

## B.VOC PROGRAM (4 Years Honors)

2020-21 onwards (21 Jan 2021)



### B. Vocation

### FOOD TECHNOLOGY

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**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 held on: 21-1-21.....Time:10.30 AM

At: Convention Center, Adikavi Nannaya University

**RAJAMAHENDRAVARAM**

Agenda:

Members present:

1.

Resolutions:

## 2. DETAILS OF PAPER TITLES & CREDITS

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**Course structure and syllabi: w.e from 2020-2021 Admitted Batch**  
**I Year Semester – I**

S. No	Name of the Course	Course Type (T/L/P)	Hours/week (Sciences 4+2)	Credits (Science 4+1)	Each course Evaluation		
					Conti-Assess	Univ-exam	Total
1	Chemistry (Inorganic and Physical Chemistry) *	T	4	4	25	75	100
2	Chemistry (Practical-I Analysis of SALT MIXTURE) *	L	2	1	0	50	50
3	Fundamentals of Food Microbiology	T	4	4	25	75	100
4	Fundamentals of Food Microbiology Practical	L	2	1	0	50	50
5	Fundamentals of Food Chemistry	T	4	4	25	75	100
6	Fundamentals of Food Chemistry Practical	L	2	1	0	50	50
7	Food Production Trends and Human Nutrition (No Practical )	T	4	4	25	75	100
8	On Job Training - 1	L	2	1	0	50	50
	<b>Total</b>		<b>24</b>	<b>20</b>			

Note; Course type code: T: Theory, L: Lab, P: Problem solving

\* **Common With B.Sc**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**Course structure and syllabi: w.e from 2020-2021 Admitted Batch**  
**I Year Semester – II**

S. No	Name of the Course	Course Type (T/L/P)	Hours/week (Sciences 4+2)	Credits (Science 4+1)	Each course Evaluation		
					Conti-Assess	Univ-exam	Total
1	Chemistry (Organic and General Chemistry) *	T	4	4	25	75	100
2	Chemistry (Practical-II Volumetric Analysis) *	L	2	1	0	50	50
3	Food Microbiology	T	4	4	25	75	100
4	Food Microbiology Practical	L	2	1	0	50	50
5	Food Chemistry of Macro Nutrients	T	4	4	25	75	100
6	Food Chemistry of Macro Nutrients Practical	L	2	1	0	50	50
7	Principles of Food Preservation (No Practical)	T	4	4	25	75	100
8	On Job Training – 2	L	2	1	0	50	50
	<b>Total</b>		<b>24</b>	<b>20</b>			

Note; Course type code: T: Theory, L: Lab, P: Problem solving

\* Common With B.Sc

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**Course structure and syllabi: w.e from 2020-2021 Admitted Batch**  
**II Year Semester – III**

S. No	Name of the Course	Course Type (T/L/P)	Hours/week (Sciences 4+2)	Credits (Science 4+1)	Each course Evaluation		
					Conti-Assess	Univ-exam	Total
1	Chemistry (Organic Chemistry and Spectroscopy)*	T	4	4	25	75	100
2	Chemistry (Practical – III Organic preparation and IR Spectral Analysis)*	L	2	1	0	50	50
3	Food Processing Equipment	T	4	4	25	75	100
4	Food Processing Equipment Practical	L	2	1	0	50	50
5	Techniques in Food Analysis	T	4	4	25	75	100
6	Techniques in Food Analysis Practical	L	2	1	0	50	50
7	Food Additives (No Practical)	T	4	4	25	75	100
8	On Job Training - 3	L	2	1	0	50	50
	<b>Total</b>		<b>24</b>	<b>20</b>			

Note; Course type code: T: Theory, L: Lab, P: Problem solving

\* **Common With B.Sc**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**Course structure and syllabi: w.e from 2020-2021 Admitted Batch**  
**II Year Semester – IV**

S. No	Name of the Course	Course Type (T/L/P)	Hours/week (Sciences 4+2)	Credits (Science 4+1)	Each course Evaluation		
					Conti-Assess	Univ-exam	Total
1	(Chemistry Inorganic, Organic and Physical Chemistry) *	T	4	4	25	75	100
2	Chemistry (Practical – IV Organic Qualitative analysis) *	L	2	1	0	50	50
3	Chemistry (Inorganic and Physical Chemistry) *	T	4	4	25	75	100
4	Chemistry (Practical-V Course Conductometric and Potentiometric Titrimetry)*	L	2	1	0	50	50
5	Food Chemistry of Micro Nutrients	T	4	4	25	75	100
6	Food Chemistry of Micro Nutrients Practical	L	2	1	0	50	50
7	Milk and Milk Products Processing	T	4	4	25	75	100
8	Milk and Milk Products Processing Practical	L	2	1	0	50	50
9	Fruit and Vegetable Processing	T	4	4	25	75	100
10	Fruit and Vegetable Processing Practical	L	2	1	0	50	50
11	Extrusion Technology (No Practical)	T	4	4	25	75	100
12	On Job Training – 4	L	2	1	0	50	50
	<b>Total</b>		<b>36</b>	<b>30</b>			

\* Common With B.Sc

**a. Proposed combination subjects**

Chemistry/Microbiology/Biotechnology – Any subject can be chosen as M1

**b. Student eligibility for teaching the course**

Intermediated passed with combination of Bi.P.C, M.P.C or any other 2 year Intermediate equivalent courses

**c. Faculty eligibility for teaching the course**

**Food Technology-** M Tech (Food Technology) or M Sc (Food Science and Nutrition) or Ph.D. M.Sc or M Tech - NET and SET Qualified

**Food Science and Nutrition** – M Tech (Food Technology) or M Sc (Food Science and Nutrition) or Ph.D. M.Sc or M Tech - NET and SET Qualified

**Biotechnology** - M Tech (Biotechnology) or M Sc (Biotechnology) or Ph.D. M.Sc or M Tech - NET and SET Qualified

**Biochemistry -Microbiology-** M Sc or Ph.D. M.Sc - NET and SET Qualified

**d. List Proposed Skill enhancement courses with syllabus, if any**

All Core papers are skill enhancement courses

**e. Any newly proposed Skill development / Life skill courses with drafts syllabus and required resources**

No

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

Sem No	Lab/Practical Name	Name of Instruments /software/computers required with specifications	Brand Name	Qty Required
1 2	<b>Food Microbiology practical's</b>	Fermenter *	Lambda Laboratory instruments	01
		Autoclave	mushroom lab equipment Autoclave Vertical Double Wall	01
		Incubator*	Laboratory Bacteriological incubator model LI/45	01
		Hot Air oven	Bsco Hot air Oven 14X14X14	01
		Kjeldahl digester + Distillator (Protein estimation)	KjelteckKjeldahl Automatic Nitrogen Distillation System Model: DISTYL EM S (PELICAN KELPLUS) +KEL PLUS Micro Six Sample System(100ML capacity) Model KES 06R(Block Digester)	01 + 01
		Water bath	Genist international verticle water bath	01
	pH Meter	Cyberscan 1100		



	Soxhlet apparatus	Sigma Aldrich	01
	Colourimeter	Colour flex <sup>R</sup>	01
	Spectrophotometer	Labline stock centre, Kalbadevi, Mumbai, Maharashtra	01
	Cabinet dryer	Shini Plastic Technologies India Private Limited Chakan, Pune, Maharashtra	01
	Laboratory scale spray dryer	Jay Instruments & Systems Private Limited Navi Mumbai, Thane, Maharashtra	01
	Lab scale rotary vacuum evaporator	Buchi® Rotavapor® R-215 evaporator with water jacket	01

**g. List of suitable levels of positions eligible in the Govt/Pvt organization**

S.No	Position	Company/Govt organization	Remarks	Additional skills required, if any
1	Food Safety Officer	Dept of Health and family Welfare	Nil	Nil
2	Food Safety Inspector	Dept of Health and family Welfare	Nil	Nil
3	Quality Analysts	Private Sectors	Nil	Nil
4	Food Technologists	Private Sectors	Nil	Nil

**h. 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 Safety Officer	Group -II	Technical	Technical	
2	Food Safety Inspector	Group -IV	Technical	Technical	
3	Food Technologists	Marketing	Production and analysis	Production and analysis	
4	Food Analysts	Technician	Technical	Technical	

**I. Any specific instructions to the teacher/ paper setters/ papers setters/Exam -Chief Superintendent**

Nil

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

<b>B. VOCATION</b>	<b>FOOD TECHNOLOGY</b>
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#### 1. Aim and objectives of UG program in Subject:

- Promote, facilitate and influence the best possible standards for Food Technology worldwide
- Provide the technical and general knowledge necessary for establishing food business.
- Be the organization of choice for evidence-based advice and guidance for Technology based Food Industries
- Be the membership body of choice for Food Industries, and to provide technological support and other related information for all types of food related research organizations.

#### 2. Learning outcomes of Subject

- Student should be able to understand the basic food Technology concepts behind different processed, semi processed and unprocessed foods
- Student should be able to formulate new foods in FMCGs, to perform qualitative and quantitative tests, which will satisfy the needs of the food industry
- Student should be able to acquire knowledge required to become a food entrepreneur. Student should be able to acquire skills to work in export-oriented Food Industries.

#### 3. Recommended Skill enhancement courses:

Core subjects are all Skill enhancement courses

#### 4. Recommended Co-curricular activities:

##### A. Measurable:

1. Assignments on Food Technology
2. Student seminar on Food Technology Topics
3. Quiz Programmes on Food Technology

##### B. General:

1. Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
2. Group Discussions on new trends in Food related industries

#### 5. Recommended Continuous Assessment methods:

**4. Details of course – wise Syllabus** (Five units with each unit having 12 hours of class work.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER-I FUNDAMENTALS OF FOOD MICROBIOLOGY**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different types of microbes that invade foods	By the end of the course, student will be known about organization
To impart knowledge on history of food microbiology	Student will be able to identify different microorganisms in foods
To impart knowledge on concepts of food preservation and food spoilage	Student will be able to identify spoilage of foods

**UNIT-I:** Cultivation of bacteria, nutritional requirement, Nutritional classification of bacteria, Physical conditions required for growth, growth of bacteria, normal growth curve, yeast, morphological characteristics. Algae - Protozoa- Destruction of micro organisms – control of micro organisms by chemical agents.

**UNIT-II:** History of Food Microbiology - important micro-organisms associated with foods – mould, yeast and bacteria, micro-organisms in natural food products, Microbes used in food biotechnology.

**UNIT-III:** Extrinsic and intrinsic parameters affecting growth and survival of microbes, chemical changes caused by microorganisms, Organic acids, other compounds, lipids, pectic substances.

**UNIT-IV:** Food Spoilage – Contaminants of various foods stuffs – vegetables, cereals, pulses, oilseeds, milk, meat, egg and poultry during handling and processing.

**UNIT-V:** Principles of food preservation, methods of food preservation, application in food preservation, preservation by use of low temperatures, growth of microorganisms at low temperatures, chilling or cold storage, frozen storage, sharp freezing and quick freezing, changes during freezing.

**ADIKAVI NANNAYA UNIVERSITY**  
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**2020-21 Admitted Batch**  
**I Year Semester – I**

**FUNDAMENTALS OF FOOD MICROBIOLOGY (PRACTICAL)**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Microscope demonstration.
2. Preparation of bacterial smears, staining – simple differential staining of spore, molds & yeast
3. Sterilization and inoculation techniques.
4. Preparation of different nutrient media for cultivation of bacteria, yeast and molds.
5. Isolation of micro organisms – Pour plate methods, spread plate and streak plate methods.
6. Morphological identification of important molds, yeasts in foods (Slides and Cultures).

**Text Book**

P Tauro K. K. Japur and K.S. Yadav, An Introduction to Microbiology, Wiley Eastern Limited

**Books for Reference**

1. P Tauro K. K. Japur and K.S. Yadav, An Introduction to Microbiology, Wiley Eastern Limited, NewDelhi.
2. C.B. Power and H.F. Dagainawala, General Microbiology, Himalaya Publishing House, Bombay.
3. Frazier, W.C.andWesthoff , D.C. IV Edn., Food Microbiology, Mc Graw Hill Inc, New Delhi,1988.
4. Adam, M.R and Moss M.O, Food Microbiology, New Age International Pvt. Ltd, New Delhi.
5. Frazer, Math and Deibel, Laboratory Manual for Food Microbiology, Burgers Publishers, Minnesota,USA.

**ADIKAVI NANNAYA UNIVERSITY**  
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**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER-II FUNDAMENTALS OF FOOD CHEMISTRY**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different chemical components in foods	By the end of the course, student will be known about different food matrices
To impart knowledge on history of food chemistry	Student will be able to identify chemical compositions of different foods
To impart knowledge on concepts of food analysis and changes in foods while processing	Student will be able to understand processing parameters and their effects on final products

**UNIT I:** Introduction to Food Chemistry, Approach to the study of Food Chemistry, biochemical changes in foods, moisture in foods, water activity and sorption isotherms, shelf life of foods, Hysteresis, colloidal state, colloidal solutions, classification of colloidal solutions, protective colloids and gold number.

**UNIT II:** Emulsions, classification of emulsions, Properties of emulsions, Gels, Types of Gels, properties of gels, food gels, introduction to the proximate composition of foods, official methods for the analysis of foods – AOAC, AACC, AOCS.

**UNIT -III:** Carbohydrates Introduction, Classification of Carbohydrates, structure and food sources, chemical properties in foods, functional properties of carbohydrates. Changes of carbohydrates on cooking, crude fiber, browning reactions in foods, application of stabilizers and thickeners in foods.

**UNIT -IV:** Lipids (Fats and Oils) Classification, Sources and Chemistry of lipids – physical properties and chemical properties in foods. Steps in manufacture of food fats. Role of fat and applications in food preparation, Shortenings, shortening value and factors affecting it.

**UNIT-V:** Selection of fats and oils, fat substitutes, Deterioration of fats/ oils, Rancidity, Tests for Rancidity, Reversion and Polymerization. Anti-oxidants natural and synthetic, their mechanism, Application of Enzymes in food industry, Anti-nutritional factors in foods.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – I**  
**FUNDAMENTALS OF FOOD CHEMISTRY (PRACTICAL)**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Safety rules in the laboratory, first aid and introduction to the lab equipment and glassware.
2. Preparation of standard solutions, Buffers and determination of pH content in food samples.
3. Demonstrating the principles and applications of colorimeter and Spectrophotometer.
4. Verification of Beer's law by using Colorimeter.
5. Qualitative tests for the carbohydrates, Amino acids,
6. Determination of ash content of foods and preparation of mineral solution.
7. Determination of carbohydrate content in foods by Anthrone method.
8. Determination of reducing sugars by Nelson Somogyi's method.
9. Determination of saponification value of Fats/ oils.
10. Determination of FFA content in fats/ oils.

**Text Book**

Dr. Ling, H D Belitz, Dr. Ing, W. Grosch, Food Chemistry, Springer, New York, 1987.

**Books for Reference**

1. Dr. Ling, H D Belitz, Dr. Ing, W. Grosch, Food Chemistry, Springer, New York, 1987.
2. Braverman, Introduction to the Bio-Chemistry of Foods, Elsevier Scientific Publishing Company.
3. AOAC Methods for Food Analysis.
4. Meyer, Food Chemistry, AVI Publishing Company, USA 1983.
5. Sadasivam and Manickyam, Biochemical Methods, New Age International Publications, New Delhi, 1996.
6. John M. Deman, Principles of Food Chemistry, Springer International edition, Third edition, 2007.
7. Meenakshipaul, Experimental Food Chemistry, Published gene tech books New Delhi, 2012.
8. Fenema. R, Food Chemistry, Fourth edition, CRC Press Taylors and Francis group.
9. R.P.Srivastava and Sanjeev Kumar, Fruits and vegetables preservation, principles and practices, International Book Distribution Co. Third revised edition.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER-III FOOD PRODUCTION TRENDS AND HUMAN NUTRITION**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about the current trends in food production and processing	By the end of the course, student will be known about organizations supporting food processing and will be able to programme food guides for different age groups
To impart knowledge on basic nutrition and diet concepts	Student will be able to differentiate types of Carbohydrates, proteins, Vitamins and Minerals present in different food matrices
To impart knowledge on concepts of Proteins, Carbohydrates & Vitamins	Student will be able to prepare basic nutrition guide for different age groups

**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 postharvest losses, Development programmes and strategies to eliminate food losses, Employment generation through postharvest operations.

**Textbook**

N.N. Potter, Food Science, III edition,. AVI Publishing Co. Inc., West Port, USA, 1978.

## **Books for Reference**

1. N.N. Potter, Food Science, III edition,. AVI Publishing Co. Inc., West Port, USA,1978.
2. K. Vijaya Raghavan, 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, NewDelhi.
5. M. Swaminathan, Food and Nutrition, Vol I &II, The Bangalore Printing & Publishing Co. Ltd,Bangalore.



**ADIKAVI NANNAYA UNIVERSITY**  
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**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER-IV ON JOB TRAINING-I**

**Credits 1**

**Teaching Hours 2**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce about different job roles in industry	By the end of the course, student will be given a brief idea of setting a small scale food processing industry
To impart knowledge food formulation, processing, evaluation	Student will be able to formulate and process different types of foods
To impart knowledge on marketing of processed foods	Student will be able to identify practical problems during processing of different foods

On Job Training provides students adequate experience in planning and managing an enterprise in totality starting from procurement of raw material to processing, production, packaging and storage of products, organizing resources and utilities, sale of products, maintain accounts and analyze profits. Finally, students will present their work along with a report of their performance. The Report should contain following. Developing a Business Plan/ Project Proposal

I Identification of the product to be manufactured ii Market Survey iii Analysis of the existing status of the identified product and targeted market and customer iv Innovativeness and Creativity v Preparation of the project proposal with supply chain of inputs, personnel plan, production plan, finance plan, etc. and its preparation Plan for the Production i Organization of resources ii Organizing utility iii Sequential grouping of activities iv Packaging and storage v Product pricing – physical inputs, man-hours, depreciation, etc. vi Time management Production i Regularity in production ii Adhering to production plan iii Product quality assessment iv Maintenance of production records v Team work Sales i Sales strategy ii Sales volumes iii Assessment of sales performance iv Profit generated including C/B ratio, payback period, etc. Documentation and Report Presentation & Evaluation ii Personnel Management ii Preparation of final report & Oral performance

## **II SEMESTER**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – II**  
**PAPER – I FOOD MICROBIOLOGY**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different types of microbes that invade foods	By the end of the course, student will be known about growth patterns of microbes
To impart knowledge on history of food microbiology	Student will be able to identify different microorganisms in foods
To impart knowledge on concepts of food preservation and food spoilage	Student will be able to identify spoilage of foods

**UNIT -1**

Microbial spoilage of foods. Cause of spoilage classification of foods by ease of spoilage. Factors affecting kinds and numbers of microorganisms in food. Factors affecting growth and survival of microorganisms in foods. Chemical changes caused by microorganisms - changes in nitrogenous organic compounds, non-nitrogenous organic compounds, organic acids, other compounds. Contamination of Foods. Sources of contamination. Green plants and Fruits, Animals, Sewage, Soil, Water, Air. Microorganisms importance in Food Microbiology Asepsis, removal of Micro organisms. Maintenance of Anaerobic conditions. Food Preservation by use of high temperature. Factors affecting heat resistance (Thermal death time). Heat resistance of Microorganisms and their spores. Determination of heat resistance. Heat penetration - Pasteurization, canning.

**UNIT -2**

Preservation by drying, methods of drying. Treatments of foods before drying. Procedure after drying. Microbiology of dried foods. Intermediate moisture foods. Preservation by food additives - The ideal antimicrobial preservatives. Nitrites and nitrates, sulphur dioxide and sulfites. Ethylene and propylene oxide, sugar and salt Preservation by Food Additives - Alcohol, formaldehyde, wood smoke, spices and other condiments and other additives. Other groupings of chemical agents, antibiotics, developed preservatives. Food Preservation by Radiation - U.V. Radiation, ionizing radiations, definition of terms, xrays, gamma rays and cathode rays, Microwave processing. High pressure processing, Pascalization. Microbiology of milk and milk products. Contamination, preservation, pasteurization and ultra pasteurization, vat pasteurization. Vaccination, use of low temperatures, freezing, drying.

### **UNIT -3**

Spoilage of milk and cream, gas production proteolysis, ropiness, changes in milk fat. Alkali production. Flavour changes & colour changes. Spoilage of milk at different temperatures. Condensed and dry milk products. Flavour defects, colour defects. Microbiology of fruits and vegetables, contamination, preservation of vegetables, asepsis. chilling, freezing, drying, preservatives, CA storage, MA storage. Spoilage of fruits and vegetables. Microbiology of cereal and cereal products contamination, preservation and spoilage of flours Microbiology of cereal and cereal products. Spoilage-Bread, Mold, Rope, Red bread, Chalky Bread.

### **UNIT -4**

Microbiology of Meat and Meat Products. Contamination, preservation. Spoilage of meat and meat products. Invasion of tissues by microorganisms and growth of microorganisms in meat. General types of spoilage of meats. Spoilage under anaerobic conditions, spoilage of different kinds of meats. Microbiology of fish and other sea foods. Contamination, preservation, spoilage. Factors influencing kind and rate of spoilage, evidences of spoilage, bacteria causing spoilage. Microbiology of poultry and eggs.

### **UNIT-5**

Microbiology of sugar and sugar products. Sources of contamination, spoilage and Prevention. Microbiology of salts and spices, sources of contamination, spoilage and prevention, fatty foods and rancidity. Microbiology of canned foods. Causes of spoilage, appearance of the unopened container, types of biological spoilage of canned foods. Flat sour spoilage, TA spoilage, sulfide spoilage. Types of spoilage of canned foods by bacteria, yeasts, moulds. Spoilage of canned meat and fish.

### **Text Book**

Frazer, Math and Deibel, Laboratory Manual for Food Microbiology, Burgers Publishers – Minnesota, USA.

### **Books for Reference**

1. G.L. Ganwart (1987), Basic Food Microbiology, AVI Publishing Co. Inc., USA. Frazier and Wes Uobb.
2. Adam M R and Moss M.O., Food Microbiology, New Age International (P) Ltd., Publishers, NewDelhi.
3. Frazer, Math and Deibel, Laboratory Manual for Food Microbiology, Burgers Publishers – Minnesota, USA

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – II**  
**FOOD MICROBIOLOGY PRACTICAL**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Isolation of molds from foods
2. Microbial examination of cereal and cereal Products – Identification, Isolation -I
3. Microbial examination of vegetable and fruits – Identification, Isolation -I
4. Microbialexaminationofmeatandmeatproducts–Identification,Isolation-I
5. Microbialexaminationoffishandotherseafoods–Identification,Isolation-I
6. Microbial examination of Eggs – Identification, Isolation –I
7. Microbial examination of poultry – Identification, Isolation –I
8. Microbial examination of milk and milk products – Identification, Isolation -I
9. Microbial examination of sugar, salts and spices – Identification, Isolation -I
10. Thermal Death Time determination

**ADIKAVI NANNAYA UNIVERSITY**  
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**I Year Semester – II**  
**PAPER- II FOOD CHEMISTRY OF MACRO NUTRIENTS**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different macro chemical components in foods	By the end of the course, student will be known about different food matrices and macro components
To impart knowledge on history of food chemistry	Student will be able to identify macro chemical compositions of different foods
To impart knowledge on concepts of food analysis and changes in foods while processing pertaining to macro nutrients	Student will be able to understand processing parameters and their effects on final products

**Unit -1**

Food chemistry - Definition, Introduction, Importance and History of Food Chemistry, Humectants - Role of Humectants in enhancing the shelf life of foods. Dispersed systems of foods - Sols - Types of sols, lyophilic sols, lyophobic sols, Preparation, purification and Properties of sols. Foam - Formation and structure. Starch - Starch granules, Granule gelatinization (Gelatinization of starch), Hydrolysis of starch. Functional properties of sugars

**Unit – 2**

Pure proteins of plant and animal origin with their functional characteristics. Plant proteins - cereal proteins, tuber proteins and pulse storage proteins. Milk proteins - Casein, whey proteins and colostrums. Egg proteins - Egg white proteins, Egg yolk proteins

**Unit-3**

Lipids - Introduction - Fatty acids, Acylglycerols, Phospholipids. Classification of edible fats - Milk fats, lauric acids, vegetable butters, oleic-Linoleic acids, linolenic acids, Animal fats, Marine oils. Physical aspects of lipids - Crystallization, Consistency. Chemical aspects of lipids - Lipolysis, Auto-oxidation, Thermal decomposition, polymerization. Edible fats and oils - Melting properties, chemical properties.

**Unit-4**

Technology of edible fats and oils - Rendering, pressing, solvent extraction. Chemistry of fat and oil processing : Refining, Hydrogenation, Interesterification. Frying technology of edible fats and oils - Chemistry of frying, Behaviour of frying oil. Behaviour of food during frying, chemical and physical changes, Tests for assessing the quality of frying oils

## **Unit-5**

Rancidity and its types, detection techniques. Enzymes in food industry - Carbohydrases- Amylases, pectinolytic enzymes, cellulases and hemicellulases. Proteases - Endopeptidases, Metallo peptidases. Lipid hydrolyzing enzymes - Lipases, Phospholipases. Chemical reactions of interest to food processing

### **Textbook**

Fenema O.R. Maraceladikllor, Food Chemistry – London.

### **Books for Reference**

HD. Belitz, Dr.W.Grasch 1987, Food Chemistry – Spirigerverl, Newyork.

Fenema O.R. Maraceladikllor, Food Chemistry – London.

Food Chemistry - Meyer.

Harry H. Sisler, Calvin: A.Vander Werf. Food Chemistry

N.A. Michael Eskin Biochemistry of Foods 2nd edition.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – II**  
**FOOD CHEMISTRY OF MACRO NUTRIENTS (PRACTICAL)**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Determination of moisture content in foods.
2. Determination of total carbohydrate content in foods
3. Determination of reducing sugars in foods
4. Determination of enzymatic and non-enzymatic browning in foods
5. Determination of protein in foods by kjeldhal method
6. Determination of protein in foods by folin – Lowry method
7. Determination of lipid content in foods by soxhlet apparatus
8. Determination of methionine in foods
9. Determination of selected amino acids in foods
10. Determination of saponification value of foods.



**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – II**  
**PAPER- III PRINCIPLES OF FOOD PRESERVATION**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce about the Preservation concepts	By the end of the course, student will be known about different preservation methods
To impart knowledge on different preservative methods	Student will be able to identify different chemical changes during preservation of foods
To impart knowledge on processing of foods	Student will be able to identify processing parameters for foods

**UNIT -1**

Scope - Principles of Food Science and Technology - Introduction - Definitions of Food, Food Science and Technology - introduction to other relevant terms pertaining to Food Technology. Food Classification. Food Spoilage-types- factors affecting spoilage - Definition of Food Spoilage - Major types of food spoilage including micro biological - Bio-chemical, physical and enzymatic spoilage (Bio-chemical spoilage). Factors affecting food spoilage - Extrinsic: Temperature- RHO<sub>2</sub>, CO<sub>2</sub>; Intrinsic - pH – Moisture content- aw, Chemical nature - oxidation reduction potential - physical structure - available nutrients -presence of anti microbial agents. General Principles of Food Preservation - Physical Methods - Chemical Methods -Fermentation - Other Methods.

**UNIT -2**

Different processing methods of food - Objectives of Cooking - Cooking methods – Moist heat - dry heat and combination method. Preservation by Thermal Processing - Blanching - Pasteurization-types-equipment -Sterilization. Preservation by canning - different unit operations involved in canning-equipment used in canning- types of canning containers. Use of low temperatures - Types of cold preservation - Chill storage - Procedure of low Temperature storage - types of freezing equipment used. Various changes occurring during freezing and thawing - methods of food freezing – Quick fast freezing and slow freezing-factors affecting storage.

**UNIT -3**

Drying / Dehydration - Definition of drying - Advantages of dried foods - Sun drying - Mechanical dehydration - Direct heated driers - Indirect heated driers - Cabinet driers -Tunnel drier - Drum Drier - Fluidized Bed Drier - Spray Drier. Factors affecting dehydration of food. Dehydration - methods of dehydration-advantages & disadvantages of dehydration. Changes in constituents of Food materials -

Shrinkage, case hardening - Thermo plasticites- Reconstitution properties - Thin layer drying – Deep Bed Drying.

#### **UNIT -4**

Flash Evaporator - Freeze Concentration - Ultra Filtration and reverse osmosis. Preservation by radiation - Food irradiation - What is food irradiation - Forms of energy -Ionizing radiation and sources - Units of radiation - Effects of radiation. Irradiation doses for treating foods - Mechanism underlying Irradiation-Advantages- Disadvantages. Preservation by Chemicals - Introduction - Class I Preservatives - Class II Preservatives -Safe limits of usage. Preservation by mould inhibitors, antibiotics, acidulants - Antioxidants - Antibiotics – Mould inhibitors - Parabens - Epoxides - Benzoic acid - Propionic Acid.

#### **UNIT -5**

Preservation by fermentation - Definition - Some industrial fermentation in food industries. Recent methods in preservation: Pulsed electric field processing - principle - equipment - Mechanism - effect on quality - advantages – disadvantages. High pressure processing - principle - equipment - Mechanism - effect on quality - advantages- disadvantages. Processing using ultrasound - Principle - equipment - mechanism - effect on food quality. Dielectric and Ohmic heating - Principle - equipment - mechanism - effect on food quality. Infrared heating - Theory - equipments - effect on food quality.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – II**  
**PAPER – IV ON JOB TRAINING – II**

**Credits 1**

**Teaching Hours2**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce about the basic metabolic rates and malnutrition concepts	By the end of the course, student will be known about energy values in foods
To impart knowledge on biochemical parameters in foods	Student will be able to assess different biochemical parameters in foods
To impart knowledge Amino acids, Lipids and Enzymes.	Student will be able to identify biochemical parameters for foods

On Job Training provides students adequate experience in planning and managing an enterprise in totality starting from procurement of raw material to processing, production, packaging and storage of products, organizing resources and utilities, sale of products, maintain accounts and analyze profits. Finally, students will present their work along with a report of their performance. The Report should contain following. Developing a Business Plan/ Project Proposal I Identification of the product to be manufactured ii Market Survey iii Analysis of the existing status of the identified product and targeted market and customer iv Innovativeness and Creativity v Preparation of the project proposal with supply chain of inputs, personnel plan, production plan, finance plan, etc. and its preparation Plan for the Production i Organization of resources ii Organizing utility iii Sequential grouping of activities iv Packaging and storage v Product pricing – physical inputs, man-hours, depreciation, etc. vi Time management Production i Regularity in production ii Adhering to production plan iii Product quality assessment iv Maintenance of production records v Team work Sales i Sales strategy ii Sales volumes iii Assessment of sales performance iv Profit generated including C/B ratio, payback period, etc. Documentation and Report Presentation & Evaluation ii Personnel Management ii Preparation of final report & Oral performance

### **III SEMESTER**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – III**  
**PAPER -1 FOOD PROCESSING EQUIPMENT**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different Processing methods for foods	By the end of the course, student will understand specific processing methods
To impart knowledge on processing equipment	Student will be able to identify and can design small scale processing equipment
To impart knowledge on basic unit operations in food industries	Student will be able to understand different unit operations in foods

**Unit-1**

Introduction to Material Handling and Transportation-Belt conveyor, Bucket elevator, Screw conveyor, Pneumatic conveyor, Chain conveyor. Selection of material handling machines and Conveyors. Belt conveyor; Belt conveyor idlers, Idler spacing, Belt tension, Chain conveyor Bucket Elevator: Head section, Boot section, Elevator legs, Elevator Belts, Buckets, Drive mechanism, HP requirement Screw Conveyor: Screw conveyor details, various shapes of screw conveyor trough, Capacity and Horse Power. Pneumatic conveyor, Limitations of pneumatic conveying Cleaning, Sorting and Grading

**Unit-2**

Peeling, Dehulling, Dehusking, Mixing Definition, Measurement of Mixing, Mixing index, Mixing Equipment- Double cone mixer, Ribbon mixer, Kneader, Propeller mixer, Forming- Bread moulders, Pie and biscuit formers, Confectionery moulders, Size Reduction and Separation-Introduction, Grinding and cutting, Energy used in grinding, Kick's law, Rittinger's law, Bond's law, Cutting & Grinding Equipment, Jaw crusher, Gyratory crusher, Hammer mill, Ball mill, Tumbling mill, Separation by Centrifugation, Filtration –Equipment and introduction. Introduction to heat processing - Blanching, Pasteurization, Sterilization Interaction of Heat Energy and Food Components - Introduction to Reaction Kinetics,

**Unit-3**

Separation by Expression, Extraction using solvents, Membrane concentration. Introduction and importance of Physical properties-Shape and size of grains, Shape and size of Fruits, Bulk density of the grains. True density of the grains, Porosity, Angle of repose, Test weight. Co- efficient of external friction, Co-efficient of internal friction, colour of food Materials. The need to consider hygienic design, Hazards, How to approach Hygienic design, Hygienic design Priorities, Hygienic design

principles, some general design pointers (Do's & Don'ts).Some Basic Concepts of Rheology, Biological systems and mechanical properties, ASTM

#### **Unit-4**

Standard Definition of terms related to mechanical properties, Some Basic Concepts of Rheology, Biological systems and mechanical properties, ASTM Standard Definition of Terms related to mechanical properties. Other Definitions related to Mechanical Properties, Physical states of a material, Classical Ideal materials, Ideal elastic behavior (Hookean body), Ideal plastic behavior (St. Venant body), Ideal viscous behavior (Newtonian liquid), Rheological models, Electrical equivalence of mechanical models. Temperature Dependence of Kinetics, Thermal Destruction of microorganisms, Thermal Destruction of Enzymes, Thermal Destruction of Nutrients and quality factors

#### **Unit-5**

Aero and Hydrodynamic Properties. Drag coefficient and Terminal velocity, Evaporation, Boiling point Elevation, Types of Evaporators, Batch Type pan evaporator, Natural circulation evaporators. Rising film evaporator, Falling film evaporator, Rising and Falling film evaporator, Forced - circulation evaporator, Agitated thin-film evaporator, Design of a single effect evaporator, Material and energy balances, Evaporator efficiency, multiple effect evaporator, Sizing of multiple effect evaporators. Thin layer drying, Moisture content, Equilibrium moisture content, Hysteresis, Drying curves, Constant - rate period, Falling - rate period. Tray and cabinet dryer, Tunnel dryer, Puff-drying, Fluidized - Bed drying, Spray drying, Freeze – Drying.

#### **Text Books**

Fellows P.J. Food Processing Technology, Principles and Practice. Wood Head Publishing Ltd., Cambridge, England.

Fennema. Principles of Food Science. Part II. Marcel Dekker Inc. publishers.

#### **Books for Reference**

Cabe Mc., Smith J.C and Harriot P. Unit operations of Chemical Engineering. Mc Graw Hill Publishers. New Delhi.

Mohesinin N. N. Physical properties of Plant and Animal materials.

Stanley E.C. Fundamentals of Food Engineering. AVI Publishers. Westport. USA.

Sahay K.M and Singh K.K. Unit operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd. New Delhi.

Earle R.L. Unit operations in Food Engineering.

Fellows P.J. Food Processing Technology, Principles and Practice. Wood Head Publishing Ltd., Cambridge, England.

Singh R. P and Heldman D.R. Introduction to Food Engineering. 3rd Edn., Smith P.G. Introduction to Food Process Engineering.

Chakraverty A. Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford & IBH Publishers. New Delhi

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – III**  
**FOOD PROCESSING EQUIPMENT PRACTICAL**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Determination of engineering properties of food materials
2. Study of Plate type of heat exchangers used in Dairy and Food Industry
3. Study of Shell and Tube type of heat exchangers used in Dairy and Food industry
4. Studies on heat transfer through extended surfaces
5. Studies on temperature distribution and heat transfer in HTST pasteurizer
6. Design problems on heat exchangers – I
7. Design problems on heat exchangers – II
8. Design problems on heat exchangers – III
9. Determination of viscosity of different food materials
10. Design problems on heat exchangers



**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – III**  
**PAPER-II TECHNIQUES IN FOOD ANALYSIS**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different chemical structures in foods	By the end of the course, student will understand qualitative analysis
To impart knowledge on analytical techniques	Student will be able to know procedures for analysis
To impart knowledge on standards of different foods	Student will be able to understand the importance of standards and their evaluation

**Unit-1**

Introduction to the chemical analysis of food - Definitions of food analysis, Quality control, Official methods of analysis. Association of Official Analytical Chemists, American Association of Cereal Chemists, American Oil Chemists Society, Rules and Regulations of Food Analysis, Nutritional Labelling , Food Inspection and Grading, food safety - Safety rules in the chemistry- Safety rules - What to do in case of an accident - Broken Glass - Small chemical spill - Large chemical spill - Chemical splash in your face - Large splash of dangerous chemical on your clothing and or body, small confined fire, small open fire, large fire, your clothing on fire

**Unit-2**

First Aid -Thermal burns, chemical burns, minor bleeding, toxic fumes, fainting and shock, chemical splashes. Sampling and Sampling Techniques - Introduction - Definitions of Population, Laboratory. Sample, sample, precision, accuracy, sensitivity, Reproducibility - of Analysis – Official Samples, Raw Materials. Basic principles of spectrophotometer and colorimeter and its application Analysis of Carbohydrates - Introduction - Importance of Carbohydrate Analysis – Methods of Analysis - Sample preparation - Extraction of Monosaccharides, Oligo saccharides

**Unit-3**

Chemical methods for carbohydrates - Gravimetric methods - Titrimetric methods - Colorimetric methods - phenol sulfuric acid - Enzymatic methods. Physical methods - Polarimetric method, Refractive index measurements, Density, Infrared radiation, Immuno assays, Analysis of starch and crude fibre Analysis of proteins - Introduction - Importance of protein analysis - Determination of overall protein concentration by Kjeldhal method, Enhanced Dumas method, using U.V Visible spectroscopy. Direct measurement at 280 nm, Biuret method, Lowry method, Dye binding method, Turbido metric method

#### **Unit-4**

Protein and characterisation - Basic principles of chromatography - types of chromatography and its applications. Analysis of lipids - Introduction - Importance of analysis of lipids - Determination of total lipid concentration - solvent extraction. Extraction of lipids - solvent, Non solvent extraction methods, instrumentation methods

#### **Unit-5**

Determination of lipid composition - Separation and analysis by chromatography – lipids fractions of TLC - Fatty acid methyl esters by GC - Chemical techniques - acid value, instrumental techniques of analyzing lipid oxidation in foods - Chromatography, peroxide value - Characteristics of physico chemical properties Analysis of minerals - Introduction - Importance of mineral analysis - Dry ashing – Wet ashing - Low plasma ashing, Adsorption spectroscopy

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – III**  
**TECHNIQUES IN FOOD ANALYSIS PRACTICAL**

**Credits 1**

**Teaching Hours 2**

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**List of Practicals**

1. Introduction to Food Analysis Techniques
2. Preparation of solutions
3. Preparation of Buffers
4. Preparation of standard graph
5. Sampling techniques and methods of sample preparation
6. Colorimetry and spectrophotometry
7. Determination of pH of Food samples (milk, flours, jams)
8. Determination of Titratable acidity
9. Determination of Moisture and Total solids
10. Estimation of carbohydrates by Phenol Sulphuric Acid method
11. Test for adulterants in Sugar, Jaggery, Honey
12. Test for adulterants in Milk, Ghee
13. Test for adulterants in plantation crops (Tea, coffee) and Turmic
14. Test for adulterants in spices (Cardamom, cloves, pepper)

**Text Books**

Mano Ranjan Kalia First Edition 2002, Food Analysis and Quality Control. Kalyani Publishers, New Delhi, Hyderabad.

**Books for Reference**

S.S. Nilson, Food Analysis, Aspen Publishers, Gaithery Berg, Mary Land. AOAC methods For Food Analysis.

Y. Pomeranz and C.E. Meloan, Food Analysis, Theory and practice, A.V.I Publishing Company, INC West Port, Connecticut, U.S.A.,

Jayaraman, J. 1980. Laboratory Manual in Biochemistry. Wiley Eastern Publishers, New Delhi.  
Plummer, D.T. 1979. An introduction to Practical Biochemistry. Tata Mc Graw-Hill Publishing Co., New Delhi.

Sadasivam, S. and Manickam, A. 1996. Biochemical methods for Agricultural Sciences. New Age International Publisher, New Delhi.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – III**  
**PAPER-III FOOD ADDITIVES**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different foods and their processing ingredients	By the end of the course, student will understand importance of ingredients and food additives relation
To impart knowledge on food additives	Student will be able to know regulations on food additives
To impart knowledge on safety of food additives	Student will be able to know acceptable daily intakes of different food additives

**Unit – 1**

Introduction: What are Food Additives? - Role of Food Additives in Food Processing - functions - Classification - Intentional & Unintentional Food Additives. Toxicology and Safety Evaluation of Food Additives - Beneficial effects of Food Additives / Toxic Effects - Food Additives generally recognized as safe (GRAS) - Tolerance levels & Toxic levels in Foods - LD 50. Values of Food additives. Naturally occurring Food Additives - Classification - Role in Food Processing – Health Implications

**Unit-2**

Preservatives - What are preservatives - natural preservation- chemical preservatives – their chemical action on foods and human system. Anti-oxidants & chelating agents - what are anti oxidants - their role in foods - types of antioxidants- natural & synthetic - examples - what are chelating agents - their mode of action in foods - examples. Surface active agents - What are surface active agents - their mode of action in foods -examples.

**Unit-3**

Bleaching & maturing agents: what is bleaching - Examples of bleaching agents - what is maturing - examples of maturing agents - their role in food processing. Starch modifiers: what are starch modifiers - chemical nature - their role in food processing. . Food colors - What are food colors - Natural Colours and classification

**Unit-4**

Buffers - Acids & Alkalis - examples - types - their role in food processing. Sweeteners - what are artificial sweeteners & non nutritive sweeteners - special dietary supplements & their health implication - role in food processing. Food Colors - Synthetic food colors - types - their chemical nature - their impact on health

## **Unit-5**

Flavoring agents - natural flavors & synthetic flavors - examples & their chemical nature - role of flavoring agents in food processing. Anti-caking agents - their role in food processing . Humectants - definition on their role in food processing. Clarifying agents - definition examples - their role in food processing.

### **Textbook**

Srivastava, R.P. Fruit & Vegetable Preservation – Principles and Practices. International Book Distributing Co. CIBDC, New Delhi.

### **Book for Reference**

Belitz . Food Chemistry . 3rd Revised Edition. Springer International.

Deshpande , S.S. Hand book of Food Toxicology. Marcel and Dekker .CRC Publishers.

Mahindru , S.N. Food Additives – Characteristics, Detection and Estimation .Tata McGraw Hill Publishing, India.

Shakuntala Manay and Shadakshar Swamy. Food Facts and Principles. New Age International Publishers, New Delhi.

Srivastava, R.P. Fruit & Vegetable Preservation – Principles and Practices. International Book Distributing Co. CIBDC, New Delhi.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – III**  
**PAPER – IV ON JOB TRAINING - III**

**Credits 1**

**Teaching Hours 2**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce about the basic metabolic rates and malnutrition concepts	By the end of the course, student will be known about energy values in foods
To impart knowledge on biochemical parameters in foods	Student will be able to assess different biochemical parameters in foods
To impart knowledge Amino acids, Lipids and Enzymes.	Student will be able to identify biochemical parameters for foods

On Job Training provides students adequate experience in planning and managing an enterprise in totality starting from procurement of raw material to processing, production, packaging and storage of products, organizing resources and utilities, sale of products, maintain accounts and analyze profits. Finally, students will present their work along with a report of their performance. The Report should contain following. Developing a Business Plan/ Project Proposal I Identification of the product to be manufactured ii Market Survey iii Analysis of the existing status of the identified product and targeted market and customer iv Innovativeness and Creativity v Preparation of the project proposal with supply chain of inputs, personnel plan, production plan, finance plan, etc. and its preparation Plan for the Production i Organization of resources ii Organizing utility iii Sequential grouping of activities iv Packaging and storage v Product pricing – physical inputs, man-hours, depreciation, etc. vi Time management Production i Regularity in production ii Adhering to production plan iii Product quality assessment iv Maintenance of production records v Team work Sales i Sales strategy ii Sales volumes iii Assessment of sales performance iv Profit generated including C/B ratio, payback period, etc. Documentation and Report Presentation & Evaluation ii Personnel Management ii Preparation of final report & Oral performance

## **IV SEMESTER**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER-1 FOOD CHEMISTRY OF MICRO NUTRIENTS**

Credits 4

Teaching Hours 4

OBJECTIVES	LEARNING OUTCOMES
To Introduce the student about different micro chemical components in foods	By the end of the course, student will be known about different food matrices and micro components
To impart knowledge on history of food chemistry	Student will be able to identify micro chemical compositions of different foods
To impart knowledge on concepts of food analysis and changes in foods while processing pertaining to micro nutrients	Student will be able to understand processing parameters and their effects on final products

### Unit-1

Introduction - Definition of Micronutrient, Classification of Micronutrients, Significance and Scope. Flavor - Definition, Methods for Flavor Analysis, Taste and Nonspecific Saporous Sensations, Taste Substances; Sweet, Bitter, Sour, and Salty sensations, Structural basis of taste modalities, Non specific Saporous substances; Flavour Enhancers, Astringency, Pungency and Cooling. Flavors related to Spices - Sulfur Containing volatiles in Allium sp. - Sulfur Containing volatiles in Cruciferae. Flavors related to vegetables - Methoxy Alkyl Pyrazine Volatiles in Vegetables – Volatiles derived from Fatty Acids by enzymatic action -Volatile from Branched Chain Amino Acids

### Unit-2

Flavors related to fruits - Flavors derived from the Shikimic Acid Pathway - Volatile Terpenoids. Citrus Flavors -Flavors of Herbs. Flavor volatiles - from Lactic acid, ethanol fermentation, fats and oils, Muscle foods and Milk. Pigments - Introduction - Pigments in animal and plant tissue – heme compounds, Chlorophyll, carotenoids, Flavonoids and other phenols, Betalains. Heme compounds - Myoglobin/hemoglobin, Structure of heme compounds. Myoglobin – Chemistry and color, Cured Meat pigments, stability of Meat pigments. Chlorophyll – Structure and derivatives of chlorophyll - Physical characteristics. Alterations of Chlorophyll by Enzymatic - Heat and Acid - Metallo complex formation -Allomerization - Photodegradation

### Unit-3

Loss of green color during thermal processing - different technologies of green colour preservation - Acid neutralization to retain chlorophyll, High Temperature Short Time Processing, Enzymatic conversion to chlorophyllides, Commercial application of metallo complex, Regreening of thermal processing.. Carotenoids - Structures of Carotenoids - Occurance and distribution - Physical propertiesChemical properties of carotenoids - Oxidation, Anti oxidative activity, Cis/Trans Isomerization – Stability during processing



#### **Unit-4**

Flavonoids and other phenols - Anthocyanins - Structure - Color and Stability of Anthocyanins Factors affecting stability of Anthocyanins - Structural transformation and pH – Temperature. oxygen and Ascorbic acid - Light, Sugars and their degradation products, metals, Sulfur dioxide, Co pigmentation, Enzyme reactions. Other flavonoids - physical properties - Importance in foods - Proanthocyanidins – Tannins - Quinoids and xanthones. Betalaines - Structure - Physical properties - Chemical properties - Conversion of Betacyanin to Betaxanthin

#### **Unit-5**

Vitamins - Introduction, Toxicity of vitamins - Different sources of vitamins – Dietary Recommendations, Minerals, Introduction - Principles of mineral chemistry - Nutritional aspects of minerals - Essential mineral elements - Recommended Dietary allowances – Bioavailability, Optimization in foods Bioavailability and properties. Modification of food using enzymes. Role of endogenous enzymes in food quality - color - Texture - Flavor and aroma changes in foods - Nutritional quality. Enzymes as processing aids and ingredients. Enzymes in Baking – Brewing

#### **Text Books**

Meyer. Food Chemistry - Food Chemistry - HARRY H. SISLER, Calvin : A Vander werf.

#### **Books for References**

Dr. Ling HD. Belity, Dr. Ing, W.Grach 1987, Food Chemistry - Spirigerverl,

New York.Eeskin - herderson Food Biochemistry - Town send.

R. Marceladikllor, Food Chemistry - Fenema, London.

Meyer. Food Chemistry - Food Chemistry - HARRY H. SISLER, Calvin : A Vander werf.  
Braverman

Introduction to the Biochemistry of Foods - Elsevier Scientific Publishing  
CompanySadasisivam - Biochemical Methods

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**FOOD CHEMISTRY OF MICRO NUTRIENTS PRACTICAL**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Preparation of mineral solution by using ash and tri acid method (Dry and wet oxidations)
2. Estimation of calcium in foods.
3. Estimation of Phosphorous
4. Estimation of Iron
5. Estimation of Magnesium
6. Estimation of Tannins
7. Estimation of phenols
8. Estimation of Vitamin A
9. Estimation of  $\beta$ -Carotene
10. Estimation of Thiamine

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER-II MILK AND MILK PRODUCTS PROCESSING**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different micro chemical components in foods	By the end of the course, student will be known about different food matrices and micro components
To impart knowledge on history of food chemistry	Student will be able to identify micro chemical compositions of different foods
To impart knowledge on concepts of food analysis and changes in foods while processing pertaining to micro nutrients	Student will be able to understand processing parameters and their effects on final products

**Unit-1**

Milk - Definition - Indian Standards - Composition - Milk Constituents - Food and Nutritive value of milk, Physico-chemical properties of milk constituents - Physico-chemical properties of milk Colostrum and its nutritive value - Milk and Public health - Safe guarding the milk supply - Clean milk production - Buying and collection of milk - Cooling and transportation of milk. Effect of heat on milk. Manufacture, Packaging and Storage of Pasteurized milk- Receiving - Preheating - Filtration/Clarification - Cooling - Storage of raw milk. Standardization - definition and procedure. Pasteurization - Definition - Objectives - Formulation of standards - Methods of Pasteurization- Batch method and HTST method. Vacuum Pasteurization - Standardization - Ultra High Temperature Pasteurization - Uperization

**Unit-2**

Homogenization - Bottling and storage - Flavour defects in milk, their causes and prevention. Ultra filtration and Reverse Osmosis. Cream - Definition - Classification - Composition - Food and Nutritive value – Physicochemical properties. Cream production - Gravity and Centrifugal methods Factors affecting fat percentage of cream - Yield of cream - Collection of cream - Neutralization of cream. Pasteurization of cream - Manufacture of different types of cream - Defects in cream, their causes and prevention. Butter - Definition - Classification - Composition - Method of manufacture, packaging and storage - Butter Over run. Theories of churning - Continuous butter making - Defects in butter, their causes and prevention. Butter oil - Definition - Composition - Nutritive value - Methods of manufacture, Cooling, Packaging, Storage and Distribution - Defects in butter oil, their causes and prevention.

**Unit-3**

Special milks - Sterilized milk - Definition - Method of manufacture - Homogenized milk - Definition - Factors influencing homogenization - Method of manufacture – Homogenizer - Soft curd milk -

Definition - Characteristics - Methods of preparation of soft curd milk. Flavoured milks - Definition - Types - Methods of manufacture of chocolate/fruit flavoured milks/drinks - Vitaminized/Irradiated milk - Frozen concentrated milk. Fermented milk - Merits - Types - Starter propagation - Natural butter milk - Cultured butter milk - Acidophilus milk - Bulgarian butter milk - Kumiss - Kefir. Yoghurt - Method of preparation - Flavoured yoghurt preparation - Standardized milk - Reconstituted milk - Recombined milk - Toned milk - Double toned milk - Humanized milk - Miscellaneous milks.

#### **Unit-4**

Cheese - Definition - Classification - Composition - Nutritive value - Manufacture of cheddar cheese - Curing of cheese. Cottage cheese - Method of manufacture - Different varieties of cheese - Defects in cheese, their causes and prevention. Ice cream - Definition - Classification - Composition - Nutritive value - Role of constituents in ice cream - Method of manufacture, packaging, hardening and storage. Over run in ice cream - Defects in ice cream, their causes and prevention. Manufacture of indigenous milk products - Ghee, Khoa, Chhana - Method of manufacture, packaging and storage - Nutritive value.

#### **Unit-5**

Paneer, Dahi and Shrikhand - Method of manufacture, packaging and storage. Methods of preparation of Kheer, Rabri, Kulfi and Lassi. Indian milk confectionery - Manufacturing, packaging and storage of Khoa based sweets Kalakhand and Gulabjamun. Manufacturing, packaging and storage of Chhana based sweets Sandesh and Rasogulla. By-products of dairy industry - Classification - Principle and method of utilization. Casein (industrial) - method of manufacture - Defects - Uses - Casein (edible) - method of preparation - Uses. Packaging and storage of milk and milk products

#### **Text Book**

Sukumar De. Outlines of Dairy Technology. Oxford University Press, New Delhi.

#### **Books for Reference**

Bangarappa K.S and Acharya K.L. Indian Dairy Products. Asia Publishing House, Bombay.

EIRI Board of Consultants, Engineers. Milk Processing and Dairy Products Industries. EIRI India Research Institute, New Delhi.

Kessler H.G. Food Engineering and Dairy Technology. Published by Verlag A Kessler, Post Box No 1721, D-8050 Fraising (F R Germany)

Sukumar De. Outlines of Dairy Technology. Oxford University Press, New Delhi.

Swaminathan M. Food Science, Chemistry and Experimental Foods. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

Warner J.N. Principles of Dairy Processing. Wiley Eastern Ltd., New Delhi

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**MILK AND MILK PRODUCTS PROCESSING PRACTICAL**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Sampling and analysis of milk-COB, Titratable acidity, alcohol test, fat
2. Study of physico- chemical properties, specific gravity and composition of milk
3. Determination of adulterants and preservatives in milk
4. Separation and standardization of milk
5. Heat processing of milk- Pasteurization
6. Preparation of butter
7. Preparation of ghee
8. Preparation of ice cream
9. Preparation of Dahi and Shrikhand
10. Preparation of Lassi
11. Preparation of Khoa
12. Preparation of Khoa and Khoa based sweets
13. Preparation of Chhana and Paneer
14. Preparation of Chhana based sweets
15. Visit to milk chilling centre
16. Visit to Dairy plant

**ADIKAVI NANNAYA UNIVERSITY**  
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**II Year Semester – IV**  
**PAPER-III FRUIT AND VEGETABLE PROCESSING**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about different fruit and vegetable products	By the end of the course, student will be known about processing methods for fruit and vegetables
To impart knowledge on processing of fruit and vegetables	Student will be able to identify sensory parameters
To impart knowledge on concepts of fruits and vegetables processing	Student will be able to understand processing importance of fruits and vegetables

**Unit-1**

Production and processing scenario of Fruits and vegetables in India and world-scope of fruit and vegetable processing industry in India - present status, constraints and prospective. Overview of Principles of preservation - Drying /dehydration - process - types – pretreatments required factors affecting rate of dehydration - Reconstitution - coefficient of rehydration Freezing – process, Concentration, Chemical Preservation, Hurdle Concept, Irradiation, Concentration - types of concentration - changes during concentration

**Unit-2**

Processing Technology of Jam - What is Jam? - Ingredients and their role in quality of Jam - Processing of Jam (flowcharts) - Tests for end point determination-Problems in Jam making. Pectin properties - theories - Olsen’s theory, Spencer’s theory, Hinton’s theory, Fibril Theory. Jelly and Marmalades - Jelly - Difference between Jam and Jelly - Processing of Jelly – End point determination - Failure of Jellies to set- Cloudy or foggy Jellies - Formation of crystals, Syneresis. Marmalades, Fruit preserves and candied fruits, Glazed Fruits

**Unit-3**

Glazed fruit - preparation, Crystallized fruit - preparation-problems in preparation of preserves and candied fruit. Chutneys - Preparation of chutney; Pickles - Types of Pickling-Pickling with salt – Dry salting – Brining. Pickling with Vinegar and fermentation - Sauerkraut - Role of lactic acid bacteria in pickling; Pickling with oil - pickling with mixture of salt, oil and spices - Problems/ spoilage in pickles. Sauces and Ketchups - What are sauces? - Difference between sauce and a ketchup - classification of sauces-thick and thin sauces-processing of Tomato sauce/ketchup - Preparation of soya sauce(thin sauce) - problems in making of sauces

## **Unit-4**

Processing Technology of Fruit Beverage - Unit operations involved in preparation of fruit Beverage. Equipment used in the preparation of beverages - pulping - Screw type juice extractors - Burring machines-rollers-Taglith press by CFTRI, Basket press - Rack and cloth press-Hydraulic press - Deaerators - Sietz filters – Flash Pasteurizers. Types of Beverages - Processing technology of Beverages - Flow charts of Juice - examples- RTS – Nectar, Processing of Beverages like Cordial, Squash, Crush - FPO Specification – Processing method - Ingredients - Flow Charts. Processing of Syrups - natural and synthetic- rose syrup -almond syrup- fruit syrup. Fruit juice concentrate - Fruit juice powder - Lemon Barley water - Carbonated beverages

## **Unit-5**

Processing technology of Fruit Cheese , Toffees, Wafers, Soups, Papads, Equipment required for processing. Fermented products from fruits and vegetables - Vinegar - types of vinegar - methods of vinegar production - Quick method - Orleans slow process - Generator process – problems in vinegar production. Fermented fruit beverages - Wine , Clear wines, Champagne and Cider; Fortified wines - Sherry, vermouths; orange wine, Perry, Tokay, Port. Cashew wine/ Brandy (Feni), Neera, Toddy, Arrack and different distilled spirits – their source and alcohol percentage

## **Text Books**

Srivastava.P.R. and Sanjeev Kumar. Fruit and vegetable preservation - 3rd Edition. International Publishers, Delhi.

## **Books for Reference**

Giridharlal, Siddappa and Tandon. Preservation of fruits and vegetables.ICAR, New Delhi. Sudhir

Gupta (Compiled). Fruits and Vegetables Processing Hand Book.EIRI, Delhi.

Srivastava.P.R. and Sanjeev Kumar. Fruit and vegetable preservation - 3rd Edition. International Publishers, Delhi.

EIRI Board of Consultants and Engineers. Manufacture of Snacks, Namkeen, Papads and Potato products-EIRI.

Norman.N.Potter.Food Science.CBS publishers and distributors,New Delhi.

Joshi and Pandey. Biotechnology: Food Fermentation, Volume-II. Educational Publishing and Distributing Co.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**FRUIT AND VEGETABLE PROCESSING PRACTICAL**

**Credits 1**

**Teaching Hours 2**

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**List of Experiments**

1. Canning of Fruits and Vegetables
2. Preparation of Jams
3. Preparation of Jelly and Marmalade
4. Preparation of Preserves, Candies and Crystallized Fruits
5. Preparation of Chutneys
6. Preparation of Pickles
7. Preparation of Sauces, Ketchups
8. Preparation of Fruit Squashes, Fruit Juices and RTS
9. Preparation of Fruit nectar, Cordial and Crush
10. Preparation of Fruit cheese and Toffee
11. Dehydration of Fruits and Vegetables
12. Dehydration of leafy vegetables and Soup Powders
13. Visit to Fruit and Vegetable Processing Industry



**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER-IV EXTRUSION TECHNOLOGY**

**Credits 4**

**Teaching Hours 4**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce the student about classification of extruders	By the end of the course, student will be known about processing methods for snacks
To impart knowledge on processing of extruded snacks	Student will be able to identify sensory parameters for extruded products
To impart knowledge on concepts of extruded products processing	Student will be able to understand processing importance of extruded snacks

**Unit -1**

Extrusion: definition, introduction to extruders and their principles, types of extruders. Extruders in the food industry: History and uses of extruders in the food industry. Single screw extruder: principle of working, net flow, factors affecting extrusion process, co-kneaders. Twin screw extruder: counter rotating and co-rotating twin screw extruder

**Unit-2**

Process characteristics of the twin screw extruder : feeding, screw design, screw speed, screw configurations, die design. Twin screw extruder: Barrel temperature and heat transfer, adiabatic operation, heat transfer operations and energy balances Problems associated with twin screw extruder Pre-conditioning of raw materials used in extrusion process, Pre-conditioning operations and benefits of pre-conditioning and devolatilization

**Unit-3**

Interpreted-flight expanders - extruders, dry extruders. Chemical and nutritional changes in food during extrusion Practical considerations in extrusion processing: pre-extrusion processes, cooker extruder Profiling Practical considerations in extrusion processing: Addition and subtraction of materials, shaping and forming at the die, post extrusion processes. Break fast cereals: introduction, type of cooking - High shear cooking process, steam cookers, low shear, low pressure cookers and continuous steam pre-cooking, available brands

**Unit-4**

Breakfast cereal processes: traditional and extrusion methods, classification of break fast cereals - flaked cereals, oven puffed cereals, gun puffed cereals, shredded products. Texturized vegetable protein: Definition, processing techniques, and foods. Snack food extrusion: Direct expanded (DX) and third generation (3G) Snacks: types, available brands, co- extruded snacks and indirect-expanded products

## **Unit-5**

Study of factors affecting extrusion cooking – moisture content, diameter, temperature, pressure, screw speed, time. Study of factors affecting extrusion cooking – moisture content, diameter, temperature, pressure, screw speed, time. Quality evaluation of extruded products

### **Textbooks for Reference**

Srilakshmi B. Food Science. 2nd Edn. New Age International (P) Ltd Publishers, New Delhi.

Subbulakshmi G and Shobha A. Udipi. Food Processing and Preservation. New Age International(P) Ltd Publishers, New Delhi.

Swaminathan M. Food Science, Chemistry and Experimental Foods. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER – IV ON JOB TRAINING – IV**

**Credits 1**

**Teaching Hours 2**

<b>OBJECTIVES</b>	<b>LEARNING OUTCOMES</b>
To Introduce about the basic metabolic rates and malnutrition concepts	By the end of the course, student will be known about energy values in foods
To impart knowledge on biochemical parameters in foods	Student will be able to assess different biochemical parameters in foods
To impart knowledge Amino acids, Lipids and Enzymes.	Student will be able to identify biochemical parameters for foods

On Job Training provides students adequate experience in planning and managing an enterprise in totality starting from procurement of raw material to processing, production, packaging and storage of products, organizing resources and utilities, sale of products, maintain accounts and analyze profits. Finally, students will present their work along with a report of their performance. The Report should

contain following. Developing a Business Plan/ Project Proposal I Identification of the product to be manufactured ii Market Survey iii Analysis of the existing status of the identified product and targeted market and customer iv Innovativeness and Creativity v Preparation of the project proposal with supply chain of inputs, personnel plan, production plan, finance plan, etc. and its preparation Plan for the Production i Organization of resources ii Organizing utility iii Sequential grouping of activities iv Packaging and storage v Product pricing – physical inputs, man-hours, depreciation, etc. vi Time management Production i Regularity in production ii Adhering to production plan iii Product quality assessment iv Maintenance of production records v Team work Sales i Sales strategy ii Sales volumes iii Assessment of sales performance iv Profit generated including C/B ratio, payback period, etc. Documentation and Report Presentation & Evaluation ii Personnel Management ii Preparation of final report & Oral performance

## 5. Model Question Paper (Sem-end, Exam)

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER-II FUNDAMENTALS OF FOOD MICROBIOLOGY**

Time: 3 Hours

Maximum: 75 Marks

### SECTION – A

**Answer any FIVE questions. Each question carries equal marks. (5X5 =25)**

1. Draw a neat sketch of Bacterial Growth Curve and explain in detail.
2. Write about Cultivation of Bacteria.
3. Write about Morphology of Yeasts.
4. How do you control Microbial Action in food by using chemical agents?
5. Write about Microbial Spoilage of Milk during handling and processing.
6. Explain Types of Freezing in detail.
7. Write about Methods of Food Preservation.
8. Write about Preservation of Foods at low temperature

### SECTION – B

**Answer all the questions. Each question carries TEN marks (5X10 =50)**

9. a) Write in detail about Extrinsic and Intrinsic that effect the growth of Microbes.  
(OR)  
b) Write about usage of Microbes in Food Biotechnology.
10. a) Write about Microbial Spoilage pattern of Vegetables and Poultry.  
(OR)  
b) Write about Microbial Spoilage pattern of Cereals, Pulses and Oilseeds
11. a) What is meant by Food Preservation? What are different methods for preserving foods?  
(OR)  
b) Explain Freezing of Foods in detail.
12. a) Define Bacteria. Write about Nutritional Requirement and Classification of Bacteria.  
(OR)  
b) Write in detail about Important Micro-organisms associated with foods.
13. a) Write about Microbial Food Spoilage in detail.  
(OR)  
b) Explain in detail about Yeast, Bacteria and Mould that invade foods during storage.

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**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER- II FUNDAMENTALS OF FOOD MICROBIOLOGY**  
**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**I. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

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**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER-I FUNDAMENTALS OF FOOD CHEMISTRY**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Write about different Biochemical Changes that occur during food processing.
2. Give the Classification of Carbohydrates with examples.
3. Explain in detail about Proximate Composition of foods
4. Write a note on Manufacturing of Fats.
5. Write about different Tests for Rancidity.
6. Define colloids. Explain about Protective Colloids and Gold Number.
7. Explain in detail about AOAC.
8. Write a short note on Anti-oxidants.

**SECTION – B**

**Answer all the questions. Each question carries TEN marks (5X10 =50)**

9. a) Write in detail about Food Gels.  
(OR)  
b) Write about Food Emulsions in detail.
10. a) Write about Food Colloids.  
(OR)  
b) Explain about Moisture Sorption Isotherms in Foods.
11. a) Define Carbohydrates. Write about Properties of Carbohydrates.  
(OR)  
b) Write about Applications of Stabilizers and Thickeners in foods
12. a) Explain in detail about Lipids  
(OR)  
b) Write about Anti-nutritional factors in foods.
13. a) Explain Deterioration of fats in detail.  
(OR)  
b) Write about Applications of Enzymes in food industry.

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**I Year Semester – I**  
**PAPER- I FUNDAMENTALS OF FOOD CHEMISTRY**  
**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**II. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester – I**  
**PAPER-III FOOD PRODUCTION TRENDS AND HUMAN NUTRITION**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 =25)**

1. Write about Post Harvest losses in foods.
2. What is the Scope for Expansion of Indian Food Industry?
3. Write about Classification of Foods.
4. Explain in detail about Food laws and Factors effecting Food Laws.
5. Write about World Food Day and its importance.
6. Explain different National and International Projects related to Food Industry.
7. Write about Reasons for Slow growth of Food Industry.
8. Write about Classification of Food Crops.

**SECTION – B**

**Answer all the questions. Each question carries TEN marks (5X10 =50)**

9. a) Write in detail about Scope, Future Priorities and Interdependence of Indian Food Processing Industry.

**(OR)**

b) Write about the Status of Food Processing Industries in India and Abroad

10. a) Explain the Status of Dairy sector in India.

**(OR)**

b) Explain the Status of Beverage and Snack Food Industry in India

11. a) Explain MOFPI

**(OR)**

b) Write about APEDA

12. a) Write about Convenience Foods in detail.

**(OR)**

b) Explain Functional Foods in detail.

13 a) What are different Developmental Programmes and Strategies adopted to eliminate food losses?

**(OR)**

b) Write about Global Demand for Food. Write about Scope for Future Expansion of Food Industry in India and Abroad



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**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**I Year Semester - I**  
**PAPER - IV ON JOB TRAINING-1**

**Total Marks: 50 Marks**

<b>Components for Evaluation</b>	<b>Maximum Marks</b>
Market survey	10
Documentation	10
Processing and marketing	10
Industrial Visits	10
Seminar	10

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**2020-21 Admitted Batch**  
**I Year Semester – II**  
**PAPER – I FOOD MICROBIOLOGY**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Write about chemical changes that occur in foods due to microbial action.
2. Write a note on TDT.
3. Write about IM Foods.
4. Discuss pasteurization of foods.
5. Differentiate CA and MA storage.
6. Explain different flavour defects in milk.
7. Write a short note on food preservation by radiation.
8. Discuss Microbial spoilage of Bread.

**SECTION – B**

**Answer all the questions. Each question carries TEN marks (5X10 =50)**

9. a) Write in detail about Microbiology of Cereal Products.  
(OR)  
b) Discuss CA and MA storage for foods.
10. a) Write a note on Microbiology of Meat & Meat Products.  
(OR)  
b) Explain about Microbiology of Fish and fish products
11. a) Discuss Microbiology of canned foods.  
(OR)  
b) Write about Microbiology of Sugar and related foods.
12. a) Write about Microbiology of Milk and Cream.  
(OR)  
b) Explain HPP and Pascalization
13. a) Write about Preservation of foods by High temperature.  
(OR)  
b).Discuss Preservation by Food additives in detail

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**I Year Semester – II**  
**PAPER – I FOOD MICROBIOLOGY**  
**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**I. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

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**I Year Semester – II**  
**PAPER- II FOOD CHEMISTRY OF MACRO NUTRIENTS**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Write about Food Sols
2. Discuss Gelatinization of Starch
3. Write about Plant proteins.
4. Explain Auto Oxidation of Foods
5. Write about Carbohydrates
6. Explain Refining process of oils.
7. Write about chemical properties of fats.
8. Write about Foam formation and structure.

**SECTION – B**

**Answer all the questions. Each question carries TEN marks (5X10 =50)**

9. a) Write in detail about Milk and Egg proteins  
(OR)  
b) Classify Edible fats and Exemplify them.
10. a) Discuss frying technology of edible fats and oils.  
(OR)  
b) Write about proteases and lipases.
11. a) What are different Tests for assessing quality of Frying oils  
(OR)  
b) Write a note on Applications of Enzymes in Food industry
12. a) Write about Chemical and Physical aspects of Lipids  
(OR)  
b) Discuss Chemical reactions that occur in foods during processing.
13. a) What are Humectants? What is their Role in Food Preservation?  
(OR)  
b) What is Rancidity? Write about its Detection Techniques in Foods

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**I Year Semester – II**  
**PAPER – II FOOD CHEMISTRY OF MACRO NUTRIENTS**  
**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**I. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

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**2020-21 Admitted Batch**  
**I Year Semester – II**  
**PAPER- III PRINCIPLES OF FOOD PRESERVATION**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Write about types of food spoilage.
2. Write about blanching and sterilization of foods.
3. Write about Canning of Foods.
4. Explain in detail about Fluidized bed dryer.
5. Write about Class I Preservatives.
6. Explain HPP.
7. Write about Infra Red heating.
8. Write about Irradiation.

**SECTION – B**

**Answer all the questions. Each question carries TEN marks (5X10 =50)**

9. a) Write in detail about preservation by Thermal processing.  
(OR)
- b) Write about Dehydration of foods.
10. a) Explain Class –I and Class – II preservatives.  
(OR)
- b) Explain Drying and Dehydration Phenomenon in foods.
11. a) Explain MOFPI.  
(OR)
- b) Write about APEDA.
12. a) Write about PEF and HPP Processing of Foods  
(OR)
- b) Explain different steps in Canning of Foods
13. a) Write about Dielectric heating and ohmic heating in detail.  
(OR)
- b) Write about different changes seen in foods during

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**I Year Semester - II**  
**PAPER – III ON JOB TRAINING-2**

**Maximum: 50 Marks**

<b>Components for Evaluation</b>	<b>Maximum Marks</b>
Market survey	10
Documentation	10
Processing and marketing	10
Industrial Visits	10
Seminar	10

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**II Year Semester – III**  
**PAPER -1 FOOD PROCESSING EQUIPMENT**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Write about chain conveyor
2. Write about pneumatic conveyor
3. Write about elevators.
4. Explain in detail about limitations of conveyors.
5. Write about Rittingers law.
6. Explain about Bonds law.
7. Write about Hygiene practices in industries.
8. Write about evaporators.

**SECTION – B**

**Answer all the questions. Each question carries TEN marks (5X10 =50)**

9. a) Write in detail about types of evaporators.  
(OR)
- b) Write about Elevators and their types
10. a) Explain about hysteresis and drying curves.  
(OR)
- b) Explain about thermal destruction of micro organisms
11. a) Explain about falling rate period and constant periods  
(OR)
- b) Write about physical properties of grains.
12. a) Write about equipment for centrifugation and filtration  
(OR)
- b) Explain about blanching and pasteurization
13. a) Write about hygienic design principles for processing equipment  
(OR)
- b) Write about ball mill and hammer mill and their designing principles



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**2020-21 Admitted Batch**  
**II Year Semester – III**  
**PAPER -I FOOD PROCESSING EQUIPMENT PRACTICAL**

**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**II. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

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**2020-21 Admitted Batch**  
**II Year Semester – III**  
**PAPER –II TECHNIQUES IN FOOD ANALYSIS**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Why food analysis is important in food industries?
2. Write about sampling techniques
3. Write about principle of spectrophotometer
4. Explain in detail about polarimeter
5. Write about Ashing methods.
6. Explain about gas chromatography.
7. Write about peroxide values
8. Give the list of lipid analysis techniques

**SECTION – B**

**Answer All the questions. Each question carries TEN marks (5X10 = 50)**

9. a) Write in detail about chromatographic techniques  
(OR)  
b) Write about methods of analysis of lipids
10. a) Explain about carbohydrates analysis  
(OR)  
b) Explain about gravimetric methods for analysis
11. a) Explain about calorimetric methods  
(OR)  
b) Write about Irradiation.
12. a) Write about U V visible spectrophotometer  
(OR)  
b) Explain about Protein characterization
13. a) Write about methods of protein analysis  
(OR)  
b) Write about Analysis of Minerals

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**2020-21 Admitted Batch**  
**II Year Semester – III**  
**PAPER -II TECHNIQUES IN FOOD ANALYSIS PRACTICAL**  
**(MODEL PAPER)**

**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**III. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – III**  
**PAPER –III FOOD ADDITIVES**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Define Food Additives. What is the role of Food additives in Food Processing
2. Write a short note on GRAS.
3. Write about Chelating agents
4. Explain in detail about Nutritive Sweeteners.
5. Write about Clarifying Agents
6. Explain mode of action of Surfactants in foods.
7. List out different Food Additives
8. Write about Alkalis used in Food processing.

**SECTION – B**

**Answer All the questions. Each question carries TEN marks (5X10 = 50)**

9. a) Write in detail about Flavouring Agents used in Food Processing  
(OR)  
b) Write about Humectants.
10. a) Discuss Sweeteners used in Food Industries.  
(OR)  
b) Discuss Food Colours
11. a) Explain Starch modifiers  
(OR)  
b) Write a note on Antioxidants
12. a) Write about Chemical Preservatives used in Foods  
(OR)  
b) Explain different Food additives along with their EU numbers.
13. a) Classify Food Additives.  
(OR)  
b) What is the Role of Food Additives in Processing

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**II Year Semester – III**  
**PAPER –IV ON JOB TRAINING -III**  
**(MODEL PAPER)**

**Total Marks: 50 Marks**

<b>Components for Evaluation</b>	<b>Maximum Marks</b>
Market survey	10
Documentation	10
Processing and marketing	10
Industrial Visits	10
Seminar	10

**ADIKAVI NANNAYA UNIVERSITY**  
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**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER –I FOOD CHEMISTRY OF MICRO NUTRIENTS**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Define Micronutrients
2. Exemplify sulphur containing volatiles
3. What are flavor volatiles?
4. Exemplify carotenoids
5. What are chlorophyllides
6. Define Anthocyanins.
7. Exemplify Food Enzymes
8. What are the different types of enzymes used in baking?

**SECTION – B**

**Answer All the questions. Each question carries TEN marks (5X10 = 50)**

9. a) Classify Micronutrients and give food sources  
(OR)
- b) Write in detail about flavours and flavor enhancers.
10. a) Classify pigments. Explain about anthocyanins  
(OR)
- b) Explain in detail about betalains and carotenoids
11. a) Write about alteration of chlorophyll during processing  
(OR)
- b) Give the occurrence and distribution of carotenoids
12. a) Classify anthocyanins and explain in detail  
(OR)
- b) Classify Vitamins and Give the food sources
13. a) Classify Minerals and Give the food sources  
(OR)
- b) Write about enzymes used in food processing

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**II Year Semester – IV**  
**PAPER –I FOOD CHEMISTRY OF MICRO NUTRIENTS**  
**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**IV. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

**ADIKAVI NANNAYA UNIVERSITY**  
**Bachelor of Vocation: Food Technology**  
**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER –II MILK AND MILK PRODUCTS PROCESSING**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Define Milk. Give its composition
2. Give standards for different types of milk
3. Give methods of pasteurization in detail
4. What are flavor defects in milk?
5. Give centrifugal method of cream production.
6. What are fermented milks? Exemplify them
7. Give processing flowchart for Ice Cream
8. Give FSSAI Standards for khoa based sweets

**SECTION – B**

**Answer All the questions. Each question carries TEN marks (5X10 = 50)**

9. a) Give manufacturing procedures and defects in Ice-cream  
(OR)  
b) Give manufacturing procedures and defects in Khoa based sweets
10. a) Classify by products of dairy industry  
(OR)  
b) Give manufacturing procedure for casein
11. a) Give manufacturing procedures and defects in cheese  
(OR)  
b) Give manufacturing procedures and defects in cream
12. a) What is butter oil? Write its manufacturing process.  
(OR)  
b) Give theories of churning in butter
13. a) Define standardization. Give methods of pasteurization.  
(OR)  
b) What is Homogenization? Give flowchart for manufacturing Homogenized milk.



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**II Year Semester – IV**  
**PAPER –II MILK AND MILK PRODUCTS PROCESSING**  
**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**I. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

**ADIKAVI NANNAYA UNIVERSITY**  
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**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER –III FRUIT AND VEGETABLE PROCESSING**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. What is the difference between drying and dehydration?
2. Define Hurdle concept.
3. Define glazed fruits.
4. Give flowchart for crystallized fruits
5. Give flowchart for sauerkraut manufacturing.
6. Give processing flowchart for sauces
7. Explain Orleans slow process.
8. Write about equipment required to process papads.

**SECTION – B**

**Answer All the questions. Each question carries TEN marks (5X10 = 50)**

9. a) Give manufacturing process and defects in Jam?  
(OR)  
b) Give manufacturing process and defects in Jelly?
10. a) Give manufacturing process and defects in fermented fruit beverages?  
(OR)  
b) Write about unit operations involved in fruit beverage processing
11. a) Give manufacturing process and defects in sauces and ketchups?  
(OR)  
b) Give manufacturing process and defects in Glazed and Crystallized fruits?
12. a) Give manufacturing process and defects in chutneys and Pickles?  
(OR)  
b) Write about theories of pectin and vinegar manufacturing.
13. a) What are principles of preservation? Define irradiation.  
(OR)  
b) What is concentration? Give methods of manufacturing for concentration.

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**II Year Semester – IV**  
**PAPER –III FRUIT AND VEGETABLE PROCESSING**  
**PRACTICAL QUESTION PAPER**

**Time: 3 Hours**

**Maximum: 50 Marks**

**SECTION A**

**I. Major Experiment – 40 M**

Procedure – 10M

Ingredients – 5 M

Records – 5M

Processing -5M

Result and Inference-10M

Viva voice-5M

**II Minor Experiment – 10 M**

**Total Marks: 50 Marks**

**ADIKAVI NANNAYA UNIVERSITY**  
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**2020-21 Admitted Batch**  
**II Year Semester – IV**  
**PAPER –IV EXTRUSION TECHNOLOGY**  
**(MODEL PAPER)**

Time: 3 Hours

Maximum: 75 Marks

**SECTION – A**

**Answer any FIVE questions. Each question carries equal marks. (5X5 = 25)**

1. Define Extrusion and give types of extruders
2. What are Co- kneaders?
3. Give principle for twin screw extruder.
4. What are breakfast cereals? Exemplify them.
5. Write about pre extrusion process.
6. Classify breakfast cereals
7. What are 3G snacks?
8. Write about snack food Extrusion.

**SECTION – B**

**Answer All the questions. Each question carries TEN marks (5X10 = 50)**

9. a) What is extrusion. Give design of Twin screw extruder  
**(OR)**  
b) Write about nutritional changes in extruded products
10. a) Describe High shear Cooking Process.  
**(OR)**  
b) What is TVP. Give its manufacturing process.
11. a) What are DX and 3G snacks. Give their manufacturing process  
**(OR)**  
b) What are the factors effecting extrusion cooking?
12. a) Write about Quality evaluation of extruded products  
**(OR)**  
b) Write about pre conditioning of raw materials used in extrusion process
13. a) Write about history and uses of extruders in food Industry  
**(OR)**  
b) Write about manufacturing process of breakfast cereals

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**II Year Semester – IV**  
**PAPER –IV ON JOB TRAINING -IV**  
**(MODEL PAPER)**

**Total Marks: 50 Marks**

<b>Components for Evaluation</b>	<b>Maximum Marks</b>
Market survey	10
Documentation	10
Processing and marketing	10
Industrial Visits	10
Seminar	10