Shivaji University, Kolhapur
Department of Technology
FINAL YEAR B.TECH
Food Technology
Curriculum Structure
Semester – VII

Sr. No.	Subject Code	Subject Title	Contact hours			Credits
			L	T	P	
1	FT 411	Meat, Poultry and Fish Processing Technology	3	-	-	3
2	FT 412	Legume and Oilseed Technology	3	-	-	3
3	FT 413	Food Quality & Safety Management	3	-	-	3
4	FT 414	Food Biotechnology	3	-	-	3
5	FT 415	Elective –I	3	-	-	3
6	FT 416	Major Project Phase-I	-	-	4*	3
7	FT 417	Laboratory- I Meat, Poultry and Fish Technology Lab	-	-	2	1
8	FT 418	Laboratory- II Legume and Oilseed Technology Lab	-	-	2	1
9	FT 419	Laboratory- III Food Quality & Safety Management Lab	-	-	2	1
10	FT 4110	Laboratory- IV Food Biotechnology Lab	-	-	2	1
11	FT 4111	Seminar and Industrial Training Report	-	1	-	2
12	AC 416	Audit Course VI Professional Ethics	2	-	-	-
		Total	17	1	12	24
Total Contact hours per week = 30						

Semester –VIII

Sr. No.	Subject Code	Subject Title	Contact hours			Credits
			L	T	P	
1	FT 421	Post Harvest Technology of Plantation Crops	3		-	3
2	FT 422	Design and Development of New Products	3	-	-	3
3	FT 423	Waste Management of Food Industries	3	-	-	3
4	FT 424	Elective-II	3	-	-	3
5	FT 425	Food Plant Design and Layout	3	-	-	3
6	FT 426	Major Project (Phase-II)	-	-	6*	4
7	FT 427	Post Harvest Technology of Plantation Crops Lab	-	-	2	1
8	FT 428	Design and Development of New Products Lab	-	-	2	1
9	FT 429	Waste Management of Food Industries Lab			2	1
10	FT 4210	Entrepreneurship Development for Food Technologists	2	-	-	2
11	AC 427	Audit Course VII Constitution of India	2	-	-	-
		Total	19	-	12	24
Total Contact hours per week = 31						

Elective I	**Elective II**
1. Functional Foods & Nutraceuticals (FT 415.1)	**1.** Flavors Technology (FT 424.1)
2. Beverages Technology (FT 415.2)	**2.** Snack Foods Technology (FT 424.2)
3. Refrigeration Engineering (FT 415.3)	**3.** Sugar Technology (FT 424.3)
4. Database Management (FT 415.4)	4. Energy Systems and Technology (FT 424.4)

* Students are expected to do self study and carry out experiments as per the guidance given by the project guide.

Note: Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students

Final Year UG Programme
(Branch: Food Technology)

SEMESTER VII
MEAT, POULTRY AND FISH TECHNOLOGY (FT 411)

Teaching Scheme
Lectures: 3 Hrs/ Week
Credits : 3

Examination Scheme
Theory: CIE (50) + SEE (50) =100 marks

UNIT I Introduction (06 Hrs)

Sources and developments of meat and poultry industries and importance in national economy

UNIT II Muscle (06 Hrs)

Muscle structure, chemical composition and physico-chemical properties of meat muscle Abattoir design and layout

UNIT III Slaughtering and Post-mortem changes of meat (08 Hrs)

Slaughtering of animals and poultry, post-mortem inspection and grading of meat.
Factors affecting post-mortem changes, properties and shelf life

UNIT IV Processing and preservation of meat (08 Hrs)

Processing and preservation of meat- mechanical deboning, aging or chilling, freezing, pickling, curing, cooking and smoking of meat and Meat tenderization

UNIT V Egg (06 Hrs)

Egg structure, composition, quality characteristics, processing, preservation of eggs and their products.

Unit VI Fish (06 Hrs)

Fish Types, examination, care in handling & transportation, processing, freezing, canning salting & drying of fish. Fish sauce and protein concentrates.

TEXT BOOKS/ REFERENCES:

Principles of Meat Science	F. J. Forrest
Meat Hand Book	Albert Levie
Developments in Meat Science Vol. I and II	Ralston Lawrie
Poultry Production	R. A. Singh
Meat Technology	Gerard

LEGUME AND OILSEED PROCESSING TECHNOLOGY (FT 412)

Teaching Scheme
Lectures: 3 Hrs/week
Credits: 3

Examination Scheme
Theory: CIE (50) + SEE (50) =100 marks

UNIT I Present Status and future prospects of legumes and oil Seeds (06 Hrs)
Major legumes, oilseeds and pulses grown in the country and their application, present Status and future prospects of Pulse milling industry in India.

UNIT II Morphology and classification of legumes, oilseeds and pulses. (06 Hrs)
Morphology and Classification of legumes, oilseeds and pulses. Chemical composition and nutritional value. Antinutritional factors, their chemistry, methods of removal of antinutritional factors

UNIT III Dehulling and Milling of oilseeds, legumes and pulses. (08 Hrs)
Methods of dehulling-. Home, cottage and commercial scale. Modern techniques of dehulling. Milling of oilseeds, legumes and pulses : Dal milling principles, methods, equipments and effect on quality. Principle products, fermented products of legumes.

UNIT IV Processing of oilseeds, legumes and pulses. (08Hrs)
Soaking principles, methods of soaking, sprouting, puffing, and roasting. Physical and bio-chemical changes during these processes.
Protein foods: tofu, miso, texturized vegetable protein, hydrolyzed vegetable protein, formulation and quality control

UNIT V Cooking quality of dhal (04 Hrs)
Cooking quality of dhal, methods, factors affecting quality of dhal, cooking of dhal, quick cooking of dhal and instant dhal.

UNIT VI Oil extraction and Refining of oils (08 Hrs)
Oil extraction methods: mechanical Pressing. Solvent extraction process: principle, pretreatment - breaking, cracking, flaking, extraction principle and Desolventization. Factors affecting the extraction process.
Refining of oils :
Refining, degumming, neutralization, bleaching, filtration, deodorization of oils and their principles and process controls.

TEXT BOOKS/ REFERENCE BOOKS

1	Post Harvest Biotechnology of Legumes	D.K. Salunkhe *et al.*
2	Post Harvest Biotechnology of Oil Seed	D.K. Salunkhe *et al.*
3	Processed Protein Food Stuff	A.M. Alschule
4	The Chemistry and Technology of Edible Oils and Fat	A.E. Baily
5	Post Harvest Technology of Cereals, Pulses and Oil seeds	Chakraborthy
6	Oil Seed Processing Technology	B.D. Shukla

FOOD QUALITY & SAFETY MANAGEMENT (FT 413)

Teaching Scheme **Examination Scheme**
Lectures: 3 Hrs/week **Theory: CIE(50)+ SEE(50)=100 marks**
Credits: 3

UNIT I Introduction to food quality & Food safety management (4 Hrs)
Objectives, importance and functions of quality control & Food safety management

UNIT II Methods of quality assessment of food materials (8 Hrs)
Methods of quality assessment of food materials fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products etc.

UNIT III Food laws and standards (9 Hrs)
Statistical quality control., Food laws and standards, Concept of Codex Alimentarius/ /USFDA/ISO standards, BIS standards, BRC standards

UNIT IV Sampling procedures & specification for Food Products (6 Hrs)
Sampling and specification of raw materials and finished products, Sanitation and waste disposal.

UNIT V Food Adulteration & Quality management System (6 Hrs)
Food adulteration and food safety. HACCP, GMP, GLP, EMS etc

UNIT VI Sensory Evaluation (6Hrs)
Introduction of sensory evalutation, panel screening, Sensory and instrumental analysis in quality control, IPR and patents.

TEXT BOOKS/ REFERENCES

1. Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. "Principles of Sensory Evaluation of Food". Academic Press, New York.
2. Birk, G.G., Herman, J.G. and Parker, K.J. Ed. -1977. "Sensory Properties of Foods". Applied Science, London.
3. Charalambous, G. and Inglett, G. 1981. "The Quality of Foods and Beverages". (2 vol.set). Academic Press, New York.
4. Furia, T.E. Ed. 1980. "Regulatory Status of Direct Food Additives". CRC Press, Florida.
5. Krammer, A. and Twigg, B.A. 1970. "Quality Control for the Food Industry". 3rd Edn. AVI, Westport.
6. Pattee, H.E. Ed. 1985. "Evaluation of Quality of Fruits and Vegetables". AVI, Westport.
7. Ranganna, S. 1986. "Handbook of Analysis and Quality Control for Fruits and Vegetable"
8. Tannenbaum, S.R. Ed. 1979. "Nutritional and Safety Aspects of Food Processing", marcel

FOOD BIOTECHNOLOGY (FT 414)

Teaching Scheme
Lectures: 3 Hrs/week
Credits:3

Examination Scheme
Theory : CIE (50)+ SEE(50)=100 marks

UNIT-I Introduction (4 hrs)
History and development of biotechnology. Regulatory and social aspects of biotechnology of foods.

UNIT–II Strain Improvement Techniques (8hrs)
Methods of molecular cloning, immobilization of microbial and cultured plant cells. Plant and animal tissue culture.

UNIT III Application of Genetics (6hrs)
Application of genetics to food production. Genetically modified foods (GMF).

UNIT-IV Upstream Processing Improvement Techniques (8hrs)
Metabolic Engineering, Production of alcohol, organic acids, enzymes and immobilization of enzymes.

UNIT-V Downstream Processing (8hrs)
Principles of designing of downstream processing. Product recovery of food flavor, color, polysaccharides, amino acids, vitamins, other volatiles , baker's yeast and single cell protein.

UNIT-VI Improvement Techniques in Fermented foods (8hrs)
Traditional fermented foods like idli, dosa etc. Soy fermented foods. Other foods like beer, wine, distilled liquor vinegar.

TEXT BOOKS/ REFERENCES :

Bains W. 1993, Biotechnology from A to Z, Oxford Univ. Press, Oxford.
Crueger, W. and Crueger A. 1984. Biotechnology: A Textbook of Industrial Microbiology. Science Tech. Madison, USA.
Joshi, V.K. and Pandey, A. Ed. 1999. Biotechnology. Food Fermentation, (2 Vol. set). Education Publ. New Delhi.
Knorr, D. 1982. Food Biotechnology. Marcel Dekker, New York.
Stanburry P.P. and Whitaker, A. 1984. Principles of Fermentation Technology. Pergamon Press, Oxford UK.
Steinkraus, K.H. 1983. Handbook of Indigenous Fermented Foods.Marcel Dekker,N. York.

ELECTIVE- I (415)
ELECTIVE-I : FUNCTIONAL FOODS AND NUTRACEUTICALS (FT 415.1)

Teaching Scheme
Lectures: 3 Hrs/week
Credits: 3

Examination Scheme
Theory: CIE (50) + SEE (50) =100 marks

UNIT I Introduction (8 Hrs)
Scope, importance and renewed emphasis on specicality foods, health foods, functional foods. Neutraceuticals, infant and baby foods, adolescent/ teen age foods, foods for pregnant ladies and nursing mothers, geriatric foods.

UNIT II Specific consumer oriented foods (8Hrs)
Defense persons, Space / astronought, High altitude mountain climbers, Disaster situation – crises, care, and maintenance

UNIT III Transgenic plant foods with health claims (7 Hrs)
Prebiotics and Probiotics , Genetically modified foods, Proprietary foods, Supplementary foods

UNIT IV Beneficial Effects Functional Foods and Neutraceuticals (7Hrs)
Beneficial Effects of Spices, gamma-linolenic acid, Spirulina, antioxidants and other food constituents

UNIT V Bioactive components (6 Hrs)
Sources, extraction methods, uses and health benefits.

UNIT VI Development of Functional Foods (4 Hrs)
Low sugar,low calorie foods.

TEXT BOOKS/ REFERENCES:

1. 'Human Nutrition' Benzamin T. Burton, Mc Graw Hill.
2. 'Nutrition and Dietetics' Shubhangini A. Joshi, Tata Mc Graw Hill Co. Ltd.
3. 'Dietetics' by B. Shrilakshmi, New Age International (P) Ltd. New Delhi.
4 Food Science Potter
5 Processed Protein Food Stuffs Alchule
6 Food and Nutrition M Swami Nathan
7 Therapeutic Diets NIN
8 Supplementary Foods NIN

ELECTIVE I : BEVERAGES TECHNOLOGY (FT 415.2)

Teaching Scheme **Examination Scheme**
Lectures: 3hrs/ week **Theory: CIE (50) + SEE (50) =100 Marks**
Credits: 3

Unit I Introduction (4 Hrs)
Types of beverages and their scope and importance; status of beverage industry in India;

Unit II Fruits Beverages (8 Hrs)
Manufacturing technology for juice-based beverages; synthetic beverages; low-calorie and dry beverages; isotonic and sports drinks;

Unit III Water Treatments (4Hrs)
Water treatment and quality Specification for beverage water, Alkalinity reduction, filtration of water, water softening,

Unit IV Carbonated Beverages (8 Hrs)
History and types of soft drinks, role of various ingredients of soft drinks, carbonation of soft drinks. Packaging aspects in soft drink

Unit V Quality control in soft drink (8 Hrs)
Quality control in soft drink –Chemical and sensory Quality control in soft drink – Microbiological quality

Unit VI Packaged drinking water (8 Hrs)
Definition, types, manufacturing processes, quality evaluation and raw and processed water, BIS quality standards of bottled water; mineral water, natural spring water, flavoured water, carbonated water.

TEXT BOOKS/ REFERENCES:
Hardwick WA. 1995. Handbook of Brewing. Marcel Dekker.
Hui YH et al 2004. Handbook of Food and Beverage Fermentation Technology. Marcel Dekker.
Priest FG & Stewart GG. 2006. Handbook of Brewing. 2nd Ed. CRC.Richard PV. 1981.
Commercial Wine Making - Processing and Controls.AVI Publ.
Varnam AH & Sutherland JP. 1994. Beverages: Technology, Chemistry and Microbiology.
Chapman & Hall.Woodroof JG & Phillips GF.1974. Beverages: Carbonated and NonCarbonated.
AVI Publ.

ELECTIVE I : Refrigeration Engineering (FT 415.3)

Teaching Scheme
Lectures: 3hrs/ week
Credits: 3

Examination Scheme
Theory: CIE (50) + SEE (50) =100 Marks

UNIT-1 **(6 Hr)**

Refrigeration and air conditioning- Necessity of refrigeration and air conditioning, Factors affecting comfort air conditioning History of refrigerants, Classification of Refrigerants: Primary refrigerants – Secondary Refrigerants: Halo carbon refrigerants

UNIT-II **(6 Hr)**

Azeotrope refrigerants: Inorganic refrigerants, Ammomia, Air - Carbon dioxide, Sulphur dioxide, Water Hydro carbon refrigerant, Designation system for refrigerants: Designation sytem for Dichloro-tetrafluoro-ethane

UNIT-III **(7 Hr)**

Chemical requirements of refrigerants: Physical properties of refrigerants Secondary refrigerants: Brines- Applications of various brines. Types of Refrigerators : Air Refrigerator, Vapour refrigerator , Advantages and Disadvantage of vapour compression refrigeration system over air refrigeration system

UNIT-IV **(8 Hr)**

Compressor : Classification – Suction pressure, Discharge pressure, Compression ratio, Suction volume, Stroke volume, Clearance factor, Compressor capacity, Volumetric efficiency Reciprocating compressor : Parts of a reciprocating compressor - Cycle of a reciprocating compressor Rotary compressor, Centrifugal compressor, Advantages and disadvantages of a centrifugal compressor

UNIT-V **(6 Hr)**

Condensers : Working of a condenser, Factors affecting the condenser capacity, Heat rejection factor Classification of condensers : Air cooled condensers, Water cooled condensers – Tube in condenser – Shell and coil condenser, Fouling factor – Difference between air cooled and water cooled condensers – Evaporative condenser

UNIT-VI **(7 Hr)**

Ice manufacturing: principle of ice production Application of refrigeration in different food products, Fruits and vegetables Examples of Food processing by refrigeration and storage - Meat products – fish – poultry products – dairy products Food Freezing – Freezing systems – Indirect contact systems Plate Freezers – air blast Freezers – Freezers for liquid foods Direct contact systems – Air blast - Immersion

Textbook(s) / References.

1. Required: Heating and Cooling of Buildings, Kreider, J.F., Curtiss, P.S. and Rabl, A., 2002 2nd Edition, McGraw-Hill, New York, NY.
2. Arora C.P. , Refrigeration and Air Conditioning , Tata McGraw Hill Pub.Company , New Delhi - 2000.
3. Andrew D. Althouse, Carl H. Turnquist, Alfred F. Bracciano, Modern Refrigeration and Air Conditioning, Goodheart-Wilcox, 18th Edition, 2003.
4. Dosset, R.J. "Principles of Refrigeration", John Wiley & Sons, 2001.
5. Wilbert F. Stoecker, Industrial Refrigeration Hand Book, McGraw-Hill, 1998.

ELECTIVE I: DATABASE MANAGEMENT (FT 415.4)

Teaching Scheme **Examination Scheme**
Lectures: 3 hrs / week **Theory: CIE(50)+SEE(50)=100 Marks**
Credits: 3

UNIT 1. **Introduction:**
Purpose of Database Systems, Data abstraction, Data Models, Entities and Entity sets, Mapping Constraints, E-R Diagram, Reducing E-R Diagrams to Tables (8 Hrs)

UNIT 2. Relational Model:
Structure of Relational Databases, The Relational Algebra, Structured Query Language(SQL). (8Hrs)

UNIT 3. **Integrity Constraints and Design:**
Domain Constraints, Referential Integrity, Functional Dependencies (8 Hrs)

UNIT 4. **File and System Structure:**
Overall System Architecture, File Organization, Organization of Records into Blocks, Sequential Files, Mapping Relational Data to Files, Data Dictionary Storage (8 Hrs)

UNIT 5. **Crash Recovery:**
Failure Classification, The storage Hierarchy, Transactions Model, Log-Based Recovery, Shadow Paging, Failure with Loss of Non-Volatile Storage (8 Hrs)

Set of assignments is listed below:

1. Title: ER Diagrams & Normalization
Draw ER diagrams (around 10 in number) for college Student Activities & Convert them into tables. Apply normalization. Display constraints.

2. Title: Data Dictionary
Write program to create tables, along with constraints and store them in a file, which will work as DD for later assignments.

3. Title: Insert Data
Write program to Insert data in tables created in assignment. Store data in separate File / Table. Implement insert operation as transaction.

4. Title: Modify Data
Write program to modify data in tables, which is inserted in assignment. Implement modify operation as transaction.

5. Title: View Data
Write program to view table data. Accept table attribute for ordering dynamically.

Text Book:

1. DataBase System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.) Fourth Edition
2. DataBase System Concept by Henry F. Korth, Abraham Silberschatz, (McGraw Hill Inc.)

Reference Books:

1. Principles of DataBase Systems by J.D. Ullman (Galgotia Publications)
2 DataBase Design by Wiederhold (McGraw Hill Inc.)
3. Fundamentals of Database Systems – Masri and Navathe (Bengamin Cummings, 1989).
4. Database design, application development & administration – Michael V. Mannino (MGH-International Edition)

MAJOR PROJECT Phase: I (FT 416)

Teaching Scheme
Practical: 4 Hrs/week
Credits: 3

Each student shall undertake project work assigned to him/ her related to design or R&D in the area of food technology under the supervision of a faculty member. In principle, the research /design work has to be carried out by the student himself/herself taking advice from his/her guide when problem arises. The work will be allotted at the beginning of the seventh semester specifying the different aspects to be carried out by the student.

The project undertaken by the student at the commencement of the 7^{th} semester will be continued till the end of the 8th semester. At the end of the semester the student will submit a report on his/ her work in typed and bound form.

Marks for Major Project Phase- I will be evaluated by the panel of internal teachers (which should include concerned guide also) based on viva and progress of project.

Laboratory- I
MEAT, POULTRY AND FISH TECHNOLOGY LAB (FT 417)

Teaching Scheme **Credits: 1**
Practical: 2 Hrs/week

PRACTICALS:

1. Pre-slaughter operations of meat animals and poultry birds
2. Slaughtering and dressing of meat animals
3. Preservation of meat by different methods
4. Preparation of meat, poultry and fish products
5. Quality evaluation of meat, poultry and fish products
6. Quality evaluation of egg
7. Evaluation of fish quality
8. Visit to meat and poultry processing industry

Laboratory- II
LEGUME AND OILSEED PROCESSING TECHNOLOGY (FT 418)

Teaching Scheme **Credits: 1**
Practical: 2 Hrs/week

PRACTICALS:

1. Physical properties of legumes and oil seeds
2. Methods and principles of dehulling
   a) Application oil
   b) Application red earth slurry.
3. Dal milling process.
4. Cooking quality of dal
5. Fermented product of legumes- dosa, idli, wada, dhokala,
6. Production of protein rich product.
7. Visit to dal mill and oil industry.

Laboratory- III
FOOD QUALITY & SAFETY MANAGEMENT LAB (FT 419)

Teaching Scheme **Credits: 1**
Practical: 2 Hrs/week

PRACTICALS:

1. Quality evaluation of water
2. Quality evaluation of raw materials
3. To determine BAR (Brix acid ratio)
4. Analysis of Canned Product samples
5. Quality evaluation of oils/fats
6. Study of Adulteration test of food products
7. To test market samples as per FSSAI Standards
8. Sensory evaluation of food samples
9. Visit to food industry industry

Laboratory- IV
FOOD BIOTECHNOLOGY (FT 4110)

Teaching Scheme **Credits: 1**
Practical: 2 Hrs/week

Practicals based on :

- Isolation and Preservation of industrial important Microorganism.
- Stabilization of strains of micro organisms useful in fermentation.
- Scale up kinetic studies in different fermentation processes.
- Contamination of fermentations and its control.

SEMINAR AND INDUSTRIAL TRAINING REPORT (FT 4111)

Teaching Scheme **Credits: 2 (1 credit each)**
Tutorial: 1 Hrs/week

*** SEMINAR:** **Credit : 1**

A seminar topic will be allotted to individual student according to his/her area of interest (students are also suggested to propose topics with relevant published information during the time of allotment), on which a report should be prepared and submitted after presentation as per schedule.

 # INDUSTRIAL TRAINING REPORT: **Credit : 1**

The industrial training will be undertaken by each student during the summer recess after the completion of the 6th semester examination and prior to commencement of the 7th semester. A report on the training which is required to be submitted should consist of:

1 A general overview of the plant.
2. The products & raw material sources of the plant.
3. Detail description of different processing and other equipment.
4. Scheduling of plant operations.
5. Conclusion.

AUDIT COURSE VI (AC 416)

PROFESSIONAL ETHICS

Teaching Scheme **No Credits**

Lectures: 2 hours/week

UNIT 1 **3 hrs**

Engineering Ethics – Moral Issues, Ethical theories and their uses

UNIT 2 **3 hrs**

Engineering as Experimentation – Code of Ethics

UNIT 3 **3 hrs**

Engineer's Responsibility for Safety

UNIT 4 **3 hrs**

Responsibilities in Rights

UNIT 5 **3 hrs**

Global issues of engineering ethic

UNIT 6 **3 hrs**

Introduction to Entrepreneurship awareness and Development: Functions -why men become economic innovators –Various Assistance Programmes for Small Scale and large Scale Industries through agencies, like IDBI, IFC, ICICI, NSIC, SFC, SIDCO and DIC.

REFERENCE BOOKS:

1. Agarwal, A. N., "Indian Economy", Vikas Publishing House Pvt. Ltd., New Delhi.
2. Charles D.Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
3. Datta R. and Sundharam, "Indian Economy", K. P. M., S. Chand & Co. Ltd., New Delhi
4. Seth, M. L., "Principles of Economics", Lakshmi Narain Agarwal, Agra.

Final Year UG Programme
(Branch : Food Technology)

SEMESTER VIII

POST HARVEST TECHNOLOGY OF PLANTATION CROPS & SPICES (FT 421)

Teaching Scheme
Lectures: 3 Hrs/week
Credits: 3 hr/week

Examination Scheme
Theory: CIE (50) + SEE (50) =100 marks

Unit I Introduction (04 Hrs)
Production and processing scenario of spice & plantation crops and its scope

Unit II Tea (08Hrs)
Occurrence, chemistry of constituents; harvesting; types of tea –green, oolong and CTC; chemistry and technology of CTC tea; manufacturing process for green tea and black tea manufacture; instant tea manufacture; quality evaluation and grading of tea.

Unit III Coffee (08Hrs)
Occurrence, chemical constituents; harvesting, fermentation of coffee beans; changes taking place during fermentation; drying; roasting; process flow sheet for the manufacture of coffee powder; instant coffee technology; chicory chemistry; quality grading of coffee.

Unit IV Other Plantation Crops (04 Hrs)
Vanilla, Annatto, Cashewnut, processing and quality control

UNIT V Major Spices (08Hrs)
Major Spices, Post Harvest Technology, Composition, Processed products of spices : Ginger, Chill, Turmeric, garlic, Pepper and Cardamom.

UNIT VI Minor spices (08 Hrs)
Minor spices, Ajwan, coriander, cumin, cinnamon, fenugreek, garlic, mustard, mace, nutmeg, onion, saffron, tamarind, cloves, mint and asafetida.

TEXT BOOKS/ REFERENCE BOOKS :

1. **Spices – vol. II - Parry J.W.**
2. **Spice and condiments - Pruthi J.S.**
3. **Herbs and spices - Rosemery Hemphill**
4. **The book of spices - Rosen garten, F. and Livington Jr.**
5. **Spices and herbs for the Food Inudstry - Lewies, Y.S.**
6. **Spices Vol. I and II; Tropical Agril. Series - Purseglove, J.W. Brown E.G., Green C.L. And Robbins SRJ.**

DESIGN AND DEVELOPMENT OF NEW PRODUCTS (FT 422)

Teaching Scheme
Lectures: 3 Hrs/week
Credits: 3 hr/week

Examination Scheme
Theory: CIE (50) + SEE (50) =100 marks

UNIT I Introduction and Scope (04 Hrs)
Need, importance and objectives of formulation for new product development.

UNIT II Formulation of New Product (08 Hrs)
Ideas, business philosophy and strategy of new product,Formulation based on sources availability and cost competitiveness for concept developments of new products

UNIT III Technology for New Product (06Hrs)
Adaptable technology and sustainable technology for standardized formulation for process development.

UNIT IV Scale up and Trials (06 Hrs)
Process control parameters and scale-up, production trials for new product development at lab and pilot scale

UNIT V Quality Assessment (08 Hrs)
Quality assessment of new developed products

UNIT VI Marketing, Economics of New Product, Commercialization and Launching (08Hrs)
Market testing and marketing plan, Costing and economic evaluation of developed products, Commercialization / product launch for marketing

TEXT BOOKS/ REFERENCES:

1 New Food Product Design and Development: Beckley, Blackwell Publishing Oxford UK
2 Sensory and Consumer Research in Food Product Design and Development Moskowitz, Blackwell Publishing Oxford UK

WASTE MANAGEMENT OF FOOD INDUSTRIES (FT 423)

Teaching Scheme
Lectures: 3 Hrs/week
Credits : 3

Examination Scheme
Theory : CIE (50)+ SEE(50)=100 marks

UNIT – I Introduction (6Hrs)

Types of waste and magnitude of waste generation in different food processing industries, concept, scope and importance of waste management and effluent treatment. Environmental Protection Act and specification for effluent of different food industries.

UNIT –II Waste characterization (4Hrs)

Temperature, pH, Oxygen demands (BOD, COD, TOD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues

UNIT-III Effluent Treatment (8Hrs)

Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation
Secondary treatments: Biological oxidation – trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons
Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal

UNIT-IV Treatment methods for solid wastes (6Hrs)

Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermi composting Pit.

UNIT-V Waste utilization of agro industries (8Hrs)

Characterization and utilization of by-products from cereals (breweries), pulses, oilseeds, fruits & vegetables (wineries) and plantation crops (sugar industries)

UNIT- VI Waste utilization of animal and marine product industries (8 Hrs)

Characterization and utilization of by-products from dairy, eggs, meat, fish and poultry processing industries.

REFERENCE BOOKS

Food Processing work Management by Green and Krammer; CBS publication
AFST(I) & CFTRI Proceedings of the Symposium on By-products From food Industries: Utilization and Disposal

TEXT BOOKS

Principles of food sanitation by Mariett, N.G. CBS publication
Post Harvest Technology of fruit and vegetables- Handling, Processing,Fermentation and waste Management by LR Verma and VK Joshi; Indus Publishing Co. New Delhi.
A. D. Bhide, "Solid waste management"
Pavoni,"Solid waste management handbook"

ELECTIV-II (FT 424)
ELECTIVE –II : FLAVOURS TECHNOLOGY (424.1)

Teaching Scheme **Examination Scheme**
Lectures: 3 hrs/ week **Theory: CIE (50) + SEE (50) =100 Marks**
Credits: 3

UNIT I Introduction (4 Hrs)
Production and processing scenario of flavour

UNIT II Types and sources of flavors (8 Hrs)
Types of flavours,Sources of flavours (natural, processed and added), Flavour composites (natural, semi-synthetic and synthetic). Flavours production in fermented foods.

UNIT III Biogenesis of flavours (6Hrs)
Biogenesis of flavours in food – natural and processed foods (Maillard Reaction and Lipid Oxidation).

UNIT IV Extraction and analysis of flavor components (8Hrs)
Extraction of flavours from various sources, conditions and extracting agents. Analysis of flavours components (Subjective and objective).

UNIT V Sensory evaluation (6Hrs)
Sensory evaluation of flavours, selection of flavourist, flavours and legal issues.

UNIT VI Flavors in industries (8 Hrs)
Formulations of flavours. Flavours of soft drinks, Baking and confectionery industries. Standards specification of flavours. Adulterations in Flavour emulsions.

TEXT BOOKS/REFERENCES :

1. Ashurst PR. 1994. *Food Flavorings*. 2nd Ed. Blackie.
2. Burdock GA. 2004. *Fenaroli's Handbook of Flavor Ingredients*.5th Ed.CRC Press.
3. Deibler D & Delwiche J. 2004. *Handbook of Flavor, Characterization:Sensory Analysis, Chemistry and Physiology*. Marcel Dekker.
4. Heath HB & Reineccius G.1986. *Flavor Chemistry and Technology*. AVI Publ.
5. Taylor A. 2002. *Food Flavour Technology*. Sheffield Academic Press.

ELECTIVE-II : SNACK FOODS TECHNOLOGY (FT 424.2)

Teaching Scheme **Examination Scheme**
Lectures: 3 hrs/ week **Theory: CIE (50) + SEE (50) =100 Marks**
Credits: 3

Unit I Introduction (4 hrs)
Importance and scope of snack food technology. Present status of snack foods industries.

Unit II Various types of snack food (8 hrs)
Technology for grain-based snacks: whole grains – roasted, toasted, puffed,popped and flakes, coated grains-salted, spiced and sweetened;flour based– batter and dough based products; *savoury* and *farsans*; formulated chips and wafers, papads, instant premixes of traditional Indian snack foods.

Unit III Technology for fruit and vegetable based snacks (6 hrs)
Technology for fruit and vegetable based snacks: Chips, wafers;

Unit IV Technology for coated nuts (6 hrs)
Technology for coated nuts – salted, spiced and sweetened; *chikkis* .

Unit V Extruded snack foods (8 hrs)
Formulation and processing technology, colouring, flavouring and packaging, Raw materials &their role

Unit VI Equipments (8hrs)
Equipments for frying, Baking and drying, toasting, roasting and flaking, popping, blending, Coating, chipping.

TEXT BOOKS/ REFERENCES:

Edmund WL. *Snack Foods Processing*. AVI Publ.
Frame ND .1994.*The Technology of Extrusion Cooking*. Blackie Academic.
Gordon BR.1997 *Snack Food*.AVI Publ
Samuel AM.1976. *Snack Food Technology*. AVI Publ.
Extruded foods Matz.
Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
New protein foods, vol.I,II, A.L. Altschul.

ELECTIVE-II : SUGAR TECHNOLOGY (FT 424.3)

Teaching Scheme
Lectures: 3 hrs/ week
Credits: 3

Examination Scheme
Theory: CIE (50) + SEE (50) =100 Marks

Unit I (7 Hr)

Introduction: Brief account of Sugar Industry and Sugar Manufacturing Process Composition of Sugarcane and Juice, Importance of juice clarification, Weighing and metering of juice (Maxwell Boulogne Scale & Magnetic Flow Meters)

Juice Heating: Types of juice heater, construction & working of tubular heater, removal of condensate and non-condensable gases, vacuum equalization, scaling of tubes, cleaning & testing of heater, concept of vapor line & dynamic juice heater. Effect of heat on juice, Purpose of primary and secondary heating. Construction and working of Direct Contact Heater (DCH), Plate Heater (PHE), advantages & disadvantages.

Unit II (6 Hr)

Clarification: Techniques of clarification; Defecation, Sulphitation & Carbonation, clarificants used in Sugar Manufacture.

Lime; specification, storage - Preparation of milk of lime; rotary lime slacker, classifier, MOL tanks, lime pumps, use of hydrated lime powder.

Sulphur; specification & storage, production of sulphur dioxide gas - combustion of sulphur, construction & working of sulphur burner, film type sulphur burner.

Liming & Sulphitation; Effect of liming & sulphitation on cane juice, simultaneous liming & sulphitation.

Unit III (7 Hr)

Subsidation and Filtration: construction & working of Dorr clarifier, operation of Dorr, velocity of juice in clarifier, flash tank cleaning & maintenance of clarifier, Vacuum filter; construction and working, effect of washing on pol in cake, filtrate receivers, baby condenser, vacuum pump, filtrate clarification system.

Unit IV (6 Hr)

Evaporation: Introduction, Construction & Working of Robert type evaporator, Rellieuxs' principles, working of multiple effect evaporator, factors affecting heat transfer and performance of evaporators.

Pan Boiling: Vacuum Pan, Continuous Pan: Boiling Technique:

Unit V (7 Hr)

Refine of Sugar : Crystallisation: Crystallisation while cooling, air cooled & water cooled crystalliser, vertical crystalliser, cooling and reheating of massecuite, transient heater, molasses exhaustion, Centrifugals: Continuous Centrifugals – construction & working, importance of rpm & screen size, factors affecting

Unit VI (7 Hr)

Manufacturing of Khandasari Sugar: Specification of Khandsari Sugar, Extraction & Clarification of Cane Juice Open Pan Boiling System, Centrifugation Drying & Packing,

Manufacturing of Jaggry/ Gur : Extraction of Juice, Clarification of Gur, Concentration of Juice, Drying & grading of Gur,Storage of Gur

Reference:

1. Principles of Sugar Technology Vol. 2 - Peter Honig
2. Cane Sugar Handbook - D P Kulkarni
3. Handbook of Cane Sugar Technology – R B L Mathur.
4. Introduction to Cane Sugar Technology – G H Jenkins.
5. Hand Book of Cane Sugar Engineering – E Hugot
6. Introduction to Sugar Technology – Chen & Chou
7. Sakhar Nirmiti – By S.V. Karmarkar
8. Handbook of Cane Sugar Technology- By Jenkins G.H.
9. Cane Sugar Manufacture in India - By D.P. Kulkarni

ELECTIVE-II : ENERGY SYSTEMS & TECHNOLOGY (FT 424.4)

Teaching Scheme
Lectures: 3 hrs/ week
Credits: 3

Examination Scheme
Theory: CIE (50) + SEE (50) =100 Marks

UNIT I Introduction (4 Hours)

Energy chains, Energy demand, Energy crises, Worlds production & consumption of energy resources, Impact of energy on sustainable development Energy Management & planning: Energy management principles, Energy & pollution trade off, objectives of energy management, energy strategy & energy planning.

UNIT II Solar Energy (6 Hours)

Introduction, utilization methods, merits & demerits of solar energy utilization, potential of solar energy, solar radiation, data for India, solar thermal collectors, concentrators & reflectors, collector efficiency, application of solar energy, solar cooker, solar water heating, solar dryer, solar distillation, solar photovoltaic systems, solar pond.

UNIT III Wind Energy: (4 Hours)

Introduction, potential & scope, classification & types of wind machines, application of wind energy, merits & limitations of wind energy. Site selection for wind farm, wind map of India, wind energy station in India.

Geothermal Energy: (4 Hours)

Introduction, types of geothermal resources, potential of geothermal resources in India & world. Environmental problems in utilization of geothermal resources.

UNIT IV Tidal Energy (6Hours)

Tides, tidal range, tidal power, suitably sites & prospects. Types of tidal power plants, single basin, modulated single basin & double basin schemes, main equipments, energy storage.

UNIT VBiomass Energy Resources (8Hours)

Biomass energy, biomass energy from cultivated crops & from waste organic matter, biomass conversion processes, incineration & thermo chemical, biochemical conversion of biomass, urban solid waste to energy by incineration & from landfill biogas projects, pyrolysis plants, biogas plants.

UNIT VI Hydro Energy (6Hours)

Introduction, India's Hydro reserves, merits & limitations, low head , medium head, high head schemes, hydro turbines, economics.

Nuclear Energy **(4 Hours)**

Atomic structure, fusion & fission nuclear reactor, radioactive waste management

REFERENCE BOOKS:

1. Benny Joseph, " Environmental studies"
2. K. C. Agarwal, " Environmental Biology"
3. Cunningham, W. P. Cooper, T. H. Hepworth, "Environmental Encyclopedia" Jaico Pub.
4. David M.Gates, " Energy & Ecology" Sinaur Associates
5. G.D.Rai, " Non Conventional Energy Sources"
6. Stephenson, " Power Technologies"
7. S.Rao & B.B.Parulekar, " Energy Technology"

FOOD PLANT DESIGN AND LAYOUT (FT 425)

Teaching Scheme
Lectures: 3 hrs/week
Credits: 3

Examination Scheme
Theory : CIE (50)+ SEE(50)=100 marks

Unit I Introduction (4 hrs)

Basic concepts of plant layout and design with special reference to food process industries. Application of HACCP concept, ISO, FPO & MPO requirements in food plant layout and design.

Unit II Plant Location (6 hrs)

Influence of location on plant layout, location factors, location theory and models, Economic plant size, types of manufacturing processes like continuous, repetitive and intermittent processes.

Unit III Plant Layout (8hrs)

Preparation of a Plant Layout, Plant Layout problem, importance, objectives, classical types of layouts. Evaluation of layout. Advantages of good layout

Unit IV Plant Building (8 hrs)

Considerations in building design, type of factory buildings, choice of building construction, material for floors, foundation, walls, doors, windows, drains etc, ventilation, fly control, mold prevention and illumination in food processing industries.

Unit V Plant layout & Equipment Layout (8hrs)

Plant layout and design of bakery and biscuit industries; fruits and vegetables processing industries including beverages; milk and milk products; meat, poultry and fish processing industries.

Equipment layout in Food Industries :

Basic understanding of equipment layout and. Preparation of flow sheets for material movement and utility consumption in food plants.

Unit VI Cost Analysis (6 hrs)

Fixed cost, variable cost, depreciation, method of economic analysis, profitability analysis of a plant.

REFERENCE BOOKS/ TEXT BOOKS

1 Milk Plant Layout H.S. Hall (1963). FAO Pub., Rome
2 Plant Layout and Design James M.Moore (1962), Mac Millan, New York
3 Production Engg. & Industrial mgmt. O.P. Khanna Dhanpat rai & sons
4 Plant Design for Chemical Engg. Peterse & Timmerhaus, McGraw Hil
5 Project Engg. of process plan Rase & Brrow t John Willey & Sons

MAJOR PROJECT Phase : II (FT 426)

Teaching Scheme
Practical: 6 Hrs/week

Each student shall undertake project work assigned to him/ her related to design or R&D in the area of food technology under the supervision of a faculty member. In principle, the research /design work has to be carried out by the student himself/herself taking advice from his/her supervisor when problem arises. The work will be allotted at the beginning of the seventh semester specifying the different aspects to be carried out by the student.

The project undertaken by the student at the commencement of the 7^{th} semester will be continued till the end of the 8th semester. At the end of the semester the student will submit a report on his/ her work in typed and bound form.

Marks for Major Project Phase- II will be evaluated by the panel of internal teachers (which should include concerned guide also) and external examiner based on viva and project report.

Laboratory- I
POST HARVEST TECHNOLOGY OF PLANTATION CROPS & SPICES LAB (FT 427)

Teaching Scheme **Credits: 1**
Practical: 2 Hrs/week

PRACTICALS:

(1) Analysis of tea & coffee
(2) Extraction of oleoresins
(3) Determination of the volatile oil
(4) Adulteration detection of the spices
(5) Detection of microbial quality of the spices
(6) Determination of pigments of the spices
(7) Study of standard specification of spices
(8) Preparation of curry powder
(9) Storage and packaging of spices
(10) Visit to spice processing industry

Laboratory- II
DESIGN AND DEVELOPMENT OF NEW PRODUCTS LAB (FT 428)

Teaching Scheme **Credits: 1 hr/week**
Practical: 2 Hrs/week

PRACTICALS:

1. Market survey of existing various products
2. Formulation of new products based on corporate decision /need based
   a) Protein-energy rich b) Low calorie (fat replacer)
   c) Low sodium content d) Glycemic index based
   e) Cholestrolemic index based
3. Product development based on above formulation depending on local sources/ technology
4. Quality assessment
   a) New product development for b) Infant / weaning foods
   c) Geriatric d) Physiological status

Laboratory- III
WASTE MANAGEMENT OF FOOD INDUSTRIES LAB (FT 429)

Teaching Scheme **Credits: 1 hr/week**
Practical: 2 Hrs/week

Practical :

1. Waste characterization:
(a) temperature (b) pH (c) solids content (d) turbidity (e) BOD (f) COD
2. Visit to effluent treatment plant attached with food industry and city
3. To estimate residual chlorine
4. Evaluation effect of lime treatment on waste water in respects of BOD, COD, solids content, phosphate content
5. Visits to various industries using waste and food by-products
6. Visit to BiogDas plant and vermin-culture centre
7. Extraction of banana fiber , Alcohol from molasses,
8. Isolation and purification of pectin from organic waste,
9. Extraction of volatile oils from organic waste

ENTREPRENEURSHIP DEVELOPMENT FOR FOOD TECHNOLOGISTS (FT 4210)

Teaching Scheme **Credits: 2**
Lecture : 2 hrs/week

Unit I Entrepreneurship (4 hrs)
Concept/Meaning, Need, Competencies/qualities of an entrepreneur

Unit IIEntrepreneurial Support System (6 hrs)
District Industry Centers (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institutes (SISIs), Small Industries Development, Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC), Khadi Village and Industries Commission (KVIC), other relevant institutions/organizations/NGOs at State level

Unit III Market Survey and Opportunity Identification (Business Planning) (6 hrs)
Identification and Guidance Business Plant, Market, Assessment, Procedures for registration of small scale industry, List of items reserved for exclusive manufacture in small scale industry, Assessment of demand and supply in potential areas of growth, Understanding business opportunity, Considerations in product selection, Data collection for setting up small ventures,

Unit IV Project Report Preparation (4 hrs)
Preliminary Project Report, Techno-Economic feasibility report, Project Viability

Unit V Managerial Aspects of Small Business (6 hrs)
Principles of Management (Definition, functions of management viz planning, organization , coordination and control, Operational Aspects of Production, Inventory Management, Basic principles of financial management, Marketing Techniques, Personnel Management, Importance of Communication in business

Unit VI Legal Aspects of Small Business (4 hrs)
Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules, Factory Act and Payment of Wages Act,

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi

AUDIT COURSE VII

AC 427 CONSTITUTION OF INDIA

Teaching Scheme: P: 2hrs/week **No Credits**

UNIT 1 **4 hrs**

Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases.

UNIT 2 **3 hrs**

Relevance of Directive principles of State Policy under Part – IV. Fundamental duties & their significance.

UNIT 3 **3 hrs**

Union Executive – President, Prime Minister, Parliament & the Supreme Court of India.

UNIT 4 **3 hrs**

State executive – Governors, Chief Minister, State Legislator and High Courts.

UNIT 5 **4 hrs**

Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions.

UNIT 6 **3 hrs**

Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments.

Reference Books:

1. Agarwal R.C., "Indian Political System", (1997) S.Chand and Company, New Delhi. Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi.
2. Durga Das Basu, "Introduction to the Constitution of India"(Students Edn.), Prentice – Hall EEE, 19th/20th Edn., 2001.
3. Gahai U.R., "(1998) Indian Political System", New Academic Publishing House, Jalaendhar.
4. Pylee M.V., "An Introduction to Constitution of India", Vikas Publishing, 2002.

5. Sharma K.L., "Social Stratification in India: Issues and Themes",(1997), Jawaharlal Nehru University, New Delhi.

6. Sharma R.N., "Indian Social Problems", Media Promoters and Publishers Pvt. Ltd.

7. Sharma and Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.

8. Singh Yogendra and Manohar,"(1997) Social Stratification and Charge in India", New Delhi.

Equivalence of Final Year B. Tech (Food Tech.) Semester VII & VIII

The above detailed syllabus is a revised version of the Final Year B. Tech (Food Technology) course being conducted by the Shivaji University, Kolhapur at the Department of Technology. This syllabus is to be implemented from June 2014(academic year2014-15).

The Equivalence for the subjects of Food Technology at Final Year B Tech Semester VII and VIII pre-revised course under the faculty of Engineering and Technology is as follows.

Semester VII

Sr. No	Final Year B. Tech(Food Tech.) Pre-revised syllabus	Final Year B. Tech(Food Tech.) Revised syllabus	Remark
1.	Meat, Poultry and Fish Processing Technology	Meat, Poultry and Fish Processing Technology	No Change
2.	Legume and Oilseed Technology	Legume and Oilseed Technology	No Change
3.	Waste Management of Food Industries	Food Quality & Safety Management	Interchange between subjects for better alignment as per the suggestion of committee
4.	Food Biotechnology	Food Biotechnology	No Change
5.	Elective –I	Elective –I	Introduction of additional elective as per the suggestion of committee
6.	Meat, Poultry and Fish Technology Lab	Meat, Poultry and Fish Technology Lab	No Change
7.	Legume and Oilseed Technology Lab	Legume and Oilseed Technology Lab	No Change
8.	# Industrial Training Report & * Seminar	# Industrial Training Report & * Seminar	No Change
9.	Waste Management of Food Industries Lab	Waste Management of Food Industries Lab	No Change
10.	Food Biotechnology Lab	Food Biotechnology Lab	No Change
11.	Major Project Phase- I	Major Project Phase- I	No Change
12.	-	Audit Course VI Professional Ethics	Introduction of additional audit course as per the suggestion of committee

Semester VII

Sr. No	Final Year B. Tech(Food Tech.) Pre-revised syllabus	Final Year B. Tech(Food Tech.) Revised syllabus	Remark
1.	Post Harvest Technology of Plantation Crops	Post Harvest Technology of Plantation Crops	No Change
2.	Food Plant Design and Layout	Food Plant Design and Layout	No Change
3.	Industrial Economics and Management	Waste Management of Food Industries	Interchange between subjects for better alignment as per the suggestion of committee
4.	-	Waste Management of Food Industries Lab	
5.	Design and Development of New Products	Design and Development of New Products	No Change
6.	Elective –II	Elective –II	Introduction of additional elective as per the suggestion of committee
7.	Design and Development of New Products Lab	Design and Development of New Products Lab	No Change
8.	Major Project Phase- II	Major Project Phase- II	No Change
9.	Post Harvest Technology of Plantation Crops Lab	Post Harvest Technology of Plantation Crops Lab	No Change
10.	Entrepreneurship Development for Food Technologists	Entrepreneurship Development for Food Technologists	No Change
11.		Audit Course VII Constitution of India	Introduction of additional audit course as per the suggestion of committee