

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for

IIIrd Semester Diploma in Food Processing and Preservation (Effective from Session 2022-23 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION- SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam. (ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Crop Processing Technology	2049301	03	03	10	20	70	100	28	40	03
2.	Technology of food preservation	2049302	03	03	10	20	70	100	28	40	03
3.	Post-harvest management of fruits and vegetables	2049303	03	03	10	20	70	100	28	40	03
4.	Food and nutrition	2049304	03	03	10	20	70	100	28	40	03
5.	Food additives	2049305	03	03	10	20	70	100	28	40	03
			Total: -15				=	500			15

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal (PA) A	External (ESE) B			
6.	Food and nutrition (lab)	2049306	04 50% physical 50% Virtual	03	15	35	50	20	02
7.	Post harvest management of fruits and vegetables (lab)	2049307	04 50% physical 50% Virtual	03	15	35	50	20	02
8.	Crop Processing Technology (lab)	2049308	04 50% physical 50% Virtual	03	15	35	50	20	02
9.	Food Chemistry Practical	2049309	02 50% physical 50% Virtual	03	07	18	25	10	01
			Total: - 14				175		07

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal (PA) X	Marks of External ESE	Total Marks (X+Y)	Pass Marks in the Subject	Credits
10.	Python / Others(T.W.)	2000310	02	07	18	25	10	01
11.	Food Additively (T.W.)	2049311	02	15	35	50	20	01
			Total: - 04			75		02
Total Periods per week Each of duration One Hour			33	Total Marks = 750				24

CROP PROCESSING TECHNOLOGY

SUBJECT CODE 2049301	Theory			No. of period in one session:42			Credits
	No. of Periods per Week			Full Marks:	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	T . A	:	10	
				C . T	:	20	

RATIONALE:

This subject will allow students to develop understanding of the basic concepts of drying principles and theory, Milling of rice, wheat, pulses, oil seeds.

COURSE OBJECTIVE:

At the end of the course the student will be able to :

1. Understand drying principles
2. Perform Milling of rice, wheat, pulses, oil seeds.
3. Recognize the equipment/Instruments used.
4. Perform Operations on above.

COURSE OUTCOME:

After completion of the course, the students will be able to:

1. Know the drying principles and theory.
2. Understand various types of separators, screens, sieve.
3. Analyze thin layer and deep bed drying.
4. Perform operations for milling of rice, pulses, oil seeds.

Contents: Theory		Hrs	Marks
UNIT 1	Cleaning and grading, aspiration, scalping, size separators, screens, sieve analysis, capacity and effectiveness of screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, Colour sorters, cyclone, shape graders.	[10]	
UNIT 2	Drying principles and theory, Thin layer and deep bed drying analysis, Falling rate and constant rate drying periods, maximum and decreasing drying rate period, drying equations.	[10]	
UNIT 3	Milling of Cereals: conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment. Milling of wheat, unit operations and equipment. Milling of corn and its products, Dry and wet milling.	[10]	
UNIT 4	Milling of pulses: traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods: CFTRI and Pantnagar methods. Pulse milling machines. Milling of oil seeds: mechanical expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oil seeds, refining of oil, stabilization of rice bran.	[12]	

Book Recommended :

1. Kader A A : post harvest lechnology of horticulture crops, 2nd edition, university of California.
2. Salukha D K and Kadam S S, hand book of world food legumes, CRC press, florida.
3. Niir Borad : Modern Technology of Agro processing and Agriculture waste, Institute of India.

TECHNOLOGY OF FOOD PRESERVATION

SUBJECT CODE 2049302	Theory			No. of period in one session: 42			Credits
	No. of Periods per Week			Full Marks:	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	T. A	:	10	
			C. T	:	20		

RATIONALE:

To make students understand about the mechanism of spoilage and deterioration in foods, the basic food preservation principles and methods to preserve foods.

COURSE OBJECTIVES:

1. To study the different ways in which food spoilage occurs and the techniques to prevent it.
2. To know the different spoilage agents and the ways in which they act on food.
3. To understand the principles behind the various methods of food preservation.
4. To use these principles to preserve different types of foods.
5. To apply the method of action of different preservatives.

COURSE OUTCOME:

After completion of the course, the students will be able to:

1. Understand food processing and preservation principles and methods.
2. Compare freezing and thawing process.
3. Apply dehydration process for food preservation.
4. Use membrane processing method in food industries.

Contents: Theory		Hrs	Marks
UNIT 1	Food processing and preservation principles, method of preservation: pasteurization (definition, time-temperature combination and equipments) sterilization (definition, time-temperature combination and equipments), blanching (definition, time-temperature combination and equipments, adequacy in blanching), canning (definition, time-temperature combination and equipments), packaging (Introduction, Metal Containers, Glass Containers, Rigid Plastic Containers, Retortable Pouches).	[08]	
UNIT 2	Food Freezing and thawing process: Introduction, freezing point and freezing rate, comparison of Freezing and thawing process; freezing methods: Air freezing, plate freezing, liquid immersion freezing and cryogenic freezing. Freezer selection. Advantages and disadvantages of freezing. Freezing curve. Freezer selection, changes in food during freezing storage	[08]	
UNIT 3	Food Drying/Dehydration: Definition, free and bound moisture, concept of water activity, factors affecting drying, Drying curve (constant rate period and falling rate period), moisture content (wet basis and dry basis), equilibrium moisture	[10]	

	content, Drying methods and equipments: sun/solar drying, Cabinet drying, tunnel dryer, spray dryer, freeze dryer, fluidized bed dryer, Nutritional, physio-chemical changes during drying.		
UNIT 4	Food Concentration: Evaporation- Definition, types of evaporator (single effect, double effect and multiple effect evaporator); Freeze concentration- General principles and applications, basic elements, ice crystal nucleation, growth and crystallization, separation techniques (filtration and wash column).	[6]	
UNIT 5	Membrane Processing: General principles and advantages, dead end and cross flow, Classification of membrane system: Reverse Osmosis, Nano Filtration, Ultra Filtration, Micro Filtration, Electro dialysis and Pervaporation; Membrane technology comparison chart, Membrane application in the food industries; Membrane performance and Limitation of membrane processes.	[10]	

Book Recommended :

1. Gould, G.W.(2012), “New methods of food preservation.”
2. Manay, N.S. Shadaksharaswamy, M.(2004), “Foods-Facts and Principles”, New age international publishers, New Delhi.
3. Srilakshmi, B. (2003), “Food Science,” New age international publishers, New Delhi.

POST HARVEST MANAGEMENT OF FRUITS AND VEGETABLES

SUBJECT CODE 2049303	Theory			No. of period in one session:42			Credits
	No. of Periods per Week			Full Marks: : 100			03
	L	T	P/S	ESE	:	70	
	03	-	-	T A	:	10	
			C T	:	20		

COURSE OBJECTIVE:

1. To reduce loss in quantity or volume and the product's qualitative or nutritional value.
2. To maintain the excellent quality of the produce (colour, taste, flavour, aroma).
3. To increase the shelf life of the crops.
4. To keep the fruits and vegetables and commodities free from insects and pests.
5. To get vegetables and fruits fresh all year round.

COURSE OUTCOME:

After completion of the course, the students will be able to:

1. Know the scope of fruits and vegetables preservation in India.
2. Apply the Juice extraction and can manufacture processes.
3. Understand statutory provisions for Quality control in India.
4. Analyze advantages, disadvantages and applications of MAP.

Theory Contents		Hrs	Marks
UNIT 1	Current status of production and processing of fruits and vegetables. Scope of fruits and vegetables preservation in India: Product mix, availability of raw material, manpower, capital, lack of awareness, marketing facility, transport facility, availability of containers, publicity and role of government.	[08]	
UNIT 2	Juice extraction: juice, history of juicing, types of juices, process flow diagram for fruit juice production, juice extraction process- fruit selection, sorting, washing, juice extraction, deaeration, straining/filtration, clarification, adding of sugars, fortification, bottling, sealing and storage; methods of juice preservation, causes of juice spoilage.	[09]	
UNIT 3	Canning: Introduction, can manufacture, canning process - selection of fruits and vegetables, grading, washing, peeling, cutting, blanching, cooling, filling, exhausting, sealing, processing, cooling and storage; types of canning- pressure canning and water bath canning, common causes of spoilage in canning of foods.	[09]	
UNIT 4	Minimally processed fruits and vegetables: Modified atmosphere packaging (MAP): Introduction, gases used in MAP, role of N ₂ , O ₂ & Co ₂ , Principles of MAP, Types of MAP. Active packaging & passive packaging, factors affecting MAP, graphical representation, application of MAP, effect of MAP on shelf-life, future research needed, advantages and disadvantages; and controlled atmosphere packaging (CAP): Introduction, gases used in CAP, factors affecting CAP- Temperature control, humidity control and gas control, advantages and disadvantages.	[08]	

UNIT 5	Statutory Provisions for Quality Control in India: Prevention of Food Adulteration act, Fruit Product Order act, AGMARK act, Vegetable Oil Product order; Food Standardization and regulatory agencies in India: Central Committee for Food Standards, Central and state food departments, State Food Laboratories / Food and Drug Administration, Bureau of Indian Standards, Food Corporation of India, Army Supply Corps and Central Insecticide Board.	[08]	
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FOOD AND NUTRITION

SUBJECT CODE 2049304	Theory			No. of period in one session:42			Credits
	No. of Periods per Week			Full Marks:	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	T . A	:	10	
				C . T	:	20	

COURSE OBJECTIVES:

1. To define nutrition, nutrients, RDA.
2. To classify macro nutrients various parameter.
3. To find deficiency & excess of macro nutrients.
4. To identify Macro & micro nutrients.

COURSE OUTCOME:

After completion of the course, the students will be able to:

1. Differentiate between macro and micro nutrients.
2. Know the functions, RDA, Composition, deficiency, sources of water and fibre.
3. Recognize vitamins, minerals, carbohydrates, proteins fats in micro and macro nutrients.

Theory contents		Hrs.	Marks
UNIT 1	Introduction to Food and Nutrition -Definition of nutrition, nutrients, RDA -Classification of nutrients (Macro, Micro)	[10]	
UNIT 2	Macro nutrients (Carbohydrates, Proteins, fats) -Classification, Sources -Functions, RDA -Deficiency, excess	[10]	
UNIT 3	Micro nutrients (Vitamins, Minerals) -Classification, Sources -Functions, RDA -Deficiency, excess	[12]	
UNIT 4	Water and Fibre -Composition, Sources, Classification -Functions, RDA -Deficiency, excess	[10]	

Text Books / References :

1. Lehninger, Nelson & Cox, Principle of Biochemistry, CBS Publication.
2. Hames Nutrition and dietetics by Rose.
3. Voet & Voet, Fundamentals of Biochemistry, John Wiley & Sons.

FOOD ADDITIVES

SUBJECT CODE 2049305	Theory			No. of period in one session:42			Credits
	No. of Periods per Week			Full Marks:	:	100	
	L	T	P/S	ESE	:	70	
	03	-	-	T . A	:	10	
			C . T	:	20		03

COURSE OBJECTIVES:

1. To provide theoretical knowledge on the definition of food additives, and their role in the food industry in the context of current food regulations; current national and international regulations on food additives; functional classification and safety assessment of food additives.
2. To develop the scientific approach and critical thinking and communication skills required for the assessment of the impacts of food additive applications on health, food safety and quality and the current issues related to food additives.

COURSE OUTCOME:

After completion of the course, the students will be able to:

1. Differentiate between additives and adulterants.
2. Use Acid, Base, Buffer systems, Salts and Chelating agents.
3. Know antioxidants, Emulsifying and stabilizing agents.
4. Know colours and flavours and their stability during food processing.

	Theory contents	Hrs.	Marks
UNIT 1	Definitions of Food Additives, Classification and Functions, Legitimate uses of Additives in foods, Intentional & Non Intentional additives, Indirect food additives; Difference between Additives & Adulterants, Food uses and functions in formulations; Toxicological evaluation of food additives.	[09]	
UNIT 2	Uses & functions of: Acid, Base, Buffer systems, Salts and Chelating/Sequestering agents, Masticatory substances. Low calorie and non nutritive sweeteners, Polyols.	[08]	
UNIT 3	Antioxidants, Emulsifying and stabilizing agents, Anti-caking agents, Thickeners, Firming agents. Flour bleaching agents and Bread improvers.	[10]	
UNIT 4	Anti microbial agents / Class I and Class II preservatives as per PFA Act. Clarifying agents, Gases and Propellants. Tracers and other additives.	[07]	
UNIT 5	Colours and Flavours (synthetic and natural) Types of flavours, Flavours generated during processing – reaction flavours, Stability of flavours during food processing, flavor emulsions; essential oils and oleoresins.	[08]	

Books Recommended: -

FOOD AND NUTRITION (LAB)

SUBJECT CODE : 2049306	Practical			No. of period in one session: 56			Credits 02	
	No. of Periods per Week			Full Marks:				: 50
	L	T	P/S	Internal (PA)				: 15
	-	-	04	External (ESE)				: 35

COURSE OBJECTIVES:

1. To acquaint with process to prepare high carbohydrate product form cereals.
2. To understand process to prepare high protein product animal source.
3. To calculate nutritive value of high fibre products, high fat products and high protein produces.

PRACTICAL OUTCOMES:

After completion of the course, the students will be able to:

1. Understand the process for preparation of high fiber products, high fat products, Iron Rice produces.
2. Calculate the nutritive value of food, high carbohydrate product, high fibre product high protein product, Low fat product, high fat product and Iron rich product.

CONTENTS: Practical		Hrs	Ma rks
Experiment-1	Preparation of list of nutrient rich food sources (carbohydrates, proteins, fats)	[04]	
Experiment-2	Calculation of nutritive value of food	[06]	
Experiment-3	Preparation of high carbohydrate product from cereals with calculation of nutritive value	[06]	
Experiment-4	Preparation of high fiber products with calculation of nutritive value	[08]	
Experiment-5	Preparation of high protein product from plant source with calculation of nutritive value	[06]	
Experiment-6	Preparation of high protein product from animal source with calculation of nutritive value	[06]	
Experiment-7	Preparation of high fat product with calculation of nutritive value	[08]	
Experiment-8	Preparation of low fat product with calculation of nutritive value	[06]	
Experiment-9	Preparation of iron rich product with calculation of nutritive value	[06]	

POST HARVEST MANAGEMENT OF FRUITS AND VEGETABLES (LAB)

SUBJECT CODE: 2049307	Practical			No. of period in one session: 50			Credits 02
	No. of Periods per Week			Full Marks:			
	L	T	P/S	Internal (PA)			
	-	-	04	External (ESE)			

COURSE OBJECTIVES:

1. To study the process to canning.
2. To understand the process of MAP.
3. To know the process of CAP.
4. To perform juice extraction in laboratory.

COURSE OUTCOME:

After completion of the course, the students will be able to:

1. Study the process of canning from different types of fruits and vegetables.
2. Understand the proves of MAP.
3. Prepare list of gases used in MAP, Role of N₂, O₂, and Co₂ in MAP.
4. Know the process of CAP.
5. Perform juice extraction in laboratory.

CONTENTS: PRACTICAL		Hrs.	Marks
Experiment-1	Perform experiment for juice extraction from different types of fruits and vegetables.	[10]	
Experiment-2	Study the process of canning from different types of fruits and vegetables.	[08]	
Experiment-3	Study the process of MAP (Modified Atmosphere Packaging) & list the gases used in MAP, role of N ₂ , O ₂ , and Co ₂ in MAP.	[08]	
Experiment-4	Study the process of CAP (Controlled Atmosphere Packaging)	[08]	
Experiment-5	Visit of related Industry.	[16]	

CROP PROCESSING TECHNOLOGY (LAB)

SUBJECT CODE: 2049308	Practical			No. of periods in one session: 50			Credits
	No. of periods per week			Full Marks	:	50	02
	L	T	P/S	Internal(PA)	:	15	
			04	External (ESE)	:	35	

COURSE OBJECTIVES:

1. To identify crops for seed quality, germination, viability and vigor.
2. To estimate agro-input requirement and their Field application.
3. To perform chemical analysis of plant for macro and micro nutrients.
4. To calibrate and evaluate crop model.

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. To identify crops for seed quality, germination, viability and vigor.
2. To estimate agro-input requirement and their Field application.
3. To perform chemical analysis of plant for macro and micro nutrients.
4. To calibrate and evaluate crop model.

CONTENTS: Practical		<u>Hrs.</u>	<u>Marks</u>
Experment-1	Identification of crops; Seed quality, germination, viability and vigor.	[10]	
Experment-2	Estimation of agro-input requirement and their field application; Plantation techniques and raising of field crops.	[10]	
Experment-3	Biometrics Observations: growth, leaf area index, yield attributes and yield estimation.	[10]	
Experment-4	Chemical analysis of plant for macro and micro nutrients.	[10]	
Experment-5	Crop quality testing. Field experimental design; Field visit; Calibration and evaluation of crop model.	[10]	

FOOD CHEMISTRY PRACTICAL

SUBJECT CODE: 2049309	Practical			No. of period in one session: 28			Credits
	No. of Periods per Week			Full Marks:	:	25	01
	L	T	P/S	Internal (PA)	:	07	
	-	-	02	External (ESE)	:	18	

RATIONALE:

The student should be knowledgeable about chemistry and the different types of food.

COURSE OBJECTIVES:

1. The Student will be able to know the chemical constituents of food, their inter actions during cooking, and evaluation of taste characteristics of food.
2. The student will be able to relate the metabolic pathways of macronutrients to function in the body.

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Prepare primary and secondary solutions.
2. Determine gelatinization temp range of different starches.
3. Calculate moisture, protein, ash, crude fat in food. Sample.
4. Determine smoke part, acidity and PH in food sample.

CONTENTS: PRACTICAL		<u>Hrs.</u>	<u>Marks</u>
Experiment-1	Preparation of primary and secondary solutions.	[02]	
Experiment-2	Determination of gelatinization temperature range(GTR) of different starches and effect of additives on GTR.	[02]	
Experiment-3	Determination of Moisture in food sample.	[02]	
Experiment-4	Determination of Protein in food sample.	[02]	
Experiment-5	Determination of Ash in food sample.	[02]	
Experiment-6	Determination of Crude Fat in food sample.	[03]	
Experiment-7	Determination of Acidity and pH in food sample/beverages.	[03]	
Experiment-8	Determination of total, non-reducing and reducing sugars.	[03]	
Experiment-9	Determination of refractive index and specific gravity of fat sand oils.	[03]	
Experiment-10	Determination of smoke point and percent fat absorption for different fat and oils.	[03]	
Experiment-11	Determination of Vitamin C in food sample Estimation of saponification value.	[03]	

Books Recommended :

PYTHON / OTHERS –TW

Subject Code 2000310	Term Work			No. of period in one session:28			Credits 01		
	No. of Periods Per Week			Full Marks				: 25	
	L	T	P/S	Internal					: 07
	—	—	02	External					

COURSE OBJECTIVES:

1. To write different python programs for adding, multiplying matrices.
2. To understand python programs to Extract Unique values, dictionary values.
3. To demonstrate basic data type in python.

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. To write different python programs for adding, multiplying matrices.
2. To understand python programs to extract Unique values, dictionary values.
3. To demonstrate basic data type in python.

CONTENTS		Hrs.	Marks
Experiment-1	Write a program to demonstrate basic data type in python.	[02]	
Experiment-2	Write a program to compute distance between two point staking input from the user (Pythagorean Theorem)	[02]	
Experiment-3	Write a python program Using a for loop: write a program that prints out the decimal equivalent of $1+\frac{1}{2}+\frac{1}{3}+\dots+\frac{1}{n}$	[02]	
Experiment-4	Write a Python program to find first n prime numbers. Write a program to demonstrate list and tuple in python.	[04]	
Experiment-5	Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number and prints a count down from that number to zero.	[04]	
Experiment-6	Write a Python Program to add matrices. Write a Python program to multiply matrices.	[04]	
Experiment-7	Write a Python program to check that fast ring is palindro me or not.	[02]	
Experiment-8	Write a Python program to Extract Unique values, dictionary values	[02]	
Experiment-9	Write a Python program to read file word by word Write a Python program to Get number of characters, words.	[04]	
Experiment-10	Write a Python program for Linear Search	[02]	

FOOD ADDITIVELY (T.W.)

SUBJECT CODE: 2049311	Term Work			No. of period in one session: 28			Credits 01			
	No. of Periods per Week			Full Marks:				50		
	L	T	P/S	Internal (PA)					:	15
	-	-	02	External (ESE)					:	35

COURSE OBJECTIVES:

1. To know different types of food additives.
2. To acquaint with the antimicrobial's agents, clarifying agent, gases and products.
3. To familiarize with various acid, Base, Buffer System used.

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Acquire Knowledge of different types of food additives.
2. To prepare colours and flavours for food additives.
3. Understand anti microbial agents, clarifying agents, gases and propellants.

CONTENTS : (T.W.)		Hrs.	Marks
Experiment-1	Preparation of colours (synthetic and natural) for food additives.	[04]	
Experiment-2	Preparation of flavours (synthetic and natural) for food additives.	[04]	
Experiment-3	Study of a flavors generated during processing of food additives.	[04]	
Experiment-4	Study of anti microbial agents, clarifying agents, gases and propellants.	[04]	
Experiment-5	Preparation list of Acid, Base, Buffer Systems, Salts, masticator substances and study tem.	[04]	
Experiment-6	Preparation list of food additives in foods and study them.	[04]	
Experiment-7	Prepare list of antioxidants, emulsifying and stabilizing agents and study them.	[04]	