Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Two Year M.Voc Degree Program in Food Technology & Research

(Faculty of Food Technology & Research)

CBCS Syllabus

FY M.Voc (Food Technology) Semester -II

For Department Food Technology & Research

Tuljaram Chaturchand College, Baramati

Choice Based Credit System Syllabus (2023 Pattern)

(As Per NEP2020)

To be implemented from Academic Year 2023-2024

Title of the Programme: FY M.Voc (Food Technology & Research)

Preamble

AES's, Tuljaram Chaturchand College of Arts, Science and Commerce (Autonomous) has made the decision to change the syllabi of across various faculties from June, 2023 by incorporating the guidelines and provisions outlined in the National Education Policy (NEP), 2020. The NEP envisions making education more holistic and effective and to lay emphasis on the integration of general (academic) education, vocational education and experiential learning. The NEP introduces holistic and multidisciplinary education that would help to develop intellectual, scientific, social, physical, emotional, ethical and moral capacities of the students. The NEP 2020 envisages flexible curricular structures and learning based outcome approach for the development of the students. By establishing a nationally accepted and internationally comparable credit structure and courses framework, the NEP 2020 aims to promote educational excellence, facilitate seamless academic mobility, and enhance the global competitiveness of Indian students. It fosters a system, where educational achievements can be recognized and valued not only within the country but also in the international arena, expanding opportunities and opening doors for students to pursue their aspirations on a global scale.

In response to the rapid advancements in science and technology and the evolving approaches in various domains of Food Technology and related subjects, the Board of Studies in Dept. of Food Technology and Research at Tuljaram Chaturchand College of Arts, Science and Commerce (Autonomous), Baramati - Pune, has developed the curriculum for the first semester of F.Y. M.Voc. Food Technology, which goes beyond traditional academic boundaries. The syllabus is aligned with the NEP 2020 guidelines to ensure that students receive an education that prepares them for the challenges and opportunities of the 21st century. This syllabus has been designed under the framework of the Choice Based Credit System (CBCS), taking into consideration the guidelines set forth by the National Education Policy (NEP) 2020, LOCF (UGC), NCRF, NHEQF, Prof. R.D. Kulkarni's Report, Government of Maharashtra's General Resolution dated 20th April and 16th May 2023, and the Circular issued by SPPU, Pune on 31st May 2023.

A Food Technology Post-Graduates degree equips students with the knowledge and skills necessary for a diverse range of fulfilling career paths. Food Technology post-graduate students find opportunities in various fields, including procurement, Testing and quality control, Processing and Production, Research and Development, Storage and Supply Chain Management, Food Regulatory Agencies, Auditing, Academics, Competitive exams, Biostatistics, Database analysis, Entrepreneurship Development, and many other food and food related organizations.
Throughout their Two-year degree program, students explore the significance of Farm to Fork processing by utilization of post harvest technology. They learn tools, techniques, processes which are required to set up agencies including pickles, jam and jelly, fruit processing, vegetable processing, organic product, dairy products, animal product processing, Bakery and Confectionery products producing industries.

Overall, revising the post-graduate Food Technology syllabi in accordance with the NEP 2020 ensures that students receive an education that is relevant, comprehensive, and prepares them to navigate the dynamic and interconnected world of today. It equips them with the knowledge, skills, and competencies needed to contribute meaningfully to society and pursue their academic and professional goals in a rapidly changing global landscape.

Programme Specific Outcomes (PSOs)

PO-1	**Disciplinary Knowledge**	Understandthebasicconcepts,fundamentalprinciplesandexperimental findingsandthescientifictheoriesrelatedtofoodtechnology,foodscienceand foodtechnology&engineeringanditsotherfieldsrelatedtothe program.
PO-2	**Communication Skills**	Developvariouscommunicationskillssuchasreading,listeningandspeaking skills to express ideas and views clearly and effectively.
PO-3	**Critical Thinking**	Proposenovelideasinexplainingthescientificdata,factsandfiguresrelatedto scienceandtechnology.
PO-4	**Analytical Reasoningand Problem Solving**	Toenable the studentswithgoodscientific andengineeringknowledge soasto comprehend,design,andcreatefoodproductsanddevicesforthefoodindustry and provide solutions for the challenges in the food industry as well as in agriculture.
PO-5	**Senseof Inquiry**	Curiously ask relevant questions for better understanding of fundamental conceptsandprinciples,scientifictheoriesandapplicationsrelatedtothestudy.
PO-6	**UseofModern Tools**	Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
PO-7	**Research Skills**	Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
PO-8	**Applicationof Knowledge**	Developascientificoutlookandapplytheknowledgewithrespecttofood technology.
PO-9	**Ethical Awareness**	Totrainstudentsinprofessionalandethicalattitude,effectivecommunication skills, teamworkskillsandmultidisciplinaryapproachesrelatedtofoodtechnology and engineering.
PO-10	**Teamwork**	Understandthebasicconcepts,fundamentalprinciplesandexperimental findings and the scientific theories related to food technology, food science and food technology & engineering and its other fields related to the program.
PO-11	**Environmentand Sustainability**	Developvariouscommunicationskillssuchasreading,listeningandspeaking skills to express ideas and views clearly and effectively.
PO-12	**LifelongLearning**	Propose novel ideas in explaining the scientific data, facts and figures related to science and technology.

Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Board of Studies (BOS) M.Voc Food Technology & Research

From 2022-23 to 2024-25

Sr.No	Name of the BOS members	Designation
1.	**Dr. Wajid A. Khan** Head & Associate Professor, Department of Food Technology &Research,T. C. College, Baramati	Chairman
2.	**Ms. Vaibhavi A. Bhosale** Assistant Professor, Dept. of Food Tech. & ResearchT. C. College, Baramati	Internal Member
3.	**Ms. Asawari D. Katekar** Assistant Professor, Dept. of Food Tech. & ResearchT. C. College, Baramati	Internal Member
4.	**Ms. Tilotama R. Pawar** Assistant Professor, Dept. of Food Tech. & ResearchT. C. College, Baramati	Internal Member
5.	**Ms. Shreeja R. Deokar** Assistant Professor, Dept. of Food Tech. & ResearchT. C. College, Baramati	Internal Member
6.	**Ms. Gayatri T. Deshmukh** Assistant Professor, Dept of Food Tech. & ResearchT. C. College, Baramati	Internal Member
7.	**Dr. A.K. Sahoo** Professor, Dept. of Food Technology, Shivaji University, Kolhapur	External Member Expertfromother University
8.	**Dr. Rinku Agarwal** Assistant Professor, Dept. of Food Technology, MIT-ADT University	External Member Expertfromother University
9.	**Ms. Meenaz Wadgaonkar**, General Manager- Operation, Gits Food Products Pvt. Ltd., Hadapsar	External Member IndustryExpert
10.	**Mr. Sagar Salunkhe** Plant Manager, Bauli India Bakes & Sweets, MIDC, Baramati	Meritorious Alumni

Information

1. **One semester** = 15 weeks (12 weeks actual teaching and 3 weeks for internal evaluation, tutorials, problem solutions, student's difficulty solution, etc.)
2. As per NCrF :
   - Theory course: A minimum of 15 hours of teaching per credit is required.
   - Laboratory course: A minimum of 30 hours in laboratory activities per credit is required.
3. **1-credit theory** = 15 hours i.e. for 1 credit, 1 hour per week teaching is to be performed.

   15 hours of 1-credit are splinted as 12 hours actual teaching + 3 hours Tutorial (practice, problem solving sessions, repeated discussion on difficult topics, discussion on student's difficulties, questions discussion and internal evaluation)

4. **1-credit practical** = 30 hours. Thus, 1 credit practical = 2 contact hours in laboratory per week

   30 hours splinted as 24 hours' actual table work and 6 hours for journal competition, oral on each practical and other internal evaluation.

5. **Each theory courses of any type** (Major, Minor, VSC, VEC, OE/GE, VEC, SEC, CC, etc.) **is of 2 credits**.
   a. **Theory per semester:** Contact hours = 24 teaching + 6 tutorials (problem solving sessions, repeated discussion on difficult topics, difficult solution, questions discussion and internal evaluation)
   b. Each course will be of two modules, One module = 15 hours
   c. Each module may consist of one or more than one chapter.
6. **Each practical course of any course is of 2 credits = 60 hours per semester**
   a. Minimum 12 laboratory sessions must be conducted in one semester.
   b. Each laboratory sessions should be 4 hours.
   c. If practical is short, then two short practicals should be included in one laboratory sessions.
   d. In 12 laboratory sessions maximum 2 demonstration sessions or table work sessions may be included and must be designed carefully for 4 hours' sessions.
   e. 4 hours' laboratory sessions include - performing table work (practical), calculation, writing results and conclusion, and submission of practical in written form to practical in charge.
   f. Prelab oratory reading and post laboratory work / questions should be assigned on each practical and this will be the part of internal evaluation.
7. **Design syllabus of each theory and practical course as per above guidelines.**
   a. **Theory syllabus** should be given module wise and chapter wise.
   b. **Theory syllabus** should include name of topic, number of teaching hours allotted, detailed point wise syllabus, page numbers, references book no.

c. It is recommended that**, design syllabus of one theory course from maximum two references books** and they will be called as main reference books/text books. Below that, you can add names of more reference books and they will be supplementary reference books.

d. Syllabus of practical must be given practical wise. Name of experiment and aim of the experiment should be clearly mentioned. Mention reference book number or bibliography for each practical. At least 16 practicals must be included in syllabus from which 12 practicals will be actually conducted. If practical is short, then two short practicals will be considered as one practical.

e. At the end of syllabus of theory and practical course, a list of references book should be given number wise.

f. At the end of each theory and practical course 6 CO should be given.

A. Names of UG and PG courses related to Specialization

Important Note: For specialized subjects wherever designing of practical course is not adequate then included, theory course of 2 credits in place of practical course.

Semester	Major Courses	Major Elective Curses	Minor Curses	VSC	IKS
I	2 theory + 1 Practical			1 Theory	1 Theory
II	2 theory + 1 Practical		1 Theory + 1 Practical	1 Practical	0
III	3 theory + 1 Practical		1 Theory + 1 Practical	1 Theory	0
IV	3 theory + 1 Practical		1 Theory + 1 Practical	1 Practical	0
V	3 theory + 2 Practical	1 Theory + 1 Practical	1 Theory + 1 Practical	1 Theory	0
VI	3 theory + 2 Practical	1 Theory + 1 Practical		1 Practical	0
	VII and VIII Sem honours degree with major				
VII	5 theory + 2 Practical	1 Theory + 1 Practical	0	0	0
VIII	5 theory + 2 Practical	1 Theory + 1 Practical	0	0	0
	VII and VIII Sem honours degree with research				
VII	4 theory + 1 Practical	1 Theory + 1 Practical	0	0	0
VIII	4 theory + 1 Practical	1 Theory + 1 Practical	0	0	0

* In elective course 2T+2P are related to each other. In this case students have to choose more than 1 option i.e. in elective part, at least 2 courses each consisting of 1 theory 1 practical courses in combination.

Course Structure for F. Y. M. Voc. (Food Technology) 2023-204

Level	Semester	Major		Research Methodology	OJT/FP	RP	Cum. Cr.
		Mandatory	Elective				
6.0	I	FTR-501-MJM- Food Microbiology (T) (4 C) FTR-502-MJM- Food Chemistry & Analysis (T) (4C) FTR-503-MJM- Nutrition Science (T) (2 C) FTR-504-MJM- Food Microbiology (P) (2 C) FTR-505-MJM- Food Chemistry & Analysis (P) (2 C)	FTR-511-MJE- Bakery Technology(T) (2 C) **OR** FTR-511-MJE- Confectionery Technology(T) (2 C) FTR-512-MJE- Bakery Technology(P) (2 C) **OR** FTR-512-MJE- Confectionery Technology(P) (2 C)	FTR-521-RM Research Methodology (T)(4C)			**22 Cr.**
	II	FTR-551-MJM- Food Processing & Packaging (T) (4 C) FTR-552-MJM- Food Additives & Toxicology (T) (4 C) FTR-553-MJM Fermentation Technology (T) (2C) FTR-554-MJM- Food Processing & Packaging (P) (2 C) FTR-555-MJM- Fermentation Technology (P) (2C)	FTR-561-MJE- Beverage Technology(T) (2 C) **OR** FTR-561-MJE-Snacks Technology(T) (2 C) FTR-562-MJE- Beverage Technology(P) (2 C) **OR** FTR-562-MJE Snacks Technology(P) (2 C)		FTR-581-OJT/ FP (4 C)		22 Cr.
Cum. Cr.		**28**	**8**	**4**	**4**	**-**	**44**

Sem	CourseType	Course Code	Course Name	Theory /Practical	Credits
I	MajorMandatory	FTR-501-MJM	Food Microbiology	Theory	04
	MajorMandatory	FTR-502-MJM	Food Chemistry & Analysis	Theory	04
	MajorMandatory	FTR-503-MJM	Nutrition Science	Theory	02
	MajorMandatory	FTR-504-MJM	Food Microbiology	Practical	02
	MajorMandatory	FTR-505-MJM	Food Chemistry & Analysis	Practical	02
	MajorElective	FTR-511-MJE	Bakery Technology OR Confectionery Technology	Theory	02
	MajorElective	FTR-512-MJE	Bakery Technology OR Confectionery Technology	Practical	02
	Research Methodology	FTR-521-RM	Research Methodology	Theory	04
				TotalCreditsSemester-I	**22**
II	Major Mandatory	FTR-551-MJM	Food Processing & Packaging	Theory	04
	Major Mandatory	FTR-552-MJM	Food Additives & Toxicology	Theory	04
	Major Mandatory	FTR-553-MJM	Fermentation Technology	Theory	02
	Major Mandatory	FTR-554-MJM	Food Processing & Packaging	Practical	02
	Major Mandatory	FTR-555-MJM	Fermentation Technology	Practical	02
	MajorElective	FTR-561-MJE	Beverage Technology OR Snacks Technology	Theory	02
	MajorElective	FTR-562-MJE	Beverage Technology OR Snacks Technology	Practical	02
	OJT/FP	FTR-581	On Job Training/ Field Projects	Practical	04
				TotalCreditsSemesterII	22
				CumulativeCreditsSemesterIandII	**44**

CBCS Syllabus as per NEP 2020 for F.Y M.Voc. Food Technology & Research (2023 Pattern)

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

CourseType **:**Major Mandatory

Course Code **:**FTR-551-MJM

CourseTitle **:**Food Processing & Packaging

No. of Credits *:04*

No.ofTeachingHours 60

LearningObjectives:

- Cold preservation and freezers
- Dehydration & Irradiation
- Food Packaging
- Thermal Processing
- Properties of packaging material

CourseOutcomes:

- Working of packaging instruments

CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO3: Students may know about the safety & wholesomeness
CO4: Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.
CO5: Students will be able to understand operations involved in packaging material manufacturing.
CO6: Students will be able to understand major packaging material and methods used in food packaging.
CO7: Students will learn about effect of advance processing techniques on food product.

Unit I: Preservation by low temperature **12 Periods**

1.1 Freezing: requirements of refrigerated storage-controlled low temperature
1.2 air circulation and humidity
1.3 changes in food during refrigerated storage
1.4 progressive freezing, and changes during freezing-concentration effect and ice crystal damage, freezer burn.
1.5 Refrigeration load, factors determining freezing rate-food composition and non - compositional influences.

Unit II: Thermal and Non-Thermal Processing **10 Periods**

2.1 Introduction, classification of Thermal Processes
2.2 Principles of thermal processing
2.3 Thermal resistance of microorganisms, Thermal death time, Lethality concept
2.4 Characterization of heat penetration data, Thermal process Calculations.

Unit III: Food Irradiation and Microwave Heating **8 Periods**

3.1 Ionizing radiation and sources, unit of radiations,
3.2 Direct and indirect radiation effects, safety and wholesomeness of irradiated food.
3.3 Microwave heating and applications, High pressure processing,
3.4 Hurdle Technology, Cold plasma.

Unit IV: Packaging of Foods **6 Periods**

4.1 Packaging: Properties of packaging material,
4.2 factors determining the packaging requirements of various foods and brief description of packaging of frozen products,
4.3 dried products, fats and oils and thermally processed foods.

Unit V: Advances in packaging technology **7 Periods**

5.1 Introduction, Active packaging,
5.2 Modified atmospheric packaging,
5.3 Aseptic packaging, packages for microwave ovens
5.4 Biodegradable plastics, Edible gums, Coatings.

Unit VI: Packaging equipment and machinery **7 Periods**

6.1 Vacuum packaging machine,
6.2 CA and MA packaging machine, Gas packaging machine, Seal and shrink packaging machine.
6.3 Form and fill sealing machine,
6.4 Aseptic packaging systems, Retort pouches,

6.5 Bottling machines, Package printing machines.

References:

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
- Fruit & Vegetable Preservation, Shrivastava of Foods, Z. Berk

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	-	3	5	4	2	-	1	-	1
CO2	-	2	1	-	2	-	-	4		-	2	1
CO3	3	-	-	2	3	-	-	-	-	3	-	-
CO4	-	-	-	-	-	5	3	-	5	-	-	-
CO5	2	-	-	3	5	-	5	4	6	2	-	-
CO6	2	2	1	5	-	6	-	4	5	2	2	1
CO7	-	2	1	-	5	6	-	-	-	-	2	1

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.
CO1: Students will be able to understand major food preservation techniques.
CO3: Students may know about the safety & wholesomeness and their use.
CO5: Students will be able to understand operations involved in packaging material manufacturing
CO6: Students will be able to understand major packaging material and methods used in food packaging.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO6: Students will be able to understand major packaging material and methods used in food packaging.
CO7: Students will learn about effect of advance processing techniques on food product.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO6: Students will be able to understand major packaging material and methods used in food packaging.

CO7: Students will learn about effect of advance processing techniques on food product.

PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
CO3: Students may know about the safety & wholesomeness and their use.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.
CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them.

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO3: Students may know about the safety & wholesomeness and their use.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.
CO7: Students will learn about effect of advance processing techniques on food product and their effect on the food.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO1: Students will be able to understand major food preservation techniques.
CO4: Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.
CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them.
CO7: Students will learn about effect of advance processing techniques on food product and their effect on the food.

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO1: Students will be able to understand major food preservation techniques.
CO4: Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.

PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.
CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them.
PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.
CO4: Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.
CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them
PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Students will be able to understand major food preservation techniques.
CO3: Students may know about the safety & wholesomeness and their use.
CO5: Students will be able to understand operations involved in packaging material manufacturing
CO6: Students will be able to understand major packaging material and methods used in food packaging.
PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO6: Students will be able to understand major packaging material and methods used in food packaging.
CO7: Students will learn about effect of advance processing techniques on food product.

PO12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO6: Students will be able to understand major packaging material and methods used in food packaging.
CO7: Students will learn about effect of advance processing techniques on food product.

CBCS Syllabus as per NEP 2020 for F.Y M.Voc Food Technology & Research (2023 Pattern)

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

CourseType **:**Major Mandatory

Course Code **:**FTR-552-MJM

CourseTitle **:**Food additives & Toxicology

No.ofCredits *:04*

LearningObjectives:

No.ofTeachingHours 60

- To study about different food additives & their functions.
- To learn about toxicants in food processing industry.
- To learn about the laws related to food additives.
- To know about types of contamination in food industry.
- To understand about the formulation of food product by using additives.
- To get knowledge about difference between Additives & Adulterants

CourseOutcomes:

CO1: Able to get knowledge about different of food additives & their role in food processing industry.
CO2: Understand effect of toxicants to our food products .
CO3:Understand about the Laws related to food additives
CO4:Learn about types of contaminants & their hazard to our body.
CO5:get knowledge about difference between Additives & Adulterants
CO6 : Understand about the formulation of food product by using additives.
CO7: Learn about the types of food additives.

Topics and Learning Points

Unit-I: Introduction to Food Additives **13 Periods**

1.1 Definitions of Food Additives, Classification and Functions,
1.2 Legitimate uses of Additives in foods, Intentional &Non Intentional additives,
1.3 Indirect food additives
1.4 Difference between Additives & Adulterants
1.5 Food Formulation
1.6 Food uses and functions in formulations.

Unit-II: Properties of Additives **8 Periods**

2.1 Toxicological evaluation of food additives,
2.2 Acute and chronic studies. LD50.
2.3 Analytical methods: chemical and instrumental.

Unit-III: Food additives - I **12 Periods**

3.1 Various additives such as preservatives, antioxidants, emulsifiers, sequestrants, humectants, stabilizers with respect to chemistry
3.2 food uses and functions in formulations

Unit-IV: Food additives - II **10 Periods**

4.1 Colours, flavours, sweeteners, acidulants with respect to chemistry
4.2 food uses and functions in formulations, indirect food additives

Unit V: Laws related to Food Additives **10 Periods**

Unit-VI: Food Contaminants **7 Periods**

6.1 Food contaminants, physical, chemical, microbial and other contaminants;
6.2 food toxicants.

References:

- Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. MarcelDekker, New York.
- Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
- Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, NewYork.
- Furia, T.E. 1980, Handbook of food additives, Vol I and Vol II.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	-	3	5	4	2	-	1	-	1
CO2	-	2	1	-	2	-	-	4		-	2	1
CO3	3	-	-	2	3	-	-	-	-	3	-	-

CO4	-	-	-	-	-	-	-	-	5	-	-	-	
CO5	2	2	-	3	5	-	-	-	6	2	2	-	
CO6	2	-	1	5	-	-	-	4	5	2	-	1	
CO7	-	-	1	-	5	6	-	-	-	-	-	1	

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.

CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them.
CO3: Understand about the Laws related to food additives.
CO5: get knowledge about difference between Additives & Adulterants and their uses
CO6: Understand about the formulation of food product by using additives and their advantages

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Understand effect of toxicants to our food products.
CO5: Student will get knowledge about difference between Additives & Adulterants and their uses

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them.
CO2: Understand effect of toxicants to our food products.
CO6: Understand about the formulation of food product by using additives and their advantages.
CO7: Study about the use of additives in food products their advantages disadvantages & uses.

PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
CO3: Understand about the Laws related to food additives so they can use it during industrials audit.
CO5: get knowledge about difference between Additives & Adulterants and their uses
CO6: Understand about the formulation of food product by using additives and their advantages

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them.
CO2: Understand effect of toxicants to our food products.
CO3: Understand about the Laws related to food additives so they can use it during industrials audit.
CO5: get knowledge about difference between Additives & Adulterants and their uses
CO7: Study about the use of additives in food products their advantages disadvantages & uses.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them
CO7: Study about the use of additives in food products their advantages disadvantages & uses.

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them

PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them
CO2: Understand effect of toxicants to our food products.
CO6: Understand about the formulation of food product by using additives and their advantages
PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.
CO4: Learn about types of contaminants & their hazard to our body and their effect on human body as well as food.
CO5: get knowledge about difference between Additives & Adulterants and their uses
CO6: Understand about the formulation of food product by using additives and their advantages

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them.

CO3: Understand about the Laws related to food additives.
CO5: get knowledge about difference between Additives & Adulterants and their uses
CO6: Understand about the formulation of food product by using additives and their advantages

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Understand effect of toxicants to our food products.
CO5: Student will get knowledge about difference between Additives & Adulterants and their uses

PO12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Able to get knowledge about different of food additives & their role in food processing industry and how to use them.
CO2: Understand effect of toxicants to our food products.
CO6: Understand about the formulation of food product by using additives and their advantages.
CO7: Study about the use of additives in food products their advantages disadvantages & uses.

CBCS Syllabus as per NEP 2020 for F.Y M.Voc. Food Technology & Research

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

CourseType **:**MajorMandatory

Course Code **:**FTR-553-MJM

CourseTitle **:**Fermentation Technology

No.ofCredits *:02*

No. of Teaching Hours 30

Learning Objectives:

- To learn about the fermentation technology
- To study the history & innovations in fermentation
- To study about the scope of food fermentation
- To learn about important fermentation techniques and equipments
- To know about processing of different types of fermented alcoholic beverages.
- To learn about principles of downstream processing and product recovery.

CourseOutcomes:

CO1: Students will get knowledge about the different types of traditional fermented foods.
CO2: Students will have a thorough understanding of different fermentation techniques.
CO3: The students will know the classification of fermented foods and beverages.
CO4: Student will learn about the preservation by using fermentation.
CO5: Students will study about the scope of food fermentation.
CO6: The students may learn about the history & innovations in fermentation.
CO7: Students will know about the working of different fermentation equipments.

Topics and Learning Points

Unit-I: Introduction: **08 Periods**

1.1 Introduction, History
1.2 Fermented Foods: Past, Present and future

Unit – II: Microorganisms involved in Food Fermentations **06 Period**

2.1 Fermentation –definition and types
2.2 Microorganisms used in food fermentations

Unit –III: Fermentation of Alcoholic Beverages **07 Periods**

3.1 Malt beverages
3.2 Distilled liquors: Wine, Beer etc.
3.3 Fermentation of Vinegar- history, introduction, process, types , defects and diseases
3.4 Equipments used for fermented products

Unit – 4: Oriental fermented foods - **09 Periods**

4.1 Milk based fermented product: Kefir, yoghurt,
4.2 Meat based fermented products: dry semidry sausage, salami, fermented fish, preserved egg.
4.3 Plant based fermented product: Sauerkraut, kombucha, miso, Kimchi, temphesoysauce, idli, dosa, minchin, soybean cheese, natto.

References:

- Principles of fermentation technology/Peter F. Stanbury, Allan Whitaker, Stephen J. Hall. - 2nd ed.
- Basic of Fermentation Technology, S M Reddy
- Fruit & Vegetable Preservation, Shrivastava
- Food Microbiology, Frazier

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	6	-	-	-	-	-	-	-	2	2	-	-
CO2	-	-	2	6	5	6	6	-	-	-	-	6
CO3	-	-	-	-	-	-	-	-	-	-	-	2
CO4	-	2	-	-	2	-	-	4	-	-	6	-
CO5	-	-	2	-	2	2	-	2	-	2	-	-
CO6	4	-	-	-	2	-	-	-	-	2	-	-
CO7	2	-	1	4	2	6	-	-	-	-	-	-

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.
CO1: Students will get knowledge about the different types of traditional fermented foods and their notional value.
CO6: The students may learn about the history & innovations in fermentation.
CO7: Students will know about the working of different fermentation equipments.

CO3: The students will know the classification of fermented foods and beverages.
CO6: The students may learn about the history & innovations in fermentation.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Student will learn about the preservation by using fermentation and their health benefits.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have a thorough understanding of different fermentation techniques
CO5: Students will study about the scope of food fermentation.
CO7: Students will know about the working of different fermentation equipments.

PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
CO2: Students will have a thorough understanding of different fermentation techniques and provide solutions for the challenges in the food industry.
CO7: Students will know about the working of different fermentation equipments.

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO2: Students will have a thorough understanding of different fermentation techniques
CO4: Student will learn about the preservation by using fermentation and their health benefits.
CO5: Students will study about the scope of food fermentation
CO7: Students will know about the working of different fermentation equipments and their handling .
CO6: The students may learn about the history & innovations in fermentation.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.

CO2: Students will have a thorough understanding of different fermentation techniques

CO5: Students will study about the scope of food fermentation

CO7: Students will know about the working of different fermentation equipments and their handling

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

CO2: Students will have a thorough understanding of different fermentation techniques and Understand designs of various equipments.

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO4: Student will learn about the preservation by using fermentation and their health benefits.
CO5: Students will study about the scope of food fermentation apply the knowledge with respect to food technology.
PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

CO2: Students will have a thorough understanding of different fermentation techniques and Understand designs of various equipments also develop the team work skills and multidisciplinary approaches related to food technology and engineering.

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.
CO1: Students will get knowledge about the different types of traditional fermented foods and their notional value.
CO6: The students may learn about the history & innovations in fermentation.
CO7: Students will know about the working of different fermentation equipments.
CO3: The students will know the classification of fermented foods and beverages.
CO6: The students may learn about the history & innovations in fermentation.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Student will learn about the preservation by using fermentation and their health benefits.

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have a thorough understanding of different fermentation techniques
CO5: Students will study about the scope of food fermentation.
CO7: Students will know about the working of different fermentation equipments.

CBCS Syllabus as per NEP 2020 for F.Y M.Voc. Food Technology & Research

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

CourseType **:**Major Mandatory

Course Code **:**FTR-554-MJM

CourseTitle **:**Food Processing & Packaging

No.ofCredits *:02*

No.ofTeachingHours 30

LearningObjectives:

- To learn about the Cold preservation and freezers
- To know about Dehydration & Irradiation
- To get the knowledge about Food Packaging
- To know about Thermal Processing
- To know about Properties of packaging material
- To learn about Working of packaging instruments

Course Outcomes:

CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO3: Students may know about the safety & wholesomeness
CO4: Students will be able to understand Novel food processing methods.
CO5: Students will be able to understand operations involved in packaging material manufacturing.
CO6: Students will be able to understand major packaging material and methods used in food packaging.
CO7: Students will learn about effect of advance processing techniques on food product.

Topics and Learning Points

Sr. No.	Practical Name	Periods
1.	. Comparison of conventional and microwave processing of food	**2P**
2.	Frozen food processing	**2P**
3.	Drying of food using tray dryer/other dryers	**3P**
4.	Preservation of food by using canning(Fruit/Vegetable)	**2P**
5.	Osmotic dehydration	**2P**
6.	Identification and testing of packaging materials	**2P**
7.	Determination of tensile strength of given packaging material	**2P**
8.	Cut out analysis of canned food	**2P**
9.	Determining water absorption capacity of packaging material	**2P**
10.	Determining bursting strength of packaging material	**2P**
11.	Determining tearing strength of packaging material	**2P**
12.	To perform vacuum packaging of food sample and carry out its storage study	**1P**
13.	Testing of lacquered tinplate sheets	**1P**
14.	Determination of water vapour transmission rate of package films	**2P**
15.	Pre-packaging practices followed for packaging fruits and vegetables	**2P**
16.	Packaging and labelling of the product-packaging design, graphics, labelling	**1P**

References:

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
- Fruit & Vegetable Preservation, Shrivastava

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**-**	**1**	**-**	**3**	**5**	**4**	**2**	**-**	**1**	**-**	**1**

CO2	**-**	**2**	**1**	**-**	**2**	**-**	**-**	**4**		**-**	**2**	**1**
CO3	**3**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**-**	**-**	**-**	**-**	**-**	**5**	**3**	**-**	**5**	**-**	**-**	**-**
CO5	**2**	**-**	**-**	**3**	**5**	**-**	**5**	**4**	**6**	**2**	**-**	**-**
CO6	**2**	**2**	**1**	**5**	**-**	**6**	**-**	**4**	**5**	**2**	**2**	**1**
CO7	**-**	**2**	**1**	**-**	**5**	**6**	**-**	**-**	**-**	**-**	**2**	**1**

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.

CO1: Students will be able to understand major food preservation techniques.

CO3: Students may know about the safety & wholesomeness and their use.

CO5: Students will be able to understand operations involved in packaging material manufacturing

CO6: Students will be able to understand major packaging material and methods used in food packaging.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

CO2: Students will learn about the packaging techniques, and underlying principles.

CO6: Students will be able to understand major packaging material and methods used in food packaging.

CO7: Students will learn about effect of advance processing techniques on food product.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

CO1: Students will be able to understand major food preservation techniques.

CO2: Students will learn about the packaging techniques, and underlying principles.

CO6: Students will be able to understand major packaging material and methods used in food packaging.

CO7: Students will learn about effect of advance processing techniques on food product.

PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.

CO3: Students may know about the safety & wholesomeness and their use.

CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.

CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them.

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO3: Students may know about the safety & wholesomeness and their use.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.
CO7: Students will learn about effect of advance processing techniques on food product and their effect on the food.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO1: Students will be able to understand major food preservation techniques.
CO4: Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.
CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them.
CO7: Students will learn about effect of advance processing techniques on food product and their effect on the food.

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO1: Students will be able to understand major food preservation techniques.
CO4: Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.

PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Students will be able to understand major food preservation techniques.
CO2: Students will learn about the packaging techniques, and underlying principles.
CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.
CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them.

PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

CO4: Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.

CO5: Students will be able to understand operations involved in packaging material manufacturing and their advantages.

CO6: Students will be able to understand major packaging material and methods used in food packaging and how to use them

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.

CO1: Students will be able to understand major food preservation techniques.

CO3: Students may know about the safety & wholesomeness and their use.

CO5: Students will be able to understand operations involved in packaging material manufacturing

CO6: Students will be able to understand major packaging material and methods used in food packaging.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

CO2: Students will learn about the packaging techniques, and underlying principles.

CO6: Students will be able to understand major packaging material and methods used in food packaging.

CO7: Students will learn about effect of advance processing techniques on food product.

PO12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

CO1: Students will be able to understand major food preservation techniques.

CO2: Students will learn about the packaging techniques, and underlying principles.

CO6: Students will be able to understand major packaging material and methods used in food packaging.

CO7: Students will learn about effect of advance processing techniques on food product.

CBCS Syllabus as per NEP 2020 for F.Y M.Voc. Food Technology & Research

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

CourseType **:**MajorMandatory

Course Code **:**FTR-555-MJM

CourseTitle **:**Fermentation Technology

No.ofCredits *:02*

No.ofTeachingHours 30

LearningObjectives:

- To learn about the fermentation technology
- To study the history & innovations in fermentation
- To study about the scope of food fermentation
- To learn about important fermentation techniques andequipments
- To know about processing of different types of fermented alcoholic beverages.
- To learn about principles of downstream processing and product recovery.
- To learn about different oriented products.

CourseOutcomes:

CO1: Students will get knowledge about the different types of traditional fermented foods.
CO2: Students will have a thorough understanding of different fermentation techniques.
CO3: The students will know the classification of fermented foods and beverages.
CO4: Student will learn about the preservation by using fermentation.
CO5: Students will study about the scope of food fermentation.
CO6: The students may learn about the history & innovations in fermentation.
CO7: Students will know about the working of different fermentation equipments.

Topics and Learning Points

Sr. No.	Practical Name	Periods
1.	To study the types of fermentation	**3P**
2.	Preparation of Kefir	**2P**
3.	Preparation of Saurkraut	**2P**
4.	Preparation of yogurt	**2P**
5.	Preparation of wine	**2P**
6.	Preparation of beer	**2P**
7.	Preparation of soysauce	**2P**
8.	Preparation of miso	**2P**
9.	Preparation of Cheese	**2P**
10.	Prep[aration of Kombucha	**2P**
11.	Preparation of bakers yeast	**2P**
12.	Preparation of Idli	**2P**
13.	Analysis of fermented food products	**2P**
14.	Visit to winery or any other fermented products based industry and report submission.	**3P**

References:

- Bamji MS, Krishnaswamy K, Brahmam GNV (2009). *Textbook of Human Nutrition*, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd.
- Srilakshmi (2007). *Food Science*, 4th Edition. New Age International Ltd. 29
- Wardlaw MG, Paul M Insel Mosby (1996). Perspectives in Nutrition, Third Edition.
- B. Srilakshmi (2007) Dietetics, Revised Fifth Edition, New Age International Publishers
- B. Srilakshmi (2011) Nutrition Science, Third Edition, New Age International Publishers

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**
CO2	**-**	**-**	**2**	**6**	**5**	**6**	**6**	**-**	**-**	**-**	**-**	**6**
CO3	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**-**	**2**	**-**	**-**	**2**	**-**	**-**	**4**	**-**	**-**	**6**	**-**
CO5	**-**	**-**	**2**	**-**	**2**	**2**	**-**	**2**	**-**	**2**	**-**	**-**
CO6	**4**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO7	**2**	**-**	**1**	**4**	**2**	**6**	**-**	**-**	**-**	**-**	**-**	**-**

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.
CO1: Students will get knowledge about the different types of traditional fermented foods and their notional value.
CO6: The students may learn about the history & innovations in fermentation.
CO7: Students will know about the working of different fermentation equipments.

CO3: The students will know the classification of fermented foods and beverages.
CO6: The students may learn about the history & innovations in fermentation.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Student will learn about the preservation by using fermentation and their health benefits.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have a thorough understanding of different fermentation techniques
CO5: Students will study about the scope of food fermentation.
CO7: Students will know about the working of different fermentation equipments.

PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
CO2: Students will have a thorough understanding of different fermentation techniques and provide solutions for the challenges in the food industry.
CO7: Students will know about the working of different fermentation equipments.

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO2: Students will have a thorough understanding of different fermentation techniques
CO4: Student will learn about the preservation by using fermentation and their health benefits.
CO5: Students will study about the scope of food fermentation
CO7: Students will know about the working of different fermentation equipments and their handling .
CO6: The students may learn about the history & innovations in fermentation.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.

CO2: Students will have a thorough understanding of different fermentation techniques

CO5: Students will study about the scope of food fermentation

CO7: Students will know about the working of different fermentation equipments and their handling

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

CO2: Students will have a thorough understanding of different fermentation techniques and Understand designs of various equipments.

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO4: Student will learn about the preservation by using fermentation and their health benefits.
CO5: Students will study about the scope of food fermentation apply the knowledge with respect to food technology.

PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

CO2: Students will have a thorough understanding of different fermentation techniques and Understand designs of various equipments also develop the team work skills and multidisciplinary approaches related to food technology and engineering.

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.
CO1: Students will get knowledge about the different types of traditional fermented foods and their notional value.
CO6: The students may learn about the history & innovations in fermentation.
CO7: Students will know about the working of different fermentation equipments.
CO3: The students will know the classification of fermented foods and beverages.
CO6: The students may learn about the history & innovations in fermentation.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Student will learn about the preservation by using fermentation and their health benefits.

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have a thorough understanding of different fermentation techniques
CO5: Students will study about the scope of food fermentation.
CO7: Students will know about the working of different fermentation equipments.

CBCS Syllabus as per NEP 2020 for F.Y M.Voc. Food Technology & Research

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

Course Type **:** Major Elective

Course Code **:**FTR-561-MJE

CourseTitle **:**Beverage Technology

No.ofCredits :02

No.ofTeachingHours 30

LearningObjectives:

- To develop the skills for processing of different types of alcoholic and non-alcoholic beverages,
- To get knowledge of packaged drinking water manufacturing industry.
- To learn about water purification.
- To know about FSSAI specifications for beverages.
- To study the history &importance of beverages
- To know about different types of beverages found in Indian as well as international market.

CourseOutcomes:

CO1: Students will be able to know different types of beverages found in Indian as well as international market.

CO2: Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

CO3: Students will have thorough knowledge of processing techniques used in beverage industry.

CO4: Students will learn about the history of beverages

CO5: Students will learn aboutFSSAI specifications for beverages

CO6: Students will learn about quality of beverages.

CO7: Students will learn abouthistory &importance of beverages

TopicsandLearningPoints

Unit I: **5 Periods**

1.1 History, importance of beverages and status of beverage industry

1.2 Types of Beverages, history of beverage industry

Unit-II: Processing of beverages **10 Periods**

2.1 Juice based beverages processing, Synthetic, still, carbonated, low-calorie and dry beverages

2.2 Isotonic and sports drinks, dairy based, alcoholic beverages fruit beverages, speciality beverages

2.3 Tea, coffee, cocoa, spices, plant extracts

Unit-III: Quality of Beverages **10 Periods**

3.1 FSSAI specifications for beverages, Ingredients, manufacturing and packaging processesand equipment for different beverages

3.2 Sweeteners, colorants, acidulants, clouding and clarifying and flavouring agents for beverages, Carbon dioxide and carbonation, Quality tests and control in beverages;

3.3 Miscellaneous beverages Coconut water, sweet toddy, sugar cane juice, coconut milk, flavoured syrups

Unit-IV: Water treatment **5 Periods**

4.1 Water treatment and quality of process water

4.2 water purification, packaged drinking water Processing

References:

- Fruit & Vegetable Preservation, Shrivastava
- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	4	-	-	3	4	2	-	-
CO2	-	-	2	-	-	-	-	-	3	-	-	2
CO3	3	-	-	2	2	-	-	1	2	3	-	-
CO4	2	1	1	-	2	2	1	-	-	2	1	1
CO5	2	2	1	-	-	2	5	-	-	2	2	1
CO6	-	2	-	4	-	-	1	-	1	-	2	-
CO7	-	-	1	-	-	-	-	-	-	-	-	1

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.

CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
CO3: Students will have thorough knowledge of different types of cereal basedsnacks food items available in market and their preparation method.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO6: Students may get knowledge about the Quality tests and control in beverages

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have better ideas regarding alcoholic and non-alcoholicbeverages with water industry.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO7: Students will understand about the FSSAI specifications for beverages.

PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO6: Students may get knowledge about the Quality tests and control in beverages

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
CO3: Students will have thorough knowledge of different types of cereal basedsnacks food items available in market and their preparation method.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO6: Students may get knowledge about the Quality tests and control in beverages

PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
CO3: Students will have thorough knowledge of different types of cereal basedsnacks food items available in market and their preparation method.

PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
CO2: Students will have better ideas regarding alcoholic and non-alcoholicbeverages with water industry.
CO3: Students will have thorough knowledge of different types of cereal basedsnacks food items available in market and their preparation method.
CO6: Students may get knowledge about the Quality tests and control in beverages

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
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PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO6: Students may get knowledge about the Quality tests and control in beverages

PO12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have better ideas regarding alcoholic and non-alcoholicbeverages with water industry.
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CO7: Students will understand about the FSSAI specifications for beverages.

CBCS Syllabus as per NEP 2020 for F.Y M.Voc. Food Technology & Research

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

CourseType **:**Major Elective

Course Code **:**FTR-561-MJE

CourseTitle **:**Snacks Technology

No.ofCredits *:02*

No.ofTeachingHours 30

CourseOutcomes:

- To develop the skills for processing of different types of snack products
- To get knowledge of Indian snack food markets.
- To learn about the extrusion techniques
- To study the history &types of snacks.
- To get knowledge of fruits and vegetables based snacks
- Students will have thorough knowledge of different types of cereal based snacks food items available in market.

LearningObjectives:

CO1: Students will have thorough knowledge of different types of cereal based snacks food items available in market.
CO2: Students will get knowledge of fruits and vegetables based snacks
CO3: Students will get knowledge of extrusion technologyindustry.
CO4: Students will get knowledge ofhistory &different types of snacks.
CO5: Students willdevelop the skills for processing of different types of snack products.
CO6: Students willget knowledge of Indian snack food markets.
CO7: Students willget knowledge abouttechnology for coated nuts

TopicsandLearningPoints

Unit I: 5 Periods

1.1 Introduction

1.2 history of snack

1.3 types of snack

Unit II: Grain Based Snacks **10 Periods**

2.1 Overview of grain-based snacks: whole grains – roasted, toasted, puffed, popped and flakes Coated grains-salted

2.2 Spiced and sweetened Flour based snack– batter and dough based products

2.3 savoury and farsans

2.3 formulated chipsand wafers, papads.

Unit III: Other Snack Foods **10 Periods**

1.1 Technology for fruit and vegetable based snacks: chips, wafers, papads etc.

1.2 Technologyfor coated nuts – salted,

1.3 spiced and sweetened products- chikkis, Singbhujia,

1.4 Technology for RTE puffed snack and puffing, hot air puffing, explosion puffing, gun puffing etc.

Unit IV:**5 Periods**

4.1 Extrusion method

4.2 types of extruder

4.3 types of extruded product

References:

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
- Food science, Shrilakshm

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	4	-	-	3	4	2	-	-
CO2	-	-	2	-	-	-	-	-	3	-	-	2
CO3	3	-	-	2	2	-	-	1	2	3	-	-
CO4	2	1	1	-	2	2	1	-	-	2	1	1
CO5	2	2	1	-	-	2	5	-	-	2	2	1
CO6	-	2	-	4	-	-	1	-	1	-	2	-
CO7	-	-	1	-	-	-	-	-	-	-	-	1

Justification for the mapping

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PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
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CO6: Students may get knowledge about the Quality tests and control in beverages

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CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
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CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO6: Students may get knowledge about the Quality tests and control in beverages

PO12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have better ideas regarding alcoholic and non-alcoholicbeverages with water industry.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
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CO7: Students will understand about the FSSAI specifications for beverages.

CBCS Syllabus as per NEP 2020 for F.Y M.Voc. Food Technology & Research (2023 Pattern)

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

CourseType **:**Major Elective

Course Code **:**FTR-562-MJE

CourseTitle **:**Beverage Technology

No.ofCredits :02

No.ofTeachingHours 30

LearningObjectives:

- To learn about manufacturing of different types of beverages.
- To get knowledge about chemical analysis of beverages
- To learn about processing of different types of beverages.
- To study about quality analysis of water
- To provide the knowledge about differentbeverage industry
- To learn about different processing techniques used in beverageindustry

CourseOutcomes:

CO1: Students will be able to know different types of beverages found in Indian as well as international market.

CO2: Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

CO3: Students will get knowledge of processing of beverages.

CO4: Students will get knowledgeabout different beverage industry

CO5: Students may learn about different processing techniques used in beverageindustry

CO6: Students will able to knowmanufacturing of different types of beverages

CO7: Students will know about different chemical analysis of beverages.

Topics and Learning Points

Sr. No.	Practical Name	Periods
1.	Quality analysis of water from different sources and treatments	**3P**
2.	Determination of aqueous extraction of tea/coffee	**2P**
3.	Detection of sodium benzoate in beverage	**2P**
4.	Measurement of pH and acidity of beverage	**2P**
5.	Detection of E. Coli in beverage	**2P**
6.	Measurement of CO2 content of carbonated beverage	**2P**
7.	Determination of caffeine in beverages	**2P**
8.	Determination of tannins in wine	**2P**
9.	Preparation of Instant Tea/coffee	**2P**
10.	Preparation of carbonated beverage	**2P**
11.	Specifications for different fruit beverages and preparation of fruits squash	**2P**
12.	Preparation of artificial lemon juice	**2P**
13.	Preparation of beverage using artificial sweetener	**2P**
14.	Preparation of Nectar	**2P**
15.	Visit to carbonation unit	**1P**

References:

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
- Food science, Shrilakshmi

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**-**	**-**	**-**	**4**	**-**	**-**	**3**	**4**	**2**	**-**	**-**
CO2	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**2**
CO3	**3**	**-**	**-**	**2**	**2**	**-**	**-**	**1**	**2**	**3**	**-**	**-**
CO4	**2**	**1**	**1**	**-**	**2**	**2**	**1**	**-**	**-**	**2**	**1**	**1**
CO5	**2**	**2**	**1**	**-**	**-**	**2**	**5**	**-**	**-**	**2**	**2**	**1**
CO6	**-**	**2**	**-**	**4**	**-**	**-**	**1**	**-**	**1**	**-**	**2**	**-**
CO7	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.

CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
CO3: Students will have thorough knowledge of different types of cereal basedsnacks food items available in market and their preparation method.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO6: Students may get knowledge about the Quality tests and control in beverages

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have better ideas regarding alcoholic and non-alcoholicbeverages with water industry.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
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CO6: Students may get knowledge about the Quality tests and control in beverages

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.

CO3: Students will have thorough knowledge of different types of cereal basedsnacks food items available in market and their preparation method.
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PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
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PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
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PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
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PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
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PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
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PO12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Students will have better ideas regarding alcoholic and non-alcoholicbeverages with water industry.
CO4: Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
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Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:**F.Y M.Voc.

Semester *II*

CourseType **:**Major Elective

Course Code **:**FTR-562-MJE

CourseTitle **:**Snack Technology

No.ofCredits *:02*

No.ofTeachingHours 30

LearningObjectives:

- To learn about manufacturing of different types of snack foods.
- To get knowledge about processing of snack food items.
- To learn about processing of different types of snack foods
- To know about physical properties of extruded foods
- To provide the knowledge about different snack industry
- To learn about different processing techniques used in snack foodindustry

CourseOutcomes:

CO1: Students will be able to know different types of snack food found in Indian as well as international market.
CO2: Students will have better ideas regarding manufacturing techniques in snack food industry.
CO3: Students will get knowledge of different types of cereal based snacks food items available in market.
CO4: Students will be known about the different physical properties of extruded foods
CO5: Students will get knowledgeabout different snacks food industry
CO6: Students will get knowledgeabout different processing techniques used in snack food industry
CO7:: Students will have thorough knowledge of different types of cereal based snacks food items available in market.

TopicsandLearningPoints

Sr. No.	Practical Name	Periods
1.	Preparation of cereals based fried snack foods	**2 P**
2.	Preparation of legume based fried snack foods	**2 P**
3.	Preparation of cereal grain based puffed products	**2 P**
4.	To study the effect of frying time and temperature on potato chips	**2 P**
5.	Preparation of cereal and legume based roasted snack	**2 P**
6.	Physical properties of extruded foods(expansion, density, water index etc)	**2 P**
7.	Preparation of protein isolate and concentrate	**2 P**
8.	Preparation of noodles/vermicelli	**2 P**
9.	Preparation of weaning foods	**2 P**
10.	Determination of oil absorption capacity of noodles	**2 P**
11.	Effect of extrusion cooking on anti-nutritional factor	**2 P**
12.	Determination of shelf-life and packaging requirements of snack food products	**3 P**
13.	To study the extraction of oil	**2 P**
14.	Visit to industries Manufacturing snack foods.	**2 P**
15.	Visit to Extrusion industry	**1 P**

References:

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
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CO1	**2**	**-**	**-**	**-**	**4**	**-**	**-**	**3**	**4**	**2**	**-**	**-**
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CO3	**3**	**-**	**-**	**2**	**2**	**-**	**-**	**1**	**2**	**3**	**-**	**-**
CO4	**2**	**1**	**1**	**-**	**2**	**2**	**1**	**-**	**-**	**2**	**1**	**1**

CO5	**2**	**2**	**1**	**-**	**-**	**2**	**5**	**-**	**-**	**2**	**2**	**1**
CO6	**-**	**2**	**-**	**4**	**-**	**-**	**1**	**-**	**1**	**-**	**2**	**-**
CO7	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

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CO5: Students will understand about the working of equipment in beverage industry and their cost and advantages.
CO7: Students will understand about the FSSAI specifications for beverages.

Practical Paper No, FTR-581, OJT/ FP- On Job Training/ Field Projects

Name of the Programme: M.Voc. Food Technology & Research

Programme Code **:** FTR

Class **:** F.Y M.Voc.

Semester *II*

Course Type **:** OJT/ FP

Course Code **:** FTR-581- OJT/ FP

Course Title **:** On Job Training/ Field Projects

No. of Credits *: 04*

No. of Teaching Hours 60

Learning Objectives:

Learning Objectives:

- To understand the working of food processing industry.
- To impart knowledge and skills related to food processing industries
- To understand about the marketing survey of food product.
- To understand the operations used in food processing industry.
- To study about the different food standards used in food industry.
- To learn about the maintenance of personal hygiene & food safety in food processing industry.

Course Outcomes:

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

CO1: Understand the working of food processing industry.
CO2: Impart knowledge and skills related to food processing industries
CO3: understand about the marketing survey of food product.
CO4: Understand the operations used in food processing industry.
CO5: Explain knowledge of the legal, environmental, quality aspectsassociated with operations used in the food industry.
CO6: Study about the different food standards used in food industry.
CO7: Learn about the maintenance of personal hygiene & food safety in food processing industry.

Topics and Learning Points

Students should undergo a project work for a period of 3 Month, during course of two year. The programme is arranged by the Department of Food Technology & Research in consultation with the food industries. The purpose of the programme is to get hands-on experience on various aspects of food industries that form the strong foundation for the young food technologists. The department will allot students to the industry, in consultation with the industry concerned. Student should report for the programme on the stipulated date. He/ she shall complete this period of 3 month training in Semester-II. On completion, each student should prepare a project report duly certified by the supervisor in the industry. Consequently, a seminar should be conducted in the department to present the finding of the project work. The bonafide project report attested by the head of the department will be evaluated by the external examiner and a viva voce will be conducted.

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	4	-	-	3	4	2	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	2
CO3	3	-	-	2	-	-	-	1	2	3	-	-
CO4	-	1	1	-	2	2	1	-	-	-	1	1
CO5	-	2	-	-	-	2	-	-	-	-	2	-
CO6	-	-	-	4	-	-	1	-	1	-	-	-
CO7	3	-	1	-	-	-	-	-	-	3	-	1

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and Food technology & engineering and its other fields related to the program.

CO1: Understand the working of food processing industry and their rules.

CO3: Student will understand about the marketing survey of food product and learn about marketing.

CO7: Learn about the maintenance of personal hygiene & food safety in food processing industry.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

CO4: Understand the operations used in food processing industry.

CO5: Explain knowledge of the legal, environmental, quality aspectsassociated with operations used in the food industry.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

CO2: Impart knowledge and skills related to food processing industries

will learn about effect of advance processing techniques on food product.
CO4: Understand the operations used in food processing industry.
CO7: Learn about the maintenance of personal hygiene & food safety in food processing industry.
PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
CO3: Student will understand about the marketing survey of food product and learn about marketing.
CO6: Study about the different food standards used in food industry and learn their advantages and disadvantages.

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO1: Understand the working of food processing industry and their rules.
CO4: Understand the operations used in food processing industry.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO4: Understand the operations used in food processing industry.
CO5: Explain knowledge of the legal, environmental, quality aspectsassociated with operations used in the food industry.

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO4: Understand the operations used in food processing industry.
CO6: Study about the different food standards used in food industry and learn their advantages and disadvantages.

PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Understand the working of food processing industry and their rules.
CO3: Student will understand about the marketing survey of food product and learn about marketing.

PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

CO1: Understand the working of food processing industry and their rules.
CO3: Student will understand about the marketing survey of food product and learn about marketing.

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Understand the working of food processing industry and their rules.
CO3: Student will understand about the marketing survey of food product and learn about marketing.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO4: Understand the operations used in food processing industry.
CO5: Explain knowledge of the legal, environmental, quality aspectsassociated with operations used in the food industry.
PO12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Impart knowledge and skills related to food processing industries
will learn about effect of advance processing techniques on food product.
CO4: Understand the operations used in food processing industry.
CO7: Learn about the maintenance of personal hygiene & food safety in food processing industry.