLANT SANITATION

Max.Time: 3Hrs. **Max. Marks: 50**

1. Demonstration of a sterilization technique **'A'** 8 M
2. Preparation of MS medium**'B'** 8M
3. Demonstration of callus culture technique/growth measurements **'C'** 12 M
4. Scientific observation and data analysis 4 x 3 =12 M
    a. Tissue culture equipment/photograph
    b. Morphogenesis or organogenesis-photograph
    c. Bioreactor/Secondary metabolite
    d. Transgenic plant/photograph
5. Record+Viva-voce 6+4 =10M

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 4
Course: 6C	Entrepreneurship Development and Food Product Development	Hrs/Wk:4

Out comes

To understand the concept of development of a new product and prepare new products based on special dietary requirements, functionality, convenience, and improvisation of existing traditional Indian foods

UNIT I: Entrepreneurial Development.

Case Studies of Successful entrepreneur exercises on way of sensing opportunities – Source of Ideas, creating efforts, SWOT Analysis

UNIT II: Entrepreneurial Skill

Entrepreneurial Skill Assessment Test – Techniques of development of entrepreneurial Skills, Positive Self Image and locus of Control.

UNIT III: Food Business Management.

Case Studies of Food Processing Business and its aspects. Business and its aspects. Business opportunity Identification and Assessment techniques.

UNIT IV: Market Analysis.

Market Assessment Study Analysis of Competitive Situation, SWOT Analysis for business and for competition. Preparation of Business Plan, Preparation of Project Report.

UNIT V: Development of New Product.

Definition : Importance, Objective & Need of Product Development, Reason for Failure of types and steps of product development product development tools and their use.

RECOMMENDED READINGS

1. Vasant Desai (2012) Fundamentals of Entrepreneurship and Small Business Management, Himalya Publishing House Pvt. Ltd., Mumbai
2. Vasant Desai (2011) The Dynamics of Entrepreneurial Development and Management, Himalya Publishing House Pvt. Ltd., Mumbai
3. D. David and S Erickson (1987) Principles of Agri Business Management, Mc Graw Hill Book Co., New Delhi.
4. Acharya S S and Agarwal N L (1987) Agricultural Marketing in India, Oxford & ISH Publishing Co., New Delhi.
5. David H. Holt (2002) Entrepreneurship – Anew Venture Creation, Prentice Hall of India, New Delhi.
6. Phill Kottler (1994) Marketing Management, Prentice Hall of India Private Limited, New Delhi.
7. Chandra, Prasanna (1996) Projects, Planning, Analysis, Selection, Implementation and Review, Tata McGraw-Hill Publishing Company Limited, New Delhi.
8. Fuller, Gordon W. 2004. New Product Development- From Concept to Marketplace, CRC Press.
9. Anil Kumar, S., Poornima, S.C., Abraham, M.K. & Jayashree, K.2004. Entrepreneurship Development. New Age International Publishers.
10. Moskowitz, Howard and Saguy, R. I. Sam 2009. An Integrated Approach to New Food Product, CRC Press.

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 1
Course: 6C	Entrepreneurship Development and Food Product Development Lab	Hrs/Wk:2

Practical or Projects on:

1. Market and literature survey to identify the concepts of new products based on special dietary requirements, functionality, convenience, and improvisation of existing traditional Indian foods.
2. Screening of product concept based on techno-economic feasibility.
3. Development of prototype product and Standardization of formulation process.
4. Proximate Analysis of New Product
5. Packaging, labeling and shelf-life studies
6. Cost analysis and Final Project Report
   Each team/group of students would develop a food product based onabove-mentioned lines /steps and would submit a project report.

Co-CurricularActivities:

a) Mandatory:*(Training of students by teacher on field related skills: 15hrs)*

1. **For Teacher**: Training of students by teacher in laboratory and field for a total of15hours on Screening of product concept on the basis of techno-economic feasibility. Development of prototype product and Standardization of formulation process and packing
2. **For Student**: Individual visit to a local plant tissue culture facility or related field or to alaboratory in a university/research organization/private sector and study of entrepreneurship and food product development. Submission of a hand-written Fieldwork Report not exceeding 10 pagesinthegivenformat.
3. MaxmarksforField WorkReport: 05.
4. Suggested Format for Field work: *Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements*.
5. Unittests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in entrepreneurship and foodproduct development
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in entrepreneurship.
5. Collection of material/figures/photos related to products of plant tissue culture, writing and organizing them in a systematic way in a file.
6. Visitsto centers where food packing is done, firms, research organizations etc.
   Invited lectures and presentations on related topics by field/industrial experts

MODEL QUESTION PAPER(Sem-End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -V(Skill Enhancement Course -Elective)

Course 6C : Entrepreneurship Development and Food Product Development

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

SECTION – A

Answer any FIVE Questions. **5 X 5= 25 M**

1. Define SWOT .
2. Short note on techniques of development of Business.
3. What is food Business Management.
4. Write a note on Market Analysis.
5. What is meant by case study.
6. Write about the Functions of Entrepreneurship.
7. What are the Organizations that provide Business Support nationally and Internationally ?
8. What is meant by Innovation ?

SECTION – B

Answer ALL the following Questions. **5 X 10 = 50 M**

9. a) Give any one case study of Food processing business and its aspects

(or)

b) Explain Business opportunity identification and assessment techniques.

10. a) Explain entrepreneurial skills assessment test.

(or)

b) Describe Techniques of development of Entrepreneurial Skills.

11. a) Explain different types of markets with example.

(or)

b) Write about the Functions of Marketing?

12. a) Steps to prepare Business Plan. Explain it.

(or)

b) Briefly explain preparation of project report.

13. a) What are objectives & needs of product development.

(or)

b) What are types of product development and its steps.

Suggested Question Paper Model for Practical Examination
Semester–V: Food Technology–6 (Skill Enhancement Course)
Entrepreneurship Development and Food Product Development

Max.Time: 3Hrs. **Max. Marks: 50**

1. Demonstration of a sterilization technique **'A'** 8 M
2. Preparation of MS medium**'B'** 8M
3. Demonstration of call us culture technique/growth measurements **'C'** 12 M
4. Scientific observation and data analysis 4 x 3 =12 M
   a. Tissue culture equipment/photograph
   b. Morphogenesis or organogenesis–photograph
   c. Bioreactor/Secondary metabolite
   d. Transgenic plant/photograph
5. Record+Viva-voce 6+4 =10M

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 4
Course: 7C	Technology of Food Preservation	Hrs/Wk:4

Out comes:

- To study the importance microorganisms in food preservation
- To introduce the basics of various food processing and preservation technologies.

UNIT I: Food Microbiology

Principles of Food Preservation, microorganisms associated with foods- bacteria, yeast and mold, Importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, pH, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Classification of food based on pH, Food infection, food intoxication, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods.

UNIT II: Food Preservation by Low Temperature

Freezing and Refrigeration: Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.

UNIT III: Food Preservation by high temperature

Thermal Processing- Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.

UNIT IV: Food Preservation by Moisture control

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

Evaporation – Definition, factors affecting evaporation, names of evaporators used in food Industry.

UNIT V: Food Preservation by Irradiation

Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.

RECOMMENDED READINGS:

1. B. Srilakshmi, Food science, New Age Publishers,2002
2. Meyer, Food Chemistry, New Age,2004
3. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency, 2013
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004.

B. Sc	Semester – V(Skill Enhancement Course -Elective)	Credits: 1
Course: 7C	Technology of Food Preservation Lab	Hrs/Wk:2

PRACTICAL

1. Methods of Sampling.
2. Concept of shelf life of different foods
3. To study the concept of Asepsis and sterilization
4. Determination of pH of different foods using pH meter.
5. Study quality characteristics of foods preserved by drying/dehydration/ freezing.
6. To perform pasteurization of fluids using different methods.
7. To perform blanching of different plant foods.

Co-Curricular Activities:

a) Mandatory:*(Training of students by teacher on field related skills: 15hrs)*

1. **For Teacher**: Training of students by teacher in laboratory and field for a total of 15hours on asepsis sterilization ,different methods of pasteurization of fluids, study on determination of pH of different foods and methods of sampling.
2. **For Student**: Individual visit to a local plant tissue culture facility or related field or to a laboratory in a university/research organization/private sector and study of food preservation techniques. Submission of a hand-written Fieldwork Report not exceeding 10 pages in the given format.
3. Max marks for Field Work Report: 05.
4. Suggested Format for Field work: *Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements*.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in preservation of food
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in food preservation technology
5. Collection of material/figures/photos related to products of plant tissue culture, writing and organizing them in a systematic way in a file.
6. Visitsto different food preservative facilities, firms, research organizations etc.
7. Invitedlecturesandpresentationsonrelatedtopicsby field/industrialexperts.

MODEL QUESTION PAPER(Sem-End)

B. Sc DEGREE EXAMINATIONS

SEMESTER -V(Skill Enhancement Course -Elective)

Course 7C : Technology of Food Preservation

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

SECTION – A

Answer any FIVE Questions. **5 X 5= 25 M**

1. What is a Food preservation ?
2. What are perishable Foods ?
3. Define Freezing.
4. What is meant by blanching ?
5. Define Pasteurization?
6. Define drying and dehydration.
7. What is meant by Evaporation.
8. Define Sterilization.

SECTION – B

Answer ALL the following Questions. **5 X 10 = 50 M**

9. a) Define preservation and principles of Food preservation.

(or)

b) Write about classification of Foods based on pH.

10. a) What is Freezing and different types Freezing.

(or)

b) Define Thawing and changes occur during thawing and its effect on Food.

11. a) What is Thermal processing and Explain about Sterilization in detail.

(or)

b) What is pasteurization and give processing steps with respond to Dairy Industry.

12. a) What is Drying? Write about different drying methods. List out different dries uses in Food Industry.

(or)

b) Define Evaporation? Factors affecting evaporation and list out different evaporation used in Food Industry.

13. a) What is Irradiation. What are the different kinds of Ionizing Radiation used in Food Industry.

(or)

b) What is Sterilization. Write in detail about Cold Sterilization

Suggested Question Paper Model for Practical Examination
Semester–V: Food Technology–6 (Skill Enhancement Course)
Technology Of Food Preservation

Max.Time: 3Hrs. **Max. Marks: 50**

1. Demonstration of a sterilization technique **'A'** 8 M
2. Preparation of MS medium**'B'** 8M
3. Demonstration of call us culture technique/growth measurements **'C'** 12 M
4. Scientific observation and data analysis 4 x 3 =12 M
   e. Tissue culture equipment/photograph
   f. Morphogenesis or organogenesis–photograph
   g. Bioreactor/Secondary metabolite
   h. Transgenic plant/photograph
5. Record+Viva-voce 6+4 =10M