

SCHEDULE OF WORK

FOR

**Bachelor of Food Science & Technology [Honours]
(Four Years Programme)**

(SEMESTER I – VI)

Session: (2014-15)

(Part IV)

(Annual System)

Examination: 2015

**DEPARTMENT OF FOOD SCIENCE
AND TECHNOLOGY**

**DAV COLLEGE
JALANDHAR**

Ist Semester:**Teaching Periods/Marks**

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Course code	Course title	Teaching Periods		Marks		Total
		Theory	Practical	Theory	Practical	
FST – 101	Communication Skills in English	4		35	15	50
FST – 102	Punjabi Compulsory OR Basic Punjabi (<i>Mudhli</i> Punjabi)	4	-	50	-	50
FST – 103	Crop Science	3	3	40	20	60
FST – 104	Fundamentals of Food Nutrition	3	3	50	30	80
FST – 105	Introductory Biochemistry	3	3	50	30	80
FST – 106	Principles of Food Preservation	3	3	50	30	80

IInd Semester:**Teaching Periods/Marks**

Course code	Course title	Teaching Periods		Marks		Total
		Theory	Practical	Theory	Practical	
FST – 201	Communication Skill in English	4	-	35	15	50
FST – 202	Punjabi Compulsory OR Basic Punjabi (<i>Mudhli</i> Punjabi)	4	-	50	-	50
FST – 203	Introduction to Computers	3	3	40	20	60
FST – 204	General Microbiology	3	3	50	30	80
FST – 205	Food Chemistry	3	3	50	30	80
FST – 206	Food Additives	3	3	50	30	80

**IIIrd Semester:
Teaching Periods/Marks**

Course code	Course title	Teaching Periods		Marks			Total
		Theory	Practical	Th.	Prt.	Int.	
FST – 301	Food Microbiology	3	3	40	24	16	80
FST – 302	Fluid Milk Processing	3	3	40	24	16	80
FST – 303	Processing of Meat and Meat Products	3	3	40	24	16	80
FST – 304	Post Harvest Management of Fruits and Vegetables	3	3	40	24	16	80
FST – 305	Cereal Milling and Legumes	3	3	40	24	16	80
EVS – 306*	Environmental Studies (Compulsory)	1.5	-	50			50

**IVth Semester:
Teaching Periods/Marks**

Course code	Course title	Teaching Periods		Marks			Total
		Theory	Practical	Th.	Prt.	Int.	
FST – 401	Processing of Milk Products-I	3	3	40	24	16	80
FST – 402	Egg, Poultry and Fish Technology	3	3	40	24	16	80
FST – 403	Fruits and Vegetables Processing	3	3	40	24	16	80
FST – 404	Processing of Cereals and Legumes	3	3	40	24	16	80
FST – 405	Food Plant Hygiene and Sanitation	3	3	40	24	16	80
EVS – 306*	Environmental Studies (Compulsory)	1.5	-	50			50

***Note:** Marks of EVS-306 not included in the Total Marks.

**Vth Semester (only for session 2014-15):
Teaching Periods/Marks**

Course code	Course title	Teaching Periods		Marks			Total
		Theory	Practical	Th.	Prt.	Int.	
FST – 501	Principles of Fermentation Technology	3	3	35	20	15	70
FST – 502	Food Packaging-I	3	3	35	20	15	70
FST – 503	Confectionery & Sugar Technology	3	3	35	20	15	70
FST – 504	Oil & Fat Technology – I	3	3	35	20	15	70
FST – 505	Processing of Milk Products-II	3	3	35	20	15	70

**VIth Semester (only for session 2014-15):
Teaching Periods/Marks**

Course code	Course title	Teaching Periods		Marks			Total
		Theory	Practical	Th.	Prt.	Int.	
FST – 601	Quality Assurance	3	3	35	20	15	70
FST – 602	Grain Storage	3	3	35	20	15	70
FST – 603	Food Packaging-II	3	3	35	20	15	70
FST – 604	Spices & Flavour Technology	3	3	35	20	15	70
FST – 605	Technology of Fermented Foods	3	3	35	20	15	70
FST – 606	In Plant Training 4 weeks	-	-	-	-	-	S/US

Last date for submission of Training Report: within 1 week after coming from training.

Note: All the students are required to undergo ‘In Plant Training’ for 4 weeks in a food processing unit after VIth semester’s final examinations. Final degree to the students will be awarded subject to their successfully completing the ‘In Plant Training’. In Plant Training will be evaluated as satisfactory / unsatisfactory internally by the department of the college concerned.

IVth Year:

Course Code	Course Title	Teaching Periods/Marks					
		Th.	Prt.	Th.	Prt.	Int.	Total Marks
FST – 401	Quality Assurance	3	3	50	30	20	100
FST – 402	Normal & Therapeutic Nutrition	3	3	50	30	20	100
FST – 403	Grain Storage	3	-	60	-	15	75
FST – 404	Introduction to Computer	3	3	50	30	20	100
FST – 405	Food Engineering	3	3	50	30	20	100
FST – 406	Food Fermentation	3	3	50	30	20	100
FST – 407	In Plant Training						

Note: All the students are required to undergo 'In Plant Training' for 10 weeks in a food processing unit after completing their IIIrd Year examination. Final degree to the students will be awarded subject to their successfully completing the 'In Plant Training'. In Plant Training will be evaluated as satisfactory / unsatisfactory internally by the department of the college concerned.

FST – 103 CROP SCIENCE

Theory:

JULY-SEPT

Classification of crops, Study of the following crops with particular reference to climatic and soil requirements, their improved cultural practices with special emphasis on seed bed preparation, improved varieties, rotations, seed and seed treatment, sowing, manures and fertilizers, irrigation requirements, weed control, harvesting and marketing.

Cereal crops : Paddy, Maize, Wheat

Pulses : Green gram, Black gram, Bengal gram and Soyabean.

Oilseeds : Groundnut, Sunflower and Mustard.

OCT-NOV

Vegetables : Egg plant (Brinjal), Tomato, Ladyfinger, Peas, Cauliflower, Cabbage, Carrot, Potato.

Horticultural Crops : Study of fruits with special emphasis on selection of site and soil, their cultural practices with particular reference to training, pruning, propagation methods, harvesting and fruit handling of Mango, Papaya and Kinnow.

Practicals:

JULY-SEPT

Identification of crops, vegetables and fruits studied.

Identification and composition of fertilizers and computation of doses of different fertilizers for different crops.

OCT-NOV

Identification and collection of weeds associated with crops studied.

FST-104: FUNDAMENTALS OF FOOD NUTRITION

JULY-SEPT

Definition, Scope & History of Nutrition.

Functions of Food, Food types and groups, Water Balance & Energy Balance.

Energy value of Carbohydrates, Fats & Proteins.

BMI & BMR of an individual.

Balanced diet, Protein and carbohydrate malnutrition.

Recommended daily allowances and requirement of infants, children, adults, old people, Athletes, Expectant and nursing mothers.

OCT-NOV

Diet surveys & Diet groups, Food Exchange List.

Importance of therapeutic nutrition, Deficiency diseases and disorders of metabolism.

Planning of diets for patients suffering from Ulcer, Anaemia, Diarrhoea, Diabetes, Cardiac diseases, Jaundice, Nephritis and Tuberculosis.

PRACTICALS:

JULY-SEPT

1. Identification of food sources for various nutrients.
2. Instruction to diet planning using food exchange list.
3. Calculation of BMI & BMR.
4. Evaluation of own diet.

OCT-NOV

5. Planning of diet for children, adult and old people.
6. Planning of diet for patient suffering from Ulcer, Anaemia, Diabetes, Diarrhoea and Cardiac diseases.

FST-105: INTRODUCTORY BIOCHEMISTRY

THEORY

JULY-SEPT

General introduction and importance of Biochemistry. Different nutrients of food.

Carbohydrates - Introduction, sources, classification, structure and biochemical functions, metabolic pathways (glycolysis, TCA and HMP) of carbohydrates, Lactic acid and alcoholic fermentation.

Proteins - Introduction, classification, sources, structural organisation and biochemical functions, amino acids and their importance.

Lipids - Introduction, classification, sources, structure and biochemical functions, a brief introduction to fatty acids, oxidation of fatty acids.

OCTOBER - NOVEMBER

Vitamins - Introduction, sources and biochemical functions, daily requirements & deficiency diseases of fat and water soluble vitamins.

Minerals - Introduction, classification as major and minor elements, sources, biochemical functions, daily requirements & deficiency diseases of Ca, Fe, I, P, Na, K, F & Zn.

Digestion and Absorption of carbohydrates, proteins and lipids.

PRACTICALS:

JULY TO SEPTEMBER

1. Preparation of standard solutions of acid and alkali.
2. Determination of pH using indicators and with pH meter.
3. Determination of moisture in a given sample.
4. Determination of ash in a given sample.
5. Determination of acidity in a given sample.

OCTOBER-NOVEMBER

6. Estimation of fat by soxhlet method.
7. Estimation of free fatty acid of given sample.
8. Determination of total solids in the given food product.
9. Determination of crude fibre in the given food.

FST-106 PRINCIPLES OF FOOD PRESERVATION

THEORY

JULY -SEPTEMBER

Introduction: Historical developments of food preservation. Principles of Food preservation.

Scope and benefit of food preservation. Causes of food spoilage.

Preservation by Heat: Heat resistance of microorganisms and their spores. Thermal death time,

Heat treatments – boiling, steam under pressure, pasteurization, canning, Aseptic processing.

Preservation by Low Temperature: Low temperature storage, refrigeration and freezing.

OCTOBER- NOVEMBER

Preservation By Drying: Methods Of Drying – Dehydration By Air Drying, Sun Drying And Freeze

Drying.

Preservation By Concentration Methods, Intermediate Moisture Foods.

Microwave Heating: Properties, Mechanism, Microwave Generator And Microwave Food

Application.

Preservation By Radiations: Ultraviolet And Ionizing Irradiations. Their Effect On Microorganisms, Use In The Treatment Of Food.

PRACTICALS:

JULY TO SEPTEMBER

1. Adequacy of blanching.
2. Dehydration of foods.
3. Preservation of food products by low temperature.
4. Preservation of food products by concentration method.

OCTOBER-NOVEMBER

5. Use of chemicals in preservation of foods.
6. Cut out examination of canned foods.
7. Visit to food industry.

FST-205: GENERAL MICROBIOLOGY

THEORY

JAN- FEB

Introduction : Discovery of microbial world, theory of spontaneous generation, Germ theory of disease, Koch's postulates, Pure culture concept, Nature and properties of prokaryotic and eukaryotic micro-organisms.

Microscopy: Light microscope – Resolving power, Magnification, Bright field, Dark field, Electron microscopy–Transmission Electron microscope, Scanning electron microscope.

General characteristics and Nutritional requirements: General characteristics of bacteria, yeast, mold, viruses, algae. Types of bacteria, nutritional classification of bacteria.

MARCH-APRIL

Reproduction of micro-organisms: Brief account of bacteria, yeast and mold reproduction.

Microbial Growth : Definition of growth, growth cycle, growth rate, generation time, measurement of growth, effect of environmental factors such as temperature, oxygen, moisture, salt, pH, oxidation- reduction potential and radiations on growth.

Control of Micro organisms: Control of micro organisms by physical, chemical and other chemotherapeutic agents.

PRACTICALS:

JAN-FEB

1. To study different parts of a microscope.
2. Study of instruments (autoclave, hot air oven, incubator, laminar flow, ph meter, and spectrophotometer) of microbiology laboratory.
3. Preparation of nutrient agar and macconkey's agar plates, slants and broth.
4. To study the serial dilution method.
5. To perform pour plate, spread plate and streak plate methods for isolation and enumeration of micro-organisms.

MARCH-APRIL

6. To demonstrate acid fast staining.
7. To stain the given bacteria by gram's staining method.
8. To measure the size of given micro-organisms by ocular and stage micrometer.
9. To determine the number of micro-organisms with a haemocytometer.
10. To determine the motility of bacteria by hanging drop method.

FST-205: FOOD CHEMISTRY

Theory:

JAN-FEB

Introduction- importance of food chemistry. Water in foods, structure and its properties. Water activity, free and bound moisture.

Carbohydrate: functional properties of sugars and polysaccharides in foods, chemical reactions of carbohydrates-Hydrolysis, Enolization, Mutarotation, Dehydration, Browning reactions, Gelatinization and Retrogradation of starch.

Proteins: Common food proteins, Functional properties of proteins, Denaturation, renaturation, Gelation, and Hydrolysis of proteins.

Colouring and Flavouring agents: brief introduction.

MARCH-APRIL

Lipids: physical characteristics of lipids, chemical properties of fats (hydrogenation, interesterification, oxidation-rancidity & reversion), Edible fats and oils, Tests to check purity of fats and oils, Emulsions, Lipids of biological importance like cholesterol and phospholipids, functional properties of lipids. Effect of processing on lipids and nutritional aspect of lipids.

Enzymes: Nomenclature, Definition, mechanism of enzyme action, factors affecting enzyme action, Enzyme inhibition, enzymes important in foods.

Practicals:

JAN-FEB

1. Determination of reducing sugar in the given food sample.
2. Nitrogen analysis by micro-kjeldahl method.
3. Determination of salt in food products.
4. Qualitative analysis of carbohydrates.
5. Qualitative analysis of proteins in given sample.

MARCH-APRIL

6. Qualitative analysis of lipids in the given sample.
7. Determination of food enzymes.
8. Estimation of vitamin C.

FST-206: FOOD ADDITIVES

THEORY:

JAN-FEB

Definitions, nutritional and non-nutritional food additives, uses and functions of Acid, Base, Buffer systems, Salts and chelating/sequestering agents. Low calorie and non nutritive sweeteners.

Antioxidants, Emulsifying and stabilizing agents, Anti-caking agents, Humectants, thickeners, Firming agents.

MARCH-APRIL

Flour bleaching agents and Bread improvers.

Anti microbial agents / Class I and Class II preservatives as per PFA Act., Food colour, pigments, their importance and utilization, Flavoring agents and related substances, Clarifying agents.

Practicals:

JAN-FEB

1. Description of generally recommended as safe (GRAS) food additives.
2. Spectrophotometric method for total chlorophyll.
3. Clarification of fruit juices,
4. Use of additives in bakery, fruits, vegetables, milk and meat products.

MARCH-APRIL

5. Determination of adulteration in milk, cereals, oils & fats, spices.

FST-301: FOOD MICROBIOLOGY

JULY -SEPT

Introduction - Origin of food microbiology as science, Food as nutrient for various microorganisms, Factor affecting the growth and survival of microorganisms in foods, General features and importance of different groups of bacteria, yeasts and molds important in foods.

Methods for microbial examination of foods - Traditional, non-traditional and rapid methods for the microbial examination of food and food products.

OCT- NOV

Food Spoilage - Microbial and biochemical aspect of food spoilage, role of bacteria, yeast and molds in food spoilage, Spoilage of cereal and cereal products, fruits and vegetables, meat and meat products, milk and milk products, fish and fish products, spoilage of egg and poultry and heated canned foods.

Food Borne Illness - Food intoxication and food infection, Bacterial food poisoning by *Staphylococcus aureus*, *Clostridium botulinum*, *Salmonella*, *E. coli*, *Clostridium perfringens*, *Listeria monocytogenes*, and *Campylobacter jejuni*, Food borne viruses, Aflatoxigenic molds, Investigation of food borne disease outbreak

PRACTICALS:-

JULY-SEPT

1. Sterilization and disinfection of equipment used in food microbiology laboratory.
2. Preparation of media, slant and broths required in the microbial analysis of foods.
3. To count the number of microorganisms by direct microscopic count method.
4. Study of different types of microorganism colony shapes on agar plates.
5. Study of the capsular and spore staining methods.

OCT-NOV

6. Isolation of fungi from food materials.
7. Study of incubation test of heated canned foods.
8. Study of dye reduction test of milk.
9. Microbiological analysis of egg, cereal product and fruit product.

FST-302: FLUID MILK PROCESSING

Theory:

JULY-SEPT

Milk: Definition, composition of milk, important characteristics of major constituents of milk i.e. milk fat, milk proteins, lactose and minerals and minor constituents of milk. Factors affecting the quality and quantity of milk produced by milch animals. Physical, chemical and nutritive properties of milk.

Market Milk: Brief introduction to Standard milk, Toned milk, Double toned milk, Flavoured milk, Vitamin enriched milk, Reconstituted milk and recombined milk. Condensed and Evaporated milk, Legal and ISI standards of milk. Adulteration of milk and its detection. Common preservative used in milk and their detection. Clean milk production.

Milk Processing: Processes of straining, filtration and clarification.

OCT-NOV

Standardization: Definition of standardization, purpose and uses of standardization process. Use of pearson's square method to solve the standardization problems in dairy industry.

Homogenization: Definition, Effect of homogenization on milk. Uses of homogenization. Checking the effectiveness of homogenization.

Pasteurization : Definition, purposes and objects of pasteurization – LTLT and HTST processes of pasteurization.

Sterilization: Definition, Method for manufacturing sterilized flavoured milk. UHT process.

PRACTICALS:

JULY-SEPT

1. Sampling equipment and sampling of milk.
2. Platform tests (Acidity, COB and Alcohol test).
3. Organoleptic Tests.
4. Determination of milk fat percentage by Gerber's method.
5. Determination of specific gravity by lactometer.
6. Determination of SNF percentage and TS percentage of milk with lactometer.

OCT-NOV

7. Detection of common adulterants and preservatives of milk.
8. Reporting on the suitability of milk for heat processing.
9. Reporting on the quality of given sample of milk.
10. Visit to milk processing plants/NDRI, Karnal.

FST-303: PROCESSING OF MEAT & MEAT PRODUCTS

Theory:

JULY-SEPT

1. Scope of meat processing industry in India.
2. Structure, composition & nutritive value of meat.
3. Classification of meat - Mutton, Pork & Sheep.
4. Meat quality parameters- Meat color, water holding capacity, Marbling, firmness & factors affecting it.
5. Ante-mortem examination of meat animal, their slaughtering & dressing.
6. Postmortem changes in meat: Rigor mortis, biochemical changes associated with rigor-mortis, conversion of muscle to meat.
7. Methods of tenderization, factors affecting tenderness.

OCT-NOV

8. Chilling, freezing, canning, drying, curing & smoking of meat.
9. Mechanical deboning of meat, Restructured meat products, Inter-mediate moisture meats, Meat by-products.
10. Modern abattoir: layout & features, Meat plant & hygiene- GMP & HACCP.

PRACTICALS:

JULY-SEPT

- 1) Pre slaughter operations of meat animals.
- 2) Slaughtering and dressing of meat animals.
- 3) Study of post-mortem changes.
- 4) Evaluation of meat quality.
- 5) Preservation of meat by different methods

OCT-NOV

- 6) Preservation of meat by pickling method.
- 7) Preparation of different meat products- canned, dehydrated and barbecued.
- 8) Preparation of sausages, burger, kabab, meat balls, meat patties.
- 9) Visit to slaughter ho
- 10) uses.

FST-304: POST HARVEST MANAGEMENT OF FRUITS AND VEGETABLES

Theory:

JULY-SEPT

Present status of post harvest technology in India.

Importance and role of post harvest technology.

Post harvest losses of fruits and vegetables and factors affecting the post harvest losses. Post harvest changes in fruits and vegetables Harvesting methods – manual and mechanical.

Maturity indices of fruits and vegetables-Importance of maturity indices, determination of maturity Climacteric and Non climacteric fruits, Fruit ripening and changes, Ethylene biosynthesis.

OCT-NOV

Cleaning, Sorting & Grading of fruits and vegetables

Post harvest physical and chemical treatments to enhance the shelf life of fruit and vegetables.

Transportation methods of fruits and vegetables Storage of fruits and vegetables Post harvest diseases of fruits and vegetables, Post harvest loss assessment and loss reduction.

PRACTICALS:

JULY-SEPT

1. Analyze the maturity stages of fruits and vegetables.
2. To study the effect of pre-packing of fruits and vegetables.
3. To study the effect of pre-cooling of fruits and vegetables.
4. To study the ripening of fruits and vegetables.
5. To study the shelf life of fruits and vegetables at low- temperature.

OCT-NOV

6. To study the different types of spoilage in fruits and vegetables.
7. To determine the optimum temperature for storage of different fruits and vegetables.
8. To study the effect of wax coating on shelf life of fruits and vegetables.
9. Visit to a cold store and controlled atmosphere storage.

FST-305: CEREAL MILLING AND LEGUMES

Theory:

JULY-SEPT

Cereal grain definition and different types of grains.

Structure and chemical composition of wheat, rice, maize, barley, oat, sorghum and millets.

Milling criteria and quality criteria for grains.

Traditional and modern milling of wheat, wheat cleaning and conditioning, extraction rate.

OCT-NOV

Traditional and modern milling of paddy.

Dry and wet milling of corn.

Introduction and chemical composition of pulses.

Decortication and polishing of pulses.

Toxic constituents of pulses and their elimination.

Practicals:-

JULY-SEPT

1. Determination of physical characteristics of wheat.
2. Determination of physical characteristics of rice.
3. Determination of moisture, ash and crude fibre in cereal grains.
4. Milling of wheat into flour.

OCT-NOV

5. Milling of paddy to brown rice and white rice.
6. Cooking quality of rice.
7. Visit to flour mill, rice mill and pulse mill.

FST-401: PROCESSING OF MILK PRODUCTS-I

JAN -FEB

Cream: Different types of cream with their respective fat content, composition of cream, production methods: gravity methods, mechanical method- by the use of cream separator. Factors affecting the richness of cream produced by cream separator. Efficiency of cream separator. Care of cream separator. Selection of site for setting up creamery. Neutralization of cream, use of different types of neutralizers, double neutralization of cream. Ripening of cream for butter making: natural ripening, ripening with the use of starter cultures. Objects of cream ripening. Various changes during the ripening of cream.

MAR- APR

Butter : Types of butter, composition. Preparation of butter. Factors affecting the churnability of cream. Churning theories.

Grading of butter:

1. Requirements of grading room
2. Grading procedure
3. Score card method.

Defects of butter their possible causes and their remedies.

Standards of butter and shelf life.

Ghee: Manufacturing methods of ghee:

1. Cream method
2. Butter method
3. Pre-stratification method

Granularity in ghee, storage of ghee and shelf life.

PRACTICALS:

JAN-FEB

1. To study the construction and working of a cream separator.
2. Cream separation.
3. Neutralization of cream.
4. Ripening of cream.
5. Preparation of butter.

MARCH-APRIL

6. Determination of moisture content in butter.
7. Preparation of ghee from cream.
8. Preparation of ghee from butter.
9. Visit to different milk plants to learn about cream, butter and ghee processing operations.
10. Visit to n.d.r.i., karnal.

FST-402: EGG, POULTRY & FISH TECHNOLOGY

Theory:

JAN-FEB

Structure and composition of egg. Nutritive value, interior qualities, grading, handling, packaging, storage, transportation, freezing, pasteurization, de-sugarization, dehydration, functional properties of eggs.

Types of Poultry –Hen, Turkey, Ducks, Geese. Ante-mortem examination & slaughtering of hen. Poultry sanitation & waste disposal. MAP of Poultry.

MARCH-APRIL

Types of fish, composition, structure and nutritive value, post – mortem changes in fish, on-board handling, storage and transportation of fish, curing, smoking, salting, canning, freezing and drying of fish, Comminuted Fish Products, Fish protein concentrate, Packaging of fish, Utilization of fish and marine industry by-products.

PRACTICALS

JAN-FEB

1. Slaughtering of hen.
2. Determination of egg components.
3. Grading and quality evaluation of eggs.
4. Preservation of shell eggs.
5. Preparation of egg products, boiled, fried, poached, scrambled, omellette.

MARCH-APRIL

6. Determination of egg density
7. To check freshness of fish.
8. Chilling & freezing of fish.
9. Preparation of fish & marine products.
10. Visit to industry.

FST-403: FRUITS AND VEGETABLES PROCESSING

Theory:

JAN-FEB

Classification, chemical composition and nutritive value of fruits and vegetables.

Preparing fruits and vegetables for processing-washing, sorting, grading, peeling, blanching, cutting, destoning and pitting.

Canning and bottling of fruits and vegetables products.

Freezing- General Methods of freezing of fruits and vegetables, their packaging and storage.

Drying of fruits and vegetables.

MARCH-APRIL

Definition, formulation, preparation and standards of fruit juices, Squashes and cordials; Fruit syrups, nectar, RTS, pulp.

Preparation and standards of Jam, Jelly & marmalades, preserve, candied and crystallized fruits.

Preparation of Pickles.

Tomato processing-Tomato juice, puree, paste, chutney, sauce, soup and ketchup.

PRACTICALS

JAN-FEB

1. Preparation of fruit juice.
2. Preparation of squashes.
3. Preparation of jam, jellies, marmalade.
4. Preparation of potato chips.
5. Preparation of pickles- sweet and sour.

MARCH-APRIL

6. Dehydration and sun-drying of fruits and vegetables.
7. Preparation of tomato puree, paste and ketchup.
8. Organoleptic evaluation of fruits and vegetable products.
9. Visit to food industry.

FST-404: PROCESSING OF CEREALS AND LEGUMES

Theory:

JAN-FEB

Wheat flour- types, storage and use, quality criteria for wheat flour, physical dough testing instruments, Improvers and Bleachers used in flour- their principle and action, major and minor ingredients used for bakery products, leavening agents.

Preparation methods of bread, biscuits, cookies and cakes.

Parboiling of paddy-methods, advantages and disadvantages, various changes during parboiling

Storage and uses of rice bran, extraction of rice bran oil and its use.

MARCH-APRIL

Corn starch and corn sweeteners.

Breakfast cereals and pasta products-ingredients and method of preparation.

Malting of barley, malt and its uses.

Brewing of barley to prepare beer.

Pulse protein concentrates-soybean curd and milk.

Protein enriched cereal foods.

PRACTICALS:-

JAN-FEB

1. Preparation of bread, biscuits and cakes.
2. Parboiling of paddy.
3. Estimation of free fatty acids in flour and rice bran.\

MARCH-APRIL

4. Determination of dry and wet gluten in flour.
5. Malting of barley.
6. Extraction of oil from rice bran.
7. Visit to food industry.

FST-405: FOOD PLANT HYGIENE & SANITATION

Theory:

JAN-FEB

Importance of personal hygiene of food handler-habits, clothes, illness, education of handler in handling and service.

Cleaning agents and disinfectants.

Cleaning methods – sterilization, disinfection, heat & chemicals, chemical tests for sanitizer strength.

Food sanitation-Principles & methods, control, inspection.

MARCH-APRIL

Sanitation in fruits & vegetables industry, cereals industry, dairy industry, meat, egg & poultry units.

Control of infestation, rodent control, vector control, Use of pesticides.

Hygiene of water used for processing.

Planning & implementation of training programmes for health personnel.

Practicals:-

JAN-FEB

1. Sterilization of equipments used in the laboratory by using heat and chemicals.
2. Determination of B.O.D
3. Determination of C.O.D
4. Determination of sanitary status of plant equipment.

MARCH-APRIL

5. Chlorination of water.
6. To study the bacteriology of water.
7. Chemical analysis of water.

FST – 501: PRINCIPLES OF FERMENTATION TECHNOLOGY

Theory:

JULY-SEPT

Introduction to fermentation, Fermentation an ancient tradition, Developments in fermentation technology, Scope and future prospects of fermentation microbiology, Gaden's fermentation classification, Rate of microbial growth and death, Rate of Product formation, Classification of food fermentations - Alcoholic, lactic and acetic acid fermentations

General methods of fermentation – Aerobic fermentation, Anaerobic fermentation, Solid state fermentation, and submerged fermentation, Batch and continuous fermentation. Pre-requisite for Industrial fermentation process.

OCT-NOV

Component parts of a fermentor and their functions, Peripheral parts and accessories of a fermentor, Online and off-line devices of fermentor, Biosensors in fermentation monitoring, Common measurement and control systems in fermentor, Contamination problems in fermentation process, Computer applications in fermentation process.

PRACTICALS:-

JULY-SEPT

1. To study different parts of a fermentor
2. To study the operation /working of a fermentor
3. To study media formulation and sterilization of a fermentation process
4. To study the growth of given microorganism in a batch culture
5. To perform fermentation test for a given microorganism

OCT-NOV

6. To study the effect of different temperatures on growth of a given Microorganism
7. To study the effect of aeration on growth kinetics of a given Microorganism
8. To study the product synthesis kinetics of any microorganism

FST – 502: FOOD PACKAGING – I

Theory:

JULY-SEPT

Packaging Technology:Definitions, functions of packaging. Properties of packaging material in relation to these functions, package design, Tests for flexible packaging materials , different levels of packaging, materials used in packaging, types of containers-primary & secondary, flexible & rigid, hermetic & non hermetic

Packaging materials :Wood- structure,types, properties and wooden containers used in packaging, types of wooden boxes

paper and paper board- structure, making, properties ,types and uses of paper and paper board, CFB boxes and their comparison with wooden containers

Glass – composition ,properties,structure,types & manufacture of glass containers, their uses, breakage in glass , closure for glass containers

OCT-NOV

Metals- properties of metals,different metals used in food packaging,steel plate and functions of various constituents of steel, formation of two piece and three piece cans,tinning process, tin free steel, aluminium containers ,lacquering –type and applications, aluminium foil ,corrosion of metal cans

PRACTICALS:

JULY-SEPT

1. To determine basis weight of paper and paper board
2. To determine thickness of paper and paper board
3. To determine Cobb's value of a paper board
4. To find out the uniformity and amount of wax on wax paper
5. To determine the thermal shock resistance of a glass container

OCT-NOV

6. To find out the porosity of tin plate.
7. To find out the tin coating weight.
8. To identify the different types of packaging materials

FST – 503: CONFECTIONERY & SUGAR TECHNOLOGY

Theory:

JULY-SEPT

Sugar:

Composition and characteristics of cane Juice, Cane Juice extraction. Manufacturing of sugar, Deterioration of sugars during storage & transportation and its prevention, By-products of sugar industry and their utilization.

OCT-NOV

Confectionary:

1. Classification of confectionary
2. Hard and soft boiled sugar confectionary: fondant, fudge, caramel, toffee butterscotch, Sugar panning, hard boiled candy.

PRACTICALS:

JULY-SEPT

1. Quality testing of raw as well as finished products of confectionary.
2. Preparation of: 1. candies, 2.caramel 3.toffees.
3. Collection of various types of confectionary packages.
4. Determination of sugar in confectionary product by saccharometer.

OCT-NOV

5. Determination of refractive index of sugar – solutions of different consistencies.
6. Organoleptic testing of different confectionary products.
7. Visit to sugar and confectionary industry

FST – 504: OIL & FAT TECHNOLOGY - I

Theory:

JULY-SEPT

1. Introduction to oils and fats and their nomenclature.
2. Physical and chemical Properties of fats and oils.
3. Nutritional importance of oils and fats.
4. Source and physico-chemical properties of following oils:-
 - a) Animal – Butter oil, lard and tallow.
 - b) Plant – Mustard, Groundnut, Sunflower, Soybean, , Coconut, Rice bran, cottonseed, linseed etc.

OCT-NOV

5. Extraction of oils/fats.
6. Problems during storage – rancidity, reversion.

PRACTICALS:

JULY-SEPT

1. To determine moisture content of oilseed
2. To determine FFA of oil
3. Determination of : R.M. Value, Polenske Value & Iodine Value.
4. To determine Iodine value, Saponification value, anisidine value, peroxide value and melting point of fats

OCT-NOV

5. Detection of sesame oil in vanaspati by furfural test.
6. Detection of adulteration with mineral oil, Cotton seed oil, Ground nut oil.
7. Organoleptic evaluation of fats and oils
8. Visit to vegetable oils industry.

FST – 505: Processing of Milk Products - II

Time: 3 Hrs.

Th.	Pr.	Int.	Total
35	20	15	70

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical:– Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

JULY-AUGUST

Cheese: Classification of cheese. Quality of milk for cheese.

Preparation methods of cheddar cheese.

Paneer and Channa: Manufacturing processes.

AUGUST-OCTOBER

Condensed and evaporated milk: Definition, composition & standards. Condensing operations.

Dried milk products: Introduction, objects of production, standards and composition.

Preparation of dried milk and milk powder by roller and spray drying methods. Packaging and storage. Malted milk powders and infant milk food.

OCTOBER-NOVEMBER

Ice Cream: Different types of ice creams and their composition. Ingredients used and their role in processing. Manufacturing process. Defects of ice cream, their causes and remedies.

Indigenous milk products: Kulfi, Srikhand, Lassi and Rabri, Preparation of Khoa.

BIS and legal standards of different milk products.

Practicals:

JULY-SEPT

1. Preparation of flavoured milk.
2. Preparation of Khoa.
3. Preparation of Paneer and Channa.
4. Preparation of common varieties of ice-cream.

OCTOBER-NOVEMBER

5. Visit to different milk plants to learn about milk condensing and drying operations.
6. Visit N.D.R.I., Karnal.

FST – 602: GRAIN STORAGE

Theory :

JAN-FEB

General problems of storage. Sources and detection of infestation in stored food grains.

Causes, types and content deterioration in stored food grains and methods to check them.

Traditional and modern methods of bag and bulk storage.

Insect pest of stored grain . Chemical, non – chemical and integrated methods of controlling stored grain insect pest.

Toxic contamination in good grains, their ill effects.

MARCH-APRIL

Pesticidal contamination tolerance limits, residue and precautions of safe handling of pesticides.

Cleaning aeration and drying of stored products at farmers, commercial and Govt. levels.

Role of moisture in spoilage of stored grains. Categorisation of food grains for storage, Principle of godown sanitation and hygiene.

Practicals

JAN-FEB

1. To study various insect pests of grains.
2. To study the quality tests for grains.
3. To store the grains and check its shelf life.

MARCH-APRIL

4. To study the various pesticides used for grain storage.
5. To study the effect of moisture on spoilage of grains.
6. Visit to grain storage godowns.

FST – 603: FOOD PACKAGING – II

Theory:

JAN-FEB

cellophane –preparation , properties and uses

plastics-thermoplastics&thermosets

polyethylene,polypropylene,polyvinylchloride,polyvinylidenechloride,polyester, polystyrene & polyamide,rubber hydrochloride (properties and uses)

polymerization and processing of plastics-compression moulding, injection moulding, blow moulding, thermoforming and extrusion,coextrusion,calendaring, orientation

plastic containers-bottles, cans,jars, cups,tubes ,cartons,retort pouch,laminates

biodegradable plastics

Aseptic packaging, shrink packaging ,gas packaging , vacuum and modified atmosphere packaging

MARCH-APRIL

Techniques & methods used for Packaging of cereals and cereal product, fruits and vegetables & their products , milk and milk products and meat and meat products , beverages

Shelf life evaluation of packed products

Food packaging & environment-recycling,composting,thermal treatment& land fill

Practicals:

JAN-FEB

1. To determine the sorption isotherm of a given sample of food.
2. Shelf life studies of packaging foods.
3. To determine grease resistance of packaging materials.
4. To see the chemical resistance of packaging material.
5. Determination of water vapour transmission rate of various packaging materials

MARCH-APRIL

6. Identification of packaging materials
7. To study the different layers of a laminate
8. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.

FST – 604: SPICES & FLAVOUR TECHNOLOGY

Theory:

JAN-FEB

Introduction:

Classification & use of spices
Chemical constituents of spices.
Processing of white pepper.
Dehydration products of onion, garlic.
Cryomilling of spices.

MARCH-APRIL

Spice oleoresins and spice emulsion.
Packaging of spices and spice products.
Microbial contamination and insect infestation in spices and its control.

Flavours:

Classification of flavouring compounds.
Processing of Cocoa and Coffee.
Stability of flavourings.

Practicals:

JAN-FEB

1. Determination of moisture in ground spices.
2. Determination of total ash in spices.
3. Determination of extraneous matter in spices.
4. Determination of pungency rating (Scoville method) in Red Pepper.

MARCH-APRIL

5. Adulteration tests for different spices.
6. Organoleptic evaluation of flavours.
7. Identification of Saffron by sulphuric – diphenylamine test.

FST – 605: TECHNOLOGY OF FERMENTED FOODS

Theory:

JAN-FEB

Introduction: Concept of fermented foods, Scope & development in fermented foods & beverage industry. Benefits of fermented foods,

Fermented milk products :

Curd, Yoghurt, Acidophilic milk, Bulgarian milk, Koumiss and Kefir

Legume products :

soy sauce, miso, tempeh, idli.

MARCH-APRIL

Fruit and Vegetable products:

Sauerkraut, Kimchi, Cucumber pickles,

Meat products:

Fermented meat sausages.

Alcoholic beverages:

Beer, wine, vinegar,

Practicals :

Preparation of following fermented foods in the laboratory and study their spoilage:

JAN-FEB

- 1.Sauerkraut
- 2.Pickles
- 3.Cheese
- 4.Yoghurt

MARCH-APRIL

- 5.Idli
- 6.Fruit Wine
- 7.Dosa

FST – 401:-QUALITY ASSURANCE

Theory:

JULY-SEPT

Objectives, importance and functions of quality control. Methods of quality assessment of food materials fruits, vegetables, cereals, dairy products, meat, egg and processed products.

OCT-DEC

Sampling, specifications of raw materials and finished products. Sensory evaluation. Concept of HACCP & GMP.

JAN-FEB

Quality Attributes: Size, Shape, Colour, Aroma, Texture Food Laws and regulations. AGMARK, FPO, PFA, MFPO, BIS, ISO.

Practicals:

JULY-SEPT

1. Quality evaluation of milk & milk products.
2. Quality evaluation of cereals.
3. Quality evaluation of fruits and vegetables.
- 4.

OCT-DEC

5. Quality evaluation of Oils & Fats.
6. Quality evaluation of Meat & Poultry.

JAN-FEB

7. Adulterants in milk, cereals, oils & fats and their detection.

FST – 402 NORMAL AND THERAPEUTIC NUTRITION

Theory:

JULY-SEPT

Definition and scope, History of Nutrition, Functions of Food, Water Balance, Energy Balance, Energy value of Carbohydrates, Fats and Proteins, minerals and vitamins. Balanced diet. Recommended daily allowances and requirement of infants, children, adults, old people. Athletes, Expectant and nursing mothers.

OCT-DEC

Diet surveys, Malnutrition, Deficiency diseases and disorders of metabolism, Diet groups, importance of therapeutic nutrition, toxicants Naturally occurring in foods, fortification of food with vitamins and minerals.

JAN-MARCH

Planning of diets for patients suffering from Ulcer, Anaemia, Diarrhoea, Diabetes, Cardiac diseases, Jaundice, Nephritis and Tuberculosis,

Practicals:

JULY-SEPT

1. Diet survey of an infant.
2. Visit to a hospital.
3. Visit to a slum area.
4. Planning of diet for patient suffering from Ulcer.
5. Planning of diet for patient suffering from Anaemia.

OCT-DEC

6. Planning of diet for patient suffering from Diarrhoea.
7. Planning of diet for patient suffering from Diabetes.
8. Planning of diet for patient suffering from Cardiac diseases.

JAN-FEB

9. Planning of diet for patient suffering from Jaundice.
10. Planning of diet for patient suffering from Nephritis.
11. Planning of diet for patient suffering from Tuberculosis.

FST – 403 GRAIN STORAGE

Theory :

JULY-SEPT

General problems of storage. Sources and detection of infestation in stored food grains. Causes, types and content deterioration in stored food grains and methods to check them. Traditional and modern methods of bag and bulk storage. Insect pest of stored grain and milled products nature of damage. Chemical, non – chemical and integrated methods of controlling stored grain insect Pest.

OCT-DEC

Vertebrate pests and their control. Toxic contamination in good grains, their ill effects. Pesticidal contamination tolerance limits, residue and precautions of safe handling of pesticides. Cleaning aeration and drying of stored products at farmers, commercial and Govt. levels.

JAN-FEB

Role of moisture in spoilage of stored grains. Categorisation of food grains for storage, loss measurement and disposal. Principle of godown sanitation and hygiene. Safe storage cereal seeds.

FST 405:- FOOD ENGINEERING

THEORY

JULY-SEPT

UNITS AND MEASUREMENTS: Brief introduction to dimensions, fundamental units and derived units. Systems of measurement-fps, cgs, mks, SI units.

DEHYDRATION: Moisture-dry and wet basis, free and bound, critical moisture content and equilibrium moisture content, drying theory and drying rate curves, drying time, mechanical drying by using tray dryer, conveyer dryer, rotary dryer, drum dryer, fluidized bed dryer, spray dryer, vacuum dryer, and freeze dryer.

PSYCHROMETRY: Psychrometric properties and psychrometric chart. Determination of humidity, relative humidity, dry bulb temperature, wet bulb temperature and dew point

EVAPORATION: Parts of evaporator, single effect and multiple effect evaporator, different types of evaporators, steam economy, design of evaporator, thermal and mechanical vapour recompression system.

SIZE REDUCTION: Definition and requirements of size reduction, forces used in size reduction, equipments for size reduction-crushing rolls, hammer mill, disc attrition mill, buhr mill, tumbling mill- ball and rod mill. Critical speed in a tumbling mill. Modes of operation, energy requirements for comminution of solids- Rittenger's law, Kick's law and Bond's law.

SCREENING: Types of screens-grizzly, trammels, vibrating screens, screen openings, and aperture, perforated metal screens and wire mesh screens, factors affecting screening.

OCT-DEC

FLUID FLOW: Properties of fluid- density, pressure, surface tension and viscosity. Newtonian and non Newtonian fluids, laminar and turbulent fluid, Reynold's number, equation of continuity, Bernoulli's theorem, Poiseuille's equation-viscosity measurement in tube, manometer, flow measuring devices-Pitot tube, Venturimeter, orifice meter.

PUMPS: Definition, classification, positive displacement and centrifugal pumps, factors affecting choice of a pump.

REFRIGERATION AND FREEZING: Components of Refrigeration system, refrigeration cycle and refrigeration load.

Direct and indirect contact freezing, freezing time calculation.

JAN-FEB

PRINCIPLES OF HEAT TRANSFER: Steady and unsteady heat transfer.

Conductive heat transfer-Fourier's law, thermal conductivity, conduction through rectangular slab, hollow cylinder, spherical shell, composite rectangular wall (series), and composite cylinder.

Convective heat transfer-convective heat transfer coefficient, free and forced convection, overall heat transfer coefficient.

HEAT EXCHANGERS: Steam injection and steam infusion.

Tubular, scrapped surface, plate heat, shell and tube heat exchangers

FILTRATION: Introduction, filtration theory, types of filtration, filtration equipments-pressure filters and vacuum filters.

PRACTICLAS:

JULY-SEPT

- Study of psychrometric chart-use and applications.
- Study of dehydration characteristics of different food materials.
- .To study the working principle of an evaporator.
- To study the working principle and operation of a hammer mill.
- To study the Working principle and operation of a ball mill.
- Determination of particle size of given flour sample using Sieve analysis

OCT-DEC

- Determination of viscosity of a liquid food.
- Determination of pressure drop by using manometer.
- Determination of flow rate by using Orifice meter.
- Determination of flow rate by using Venturi meter.

JAN-FEB.

- Determination of thermal conductivity.
- To calculate the refrigeration load in cold storage plant

FST – 406: Food Fermentation
FST – 406: FOOD FERMENTATION

JULY -SEPTEMBER

Introduction : History of fermentation processes. Types of fermentation-Alcohol, lactic acid, acetic acid

Fermented milk products : Curds, yogurt, acidophilus milk, Bulgarian milk, butter milk, Kefir, Kumiss

Fermented Fruits & Vegetables : Sauerkraut, cucumbers.

Fermented meats : meat sausage.

Fermented cereal products : Soya – sauce, miso, tempeh, idli.

Fermented beverages : Beer, Wine, Vinegar.

OCT TO NOV

Fermentor Design : Parts of fermentor, measurement of process variables & their control.

Industrial Fermented Products : Study of the production of Lactic Acid, Citric Acid.

JAN TO FEB

Industrial Fermented Products : Single Cell, Protein, Vitamins. Alcohol as fuel and Enzymes (General Methods only).

Down stream processing : Filtration, precipitation, centrifugation, cell disruption, Liquid extraction, drying & crystallization

PRACTICALS :

JULY-SEPT

1. Preparation of fermented Foods.

- a) Saurkraut, b) Pickles, c) Processed Cheese, d) Yogurt,
e) Fruit Wine f) Idli .

2. To study the various parts of a fermenter.

3. To study the alcoholic fermentation by yeast.

OCT-NOV

4. To prepare Citric Acid & Lactic Acid in the laboratory by fermentation.

5. To prepare Amylase enzyme in the laboratory by fermentation and its estimation.

JAN-FEB

6. To prepare cellulose enzyme in laboratory and its estimations.

7. Visit to food industry.