SNDT Women's University

Centre for Vocational and Technical Education

Curriculum for

B. Voc/D. Voc

In

Food Processing Technology

(Revised in 2019)

1.1 Key Features:

Objectives

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the Diploma, undergraduate level of higher education to enhance employability of the students and meet industry requirements. Such student apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students admitted in such vocational courses.
- The certification levels will lead to Diploma/Advanced Diploma/B. Voc. Degree in Food Processing and Technology and will be offered by respective affiliating University/Board of Technical Education.
- Students may be awarded Level Certificate/Diploma/Advance Diploma /Degree as out-lined in the Table below:

Award	Duration after class X	Corresponding NSQF level
Level 3 Certificate	1 Year	3
Level 4 Certificate	2 Years	4
Diploma	3 Year	5
Advance Diploma	4 Years	6
B.Voc. Degree	5 Years	7

2. Course Objectives

After successfully completing the vocational course, the student would have acquired relevant appropriate and adequate technical knowledge together with the professional skills and competencies in the field of Food Processing, so that he/she is properly equipped to take up gainful employment in this Vocation. Thus he/she should have acquired:-

A. Understanding of

(a)The relevant basic concepts and principles in basic Food Science and Preservation to understand the different vocational subjects.
(b) The basic concepts in Food Technology.
(c) The concepts and principles of Food Engineering.
(d) The knowledge of raw materials and services used in Food Processing Sector.
(e) IT tools used in Food Processing industry.

B. Adequate Professional Skills and Competencies in

(a) Mathematical skills, good planning and presentation skills.
(b) New Product/Process Development.
(c) Problem solving during post-harvest processing, manufacturing and packaging.
(d) Quality assurance, hygiene and safety procedures.

C. A Healthy and Professional Attitude so that He/she has

(a) An ability to work independently and multitasking ability.
(b) Possess people skills, reading and writing ability, communication, analytical, networking and listening skills along with creative bent of mind.
(c) An ability to work independently and make various operational decisions, have skills of supervision, multitasking ability, good planning and presentation skills.
(d) Respect for honesty, punctuality and truthfulness.

D.NSQF compliant skills in Qualification developed by sector skill council in Food Processing Sector

3. Course Structure

The course will consist of combination of practice, theory and hands on skills in the **Food Processing and Allied** sector.

Curriculum

Level	Process required	Professional Knowledge	Professional skill	Core skill	Responsibility
Level 3	Person may carry put a job which may require limited range of activities routine and predictable	Basic facts, process and principle applied in trade of employment	Recall and demonstrate practical skill, routine and repetitive in narrow range of application	Communication written and oral with minimum required clarity, skill of basic arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment	Under close supervision some responsibility for own work within defined limit
Level 4	Work in familiar, predictable, routine, situation of clear choice	Factual knowledge of field of knowledge or study	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools materials and information	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and learning and some responsibility for other's works and learning

Level 6	Demands wide range of specialized technical skill, clarity of knowledge and practice in broad range of activity involving standard/ non-standard practices	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Reasonably good in mathematical calculation, understanding of social, political and reasonably good in data collecting organizing information, and logical communication	Responsibility for own work and learning and full responsibility for other's works and learning
Level 7	Requires a command of wide ranging specialized theoretical and practical skill, involving variable routine and non-routine context	Wide ranging, factual and theoretical knowledge in broad contexts within a field of work or study	Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Good logical and mathematical skill understanding of social political and natural environment good in collecting and organizing information, communication and presentation skill	Full responsibility for output of group and development

The curriculum in each of the years of the programme would be a suitable mix of general education and skill components.

Skill Components:

The focus of skill components shall be to equip students with appropriate knowledge, practice and attitude, to become work ready. The skill components will be relevant to the industry as per its requirements.

- The curriculum will necessarily embed within itself, National Occupational Standards (NOSs) of specific job roles within the industry. This would enable the students to meet the learning outcomes specified in the NOSs.

- The overall design of the skill development component along with the job roles selected will be such that it leads to a comprehensive specialization in few domains.
- The curriculum will focus on work-readiness skills in each of the year of training.
- Adequate attention will be given in curriculum design to practical

General Education Component:

- The general education component adhere to the normal senior secondary and university standards. It will emphasize and offer courses which provide holistic development. However, it will not exceed 40% of the total curriculum.
- Adequate emphasis is given to language and communication skills.

The curriculum is designed in a manner that at the end of each year after class XIIth students can meet below mentioned level descriptors of NSQF:

1. **VISION**

   Empowered women food technologist through value added education.

2. **MISSION**
   1. To deliver quality education and training in Food Technology for holistic development of women.
   2. To inculcate the spirit of social, environmental, cultural responsibility through appropriate education and training.
   3. To empower women by developing entrepreneurial skills.

3. **Program educational objectives (PEO)**

   After successful completion of the program , the graduates will be able

   1. To become highly competent food technologist to contribute professionally to the field of food technology and society.
   2. To develop practicing consultants & entrepreneurs to set up small scale food industry in food & allied sector.

3. To continue to develop both professionally and personally through graduate study, participation in professional societies continuing education and community service and demonstrate spirit of team work and high moral value.

4. Program Specific Objectives

At the end of program the student should

PSO1- be able to understand concepts & apply in the field of food technology, engineering, analysis, packaging, hygiene.

PSO2- be able to associate the learning from the courses related to technology, processing, preservation, engineering, analysis, packaging, hygiene to arrive at solutions to real world problems.

PSO3- have ability to comprehend technological advancements to analyse & design processes for a variety of applications.

PSO4- have adaptability to function in multidisciplinary work environment, good interpersonal skills, professional ethics & societal responsibilities

Curriculum

Level	Code	Educational Component	Credit	Marks
4 Semester I		**Theory**		
	103101	Communication Skills And Documentation	2	50
	103102	EVS	2	50
	103103	Food Process Technology I	4	100
	103104	Food Chemistry (Theory)	2	50
	103201	Food Chemistry (Practical)	2	50
		Lab/Practical		
	103202	Food Process Technology I	3	75
	103901	On-Job-Training (OJT)/Qualification Packs (NSQF Level 4)(Any one)	15	375
	FIC/Q5002	Craft Baker		
	FIC/Q2002	Dairy Processing Equipment		
	FIC/Q1003	Grain Miller		

	FIC/Q7601	Assistant Lab Technician
	FIC/Q8501	Traditional Snack and Savoury Maker
	FIC/Q8502	Spice Processing Technician

Level	Code	Educational Component	Credit	Marks
5 Semester II		**Theory**		
	203101	Food Preservation	2	50
	203201	Food Preservation (PR)	2	50
	203102	Food Additives and Flavour Technology	2	50
	203103	Food Processing Technology II	4	100
	203202	Computer Skills Practical	2	50
		Lab/Practical		
	203203	Food Processing Technology II	3	75
	203901	On-Job-Training (OJT)/Qualification Packs(NSQF Level 5)(Any one)	15	375
	FIC/Q5001	Plant Baker		
	FIC/Q2001	Dairy Product Processor		
	FIC/Q2007	Supervisor Dairy Product Processor		
	FIC/Q1002	Milling Technician		
	FIC/Q7001	Food Products Packaging Technician		
	FIC/Q9001	Process Food Entrepreneur		
Level	**Code**	**Educational Component**	**Credit**	**Marks**
6 Semester III		**Theory**		
	303101	Food Microbiology (Theory)	2	50
	303201	Food Microbiology (Practical)	2	50
	303102	Food Nutrition	2	50
	303103	Food Biochemistry	2	50
	303104	Unit Operation	2	50
	303105	Fruits and Vegetable Processing	2	50
		Lab/Practical		
	303202	Food Processing Technology III	3	375
	303901	On-Job-Training (OJT)/Qualification Packs (NSQF Level 6)(Any one)	15	375
	FIC/Q1001	Chief Miller		
		Food Microbiologist		

Level	Code	Educational Component	Credit	Marks
6 Semester IV		**Theory**		
	403101	Food Sanitation and Hygiene (Theory)	2	50
	403201	Food Sanitation and Hygiene (Practical)	4	100
	403102	Food Analysis	2	50
	403103	Food Laws and Regulation	2	50
	403104	Food Processing Equipment	2	50
		Lab/Practical		
	403202	Food Analysis	3	75
	403901	On-Job-Training (OJT)/Qualification Packs (NSQF Level 6)(Any one)	15	375
	FIC/Q9002	Food Regulatory Affair Manager		
	FIC/Q7602	Quality Assurance Manager		

Level	Code	Educational Component	Credit	Marks
7 Semester V		**Theory**		
	503101	Food Packaging	4	100
	503102	Technology of Animal Products	2	50
	503103	Food Industry Waste Management	2	50
	503201	Computer Skills Practical	2	50
	503104	Beverage Technology and Plantation Crops	2	50
		Lab/Practical		
	503202	Food Processing Technology IV and Sensory Evaluation	3	75
	503901	On-Job-Training (OJT)/Qualification Packs(NSQF Level 7)(Any one)	15	375
	FIC/Q9003	Production Manager		
		* Assistant Plant Manager		

Level	Code	Educational Component	Credit	Marks
7 Semester VI		**Theory**		
	603101	Quality Assurance and Certification	4	100
	603102	Grass root Innovation and Entrepreneurship	4	100
	603103	Ecommerce	4	100
		Lab/Practical		
	603201	Internship (3 months)	3	75
	603901	On-Job-Training (OJT)/Qualification Packs(NSQF Level 7)(Any one)	15	375
		* Hygiene Manager		
		* Application Manager		

Note: * Qualification packs not available, to be prepared and submitted to NSDA for approval.

SEMESTER I				
Sr. No.	Subject Code	Subject Name	Credits	Page No
1	103101	Communication Skills And Documentation	2	
2	103102	Environmental Study	2	
3	103103	Food Processing Technology I	4	
4	103104	Food Chemistry Theory	2	
5	103201	Food Chemistry Practical	2	
5	103202	Food Process Technology I Practical	3	
6	103901	On-Job-Training OJT)/Qualification Packs (QP)	15	

INDEX

SEMESTER II				
Sr. No.	Subject Code	Subject Name	Credits	Page No
1	203101	Food Preservation	2	
2	203201	Food Preservation PR	2	
3	203102	Food Additives &Flavour Technology	2	
4	203103	Food Processing Technology II	4	
5	203202	Computer Skills	2	
6	203203	Food Processing Technology II Practical	3	
7	203901	On-Job-Training OJT)/Qualification Packs (QP)	15	

SEMESTER III				
Sr. No.	Subject Code	Subject Name	Credits	Page No
1	303101	Food Microbiology Theory	2	
2	303201	Food Microbiology Practical	2	
3	303102	Food Nutrition	2	
4	303103	Food Biochemistry	2	
5	303104	Unit Operation	2	
6	303105	Fruit and Vegetable Processing	2	
7	303202	Food Processing Technology III Practical	3	
8	303901	On-Job-Training OJT)/Qualification Packs (QP)	15	

SEMESTER IV				
Sr. No.	Subject Code	Subject Name	Credits	Page No
1	403101	Food Sanitation and Hygiene Theory	2	
2	403201	Food Sanitation and Hygiene Practical	4	
3	403102	Food Analysis	2	
4	403103	Food Laws & Regulation	2	
5	403104	Food Processing Equipment	2	
6	403202	Food Analysis Practical	3	
6	403901	On-Job-Training OJT)/Qualification Packs (QP)	15	

SEMESTER V				
Sr. No.	Subject Code	Subject Name	Credits	Page No
1	503101	Food Packaging	4	
2	503102	Technology of Animal products	2	
3	503103	Food Industry Waste Management	2	
4	503201	Computer Skills	2	
5	503104	Beverage Technology & Plantation Crops	2	
7	503202	Food Processing Technology IV & Sensory Evaluation Practical	3	
8	503901	On-Job-Training OJT)/Qualification Packs (QP)	15	

SEMESTER VI				
Sr. No.	Subject Code	Subject Name	Credits	Page No
1	603101	Quality Assurance and Certification	4	
2	603102	Grass root Innovation and Entrepreneurship	4	
3	603103	Ecommerce	4	
4	603201	Internship (3 Months)	3	
5	603901	On-Job-Training OJT)/Qualification Packs (QP)	15	

SEMESTER I

103101:- COMMUNICATION SKILLS AND DOCUMENTATION 30 Hours
Hr/week:-2 Credit:-2 Marks: - 50

Objective: To implement Oral and written communication in professional environment

Students Will Be Able To:

CO1 – Identify objectives, enablers and barriers of communication

CO2 – Write business letters, e-mails and other forms of communication in a professional manner

CO3 – Compare channels of communication and select appropriate one

CO4 – Apply appropriate techniques for group commnication

Course Content

MODULE I: Basis of Communication 6 Hours

Meaning, importance and process, need and objectives of communication, 7Cs of communication, barriers of communication, How to overcome communication barrier.

MODULE II 8 Hours

Formal Writing Skills: Composition Writing: Business Letters (Functions of a Business Letter, Layout of a Business Letter, Salient Features of a Business Letter, Kinds of Business Letter, Application Writing), etiquettes of Social Media writing .

MODULE III: Means/Media of Communication 8 Hours

Verbal and nonverbal communication channel of formal and informal communication. Types of communication. Downward, upward, Horizontal or lateral, Diagonal or cross.

MODULE IV: Groups and New Trends in Business communication 8 Hours

Importance of features, advantage and disadvantages techniques of group decision making-Brain storming sessions, Nominal group technique, Delphian Technique, solving problems in groups. E mail, teleconferencing, video conferencing, SMS.

References:

1. High School English Grammar and Composition - Wren & Martin, Publisher - Churchill Livingstone.
2. Anthology of English Language and Communication Skills - Sharma S R, Jacob, Mark Publications.
3. Language and Communication Skills - Shastri, Rameshchandra, ABD Publications
4. Course in Academic Writing - Renu Gupta, Orient Blackswan Publications.

103102 :- ENVIRONMENTAL STUDY **30 Hours**
Hr/week:-2 **Credit:-2** **Marks:- 50**

Objective:- To acquire Knowledge of ecology and natural resources and understand the impact of human activities on ecology ant need to conserve the resources

Students Will Be Able To:

CO1 **–** Understand and describe different types of pollution

CO2 – Apply the knowledge in reducing global warming and green house effects along with different types of pollution and diseases.

CO3 – Analyse different types of tree, their medicinal , food values.

Course Content

MODULE I **6 Hours**

The Multidisciplinary Nature of Environmental Studies- Definition, Scope and Importance, Need for public awareness, Natural Resources - Renewable and Non- Renewable Resources - Natural Resources and Associated Problems-

a) Forest Resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water Resources: Use and Over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems

c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilization-pesticide problems, water logging, salinity, case studies

e) Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies

f) Land Resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
Role of individual in conservation of natural resources , Equitable use of resources for sustainable lifestyles

MODULE II **8 Hours**

Ecosystems Concept of ecosystem**,** Structure and function of ecosystem**,** Producers, consumers and Decomposers**,** Energy flow in the ecosystem, Ecological succession **,**Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following ecosystem- a) Forest ecosystem b) Grassland Ecosystem c) Desert ecosystem d) Aquatic ecosystem (pounds, steams, lakes, rivers, oceans, estuaries).

Biodiversity and its conservation Introduction- Definition: genetic, species and ecosystem diversity.**,** Bio-geographical classification of India **,** Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values **,** India as a mega-diversity nation **,** Hot-sports of biodiversity **,** Threats to bio-diversity: habitat loss, poaching of wildlife, man-wildlife conflicts **,** Endangered and endemic species of India **,** Conservation of bio-diversity: In-Situ and Ex-situ conservation of biodiversity

MODULE III **8 Hours**

Environmental Pollution - Definition, Causes, effects and control measures of – a) Air pollution b) Water pollution c) Soil pollution d) Marine pollutione) Noise pollution f) Thermal pollution g) Nuclear hazards.

Solid waste management: Causes, effects and control measures of urban and industrial waste**,** Role of individual in prevention of pollution**,** Pollution case studies, Disaster Management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment -From Unsustainable to Sustainable development**,** Urban problems related to energy **,** Water conservation, rain water harvesting , watershed management **,** Re-settlement and rehabilitation of people; its problems and concerns. Case studies**,** Environmental ethics: Issues and possible solutions**,** Climate changes, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation **,** Consumerism and waste products **,** Environment Protection Act**,** Air (Prevention and Control of Pollution) Act **,** Water(Prevention and Control of Pollution) Act**,** Wildlife Protection Act**,** Forest Conservation Act**,** Issues involved in enforcement of environmental legislation**,** Public awareness .

MODULE IV **8 Hours**

Human Population and the Environment -Population growth, variation among nation**,** Population explosion- Family Welfare Programme **,** Environment and Human Health**,** Human

Rights**,** Value Education**,** HIV/AIDS**,**Women and Child Welfare, Role of Information Technology in Environment and Human health, Case Studies.

Visit to local area to document environmental assets-
a) rivers/forest/grassland/hill/mountain.
b) Local Pollution site- Urban/Rural/Industrial/ Agricultural
c) Study of common plants/insects/birds
d) Study of simple ecosystems- ponds, rivers, hill slope etc

References :

1. The Biodiversity of India, Bharucha Erach , Mapin Publishing Pvt.Ltd, Ahmedabad-380013, India, Email: mapin@icenet.net
2. Environmental Biology, Agarwal, K.C , Nidi Publi.Ltd.Bikaner2001 ,
3. Hazardous Waste Incineration , Brunner R.C, McGraw Hill Inc.480p, 1989
4. Marine Pollution, Clark R.S, Clanderson Press Oxford (TP)
5. Environmental Encyclopedia, Cunningham, W.P.Cooper, Jaico Publ. House, Mumbai, 1196p M.T.2001
6. Environmental Chemestry , De A.K, Wileely Eastem Ltd.

103103 :- FOOD PROCESSING TECHNOLOGY I **60 Hours**
Hr/week:-4 Credit:-4 **Marks: - 100**

Objective:- To acquire basic knowledge and applied technology of dairy and bakery and confectionary and acquaint with the manufacturing technology of the same.

Students Will Be Able To:

CO1 – Understand technical know how of basic ingredients and the methodology of bakery, dairy and confectionary products

CO2 **–** Describe different methods of manufactures

CO3 – Evaluate and select appropriate raw materials as per product requirements

Course Content

MODULE I: Manufacture of Sugar and Classification of confectionery15 Hours

Sugarcane, jaggery, khandasari sugar, raw sugar, refined sugar, white sugar, beet sugar, manufacture of sugar from sugar cane, refining of sugar. Sugar boiled confectionery-

crystalline and amorphous confectionery, rock candy,hard candy, lemon drop, china balls, soft candy, lollypop, marshmallows, fudge,cream, caramel, toffee, lozenges, gumdrops, honeycomb candy, Wheat - Properties, Quality - Hardness, Gluten strength, protein content, soundness. Methodology and approaches to evaluate bread and bread wheat quality, processing factors, product factors.

MODULE II: Principles of baking and Bread manufacturing 15 Hours

Major baking ingredients and their functions, role of baking ingredients in improving the quality of bread. Characteristics of good flour used for making bread, biscuits and cakes. Ingredients used for bread manufacture, methods of mixing the ingredients, dough development methods - straight dough, sponge dough, moulding, proofing, baking, packing, spoilage, bread staling, methods to reduce bread staling and spoilage, Processing of cakes and biscuits- ingredients, development of batter, baking and packing, Spoilage in cakes and biscuits.

MODULE III : Introduction 15 Hours

Milk - Definition, sources, and composition of milk, factors effecting composition of milk, physiochemical properties of milk, grading of milk-definition and types of grades, collection and transportation of milk. Flowchart of milk processing, Reception, Different types of cooling systems. Clarification and filtration process, standardization- Pearson's square method, pasteurization-LTLT, HTST and UHT process- continuous pasteurizer, Sterilization and Homogenization, Cream separation- centrifugal cream separator, bactofugation.

MODULE IV: Special milks 15 Hours

Skim milk, evaporated milk, condensed milk, standardized milk, toned Milk , double toned milk, flavoured milk, reconstituted milk. Indigenous and Fermented milk product, Product description, methods for manufacture of butter, cheese, Ice cream, khoa, channa, paneer, shrikhand, ghee. Spray drying system: dried milk- whole milk and skim milk powder. Instantization of milk.Introduction to Cleaning in- place (CIP) system – cleaning procedure,

Cleaning efficiency, Methods of cleaning in food industry, cleaning solutions, detergents, sanitizers. SIP system of dairy plant, Personal hygiene in dairy plant.

References

1. Joshi.V.K., (2015),"Indigenous Fermented Foods of South Asia",CRC Press.
2. Alan H. Varnam, (2012), "Milk and Milk Products: Technology, chemistry and microbiology", Springer Science & Business Media Publishers.
3. Robinson, R. K., (2012), "Modern Dairy Technology: Volume 2 Advances in Milk Products", Springer Science & Business Media Publishers.
4. Zhou. W, Hui Y,H; (2014), "Bakery Products Science and Technology", 2nd Edition, Wiley Blackwell Publishers,

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103104 :- FOOD CHEMISTRY **30 Hours**

Hr/week:-2 **Credit:-2** **Marks: - 50**

Objective To acquaint with properties and role of various constituents in foods, interaction and changes during processing.

Students Will Be Able To:

CO1 – Understand and enlist properties of components of foods

CO2 – Apply the knowledge for analytical and processing methods

Course Content

MODULE I **6 Hours**

Food Constituents: Proximate composition of foods, water in foods, Carbohydrate:Introduction, definition nomenclature, classification. General properties of sugar (physical and Chemical) identification of common mono saccharides, disaccharides and polysaccharides, determination of the amount of reducing and non - reducing sugars. Chemistry of starch, glycogen, cellulose, gums and mucilage, crude fibre.

MODULE II **8 Hours**

Protein: Physical and Chemical properties of amino acids. Classification of proteins, amino acid sequence in proteins, pleated sheet and helix structure of protein tertiary structure and conformation of proteins. Physical and chemical properties of proteins,molecular weight of proteins, protein denaturation.

MODULE III **8 Hours**

Lipids: Classification of lipids, fatty acid, soap and detergent, essential fatty acids, fats and oils saponification number, acid numbers, iodine value, acetyl value, Reichart - Meissl number, Oxidative and hydrolytic rancidity, reversion.

MODULE IV **8 Hours**

Vitamins & minerals: Occurrence, chemistry, food sources, deficiency, loss during storage and processing of foods Natural Pigments and Flavouring Agents: Chlorophyll, carotenoids, anthocyannics, anthoxanthins, flavonoids, tannins. Natural flavour constituents.

103201 :- FOOD CHEMISTRY PRACTICAL

. 30 Hours

Hr/week:-2 Credit:-2 Marks:- 50

Students Will Be Able To:

CO1 – Perform qualitative test for components of food

CO2 – Perform quantitative test for components of food

1. Qualitative test for proteins and fats/oils and their identification in unknown mixtures free fatty acid, Peroxide value, Saponification value, RM Number, TBA test, Iodine value.
2. Quantitative estimation of proteins.
3. Estimation of vitamins
4. Analysis of edible common salt for MC, iodine and total chlorides.
5. Estimation of ammonia in water.
6. Estimation of plant pigments - carotenoids, flavonoids
7. To determine alcohol soluble and insoluble solids.
8. Proximate analysis of food.
9. Estimation of carbohydrates by Lane and Eynon method
10. Estimation of carbohydrates by Wilstater method.

103202 :- FOOD PROCESSING TECHNOLOGY I **45 Hours**
Hr/week:-3 **Credit:-3** **Marks: - 75**

Students Will Be Able To :

CO1 – Prepare different types of dairy, bakery and confectionary products

CO2 – Evaluate finished product with respect to sensory appeal

1. Preparation of different types of biscuits
2. Preparation of melting marvels
3. Preparation of sugar boiling
4. Preparation of different varieties of bread
5. Preparation of sugar confections
6. Preparation of cookies
7. Preparation of different varieties of cakes
8. Determination of specific gravity of milk. .
9. Preparation of Lassi.
10. Preparation of khoa.
11. Preparation of chakka and shrikand.
12. Preparation of PANEER.
13. Preparation of icecream ,kulfi
14. Visit to Dairy / Bakery

103901 : On-Job-Training (OJT) / Qualification Packs
Credit:-15 Duration : 3 Months Marks : 375

Students Will Be Able To:
CO1 – Perform work in the industry

CO2 – Apply the knowledge for problem solving and designing new process, methods

Craft Baker FIC/Q5002	(Any one)
Dairy Processing Equipment FIC/Q2002	
Grain Miller FIC/Q1003	
Assistant Lab Technician FIC/Q7601	
Traditional Snack and Savoury Maker FIC/Q8501	
Spice Processing Technician FIC/Q8502	

SEMESTER II

203101:- FOOD PRESERVATION **30 Hours**
Hr/week:-2 **Credit:-2** **Marks:- 50**

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

Students Will Be Able To:

CO1 – Identify food quality loss mechanisms and its deterioration in terms of microbial, chemical, physical and biochemical changes

CO2 – Implement preservation methods like drying, acids, added chemicals, controlled air, pressure and high energy radiation

CO3 – Apply appropriate food preservation methods depending upon the product

Course Content

MODULE I: **6 Hours**

Food Spoilage and Preservation by using Preservatives, types of spoilage - physical, enzymatic, chemical and biological spoilage. Mechanism of spoilage and its end products, shelf life determination preservation: Definition, principles, importance of food preservation, traditional and modern methods of food preservation. Food additives - definition, types, Class I and Class II preservatives.

MODULE II: **8 Hours**

Preservation by use of high temperature.

Pasteurization: Definition, types, Sterilization, Canning - history and steps involved, spoilage encountered in canned foods, types of containers used for canning foods. Food irradiation- Principles, merits and demerits, effects of irradiation and photochemical methods.

MODULE III: **8 Hours**

Preservation by use of Low Temperature, Refrigeration - advantages and disadvantages,

freezing: Types of freezing, common ,spoilages occurring during freezing, difference between refrigeration and freezing.

MODULE IV: 8 Hours

Preservation by Removal of Moisture, Drying and dehydration - merits and demerits, factors affecting, different types of drying, Concentration: principles and types of concentrated foods

References

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

203201 : FOOD PRESERVATION 30 Hours
Hr/Week : 2 Credit : 2 Marks : 50
Students Will Be Able To:

CO1 – Perform various preservation methods

CO2 – Apply appropriate method of preservation techniques for various products

Topic No.	Topic	No. of hours
1.	Preservation by dehydration	6
2.	Preservation with chemicals	6
3.	Canning and evaluation of canned products	4
4.	Fermentation – Preparation of alcoholic beverages, vinegar, Fermented milks, fermented Cereal Products,	8
5.	Freezing preservation	4
6.	Combination methods	2
	Total	**30**

203102:- FOOD ADDITIVES & FLAVOUR TECHNOLOGY 30 Hours
Hr/week:-2 Credit:-2 Marks:- 50

Objective: To understand the importance of food additives in food processing technology also to study the merits and demerits of addition of food additives.

Students Will Be Able To:

CO1 – Understand and describe type and classes of food additives and their action

CO2– Compute amount of additive to be used according to legal standards

CO3– Apply knowledge to select appropriate additive in a product

Course Content

MODULE I: Introduction to Food Additives 6 Hours

Role of Food Additives in Food Processing, functions -Classification -Intentional &Unintentional Food Additives. Safety Evaluation of Food Additives, Beneficial and Toxic Effects. Food Additives - Generally recognized as safe (GRAS), Tolerance levels &Toxic levels in Foods.

MODULE II: Types of food additive 8 Hours

Preservatives, antioxidants, colours (synthetic and natural), acidulants, buffering salts, anticaking agents - uses and functions in formulations; indirect food additives.

MODULE III: 8 Hours

Sequestrants, humectants, hydrocolloids, sweeteners, types, functions, compound used, application in food industries. acidulants, buffering salts, anticaking agents - uses and functions in formulations; Incidental Food additives.

MODULE IV: 8 Hours

Flavour Technology, Definition of Flavour, Classification of Food Flavours, Chemical Compounds Responsible for Flavour, Difficulties of Flavour Chemistry, Various Flavoring compounds used in Food processing Industries. Flavour enhancer, Flavour potentiator Problem Based Learning, Tongue and Nose, Onion, Beverage, Maillard Reaction, Thio-stench. Flavour emulsion, development techniques and application of flavour emulsion in food and beverages.

References

1. Titus A. M. Msagati, (2012),"The Chemistry of Food Additives andPreservatives", John Wiley & Sons Publishers.
2. Jim Smith, Lily Hong-Shum (2011), "Food Additives Data Book", John Wiley &Sons Publishers.
3. Deshpande, S.S. (2002). "Handbook of Food Toxicology", Marcel Dekker Publishers.

203103:- FOOD PROCESSING TECHNOLOGY II **60 Hours**
Hr/week:-4 **Credit:-4** **Marks:- 100**

Objective: To acquaint with production and consumption trends, structure, composition, quality evaluation, and processing technologies of various cereals, pulses, spices and oilseeds.

Students Will Be Able To:

CO1 – Explain the theory and working principle of processing technologies of cereals, pulses, oilseeds and spices

CO2 – Outline manufacturing processes of related products

CO3 – Evaluate raw materials as per product requirement.

Course Content

MODULE I **15 Hours**

Wheat Processing: Wheat classification, Functionality of wheat flour components. Rice Processing: Classification, paddy Processing, Parboiling and treatment for quality improvement, Milling, rice products. Maize- Dry and wet milling of corn, corn products, sorghum, pearl millet and small millets processing.

MODULE II **15 Hours**

Pulses: Pre-treatment of pulses for milling, milling of major pulses. Methods To improve recovery, Nutrition and anti- nutritional factors in pulses.

MODULE III **15 Hours**

Oil seeds Processing: Groundnut, Mustard, Soybean, Sunflower, Safflower, Sesame and other oil seeds processing. Special Topics: Processing & Utilization of Soya bean for value added products, innovative products from cereals, pulses and oilseeds. Extrusion technology for cereals.

MODULE IV: Processing of Major Spices and extractives **15 Hours**

Major spices: Pepper, cardamom, ginger, clove, nutmeg, vanilla, cinnamon, chilli and turmeric - method of manufacture; chemistry of the volatiles; enzymatic synthesis of flavour identical. Value added spice products: Spice volatile oils, spice oleoresins, Use of spice extractives,

References

1. Chakrabarty MM. 2003. Chemistry and Technology of Oils and Fats. Prentice Hall.
2. Dendy DAV &Dobraszczyk BJ. 2001. Cereal and Cereal Products. Aspen.
3. Hamilton RJ &Bhati A. 1980. Fats and Oils - Chemistry and Technology. App. Sci. Publ.
4. Hoseney RS. 1994. Principles of Cereal Science and Technology. 2nd Ed. AACC.
5. J.S.Purthi, (2003) (2001), "Minor Spices and Condiments: Crop Management.

203202 :- COMPUTER SKILLS PRACTICAL 30 Hours

Hr/week:-2 Credit:-2 Marks:- 50

Objective: - To understand application of computers technology in food industry

Students Will Be Able To:

CO 1 – Perform fundamental operating system functions.

CO2 – Use common software applications such as word processing and spreadsheet software.

CO3 – Use a computer for Internet access

CO4– Assemble the computer and its devices.

Course Content

MODULE I: Office Automation 6 Hours

Introduction-Tools, Windows 7, desktop, files and folders, printers, Microsoft Office button, Quick access tool bar

MODULE II: MS Word 8 Hours

Introduction- Typing text, saving, opening, Closing, common edit functions (cut copy paste, change case). Text Editing - Inserting text, spell check, correcting mistakes, common formatting functions. Formatting paragraph, tables, bullets & numbering, inserting clipart & word art, picture & Drawing tool bar, Header & footer.

MODULE III: MS Excel 8 Hours

Introduction- Parts of MS Excel windows, opening, saving and closing, workbook, entering data and numbers, Texts, date & time, formatting data, tool bar, drawing in MS Excel, and

drawing tool bar, formatting & editing worksheet. Format cells, row, Column , work sheet (Inserting, deleting, renaming) Formulas, functions, charts.

MODULE IV : Use of Internet **8 Hours**

203203 :- FOOD PROCESSING TECHNOLOGY II PRACTICAL **45**
Hr/week:-3 **Credit:-3** **Marks:- 75**
Students Will Be Able To:
CO1 – Prepare different products of cereal, pulses oilseeds and spices

CO2 – Describe different methods of manufacture of related products

CO3 – Apply knowledge for industrial production and analyses

1. Preparation of spice extract.
2. Preparation of mix spices
3. Preparation of Instant rice products
4. Preperat6ion of pasta products
5. Preparation of legume products
6. Preparation of oil products
7. Visit to relevant industry
8. Preservation of food by Canning.
9. Preservation of food by dehydration
10. Freezing
11. Chemical preservation

203901:- On-Job-Training (OJT)/Qualification Packs (NSQF Level 5)
Credit:-15 Duration : 3 Months **Marks : 375**
Students Will Be Able To:

CO1– Perform work in the industry

CO2 – Apply the knowledge for problem solving and designing new process, methods

Plant Baker FIC/Q5001	(Any one)
Dairy Product Processor FIC/Q2001	
Supervisor Dairy Product Processor FIC/Q2007	
Milling Technician FIC/Q1002	

Food Products Packaging Technician FIC/Q7001	
Process Food Entrepreneur FIC/Q9001	

SEMESTER III

303101 :- FOOD MICROBIOLOGY **30 Hours**

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objective: To make students understand the food and industrial microbiology and to make them aware about the importance of food quality control by avoiding pathogenic microbial attack.

Students will be able to:

CO1 – Understanding the basics of food microbiology and role of microorganism in the food industry

CO2– Evaluate and compare causes of food deterioration and food borne illness

CO3 – Students will be to apply various control measures to increase product shelf life

Course Content

MODULE I: Introduction to food microbiology **6 Hours**

Discovery, current status, role of food microbiology, sources of microorganisms in food,Changes caused by microorganisms – food fermentation, putrefaction, lipolysis. Growth and survival of microorganisms in foods, biological, chemical and physical changes caused bymicroorganisms, physical and chemical methods to controlmicroorganisms.

MODULE II: Characteristics of microorganisms **8 Hours**

Classification of microorganisms, nomenclature, morphology - yeast and moulds, bacterial cells, viruses. Important microbes in food, microbial growth characteristics - Microbial reproduction, nature of growth in food. Food hygiene and sanitation: Contamination during handling and processing and its control; indicator organisms.

MODULE III: Spoilage in different food groups **8 hours**

Factors influencing microbial growth in food: Intrinsic and extrinsic factor. Food spoilage - Introduction, spoilage in cereals, vegetables and fruits, meat, eggs,poultry, fish, milk and milk products, canned foods, nuts and oil seeds, fats and oil.

MODULEIV: Beneficial uses of microorganisms 8 Hours

Microorganisms used in food fermentation, mechanisms of nutrient transport, application in genetics, intestinal bacteria and probiotics, food bio preservatives of bacterial origin, food ingredients and enzymes of microbial origin. Economic importance of microorganisms.

References

1. Ray Bibek; ArunBhunia,(2013), "Fundamental Food Microbiology", CRC Press.
2. RayBibek; ArunBhunia,(2013), "Fundamental Food Microbiology", CRC Press.
3. Adams ,Martin R, Maurice O Moss, Peter McClure (2015), "Food Microbiology", Royal Society of Chemistry, Cambridge.
4. Jay, James M.(2012), "Modern Food Microbiology", Springer Science & BusinessMedia., Maryland.

303201 :- FOOD MICROBIOLOGY PRACTICAL 30 Hours

Hr/week:-2 Credit:-2 Marks:- 50

Students Will be able to:

CO1 – Identify the microorganisms using isolation technique

CO2– Isolate pathogen and spoilage bacteria from food and environment

1. Introduction to Food Microbiology and Laboratory Safety
2. Use of autoclave, Laminar air flow
3. Functioning and use of compound microscope
4. Cleaning and sterilization of glassware
5. Preparation and sterilization of nutrient broth
6. Cultivation and sub-culturing of microbes
7. Preparation of slant, stab and plates using nutrient agar
8. Morphological study of bacteria and fungi using permanent slides
9. Simple staining,GramStaining,Negative staining
10. Standard Plate Count of Milk and Foods
11. Heat, Cold and Other Stress Factors Affecting Microbial Growth
12. Isolation and Identification of Escherichia coli

303102 :- FOOD NUTRITION **30 Hours**

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objective:-To understand nutrients in foods, their requirement, sources & effect of deficiencies

Students Will Be Able To"

CO1 – Understand and describe different types of nutrients in the diet

CO2 – Apply the knowledge to design age specific receipies or a diet

CO3 – understand and apply the knowledge of functional foods/neutaceuticals to improve immunity and overall health

Course Content

MODULE I **6 Hours**

Introduction to Food: Definition, classification and constituents of Food: Carbohydrates, Fats, Proteins ,Fat soluble vitamins- (A,D,E and K) Water soluble vitamins – (Thiamin, Riboflavin, Niacin, Pyridoxine, Folate, Vitamin B12 and Vitamin C) Minerals – (Calcium, Iron, Zinc, Iodine and Flourin

MODULE II **8 Hours**

Nutritional Concept in Food Design: Nutritive values of cereals, pulses, oil seeds, fruits vegetables, fish, meat and eggs Functions of food, Effect of deficiency & overconsumption of dietary sources on health, Basic food groups,Recommended Dietary Allowance (RDA), Food guide pyramid, Dietary fibers, Functions of water in body. . Balanced Diet: Definition, food groups used in planning balanced diets.

MODULE III **8 Hours**

Nutrition: Basic terms used in nutrition, relationship between food, health and nutrition bioavailability of nutrients. Basal Metabolic Rate (BMR). Protein quality, Dietary allowances

and standards for different age groups: adult man/woman, pre-school children, adolescent children, pregnant woman. geriatric nutrition, nutrition for athletes

MODULE IV **8 Hours**

Nutraceuticals and functional foods :- introduction, definition, various types of functional foods, scope of nutraceuticals in India and abroad, regulations on nutraceuticals.

References:

1. N. ShakuntalaManay& M. Shadaksharaswamy Food Facts and Principles by, NewAge International (P) Ltd. Publishers.
2. N. Potter & J. Hotchkiss, Food Science CBS Publisher and Distributors.
3. ManoranjanKalia and SagitaSood, Food Preservation and Processing by KalyaniPublishers.
4. Shubhangini Joshi, Nutrition and Dietetics TataMcgraw Hill Co. Ltd.
5. M. Swaminathan, Vol-I Food and Nutrition , Bangalore Printing and PublishingCo.
6. Gopalan C, Rama Sastri BV, Balasubramanian SC .1989. Nutritive Value of Indian Foods. National Institute of Nutrition, ICMR, Hyderabad.
7. Wardlaw and Insel MG, Insel PM. 2004. Perspectives in Nutrition. Sixth Edition, McGraw Hill.
8. SrilakshmiB 2012. Nutrition Science. 4th Revised Edition, New Age InternationalPublishers.
9. Khanna K, Gupta S, Seth R, Passi SJ, Mahna R, Puri S .Textbook of Nutrition and Dietetics. Phoenix Publishing House Pvt. Ltd.
10. ICMR.2010. Recommended Dietary Allowances for Indians. Published by National Institute of Nutrition, Hyderabad.
11. Antia, F.P. and Abraham, P. 2011: Clinical Dietetics and Nutrition, Fourth Edition, Oxford University Press.
12. Joshi, V.D. 2005: Handbook of Nutrition and Dietetics, Vora Medical Publications, Mumbai.
13. Masih, S. 2011. Essentials of Food and Nutrition, Lotus Publishers.

303103:- FOOD BIOCHEMISTRY **30 Hours**

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objectives: - To apply knowledge of metabolism of food constituents forproduct development.

Students Will Be Able To:

CO1– Understand and describe types and properties of tissues, enzymes and digestive system

CO2 – Summarize different metabolic pathways of carbohydrate fat protein

CO3 – Apply the knowledge for controlled measures of metabolic disorders

Course Content

MODULE I **6 Hours**

Cell, tissues, digestive system, metabolism of food. Carbohydrates : Changes in carbohydrates on cooking, browning and Maillard reaction, Metabolic pathways (Glycolysis). Proteins: Sources of proteins; Enzymatic and non-enzymatic browning, Texturization- spin and extrusion process.

MODULE II **8 Hours**

Enzymes**:**Enzymes classification, Enzyme specificity, coenzymes, cofactors, factors affecting enzyme activity, Enzyme kinetics, Lineweaver-Burk plot, Enzyme inhibition and application of enzymes in food technology.

MODULE III **8 Hours**

Lipid peroxidation: Mechanism and inhibition-enzymatic and Non-enzymatic, antioxidants in foods; Types and function.

MODULE IV : 8 Hours

Protein metabolism**:**-protein synthesis, energyproduction, metabolic disorders.

References

1. G.A. Tucker and L.F.J. Woods, 1995, Enzymes in Food Processing,
2. Blackie Academic & Professional, USA.
3. H.D. Belitz, W. Grosch and P. Schieberle, Springer Verlag, Berlin (2004), Food Chemistry.
4. D.D. Miller, Wiley-Blackwell, 2014, Food Chemistry: A Laboratory Manual, USA .
5. L.W. Aurand, A.E. Woods and M.R. Wells, 1987, Food Composition and Analysis,
6. AVI Publishers, USA .
5. D.W.S. Wong, Chapman & Hall, UK (1995), Food Enzymes: Structure & Mechanism.
6. N.N. Potter and J.H. Hotchkiss, Springer, Netherlands 1999, Food Science .
7. M.I. Gurr, J.L. Harwood and K.N. Frayn,2002, Lipid Biochemistry: An Introduction,
7. Blackwell Science Ltd., UK.
8. J.M. de Man, 1999, Principles of Food Chemistry, AN ASPEAN Publication, USA

303104:- UNIT OPERATIONS 30 Hours

Hr/week:-2 Credit:-2 Marks:- 50

Objectives:-To provide in-depth knowledge in basic concepts of various unitoperations in a food industry

Students Will Be Able To:

CO1 – Understand and explain basic principles of unit operation such as heat and mass transfer, fluid flow, mechanical operation

CO2 – Apply concepts to solve engineering problems

CO3 – Apply the knowledge to select suitable instrument or equipment for the process

Course Content

MODULE I : Heat Transfer 6 Hours

Basic heat transfer principle, various heat transfer methods, conduction, convection,radiation, steady and unsteady state heat transfer, heat transfer coefficients, heat transfer in liquids, radiative heat transfer, concept of black and grey body, emissive power, Stefen Boltzmann law, Fourier law, Microwave heating, Numericals on above concepts

MODULE II : Mass Transfer 8 Hours

Introduction to mass transfer, Distillation, Evaporation, single effect evaporator, multiple effect evaporator, drying, drying curve, various types of evaporators, heat exchangers, drying principles, drying instruments.

MODULE III : Fluid Mechanics 8 Hours

Fluids, properties of fluid, classification of fluids, Newton's law,Newtonian fluids, non-newtonian fluids, Rheological curve, flow properties of fluids, flow measuring devices like venturimeter, rotameteretc and derivations for flow rate calculations, dimensional analysis, bernoullis equation, newtons law.

MODULE IV : Mechanical Operations and Refrigeration 8 Hours

Introduction, various mechanical operations in food processing plant like crushing, grinding, size reduction, types of crushers, grinders, laws of size reduction. Various laws of size reduction, application in food processing industry

References

1. Y.H.Hui, (2005), "Handbook of Food Science, Technology and Engineering" (vol.1-4), Marcel Dekker Publishers.
2. M.A.Rao, S.S.H.Rizvi and A.K.Dutta, (2005), "Engineering properties of Foods", 3rd ed., Marcel Dekker Publishers.
3. H.Pandey, H.K. Sharma, R.C.Chouhan, B.C. Sarkar and M.C. Bera, (2004), "Experiments in Food Process Engineering", CBS Publishers and Distributors.
4. R.P.Singh and D.R.Heldman, (2001), "Introduction to Food Engineering", 3rd ed., Academic Press.
5. S.K.Sharma, S.J.Mulvaney and S.S.H.Rizvi, (2000), "Food Process Engineering: Theory and Laboratory Experiments", Wiley and Sons Publishers.

303105 :- FRUITS AND VEGETABLE PROCESSING 30 Hours

Hr/week:-2 Credit:-2 Marks:- 50

Objective: To understand about the proper post-harvest handling technologies of fruits and vegetables and to know the process of development of fruit and vegetable processing products.

Students Will Be Able To:

CO1– Understand and describe various fruit and vegetable products and their standards.

CO2 – Evaluate raw materials for appropriate product manufacture

CO3 – Outline and compare various manufacturing processes

Course Content

MODULE I: Introduction **6 Hours**

Composition and nutritive value of fruits and vegetable. Factors effecting composition and quality of fruits and vegetables. Quality requirements of raw materials for processing; sourcing and receiving at processing plants, primary processing: grading, sorting, cleaning, washing, peeling, slicing and blanching Different types of spoilages in fruits and vegetables. Spoilage during storage of fruits and vegetables and their prevention.

MODULE II: Processing of fruits and vegetable **8 Hours**

Dehydration of fruits and vegetables using various drying technologies like sun drying, solar drying (natural and forced convection), osmotic, tunnel drying, fluidized bed drying, freeze drying, convectional and adiabatic drying; applications to raisins, dried figs, vegetables, intermediate moisture fruits and vegetables. Fruit powders using spray drying. Technology of extraction of juices from different types of fruits.

MODULE III: Manufacture of Fruit products **8 Hours**

Manufacturing process of juice, soup, puree, and paste. Jams, Jellies and marmalades: selection, preparation, production. Difference between jam and jelly. Theory of jell formation, failure and remedies in jam and jelly making. General principles and manufacturing processes of preserves, candied fruits, glazed fruits, crystallized fruits

MODULE IV: Manufacture of vegetable products **8 Hours**

Manufacturing process of sauce, ketchup, vegetable juices and concentrated products

References

1. NirmalSinha, Y. H. Hui, et al; (2010), "Handbook of Vegetables and Vegetable Processing", John Wiley & Sons.
2. Olga Martin-Belloso, Robert SolivaFortuny, (2010), "Advances in Fresh-Cut Fruits and Vegetables Processing". CRC Press.
3. W Jongen (2002), "Fruit and Vegetable Processing: Improving Quality", Elsevier Publications.

303202:- FOOD PROCESSING TECHNOLOGY III 45 Hours

Hr/week:-3 **Credit:-3** **Marks:- 75**

Students Will Be Able To:

CO1 – Select raw material of required quality and prepare fruit and vegetable based products

CO2– Evaluate the prepared products and compare it with standards products

1. Preparation and quality evaluation of fruits
2. Preparation of variety of jam
3. Processing of tomato products; Ketchup
4. Preparation of dehydrated vegetables.
5. Preparation of fruit jelly
6. Preparation of marmalades
7. Preparation of different types of squash
8. Preparation of murraba
9. Preparation of pickles
10. Preparation of candid fruit and fruit bars
11. Osmotic dehydration of fruit

303901 : On-Job-Training (OJT) / Qualification Packs

Credit:-15 Duration : 3 Months Marks : 375

Students Will Be Able To:

CO1– Perform work in the industry

CO2– Apply the knowledge for problem solving and designing new process, methods

Chief Miller FIC/Q1001	(Any one)
Food Microbiologist	

SEMESTER IV

403101:- FOOD SANITATION AND HYGIENE 30 Hours
Hr/week:-2 Credit:-2 Marks:-50

Objective: To understand and impart knowledge of importance of food hygiene, sanitation, and safety during food processing unit.
Students Will Be Able To:

CO1 – Understand the importance of application of sanitation and hygiene in food industry

CO2 – Identify and apply good hygiene practices and measure to improve industry quality standards

CO3 – Apply the appropriate measures to minimize and eliminate the risk of accidents in food catering establishments.

Course Content

MODULE I: Sanitation and Health 6 Hours

Definition, importance of sanitation, application of sanitation to food industry and food service establishments. Microorganisms and their characteristics, control of microbial growth in food. Food contamination and spoilage, food borne diseases.

MODULE II: Hygiene and food handling 8 Hours

Purchasing and receiving safe food, food storage, sanitary procedures in food preparation, serving and displaying of food, special food operations.

MODULE III: Environmental Sanitation 8 Hours

Location and layout of premises, constructional details, sanitary requirements for equipment, guidelines for cleaning equipment, cleaning procedures, pest control, water supply, storage and waste disposal, environmental pollution.

MODULE IV: Hygiene Practices in food industry 8 Hours

Introduction, necessity, personnel hygiene, sanitary practices, management and sanitation, safety at work place. Sanitation regulations and Standards. Introduction, regulatory agencies, control of food quality, local health authority. Food sanitation check list.

References

1. Marriott, Norman (2013), "Principles of Food Sanitation", Springer Science & Business Media Publishing.
2. Roday S,(2011)(2002),"Food Hygiene and Sanitation", McGraw HillPublishing Company Limited.
3. H. L. M. Lelieveld, John Holah, David Napper, (2014), "Hygiene in Food Processing: Principles and Practice", Elsevier Publications.

403201 :-FOOD SANITATION AND HYGIENE PRACTICAL 60 Hours
Hr/week:-4 Credit:-4 Marks:- 100

Students Will Be Able To:

CO1 – Analyse the microbial food contaminant

CO 2– Students Will learn to evaluate microbiological quality of foods and food ingredients by using appropriate technique

1. Extraneous matter and its detection.
2. Testing kitchen ware.
3. Microbial testing of water.
4. Determination of BOD
5. Determination of Howard mold count.
6. Testing hygiene of Food handler.
7. Microbiological report of different food products.
8. Testing quality of ingredients.

403102:- FOOD ANALYSIS **30 Hours**

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objectives : To apply knowledge of analytical techniques for different food products.

Students Will Be Able To:

CO1 – Understand and explain different analytical method

CO2– Describe principle and working of analytical instruments

CO3– Apply knowledge to select best analytical method

Course Content

MODULE I:- **6 Hours**

General Information :- Introduction to food analysis,Nutrition labeling, Sampling and sample preparation, compositional analysis of food, ash analysis, moisture analysis, protein analysis, fat analysis , carbohydrate analysis, total solids analysis, vitamin analysis, traditional methods for mineral analysis.

MODULE II:- **8 Hours**

Chemical Properties And Characterization Of Food :- Characterization of fat, Ph and titreable acidity, protein separation and characterization procedures, application of enzymes in food analysis, analysis of food contaminants, residues, and chemical constituents of concern, analysis of extraneous matter.

MODULE III:- **8 Hours**

Spectroscopy**: -** Basic principles of spectroscopy, ultraviolent, visible, fluorescence, infrared spectroscopy, mass spectroscopy, NMR.Chromatography**:-**Basic principle of chromatography, working of gas chromatography.

MODULE IV **8 Hours**

Physical Properties Of Food:-Rheological principles for food analysis, thermal analysis, color analysis.

References

1. Clifton M &Pomeranz Y. 1988. Food Analysis - Laboratory Experiments. AVI Publ.
2. Gruenwedel DW & Whitaker JR. 1984. Food Analysis Principles and Techniques. Vol. I.
3. Physical Characterization. Marcel Dekker.
4. Nollet LML. 1986. Handbook of Food Analysis. Vol. I. Marcel Dekker.

403103:- FOOD LAWS AND REGULATION 30 Hours

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objectives : To apply knowledge of law and regulatory standards during manufacture , quality check and hygiene of various food products.

Students Will Be Able To:

CO1 – Understand and explain food regulation and their significance with respect too human health

CO2 – Apply the knowledge in QC and QA department to take a correct informed decision

CO3 – Understand global food laws and apply knowledge for import and export food products

Course Content

MODULE I **6 Hou**rs

FSSAI:-Introduction to the law, Salient features of Food Safety& Standards Act, 2006, Structure of FSSAI, Administrative set up at the State level.Roles and Responsibilities of different Food safety Regulators, Food Safety Commissioner, Designated Officer, Food safety Officer, Adjudicating Officer Licensing and registration, Licenses to be granted by Central Licensing Authority, Documents/ Format required for Registration/ Licensing.

MODULE II **8 Hours**

India And Global Regulations:-FAO in India, Technical Cooperation programmes, Bio-security in Food and Agriculture, World Health Organization (WHO), World Animal Health Organization (OIE), International Plant Protection Convention (IPPC). Codex Alimentarius Commission- Codex India – Role of Codex Contact point,National Codex contact point (NCCP), National Codex Committee of India – ToR, Functions, Shadow Committees etc.

MODULE III **8 Hours**

Food Adulteration and food safety Common adulterants, methods of detection, Safety Assurance System(SAS) - HACCP and GMP Nutrition Labeling andEducation Act 1990, ECA, AGMARK ,MPEDA, BIS.

MODULE IV. **8 Hours**

Food Safety And QC,QA:-Food safety and plant sanitation, quality control,quality circle, concept of kaizen, concept of 5S, modern concept of quality assurance, quality control an use of CEDAC, sampling for product evaluation and line control, statistical quality and process control, communicating quality and the cost of quality, specifications and quality standards.Organizations:-Role of WHO to improve evaluation of GM food, Benefits & Controversies, Irradiated Food, Labelling of Irradiated Food.Freeze dried food,. World Trade Organization (WTO), Principles of trading system. SPS and TBT, differences between SPS & TBT. WTO agreement on the application of SPS.

References

1. Krammer, A. and Twigg, B.A. 1970. "Quality Control for the Food Industry".3rd Edition. AVI, Westport.
2. Pattee, H.E. Ed. 1985. "Evaluation of Quality of Fruits and Vegetables". AVI, Westport.
3. Ranganna, S. 1986. "Handbook of Analysis and Quality Control for Fruits and Vegetable".
4. Tannenbaum, S.R. Ed. 1979. "Nutritional and Safety Aspects of Food Processing",

403104:- FOOD PROCESSING EQUIPMENT30 Hours

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objective: To introduce basic equipment design and various control mechanisms.

Students Will Be Able To:

CO1 – Explain different types of equipments used in food industry

CO2 – Explain working and maintainence of equipments

CO3 – Apply the knowledge to select equipment as per the requirement

Course Content

MODULE I: Introduction to equipments used in food industry **6 Hours**

Equipments: Types, planning, factors affecting selection and purchase

MODULE II: Mechanical Equipments **8 Hours**

Transport equipments: Fluid food transport equipment, mechanical conveyors. storage equipments: Solid and liquid food storage equipment. Processing equipments : Size reduction, homogenization, mixing and foaming equipments. Separation equipments: Grading and sorting equipments.

MODULE III: Heat exchangers, dryers and evaporators **8 Hours**

Heat transfer equipments: Heat exchangers. Food evaporation equipments: food evaporators, evaporator components. Food dehydration equipments- Food dehydration principle, food dryers, hygiene and safety considerations.

MODULE IV: Refrigeration and thermal processing equipments **8 Hours**

Refrigeration and freezing equipments: Refrigerants, freezers, chillers. Thermal processing equipments: sterilizers, pasteurizers, blanchers.

References

1. Saravacos, George, (2015), "Handbook of Food Processing Equipment",Springer Publishing.
2. H. L. M. Lelieveld, John Holah, David Napper, (2014),"Hygiene in FoodProcessing: Principles and Practice", Elsevier Publications.
3. Sue Azam-Ali, (2003), "Small-scale Food Processing: A Directory of Equipment and Methods", ITDG Publishing.

403202:- FOOD ANALYSIS PRACTICAL **45 Hours**

Hr/week:-3 **Credit:-3** **Marks:- 75**

Students Will Be Able To:

CO1 – Perform analysis of food product and create a certificate of analysis

CO2 – Students will be able to analyse food products and compare them with FSSAI standards

CO3 – Apply their knowledge and check for the adulterants in food products.

1. Analysis of bakery products.
2. Analysis of confectionary.
3. Analysis of dairy products.
4. Analysis of beverages.
5. Analysis of fruit products.

6. Analysis of oil.
7. Analysis of food ingredients.
8. Detection of adulterants.

403901 On-Job-Training (OJT) / Qualification Packs

Credit:-15 Duration : 3 Months Marks : 375

Students Will Be Able To:

CO 01 – Perform work in the industry

CO 02 – Apply the knowledge for problem solving and designing new process, methods

Food Regulatory Affair Manager FIC/Q9002	(Any one)
Quality Assurance Manager FIC/Q7602	

SEMESTER V

503101 :- FOOD PACKAGING **60 Hours**

Hr/week:-4 **Credit:-4** **Marks:- 100**

Objective: To provide knowledge about trends and development in food packaging technologies and materials.

Students will Be Able To:

CO1 – Understand and describe properties of different packaging material and forms

CO2 – Summarize testing methods for materials and package

CO3 – Design appropriate package as per the requirement

Course Content

MODULE I: Introduction to packaging **15 Hours**

Definition, Functions of packaging - Containment, Protection, Preservation, Promotion, Convenience, Communication. Requirements of effective package, Types of food packaging- primary, secondary and tertiary packaging.

MODULE II: Deteriorative Reactions and shelf life of foods **15 Hours**

Introduction, deteriorative Reactions in food- factors affecting deterioration of foods- physical changes, biological changes, chemical changes. Shelf life of foods -Definition, intrinsic and extrinsic factors controlling the rate of reactions.Shelf life determination tests.

MODULE III: Packaging Materials and their properties **15 Hours**

Rigid containers- Glass, Wooden boxes, metal cans- Aluminum and tin plate containers, Semi rigid containers- paperboard cartons, Flexible packaging- paper, plastic pouches- Low density polyethylene, High density polyethylene and Polypropylene. Packaging materials for dairy products, bakery and confectionary, granular products, fruits and vegetables.

MODULE IV: Special Packaging **15 Hours**

Aseptic packaging, Active packaging, Intelligent packaging, Modified atmospheric

packaging and controlled atmospheric packaging, Shrink packaging, stretch packaging, Biodegradable packaging, Edible packaging, Tetra packs. Labelling and safety concerns in food pack. Printing process, inks, adhesives, labelling, coding- bar codes, Food packaging closures of glass and plastic containers, Legislative and safety aspects of food packaging, Machineries used in Food Packaging, Package testing-Thickness - Paper density - Basis weight - Grammage - Tensile Strength - Gas Transmission Rate (GTR) - Water Vapour Transmission Rate (WVTR).

References

1. Gordon L. Robertson (2012), "Food Packaging: Principles and Practice", Third Edition, CRC Press.
2. Takashi Kadoya (2012), "Food Packaging", Academic press.
3. Richard Coles, Derek McDowell, Mark J. Kirwan (2003), "Food Packaging Technology", CRC Press.

503102:- TECHNOLOGY OF ANIMAL PRODUCTS **30 Hours**

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objectives: To understand the technology for handling, processing, preservation of meat, poultry and fish products.

Students Will Be Able To:

CO1– Understand and describe various animal based products and their standards

CO2 – Evaluate raw materials for appropriate product manufacture

CO3 – Outline and compare various manufacturing processes

Course Content

MODULE I: Compositional and Nutritional aspect of Animal foods **6 Hours**

Fish - Classification of fish (fresh water and marine), composition, spoilage of fish microbiological, physiological, biochemical. Meat – Definition of carcass, concept of red meat and white meat, composition of meat, marbling in meat, post mortem changes in meat-rigor mortis, tenderization of meat, ageing of meat. Egg-composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality.

MODULE II: Fish Processing **8 Hours**

Preservation of fish-Chilling, Freezing, curing, drying, salting – salting methods: brining, pickling, curing and canning of fish. Smoking - smoke production, smoke components, quality, safety and nutritive value of smoked fish, pre - smoking processes, smoking process control.

MODULE III: Meat processing **8 Hours**

Meat Quality - colour, flavour, texture, Water Holding Capacity(WHC), Emulsification capacity of meat.Tests for assessment of raw meat – TVN, FFA, PV, Nitrate and nitrite in

cured meat. Preservation of meat –Refrigeration and freezing, thermal processing - canning of meat, dehydration, meat curing.

MODULE IV: Egg processing **8 Hours**

Egg-Composition and nutritive value. Factors affecting egg quality. Preservation of eggs - Refrigeration and freezing, thermal processing, dehydration, coating.Products from fish, meat and egg. Fishery products: Surimi - Process, traditional and modern production lines, quality of surimi products. Fish protein concentrates (FPC), fish protein extracts (FPE). Meat products: Sausages - processing, RTE meat products. Egg products- Egg powder, frozen egg pulp, designer eggs.

Reference

1. George M. Hall (2012), "Fish Processing Technology", Springer Science & Business Media Publication.
2. Fidel Toldra(2010),"Handbook of Meat Processing", John Wiley & Sons Publication.
4. Rao D.G. (2010), "Fundamentals of food engineering". PHI Learning Pvt. Ltd.
3. Isabel Guerrero-Legarreta (2010), "Handbook of Poultry Science and Technology, Secondary Processing", John Wiley and Sons Publication.
4. Casey M. Owens. (2010), "Poultry Meat Processing", Second Edition, CRC Press.
5. Leo M.L. Nollet and Fidel Toldra (2006), "Advanced Technologies For Meat Processing", CRC Press.

503103:- FOOD INDUSTRY WASTE MANAGEMENT **30 Hours**

Hr/week:-2 **Credit:-2** **Marks:- 50**

Objective:- To apply knowledge of waste management, to reduce environmental pollution.

Students Will Be Able To:

CO1– Learn to preserve and use minimal or alternate resources for food production and its impact

CO2 – Use of different food processing machines to minimize the waste

CO3– Recover valuable energy, organic matter from the food waste

Course Content

MODULE I **6 Hours**

Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry; Waste disposal methods – Physical, Chemical &Biological; Economical aspects of waste treatment and disposal.

MODULE II **8 Hours**

Treatment methods for liquid wastes from food process industries; Design ofActivated Sludge Process, Rotating Biological Contactors, Trickling Filters, UASB, Biogas Plant.

MODULE III **8 Hours**

Treatment methods of solid wastes: Biological composting, drying and incineration;
Design of Solid Waste Management System: Landfill Digester.

MODULE IV **8 Hours**

Bio filters and Bio clarifiers, Ion exchange treatment of waste water, Drinking-Water treatment, Recovery of useful materials from effluents by different methods.Utilisation of bi-products - Thermal and biotechnological uses of rice husk – pyrolysis and gasification of rice, utilisation of rice bran, citric acid production from fruit waste, Coconut processing – by-product utilization – fuel briquette.

Module IV is for self study.

References

1. V. Oreopoulou, W. Russ, (ed), 2007, “Utilization of by-products and treatment of waste in the food industry” Vol, 3.,Springer.
2. K. Waldron, 2007, “Handbook of waste management and co-product recovery in food processing”.CRC.
3. R. Smith, J. Klemes, J-K Kim 2008, “Handbook of water and energy management in food processing.”, CRC.
5. C. Yapijakis ,L.Wang, Yung Tse- Hung,2005, . Waste treatment in the food processing industry, H. LO, 5.Herzka A & Booth RG; 1981, Applied Science Pub Ltd, Food Industry Wastes: Disposal and Recovery
4. Fair GM, Geyer JC &Okun DA; 1986, John Wiley & Sons, Inc.
5. Bartlett RE; . Water & Wastewater Engineering; Applied Science Pub Ltd.
6. Green JH & Kramer A; 1979, Food Processing Waste Management; AVI.
7. Rittmann BE & McCarty PL; 2001, Environmental Biotechnology: Principles and Applications, Mc-Grow-Hill International editions.
8. Bhattacharyya B C & Banerjee R; Environmental Biotechnology, Oxford University Press.
9. P. N. Chereminoff& A.C Morresi, 1976, "Energy from Solid Wastes"
10. A. Chakravarthy& De, "Agricultural Waste and By Product Utilisation".
11. Bor S. Luli (ed), "Rice Production and Utilisation"
12. E. Beagle, "Rice Husk Conversion to Energy

503201:- COMPUTER SKILLS **30 Hours**
Hr/week:-2 **Credit:-2** **Marks:- 50**

(Non-University Examination)

Objective: - To understand application of computers technology in food industry
Students Will Be Able To:

CO1 – Use common software applications such as presentation software.

CO2 – Create a database and generate forms and reports from the database using database application

CO3 – Draw logo, signs, create new fonts using graphics design software

CO4 – Design news letters, certificates, advertisements, visiting and invitation cards using Desktop Publishing Software.

Course Content

MODULE I: MS Power Point **6 Hours**

Introduction- Parts of power point windows. Features, background design, word art,clipart, 3D settings. Animations, sound views, types of views, inserting, deleting ,arranging slides, slide shows.

MODULE II: Introduction to Corel Draw8 Hours

The Corel Draw Screen, Toolbar and Using the Property Bar Using Toolbox & drawing basic shapes like square, circle etc.Aligning Objects using Grids, Guidelines and ruler, changing the order of objects & Grouping the objects.

MODULE III: DBMS, 8 Hours

DBMS Introduction & basic concepts.

MODULE IV: Internet & Email 8 Hours

Internet introduction, Creating Email- Inbox, compose, draft, attachments, sharing documents , images , audio, video using drives.

503104 :- BEVERAGE TECHNOLOGY AND PLANTATION CROPS 30 Hours
Hr/week:-2 Credit:-2 Marks:- 50

Objective : To expose students to the knowledge of types and manufacture of beverages and plantation crops.
Students Will Be Able To:

CO1 –Understand and describe different beverages and plantation crop products

CO2 – Evaluate raw material and select as per product requirement

CO3 – Outline various manufacturing methods

Course Content

MODULE I 6 Hours

Packaged drinking water- definition, types, manufacturing processes, quality evaluationand raw and processed water, methods of water treatment, BIS quality standards of bottled water; mineral water, carbonated water.Types of beverages and their importance; status of beverage industry in India; Manufacturing technology for juice-based beverages; synthetic beverages; technology of still, carbonated, low-calorie and dry beverages; isotonic and sports drinks.

MODULE II 8 Hours

Alcoholic beverages- types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process,wine and related beverages, distilled spirits.

MODULE III: Tea and Coffee 8 Hours

Introduction, types, manufacturing process, quality of tea and coffee, processing defects. Plantation crops- cashew processing Composition, Structure and characteristics of cashew nut, uses, Traditional method of cashew processing, General processing, Cashew apple processing , cashew by Product - CNSL.

MODULE IV: Cocoa processing **8 Hours**

Cocoa: varieties, Processing of cocoa - Fermentation and Drying, storage. Manufacture of chocolate- conching, enrobing, milk chocolate, white chocolate, dark chocolate, cocoa butter, wafer coated chocolate, cocoa powder.

References

1. J.S.Purthi, (2003) (2001), "Minor Spices and Condiments: Crop Management and Post Harvest Technology", ICAR publication, 1st Edition,
2. Handbook of Fruit Science and Technology: Production, Composition, Storage, and Processing. D. K. Salunkhe, S. S. Kadam, CRC Press, 1st Edition, 1995.
3. N.K.Jain,(1989), "Global Advances in Tea Science", Aravali Books International, 1st Edition.

503202:- FOOD PROCESSING TECHNOLOGY IV PRACTICAL **45 Hours**
Hr/week:-3 **Credit:-3** **Marks:- 75**

Students Will BE able To :

CO1 – Prepare various fruit and vegetable based products

CO2 **–** Apply appropriate methods of processing for newer fruit and vegetable based products

1. Preparation of soy milk, fruit milkshakes, herbal beverages;
2. Preparation of fruit wines.
3. Preparation of carbonated beverages
4. Processing of Egg and Poultry.
5. Processing of Meat and Fish.
6. Introduction to sensory analysis
7. Difference tests
8. Descriptive test
9. Acceptance test
10. Hedonic rating
11. Multiple sample ranking test
12. Visit to relevant Industry.

503901: On-Job-Training (OJT) / Qualification Packs

Credit:-15 **Duration : 3 Months** **Marks : 375**

Students Will Be Able To:

CO1 – Perform work in the industry

CO2– Apply the knowledge for problem solving and designing new process, methods

Production Manager FIC/Q9003	(Any one)
*Assistant Hygiene Manager	

SEMESTER VI

603101:- QUALITY ASSURANCE AND CERTIFICATION 60 Hours
Hr/week:-4 Credit:-4 Marks:- 100

Objectives : To acquaint the students with the certifications involved in raw material food and industries and different organizational system such as HACCP, GMP/GHP and auditing and surveillance.

Students Will Be Able To:

CO1 – Understand and describe various quality systems such as ISO, HACCP

CO2 – Understand implementation of quality systems

CO3– Apply knowledge for problem solving during implementation of quality systems

Course Content

MODULE I:- 15 Hours

Quality inspection, quality control, quality management and Quality Assurance. UNIT II 10 lectures Total quality management; Good Manufacturing Practices, Good Agricultural Practices, Good Laboratory Practices, Quality Management systems QSS. Quality Circles, SQC.

MODULE II:- **15 Hours**

ISO System - Principles, Implementation.

MODULE III:- **15 Hours**

HACCP - Principles, Implementation.
Plan of Documentation, types of records.

MODULE IV **15 Hours**

Auditing, Surveillance; Audit, Mock audit, third party quality certifying audit, Auditors and Lead auditors. Certification, Certification procedures, Certifying bodies, Accrediting bodies, International bodies.

References :

1. Early R.1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.
2. Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publication

603102: GRASS ROOT INNOVATION AND ENTREPRENEURSHIP 60 Hours

Hr/week:-4 **Credit:-4** **Marks:- 100**

Objectives : The students will be able to understand Entrepreneurial spirit and resourcefulness, learn the concept and process of entrepreneurship - its contribution in and role in the growth and development of individual and the nation, strive for entrepreneurial quality, competency and motivation, learn the process and skills of creation and management of entrepreneurial venture.

Students Will Be Able To:

CO1– Understand and compare different types of entrepreneurship styles and qualities

CO2 – Prepare buiseness plan

CO3 – Apply role of innovation in problem solving , entrepreneurial ventures

Course Content

MODULE I:- Entrepreneurship: What, Why and How **15 Hours**

Entrepreneurship – Concept, Functions, Need, Importance, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship

MODULE II:- An Entrepreneur **15 Hours**

Types of Entrepreneurs, Competencies and Characteristics, Ethical Entrepreneurship, Entrepreneurial Value – Values, Attitudes, Motivational, Mindset of an Employee and an Entrepreneur, Intrapreneur, Importance in Any Organization

MODULE III:- Entrepreneurship Journey **15 Hours**

Self-Assessment of qualities, skills, resources, dreams, Generation of ideas, Feasibility studies, Opportunity assessments, Business Plan Preparation, Execution of Business Plan, Role of Society and Family in the growth of an entrepreneur, Challenges faced by women in Entrepreneurship

MODULE IV:- Entrepreneurship as innovation and problem solving **15 Hours**

Entrepreneurs - as problem solvers, Innovations and Entrepreneurial Ventures, Social Entrepreneurship- Concept & importance, Risk Taking- Concept, Type of business risk, The role of technology/ social media in creating new forms of – Firms, Network, Organisation, Network, cooperative clusters, Barriers to Entrepreneurship, Support structure for promoting entrepreneurship- various government schemes

References :

1. P.C. Jain Handbook For New Entrepreneur Oxford Latest Edition
2. S.S.Khaka Entrepreneurial Development S.Chand latest Edition
3. ThomasW. Zimmerer & Norman M.Scarborough Essentials of Entrepreneurship and small business management 4th Edition

603103 :E-COMMERCE **60 Hours**

Hr/week:-4 **Credit:-4** **Marks:- 100**

Objectives : The students will be able to understand the E-commerce business models and concepts

Students Will Be Able To:

CO1– Understand and describe buiseness models of E- commerce and features of website

CO2 – Understand and apply knowledge of internet for business venture, online payment

CO3 – Describe and analyse digital marketing concepts and online retailing

Course Content

MODULE I:- Introduction to E-Commerce, E-commerce business models 15 Hours and concepts

E-commerce: The revolution, Understanding E-commerce, The internet and World Wide Web: Ecommerce infrastructure E-commerce Business Models, Business to Consumer (B2C) business models, Business to Business (B2B) business models, Business models in emerging E-commerce areas, How the Internet and the web change business: strategy, structure and process, The Internet: Latest technology Background&Features

MODULE II: - 15 Hours

Features of an e-commerce web site, Security and payment features of an E-commerce Web Site, Security threats in the e-commerce environment and its solution, Management policies, E-commerce payment system

MODULE III: - E-commerce marketing concepts 15 Hours

Online Services and retailing: The Internet Audience and Consumer Behavior, Basic Marketing Concepts, Internet Marketing Technologies, B2C and B2B E-commerce marketing and business strategies, retailing.

MODULE IV: - 15 Hours

E-commerce in action: E-tailing Business Models, Common Themes in online retailing, The service sector: offline and online service sector, online financial services, Online Travel Services, Online career services. Social networks, online auctions and communities, E-commerce portals

References:

1. Kenneth C. Laudon, E-Commerce : Business, Technology, Society, 4th Edition, Pearson
2. S. J. Joseph, E-Commerce: an Indian perspective, PHI

603201:- INTERNSHIP

Credit:-3 Marks:- 75

Students Will Be Able To:
CO 01 – Perform work in the industry
CO 02 – Apply the knowledge for problem solving and designing new process, methods

603901: On-Job-Training (OJT) / Qualification Packs

Credit:-15 **Duration : 3 Months** **Marks : 375**

Students Will Be Able To:

CO1 – Perform work in the industry

CO2 – Apply the knowledge for problem solving and designing new process, methods

*Hygiene Manager	(Any one)
*Application Manager	

NOTE : *Qualification Packs not available to be prepared and submitted to NSDA for approval.