



स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ

नांदेड— ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED-431606, MAHARASHTRA STATE, INDIA.

स्वामी रामानंद तीर्थ  
मराठवाडा विद्यापीठ, नांदेड.

Established on 17th September 1994 - Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade



## ACADEMIC (1-BOARD OF STUDIES) SECTION

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### परिपत्रक

सर्व संबंधितांना या परिपत्रकान्वये कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या विज्ञान व तंत्रज्ञान विद्याशाखेंगत B.Sc. Food Science Third Year CBCS Pattern चा सोबत जोडल्याप्रमाणे अभ्यासक्रमास शैक्षणिक वर्ष २०१८—१९ पासून लागू करण्यासाठी मा. कुलगुरू यांनी विद्यापरीषदेच्या वतीने मान्यता प्रदान केली आहे.

तरी उपरोक्त प्रमाणे ही बाब सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

“ज्ञानतीर्थ” परिसर

विष्णुपूरी, नांदेड.

जा.क्र.शै.०१/Syllabus/२०१८—१९/१११४

दिनांक : २७/०८/२०१८

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स्वा/—

उपकुलसचिव

शैक्षणिक (अभ्यासमंडळे) विभाग,

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) प्राचार्य, सर्व संलग्णित महाविद्यालये, प्रस्तुत विद्यापीठ.
- २) संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
- ३) कुलसचिव, (निवडणूक व सभा कक्ष) यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ४) उपकुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
- ५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ६) सिस्टीम एक्सपर्ट, प्रस्तुत विद्यापीठ. (सदरील परिपत्रक व अभ्यासक्रम विद्यापीठाच्या संकेतस्थळावर प्रसारित करावे.)

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**CHOICE BASED CREDIT SYSTEM (CBCS) SEMESTER PATTERN**



**SYLLABUS  
B.Sc. FOOD SCIENCE THIRD YEAR  
w. e. f. Academic Year 2018-19**

**Board of Studies in Biotechnology and Bioinformatics  
Swami Ramanand Teerth Marathwada University, Nanded**

**Swami Ramanand Teerth Marathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)

Faculty of Science

**B.Sc. Third Year**

**Fifth Semester Food Science Syllabus**

Semester Pattern Effective from 2018-2019

<b>Paper No.</b>	<b>Name of the Course</b>	<b>Periods/ Week</b>	<b>Total Period</b>	<b>Internal Evaluation</b>	<b>External Evaluation</b>	<b>Total Marks</b>	<b>Credits</b>
CCFS-IE	Environmental Studies	03	45	10	40	50	***
CCFS –IIE	Food Biotechnology	03	45	10	40	50	2
CCFS –IIIE	Product Development & Formulation	03	45	10	40	50	2
CCFS –IVE	By-products And Waste Utilization of Food Industry	03	45	10	40	50	2
CCFS –VE	Carbonated Beverage Technology	03	45	10	40	50	2
CCFS –VIE	Biochemical Engineering	03	45	10	40	50	2
CCFS –VIIIE	Entrepreneurship Development	03	45	10	40	50	2
CCFS –VIIIIE	Competitive Skills & Mock Interview	03	20	-	-	-	-
CCFSP-1	Practical's based on CCFSP II, III & IV E	03+03	20	20	80	100	4
CCFSP-2	Practical's based on CCFSP V, VI, & VIIIIE	03+03	20	20	80	100	4
SEC-III	Experimental Earning & Learning programme (EELP) OR Development of fortified food products	03	45	25	25	50	2
<b>Total</b>						<b>600</b>	<b>22</b>

**Swami Ramanand Teerth Marathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)

Faculty of Science

**B.Sc. Third Year**

**Sixth Semester Food Science Syllabus**

Semester Pattern Effective from 2018-2019

Paper No.	Name of the Course	Period /Week	Total Period	Internal Evaluation	External Evaluation	Total Marks	Credits
CCFS-IF	Specialty Foods	03	45	10	40	50	2
CCFS –IIF	Extrusion Technology	03	45	10	40	50	2
CCFS –IIIF	*Food Hygiene and Microbiological Standards	03	45	10	40	50	2
CCFS –IVF	Instrumentation and Process Control	03	45	10	40	50	2
CCFS –VF	Food Plant Design & Layout	03	45	10	40	50	2
CCFS –VIF	Food Laws and Regulation	03	45	10	40	50	2
CCFS-VIIF	Food Quality Assurance and certification	03	45	10	40	50	2
CCFSP-1	Practicals based on CCFS-IF, IIF& IIIF	03+03	20	20	80	100	4
CCFSP-2	Practicals based on CCFS-IV, V & VI F	03+03	20	20	80	100	4
CCFSP-3	Project Report	04	20	10	40	50	2
SEC-IV	Processing of Nutritious Bizarre FoodsORProcessing of Fermented food products	03	45	25	25	50	2
						<b>650</b>	<b>26</b>
<b>Total Marks and credits of B.Sc. I, II and III year</b>	Total Marks of B.Sc.Food Science Degree (Three years of course with dissertation, CBCS Pattern)						<b>44+</b> <b>48+</b> <b>48=</b> <b>140.</b>

**NOTE:** 1) Laboratory courses include Skill Enhance Course practicals as mention therein.

2) Internal evaluation for theory papers includes-1) Attendance 2) Assignment 3) Seminar 4) Unit Test 5) Involvement of students in class (Each Criteria Carry 2 Marks)

3) Internal evaluation for laboratory course includes record books.

**Choice Based credit System (CBCS)**

**B.Sc. Food Science**

**III year V semester**

**Subject: FOOD BIO-TECHNOLOGY Code: CCFS II E**

**Credits: 02**

**Marks: 50 (External 40, Internal 10)**

**Silent Features:-**

Syllabus includes all important aspects of food production through biotechnological approach.

**Out-come:-**

Will prepare students to understand biotechnological techniques for food production. It will also help students to learn the application in industries.

**Learning Objectives:-**

- 1) To understand the role of biotechnology in food processing and preservation
- 2) To provide knowledge about techniques used in plant, animal and microbial biotechnology
- 3) To introduce students to new developments in the field of food biotechnology

**Prerequisites:-**

Technical understanding of microbiology fermentation techniques is require to learn this subject.

<b>UNIT I</b>	Prospectus of Bio-Technology Fundamentals of molecular biology with special reference to chemistry and biology and DNA structures	<b>08</b>
<b>UNIT 2</b>	Biological role of DNA in cell metabolism Genetic recombination mechanisms and technique used for improvement in microbial strains	<b>08</b>
<b>UNIT 3</b>	Recombinant-DNA technology (plasmids and cloning) Cell and tissue culture Continuous cultures Secondary metabolites synthesis	<b>08</b>
<b>UNIT 4</b>	Biomass production by using various micro- organisms Single Cell Protein (SCP), SCP use in food industry, Citric Acid and Acetic Acid production and uses in food industry Bio-gas plant	<b>08</b>
<b>UNIT 5</b>	Application of Biotechnology in food (Food industries), pharmaceuticals and agriculture, genetically control mechanism in industrial fermentation process, (Induction, manipulation and recombination)  Bio technology approach for the exploitation of food and industrially important microorganisms	<b>08</b>

## Practicals

No. of Units	Topics
1	Study of auxotroph
2	Micro propagation through tissue culture
3	Strain improvement through U.V. mutation for lactose utilization
4	Chemical mutagenesis using chemical mutagens (Ethidium bromide)
5	Determination of survival curves using physical and chemical mutagens
6	Isolation and analysis of chromosomal / genomic DNA from <i>E.coli</i> and <i>Bacillus cereus</i>
7	Study of Replica Plate Technique
8	Introduction of ELISA / Southern blot / DNA finger printing etc
9	Agarose gel electrophoresis of plasmid DNA

## REFERENCE BOOKS

- 1 Advances in Biotechnology Vol.1  
(Scientific and Engineering principles) Murayy Moo-Young  
C.W. Gambell and C.Vezina
- 2 Advances in Biotechnology Vol-II  
(Fuels, chemicals, foods and waste treatments) Murayy Moo-Young  
C.W. Gambell and C.Vezina
- 3 Advances in Biotechnology Vol-III  
(Fermentation Products) Muray Moo-Young
- 4 VIIth International Biotechnology  
Symposium (Feb 19-25 1984) held at New Delhi-Part-I
- 5 VIIth International Biotechnology Symposium  
(Feb. 19-25 1984) Held at New Delhi Part-II.
- 6 Microbial Technology-Vol-I  
(Microbial Process) Pepler and Perlman
- 7 Microbial Technology-Vol-I I  
(Fermentation Technology) Pepler and Perlman

**Silent Features:-**

Syllabus includes all important aspects of new product development and formulation through scientific and technical approach with recent trends demanding in food industries

**Out-come:-**

Upon successful completion of this course students will be able

- 1) To understand why new product are developed
- 2) To appreciate why product may be fail
- 3) To understand the importance of product branding and marketing
- 4) To develop a novel food products of good chemical, microbiological and sensory qualities

**Learning Objectives:-**

- 1) To supervise the students in developing and producing a well packaged food product of good chemical, microbiological and sensory qualities with good and stable shelf life.
- 2) To understand and be able to make appropriate packaging, labeling designs, pricing and marketing of developed food products
- 3) To learn about latest trends and techniques in food science.

**Prerequisites:-**

Scientific and technical understanding of food production is require to learn this subject.

UNIT 1	Need, importance and objectives of formulation for new product development. General characteristics of new food products- classes of new products Ideas- idea screening, business philosophy and strategy of new product	<b>08</b>
UNIT 2	Formulation based on sources availability and cost competitiveness for concept developments of new products Standardization of various formulation and product design	<b>08</b>
UNIT 3	Adaptable technology and sustainable technology for standardized formulation for process development Process control parameters and scale-up, production trials for new product development at lab and pilot scale	<b>08</b>
UNIT 4	Quality assessment of new developed products Market testing and marketing plan	<b>08</b>
UNIT 5	Costing and economic evaluation of developed products Commercialization / product launch for marketing	<b>08</b>

## Practical

No. of Units	Topics
1	Market survey of existing various products
2	Formulation of new products based on corporate decision /needbased
	1 Protein-energy rich
	2 Low calorie (fat replacer)
	3 Low sodium content
	4 Glycemic index based
B	5 Cholestrolemic index based
	6 Phyto-chemical based
3	Product development based on above formulation depending on local sources/ technology
4	Quality assessment
5	New product development for
	i) Infant / weaning foods
	ii) Geriatric
	iii) Physiological status
	iv) Athletes

## REFERENCE BOOK

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



**Silent Features:-**

This course includes all important aspects of by- product and waste utilization of food industry through scientific and technical approach.

**Out-come:-**

After successful completion of this course students will be able to understand by- product and waste utilization techniques.

**Learning objectives:-**

- 1) To provide knowledge about food industrial by- products and waste utilization

**Prerequisites:-**

Basic knowledge of food industrial by- product and waste material

<b>UNIT 1</b>	Industrial byproducts and waste. Potentials and prospects of developing by-products industry in India. By products utilization of cereals, legumes, oil seeds.	<b>08</b>
<b>UNIT 2</b>	By products utilization of fruit and vegetables processing industries, By products utilization of dry fruits (cashew nut, almond, walnut, coconut, pista)	<b>08</b>
<b>UNIT 3</b>	By products utilization of meat, poultry and egg, fish processing units.	<b>08</b>
<b>UNIT 4</b>	Agricultural waste and agro based industrial waste management, By products utilization of plantation crops and spices & condiments. Uses of byproducts of agro based industries in various sector.	<b>08</b>
<b>UNIT 5</b>	By products utilization of dairy, fermentation, sugar and bakery industries.	<b>08</b>

## Practical

No. of Units	Topics
1	Extraction of banana fiber.
2	Extraction of leaf proteins.
3	Alcohol production from molasses.
4	Utilization of crop residues for the production of cellulose.
5	Use of mango kernels for starch manufacture.
6	Isolation and purification of pectin from organic waste.
7	Extraction of volatile oils from organic waste.

## REFERENCE BOOKS

- 1 Food from Waste Warvan
- 2 Food Protein Sources Pirie
- 3 Technology of Fish Utilization Ed. Kreuyer

**Silent Features:-**

This course will help to understand concept of carbonated beverage.

**Out-come:-**

After successful completion of this course students will be able to understand sweeteners, flavoring agents and quality control of soft drinks.

**Learning objectives:-**

- 1) To provide knowledge about techniques used in water softening in beverage industries
- 2) To help students to learn the various aspects of beverage industry.

**Prerequisites:-**

Basic knowledge about food chemistry, microbiology food quality

No. of Units	Topics	
<b>UNIT 1</b>	History and types of soft drinks, Water treatment and quality, Specification for beverage water. Alkalinity reduction, filtration of water, water softening.	<b>08</b>
<b>UNIT 2</b>	Sweeteners used in soft drink and their properties, non- nutritive sweeteners. Natural colorants used in soft drinks, Synthetic colorants used in soft drink and Acidulates used in soft drink	<b>08</b>
<b>UNIT 3</b>	Clouding and Flavoring agents used in soft drink. Carbon dioxide and carbonation for soft drink	<b>08</b>
<b>UNIT 4</b>	Equipment's and machineries used in soft drink. Packaging aspects in soft drink	<b>08</b>
<b>UNIT 5</b>	Quality control in soft drink –Chemical, sensory and Microbiological quality	<b>08</b>

## Practical

No. of Units	Topics
1	Physical properties of water
2	Determination of Hardness of water
3	Determination of density of caramel
4	Determination of viscosity of caramel
5	Determination of colours in soft drinks by wool technique
6	Determination of saccharine in beverages
7	Determination of benzoic acid in beverages
8	Determination of sulphurdioxide in beverages
9	Determination of caffeine in cola type of beverages
10	Determination of brix value, gas content, PH and acidity of beverages
11	Microbial total plate count of water and beverages
12	Microbial analysis of water for E – coli
13	Visit to carbonation Unit
14	Visit to water treatment plant
15	Visit to the drinking water/mineral water plant+-

## REFERENCE BOOKS

- 1 Preservation of Fruit and Vegetable Products - Giridharilal, Siddappa G.S. and Tondon G.D.
- 2 Fruit and Vegetable Juices - Tressler D.K., Joslyn M.A. and Marsh G.C. AVI publishing company New York.
- 3 Food Engineering Operations - Brennan, Buttler, Crowell and Lilly

**Choice Based credit System (CBCS)**

**B.Sc. Food Science**

**III year V semester**

**Subject: Code: Biochemical Engineering      CCFSVI E**

**Credits: 02**

**Marks: 50 (External 40, Internal 10)**

**Silent Features:-**

Syllabus helps to understand fermentation process with kinetics

**Out-come:-**

After successful completion of this course students will be able to know fermentation process with kinetic reaction and recovery of product in industrial level .

**Learning objectives:-**

- 1) To understand the role of biochemical engineering in food industry

**Prerequisites:-**

Basic knowledge of fermentation and bioconversion.

<b>UNIT 1</b>	Biochemical Engineering and their scope: Definition, necessity, value engineering, good manufacturing practices. Standard operating procedures, good laboratory practices History of Biochemical Engineering: Theory of scientists Pfizer, Alexander Fleming Salman Waksman. Instrumentation and their control, physical and chemical parameters.	<b>08</b>
<b>UNIT 2</b>	Role of biochemical engineering in development of modern fermenter: Scale up, management of cellular process, design, operation and their problems  Basis for biochemical engineering in fermentation industry:  Unit operation, unit process, process design, chemical reaction kinetics, process variables, biochemical properties, process control	<b>08</b>
<b>UNIT 3</b>	Kinetics of microbial growth and death: Definition, fermentation kinetics rate of cell synthesis, product formation and effect of environment. Types of kinetics, Batch and continuous type, control measures. Kinetics pattern of various fermentations: Classification of kinetics pattern, as per different scientists, simple, simultaneous, consecutive, stepwise, complex reactions and their examples	<b>08</b>

<b>UNIT 4</b>	Simple enzyme kinetics: Simple kinetics model for enzyme substrate interaction. Derive the equation of Michelin Menton, for reaction rate, product formation, calculation of Km and V max values Complex enzyme kinetics: Oxidation – reduction form of enzymes, observed apparent rate constant, factors affecting the inhibition, competitive, non -competitive inhibition, substrate interaction	<b>08</b>
<b>UNIT 5</b>	Product recovery of different process: Mass transfer resistance, extraction, leaching, drying and evaporation, sorption and storage, permeability law. Product formation for value added products using bioconversions techniques Production of single cell protein, alcohol, raw material for required for product formation, production of antibiotics, economic process, utilization of damaged grain through bioconversion, present mode of utilization and their nutritional value	<b>08</b>

### Practicals

No. of Units	Topics	No. of Experiments
1	Instrumentation and their control in fermentation industry -physical parameter, chemical parameter, metabolic parameters and biosensors in food industry	2
2	To asses the amylase activity from given foods sample	2
3	To study the different parts of 30 lit. Laboratory and 1 lakh lit. capacity fermenters	1
4	Comparative study of one lakh liter laboratory fermenter	1
5	To study the thermal stability of peroxides enzyme in potato	1
6	To study the vitamin production through bioconversion	1
7	To measure the microbial growth after (fermentation thermal death time)	1
8	To study the mass transfer of solution by dialysis process	1
9	Visit to Distillery Plant	1

### REFERENCE BOOKS

- Biochemical Engineering Shuichi Alba, Arthur E. Humphrey  
Nancy F. Millis
- Biochemical Engineering Fundamentals Bailer J.E. and Ollis D.F.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED  
**Choice Based credit System (CBCS)**  
**B.Sc. Food Science**  
**III year V semester**  
**Subject: Code: ENTREPRENEURSHIP DEVELOPMENT CCFSVIII**  
**Credits: 02** **Marks: 50 (External 40, Internal 10)**

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**Silent Features:-**

Syllabus helps to develop entrepreneurial skills in the students

**Out-come:-**

After successful completion of this course students will be able to understand importance of entrepreneurship for the development of economy.

**Learning objectives:-**

- 1) To assist students to develop multi management skills to either start their own business or manage an existing business.

**Prerequisites:-**

Basic knowledge of business and marketing

<b>UNIT 1</b>	<b>Foundation Of entrepreneurship Development</b> Introduction to Entrepreneurship Development. Concept of Entrepreneurship Types of Entrepreneurship Entrepreneurship as a career The changing role of the Entrepreneur.	<b>08</b>
<b>UNIT 2</b>	<b>Requirement of entrepreneurship</b> Attributes Required for Entrepreneurship Growth of Entrepreneurship in India Concept and function of woman Entrepreneurship	<b>08</b>
<b>UNIT 3</b>	<b>Entrepreneurship motivation and process of Entrepreneurship</b> What is motivation Motivation theories Motivation factors 4 C's of Entrepreneurship	<b>08</b>
<b>UNIT 4</b>	<b>Assessing the Market</b> Information gathering techniques Principle of Market Survey Analysis of Survey data Resource Mobilization	<b>08</b>
<b>UNIT 5</b>	<b>Entrepreneurship Programme, SWOT analysis and budget</b> SWOT analysis Types of budget Contents of project report Objectives of Entrepreneurship programme Agro Industrial project – Meaning types of projects , project cycle , Identification, formation, Appraisal, Implementation, Monitoring and evaluation	<b>08</b>

## REFERENCE BOOKS

- 1 Hand Book for New Entrepreneurs Bhatt, EDI faculty,  
Entrepreneurship Development Institute of  
India, , Ahmedabad.
- 2 Entrepreneurship and Venture Management Chifford M and Back M B Mc  
Graw Hill Book Co., New York
- 3 Entrepreneurship G.BabuRao, TTTI (SR) Hyderabad – 29
- 4 Organizational Behavior Fred Luthomi (1989)  
Tata MC Graw Hill publishers, New Delhi.
- 5 Fundamental of Business organization Y.K. Bhushan(1987)  
and Management Sultan Chand & Co. New Delhi.
- 6 Entrepreneurship Development – MSBTE
- 7 Innovation & Entrepreneurship – Peter Ducker
- 8 The Culture of Entrepreneurship – Berger



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED  
**Choice Based credit System (CBCS)**  
**B.Sc. Food Science**  
**III year V semester**  
**Subject: Code: COMPETITIVE SKILLS & MOCK INTERVIEW CCFSVIIIIE**

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**Silent Features:-**

Syllabus helps to aware students about competitive examination and improve interview skills

**Out-come:-**

After successful completion of this course students will be able to understand importance of competitive examination and interview techniques.

**Learning objectives:-**

- 1) To develop the interest of students in competitive examinations
- 2) To guide students for preparation of entrance examinations
- 3) To develop the interview skills in students

**Prerequisites:-**

Student should have basic knowledge of competitive examination and communication skill

<b>UNIT 1</b>	Gate Exam Preparation: Orientation of GATE Curriculum for students, Providing information regarding literature of GATE Examination. Solving some sample question papers of GATE Examination.
<b>UNIT 2</b>	Information regarding Technical MPSC Examination and Recruitment procedure of Graduate students with detail curriculum, Literature and Guidance
<b>UNIT 3</b>	Technical Post, Curriculum and authentic literature of RRB, BSRB examination
<b>UNIT 4</b>	Information Regarding Higher Education in Foreign Universities, Preparation of Pre requirements like SAT,PTE, LSAT,ACT, CAE,CPE GMAT, GRE, IELTS and the TOEFL.
<b>UNIT 5</b>	Preparation for PG entrance examination – Curriculum and information of entrance examination to IIM and other MBA collages.
<b>UNIT 6</b>	Information regarding different Scholarship offered For Higher Studies abroad to the Indian students.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED  
**Choice Based credit System (CBCS)**  
**B.Sc. Food Science**  
**III year V semester**  
**SEC III**

**Experimental Earning and Learning Programme**

**Credits: 02**

**Marks: 50 (External 25, Internal 25)**

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**Silent Features:-**

Syllabus helps students to develop production and marketing skills of new products.

**Out-come:-**

After successful completion of this course students will be able to understand production and marketing skills.

**Learning Objectives:-**

- 1) To learn the various skills to start a small scale food processing unit
- 2) To understand the various aspects of small scale food processing unit

**Prerequisites:-**

Student should have the basic knowledge of food processing, food quality , packaging and marketing

It is recommended that Students should be develop a new product depending upon local needs and industrial demands and sale 20 kg of these products within 25 days.

Marks distribution depends on following points

**1. Preparation of working plan**

Selection of product  
Raw material purchasing

**2. Production**

Hygiene and sanitation  
Preparation  
Packing  
Storage

**3. Marketing and Sales**

Market strategy  
Sales performance  
Sales volumes  
Profit generated including C/B ratio and Pay- back period

**4 Documentation and reports**

Book keeping  
Preparation of final report in three copies with presentation

**OR**

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
**Choice Based credit System (CBCS)**  
**B.Sc. Food Science**  
**III year V semester**  
**SEC III**

**Development of Fortified Food Products**

**Credits: 02**

**Marks: 50 (External 25, Internal 25)**

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**Silent Features:-**

Syllabus helps students to develop production and marketing skills of new products.

**Out-come:-**

After successful completion of this course students will be able to understand production and marketing skills.

**Learning objectives:-**

- 1) To develop the skill of fortification process
- 2) To help the students to learn and develop the various fortified food products

**Prerequisites:-**

Student should have the basic knowledge of food processing, food quality, packaging and marketing

❖ Development of fortified Food products under following heads

- 1) Weaning foods
- 2) Snacks
- 3) Milk products
- 4) Bakery products

**Silent Features:-**

Syllabus helps to understand role of specialty food in day to day life.

**Out-come:-**

After successful completion of this course students will be able to learn processing varies kinds of specialty food.

**Learning objectives:-**

- 1) To help students to learn the various specialty foods and its processing

**Prerequisites:-**

Student should have the basic knowledge of food processing, food quality , food sources

<b>UNIT 1</b>	Need and scope of specialty foods Specialty food based on ease in preparation for cost health benefits <ol style="list-style-type: none"> <li>i. Functional foods</li> <li>ii. Convenience food</li> <li>iii. Health care and medical benefits</li> <li>iv. Nutritional status</li> <li>v. Low cost foods</li> </ol>	<b>08</b>
<b>UNIT 2</b>	Specialty foods based on sources <ul style="list-style-type: none"> <li>• Cereals and millets</li> <li>• Legumes and pulses</li> <li>• Fruits and vegetables</li> <li>• Animal food sources</li> <li>• Probiotics</li> <li>• By product based</li> <li>• Non conventional foods</li> </ul>	<b>08</b>
<b>UNIT 3</b>	Specialty foods based on process <ul style="list-style-type: none"> <li>• Innovative process technology</li> <li>• Food additives basis</li> <li>• Bioactive components</li> <li>• Packaging techniques (Nano-technology, Smart packaging)</li> <li>• Adaptable technology basis</li> <li>• Fast and PET foods</li> </ul>	<b>08</b>

<b>UNIT 4</b>	Specialty food based on genetics 1. Genetically modified foods 2. Transgenic foods 3. Biotechnological aspects of detoxification Proprietary foods Supplementary foods <b>Therapeutic foods</b>  1 Modification of diets in disorders, feeding purposes 2 Disease oriented of different organs ex: digestive tract, liver, cardiovascular system, kidney , metabolic disorders, allergy, endocrine disorders	<b>08</b>
<b>UNIT 5</b>	Specific consumer oriented foods and Specialty foods based on growing condition - organic , inorganic farming  <ul style="list-style-type: none"> <li>• Defense persons</li> <li>• Space / astronaut</li> <li>• High altitude mountain climbers</li> <li>• Disaster situation – crises, care, maintenance</li> </ul>	<b>08</b>

### Practical

No. of Units	Topics
1	Preparation of specialty foods based on
	i) Functionality
	ii) Convenience
	iii) Low cost
	iv) Nutritional purpose
2	Preparation of specialty food using locally available foods crops, fruit and vegetables few products
3	Assessment of byproduct for preparation of value added specialty food
4	Isolation of phytochemical/ bio-reactive agent of plant sources and their utilization in proprietary foods
5	Preparation of specialty food as per requirement of
	i) Location
	ii) Nature of work
	iii) Status of worker
6	Evolution of food cultivated under organic farming conditions

## REFERENCE BOOKS

- |                                 |                                 |
|---------------------------------|---------------------------------|
| 1 Food Science                  | Norman N. Potter                |
| 2 Processed Protein Food Stuffs | Alchule                         |
| 3 Food and Nutrition            | M. Swaminathan                  |
| 4 Therapeutic Diets             | National Institute of Nutrition |
| 5 Supplementary Foods           | National Institute of Nutrition |

**Silent Features:-**

This course helps to understand processing of extruded food products.

**Out-come:-**

After successful completion of this course students will be able for the production extruded food products

**Learning objectives:-**

- 1) To provide knowledge about extruded food products
- 2) To learn extrusion process in various foods

**Prerequisites:-**

Student should have the basic knowledge of cereal and legume processing, food quality, bakery techniques.

<b>UNIT 1</b>	<b>Extrusion Technology</b> Importance, principles of extrusion cooking, methods of extrusion cooking <b>Extruders-</b> Types of extruders, single screw, twin screw, their applications, effects of dependent and independent variables on the product quality.	<b>08</b>
<b>UNIT 2</b>	<b>Extruded products-</b> Raw materials, process of manufacture, properties, quality, evaluation, packaging requirement, marketing, Processing of Pasta, Vermicelli, Noodles.  <b>Legumes and oilseed foods</b>  Isolate, concentrate, and substitute to milk, variation in composition and nutritive value.	<b>08</b>
<b>UNIT 3</b>	<b>Food proteins</b>  Types, sources, availability, need, properties etc. food problems, role, means for increasing food supply  Amino acid fortification of foods i.e. break-fast cereals, infant foods, bread, baked products.	<b>08</b>
<b>UNIT 4</b>	Meat Analogue, commercial development, nutritional aspect, marketing aspect.	<b>08</b>
<b>UNIT 5</b>	New protein foods, tofu, miso, texturized vegetable protein, hydrolyzed vegetable protein, formulation and quality control	<b>08</b>

## Practicals

No.of Units	Topics
1	Physicochemical properties of proteins, protein rich products, weaning foods, beverages
2	Texturized products, protein rich bakery products
3	Type of food extruders, preparation of extruded products
4	Factors affecting extrusion cooking, moisture content, diameter, temperature, pressure, screw speed, time, quality evaluation of these products

## REFERENCE BOOKS

1. New protein foods, vol.I,II, A.L. Altschul.
2. Extruded foods Matza.



**Choice Based Credit System (CBCS)**

**B.Sc. Food Science**

**III year VI semester**

**Subject: Food Hygiene and Microbial Standards      Code: CCFS III F**

**Credits: 02**

**Marks: 50 (External 40, Internal 10)**

**Silent Features:-**

Syllabus includes all important aspects related to hygiene and sanitation as per microbial standards.

**Out-come:-**

Will prepare students to understand sanitizers, food toxins, common pest and its control. It will also help students to importance of personal hygiene in food industries.

**Learning objectives:-**

- 1) To understand importance of food hygiene and microbial standards
- 2) To understand sanitization practices in food industries
- 3) To learn effect of presence of toxins in food

**Prerequisites:-**

Student should have the basic knowledge of hygiene and sanitation and microbiology.

<b>UNIT 1</b>	Principles of Food Hygiene, Food handling habits and personal hygiene Types of Soil (Food residues on equipment surfaces) and its properties.	<b>08</b>
<b>UNIT2</b>	Types of sanitizing agents and their properties. Physical sanitizing agent's example Hot water, Steam and UV light. Acid and alkaline cleaners. Chlorine, iodine and their compounds as sanitizers, Quaternary ammonium compounds, phenolic compounds as sanitizers. Advantages and disadvantages of these sanitizers.	<b>08</b>
<b>UNIT 3</b>	Sanitation facilities and procedures in food plant operations. CIP system. Cleaning premises and surroundings. Common Pests in food services rodents, insects, birds, house flies, cockroaches, ants and their control. Hazards in food chain physical, chemical, biological	<b>08</b>
<b>UNIT 4</b>	Toxins in food, naturally occurring, bacterial and fungal 5 Metals as toxins – sources, contamination, toxicity and elimination Pesticide residues as toxin i) Chlorinated ii) Non – chlorinated.	<b>08</b>
<b>UNIT 5</b>	Risk assessment and management during food preparation.	<b>08</b>

## Practicals

No. of Units	Experiments
1	Microbial quality of air
2	Microbial load of palm/ fingers, nose secretions of workers TPC/ <i>E.Coli</i> / Vibrio
3	Microbial quality of eating utensils
4	Investigation of organisms involved in infections, diseases vibrio typhoid.
5	Testing of sanitizers, disinfectants for antimicrobial activity
6	Methods of pest control in food industries rodents / cockroaches
7	Heavy metal detection (lead)
8	Study of HACCP for food industries
9	Study of national and international microbial quality standards
10	Isolation and identification of <i>E. Coli/Listeria</i>
11	Visit to District public health laboratory
12	Visit to restaurents/ local food industries
13	Visit to export oriented food processing industry

## REFERENCE BOOK

- |  |   |
|--|---|
| 1 Guide to improving Food Hygiene                                      | - Ed Gaston & Tiffney                   |
| 2 Practical Food Microbiology and Technology (2 <sup>nd</sup> edition) | - HarryH.Weiser,J.mountney and W.W.Gord |
| 3 Food Poisoning and Food Hygiene (3 <sup>rd</sup> Edition)            | -Betty C.Hobbs                          |
| 4 Principles of Food Sanitatin-  | - Marriott. Norman G.                   |
| 5 Hygiene in food manufacturing and Handling                           | - Barry Graham- Rack and Raymond Bmsted |
| 6 Food Hygiene and Sanitation  | S. Roday                                |
| 7 Food Microbiology  | W.C. Frazier and D.C. Westhoff          |
| 8 Food Chemistry (New Edition)   | Owin R. Fenema                          |
| 9 Handbook of Food Toxicology  | S.S. Deshpande                          |
| 10 Food Microbiology   | M.R. Adams and M.O. Moss                |
| 11 Food Additives Toxicology   | J.A. Maga and A.T. Tu                   |
| 12 Safety of Foods (II Edition)  | H.D. Graham                             |

**Choice Based Credit System (CBCS)**

**B.Sc. Food Science**

**III year VI semester**

**Subject: Instrumentation and Process Control Code: CCFSIV F**

**Credits: 02**

**Marks: 50 (External 40, Internal 10)**

**Silent Features:-**

Syllabus includes all important aspects of food industrial measurements and instrumentation process.

**Out-come:-**

Will capable students to handle instrumentation process at industrial level

**Learning objective:-**

- 1) To understand the importance and role of instrumentation process control in food industries
- 2) To learn basic technics of measurements in instrumentation and process control

**Prerequisites:-**

Student should have the basic knowledge of measurements, statistics and control system

<b>UNIT 1</b>	Introduction, definition, recorders and monitors, panel boards, General characteristics of instruments, static and dynamic characteristics	<b>08</b>
<b>UNIT 2</b>	Temperature and temp. scales, various types of thermometers - mercury-in-glass, bimetallic, pressure-spring thermometers, thermo couples, resistance thermometers and pyrometers	<b>08</b>
<b>UNIT 3</b>	Pressure and pressure scales, manometers, pressure elements differential pressure  Liquid level measurement, different methods of liquid level measurement	<b>08</b>
<b>UNIT 4</b>	Flow measurement, kinds of flow, rate of flow, total flow differential pressure meters, variable area meters  Transmission, pneumatic and electrical	<b>08</b>
<b>UNIT 5</b>	Control elements, control actions, pneumatic and electrical control systems	<b>08</b>

## Practical

No. of Units	Topics
1	To study instrumentation symbols
2	Measurement of temperature by different thermometers.
3	Measurement of pressure by 'U' tube manometer, (inclined tube manometer)
4	Measurement of liquid level in the tank with the help of Bob and tape
5	Determination of relative humidity by wet and dry bulb thermometer
6	Measurement of velocity of fluid by using venturi meter /orifice meter/pilot tube
7.	Measurement of RPM of an electric motor by Tachometer
8	Measurement of wind velocity by anemometer
9	Measurement of intensity of sun shine by sunshine recorders

### REFERENCE BOOKS

- |   |                            |
|---|----------------------------|
| 1 Instrumentation                           | F.W. Kirk and N.R. Rimboi. |
| 2 Industrial instrumentation fundamentals   | Austin E. Fjribance        |
| 3 Process instruments and controls Handbook | Considine                  |



## Practicals

No. of Units	Topics
1	Preparation of project report
2	Preparation of feasibility report
3	Layout of Food storage warehouses
4	Layout and design of cold storage
5	Layout of pre-processing house
6	Layout of Milk and Milk product plants
7	Bakery and related product plant
8	Fruits processing plants
9	Vegetable processing plants
10	Layout of multi-product and composite food Plants
11	Waste treatment and management of food plant
12	Visit to Fruit and Vegetables processing plant

## REFERENCE BOOKS

1. Milk Plant Layout H.S. Hall (1963). FAO Pub., Rome
2. Plant Layout and Design James M.Moore (1962), Mac Millan
3. Engineering for Dairy and Food Products A.W. Faral (1980). Rebert E., KrigerPub Co., New York

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED  
**Choice Based Credit System (CBCS)**  
**B.Sc. Food Science**  
**III year VI semester**

**Subject: Food Laws and Regulation**

**Code:- CCFS VI F**

**Credits: 02**

**Marks: 50 (External 40, Internal 10)**

**Silent Features:-**

This course helps students to gain the knowledge of laws and regulations in food industries.

**Out-come:-**

Will be able to understand various laws and regulation related to food safety.

**Learning Objectives:-**

- 1) To provide the knowledge of food laws and regulations
- 2) To give the importance and application process of food laws and regulations in food industries.

**Prerequisites:-**

Student should have the basic knowledge of Food adulteration, food inspection, and food safety standards.

<b>UNIT1</b>	Introduction to subject, Need of enforcing the laws and various types of laws. Mandatory food laws Food safety and standards act 2006- Food safety and standard authority of India, food advisory committee, scientific panels and scientific committees, state food safety authority, standards for food articles, food recall procedures, tribunal, offences and penalties, general principles to be followed in administration of act, general provisions as to articles of food, special responsibility as to safety of food	<b>08</b>
<b>UNIT2</b>	Prevention of Food Adulteration Act (1954) Definition, object of act, central committee for food standards; public analysis, food inspector, duties of Food inspectors, Report of Public analyst, sealing, fastening and dispatch of samples and powers of court	<b>08</b>
<b>UNIT3</b>	Other Mandatory acts  The Standards of Weights and Measure Act (1976), The Packaged Commodity Rules (1977), Essential Commodities Act (1955), Consumer Protection Act (1986), The Environment Protection Act (1986) and the Environment Protection Rules (1989), Insecticide Act (1968), The Export (Quality Control and Inspection) Act (1963), The Atomic Energy Act (1962), Control of Irradiation of Food Rules (1991)	<b>08</b>

<b>UNIT4</b>	<p>Food Product Orders</p> <p>The Fruit Products Order (1955), The Milk and Milk Products Order (1992), The Meat Food Products Order (1973), The Vegetable Oil Products (Control) Order (1947), The Edible Oils Packaging (Regulation) Order (1998), The Solvent Extracted Oil, De oiled Meal, and Edible Flour (Control) Order (1967), The Infant Milk Substitutes, Feeding Bottles and Infant Foods (Regulation of Production, Supply and Distribution) Act (1992)</p>	<b>08</b>
<b>UNIT5</b>	<p>Optional food standards</p> <p>-Scope of these standards, their need, procedure to obtain that standard, The Bureau of Indian Standards Act (1986), The Agricultural Produce (Grading and Marketing) Act (1937) -AGMARK</p> <p>Codex Alimentarius Commission</p> <p>-Scope of codex standards, codex standards for cereals, pulses, fruit &amp; vegetables, Meat &amp; Poultry products, Recommended international code of hygiene for various products</p>	<b>08</b>



## Practicals

No. of Units	Topics
1	Examination of Cereals and pulses from warehouse and market shop in relation to PFA and BIS specifications
2	Examination of Ghee for various standards of MMPO and BIS
3	Examination of honey for PFA and BIS standards.
4	Examination of spices for Agmark and BIS standards.
5	Examination of milk and milk products for BIS and milk product order- standards (MMPO)
6	Examination of fruit Jam of two to three different companies for FPO specifications
7	Examination of squash of two to three different industries for FPO specifications.
8	Examination of ketchup of two to three different Companies for FPO specifications
9	Visit to BIS Laboratory
10	Visit to Agmark laboratory
11	Visit to quality control laboratory and Food processing industry

## REFERENCE BOOKS

- 1 Hand Book on Food Safety and Standards Act, 2006. P.K.Das, Universal Law Publishers, New Delhi.
- 2 The Prevention of Food Adulteration Act Professional Book Publishers, New Delhi
- 3 Quality Control in Food Industry Vol. 1 S.M. Herschdoerfer

**Choice Based Credit System (CBCS)**

**B.Sc. Food Science**

**III year VI semester**

**Subject: Food Quality Assurance and Certification**

**Code:-CCFS VII F**

**Credits: 02**

**Marks: 50 (External 40, Internal 10)**

**Silent Features:-**

This course helps students to understand auditing, inspection, control, management and assurance the quality of food products.

**Out-come:-**

Will be able to understand role of quality controller, auditor and certifying bodies.

**Learning objectives:-**

- 1) To guide the students in their quest for the scientific principles involved in the attainment of food quality
- 2) To help students to learn the various ways of evaluating and controlling food quality

**Prerequisites:-**

Student should have the basic knowledge of food industrial parameters.

<b>UNIT1</b>	Quality inspection, quality control, quality management and quality assurance Quality Circles, SQC., ISO System	<b>08</b>
<b>UNIT2</b>	Total quality management <ul style="list-style-type: none"> <li>• Good manufacturing practices</li> <li>• Good agricultural practices</li> <li>• Good laboratory practices</li> <li>• Quality management systems (QMS)</li> </ul>	<b>08</b>
<b>UNIT3</b>	HACCP, principles, implementation	<b>08</b>
<b>UNIT4</b>	Auditing, surveillance Audit, mock audit, third party quality certifying audit, Auditors and Lead auditors. Plan documentation, types of records	<b>08</b>
<b>UNIT5</b>	Certification, certification procedures, certifying bodies, accrediting bodies, international bodies.	<b>08</b>

## Practicals

<b>No. of Units</b>	<b>Topics</b>
1	Quality assurance procedures
2	TQM, GMP, GAP documentation.
3	Preparation of quality policy & documentation (quality Manuals)
4	Preparation of laboratory manuals.
5	Application of HACCP to products.
6	Preparation of documentation and records.
7	Auditing- surveillance, mock audit.
8	Visit to units implementing GMP, GAP
9	Visit to units with ISO systems
10	Visit to units with HACCP certification.

## REFERENCE BOOKS

- 1 Preharvest and Post Harvest Food Safety Beier, Blackwell Publishing Oxford UK
- 2 Guide to Food Laws and Regulations Curties, Blackwell Publishing Oxford UK
- 3 Technology of Food Preservation Desrosier and Desrosier
- 4 HACCP Mortimore, Blackwell Publishing Oxford UK

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED  
**Choice Based credit System (CBCS)**  
**B.Sc. Food Science**  
**III year VI semester**  
**Project Report**

**Credits: 02**

**Marks: 50 (External 40, Internal 10)**

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**Guidelines for project work**

- The projects will be allotted during V semester
- Students will design experiments of projects under guidance of supervisor
- Selection of topics relevant to areas of food science
- Collection of literature and references from various sources
- Planning of research experiments
- Performing the experiments with scientific and statistical analysis
- Project writing and completion of report
- Project report to be submitted in three copies
- Presentation of experimental data in schedule of practical examination of SRTM University Nanded
- The project work to be carried out individually or in the group of maximum three students.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED  
**Choice Based credit System (CBCS)**  
**B.Sc. Food Science**  
**III year VI semester**  
**SEC IV**

**PROCESSING OF NUTRITIOUS BIZARRE FOODS**

**Credits: 02**

**Marks: 50 (External 25, Internal 25)**

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**Silent Features:-**

Syllabus helps students to gain the knowledge of nutritious bizarre food products.

**Out-come:-**

After successful completion of this course students will be able to understand processing of bizarre foods products

**Learning objectives:-**

- 1) To give the knowledge on importance of nutritious bizarre foods
- 2) To develop the processing skill of nutritious bizarre foods

**Prerequisites:-**

Student should have the basic knowledge of nutrition, food processing and food quality

I Role of bizarre foods in human health

II Processing of nutritious bizarre foods under following food groups

- Cereal and millets
- Legume and pulses
- Oil seeds
- Fruits and vegetable

**OR**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED  
**Choice Based credit System (CBCS)**  
**B.Sc. Food Science**  
**III year VI semester**  
**SEC IV**

**PROCESSING OF FERMENTED FOOD PRODUCTS**

**Credits: 02**

**Marks: 50 (External 25, Internal 25)**

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**Silent Features:-**

Syllabus helps students to gain the knowledge fermented food products.

**Out-come:-**

After successful completion of this course students will be able to understand processing fermented foods products

**Learning Objective:-**

- 1) To give the knowledge on importance of fermented foods
- 2) To develop the processing skill of fermented food products

**Prerequisites:-**

Student should have the basic knowledge of fermentation, food processing and food quality

I To study the processing of fermented food products

II Processing of fermented food products under following heads

- Cereal based
- Fruits & vegetable based
- Dairy based
- Beverages (Alcoholic & Non- Alcoholic)