।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

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

25 1994 - 2019 SILVER JUBILEE YEAR

ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542
Fax : (02462) 229574
Website: www.srtmun.ac.in
E-mail: bos.srtmun@gmail.com

संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४–२०१९** च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्यात येत आहेत.

1. Agricultural Microbiology
2. Agrochemicals & Fertilizers
3. Analytical Chemistry
4. B.C.A.
5. B.Voc. (Food Processing, Preservation and Storage)
6. B.Voc. (Web Printing Technology)
7. Biochemistry
8. Bioinformatics
9. Biophysics
10. Biotechnology (Vocational)
11. Biotechonology
12. Botany
13. Chemistry
14. Computer Application (Optional)
15. Computer Science (Optional)
16. Computer Science
17. Dairy Science
18. Dyes and Drugs
19. Electronics
20. Environmental Science
21. Fishery Science
22. Food Science
23. Geology
24. Horticulture
25. Industrial Chemistry
26. Information Technology (Optional)
27. Mathematics
28. Microbiology
29. Network Technology
30. Physics
31. Software Engineering
32. Statistics
33. Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–०१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०१९–२०/२९२
दिनांक : ०३.०७.२०१९.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS) SEMESTER PATTERN

B. Sc. FOOD SCIENCE I II & III YEAR

ACADEMIC YEAR 2019-2020

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Faculty of Science

B. Sc. First Year

First Semester Food Science Syllabus

Semester Pattern effective from June 2019 onwards

Course No.	Course title	Periods/ Week	Total Period	Internal Evaluation	External Evaluation	Total Marks	Credits
CCFS-IA	English & Science communication Skills-I	03	45	10	40	50	2
CCFS-IIA	Principles of food Processing	03	45	10	40	50	2
CCFS-IIIA	Food Production Trends and Programmes	03	45	10	40	50	2
CCFS-IVA	Food Chemistry	03	45	10	40	50	2
CCFS-VA	Fundamentals of Microbiology	03	45	10	40	50	2
CCFS-VIA	Human Nutrition	03	45	10	40	50	2
CCFS-VIIA	Fluid Mechanics & Hydraulics	03	45	10	40	50	2
CCFSP-1A	Practicals based on CCFS-II & IV A	03+03	20	20	80	100	4
CCFSP-2A	Practicals based on CCFS-V, VI &VII A	03+03	20	20	80	100	4
						550	**22**

Swami Ramanand Teerth Marathwada University, Nanded

Choice Base Credit System (CBCS) Course Structure (New Scheme)

Faculty of Science

B. Sc. First Year

Second Semester Food Science Syllabus

Semester Pattern effective from June 2019 onwards

Course No.	Course Title	Periods/ Week	Total Period	Internal Evaluation	External Evaluation	Total Marks	Credits
CCFS-IB	English & Science communication Skills-II	03	45	10	40	50	2
CCFS-IIB	Biochemistry	03	45	10	40	50	2
CCFS-IIIB	Post- Harvest Management of fruit and vegetable	03	45	10	40	50	2
CCFS-IVB	Cereal Processing	03	45	10	40	50	2
CCFS-VB	Food Microbiology	03	45	10	40	50	2
CCFS-VIB	Energy generation and Conservation	03	45	10	40	50	2
CCFS-VIIB	Heat and Mass Transfer	03	45	10	40	50	2
CCFSP-1B	Practicals based on CCFS-II,III & IVB	03+03	20	20	80	100	4
CCFSP -2B	Practicals based on CCFS-V,VI & VIIB	03+03	20	20	80	100	4
						550	**22**

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

Faculty of Science

B. Sc. Second Year

Third Semester Food Science Syllabus

Semester Pattern effective from June 2019 onwards

Sr. No.	Paper No.	Name of the course	Instruction Hrs/week	Total Period	Internal Evaluation	External Evaluation	Total Marks	Credits
1	CCFS-IC	English & Science Communication Skill	03	45	10	40	50	02
2	CCFS-IIC	Legume and Oil Seed technology	03	45	10	40	50	02
3	CCFS-IIIC	Meat, Poultry and Fish Technology	03	45	10	40	50	02
4	CCFS-IVC	Wheat Milling and Baking Technology	03	45	10	40	50	02
5	CCFS-VC	Milk &Confectionery Technology	03	45	10	40	50	02
6	CCFS-VIC	Techniques in Food Analysis	03	45	10	40	50	02
7	CCFS-VIIC	Food Processing Equipments	03	45	10	40	50	02
8	CCFSP-IC	Practicals based on CCFS-II-C, III-C,IV-C	03+03		20	80	100	04
9	CCFSP-IIC	Practicals based on CCFS-V-C VI-C,VII-C	03+03		20	80	100	04
10	SEC-I	Spice & Condiments Processing Or Bakery Technology I	03	45	25	25	50	02
							600	**24**

Swami RamanandTeerthMarathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure (New Scheme)

Faculty of Science

B. Sc. Second Year

Fourth Semester Food Science Syllabus

Semester Pattern effective from June 2019 onwards

Paper No.	Name of the course	Instruction Hrs/week	Total Period	Internal Evaluation	External Evaluation	Total Marks	Credits
CCFS-ID	English & Science Communication Skill	03	45	10	40	50	02
CCFS-IID	Fruits and Vegetable Processing	03	45	10	40	50	02
CCFS-IIID	Fermentation and Industrial Microbiology	03	45	10	40	50	02
CCFS-IVD	Spice and Flavour Technology	03	45	10	40	50	02
CCFS-VD	Food Additives	03	45	10	40	50	02
CCFS-VID	Food packaging	03	45	10	40	50	02
CCFS-VIID	Computer Fundamental	03	45	10	40	50	02
CCFSP-ID	Practicals based on CCFS-II-D, III-D,IV-D	03+03	-	20	80	100	04
CCFSP-IID	Practicals based on CCFS-V-D, VI-D,VII-D	03+03	-	20	80	100	04
SEC-II	Dairy Products Development **Or** Bakery Technology II	03	45	25	25	50	02
						600	**24**

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 June 2019 onwards

Paper No.	Name of the Course	Periods/ Week	Total Period	Internal Evaluation	External Evaluation	Total Marks	Credits
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 –VIIE	Entrepreneurship Development	03	45	10	40	50	2
CCFS –VIIIE	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 ,& VIIIE	03+03	20	20	80	100	4
SEC-III	Experimental Learning programme (ELP) OR Development of fortified food products	03	45	25	25	50	2
Total						**600**	**22**

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 June 2019 onwards

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 & VII F	03+03	20	20	80	100	4
CCFSP-3	Project Report and Seminar	03	20	10	40	50	2
SEC-IV	Processing of Nutritious Bizarre Foods **OR** Processing of Fermented food products	03	45	25	25	50	2
						650	**26**
Total Marks and credits of B.Sc. I, II and III year	Total Marks of B.Sc. Food Science Degree (Three years of course with dissertation, CBCS Pattern)						**44+ 48+ 48= 140.**

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.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)
B.Sc. Food Science
I year I semester

Subject: Principle of Food Processing **Code: CCFSII A**

Credits:02 **Marks: 50 (External 40, Internal10)**

Salient Features:-

Syllabus includes all important aspects of food processing

Learning Objectives:-

1. To understand the types of foods and their sources.
2. To provide knowledge about methods of food preservation
3. To introduce students to new developments in the field of food processing.

Out-come:-

Will prepare students to understand various methods of food preservations. It will also help students to learn the application in industries.

Prerequisites:-

Basic knowledge of food and food preservatives is required to learn this subject.

1. Food Processing:-a) Introduction, scope. b) Sources of food. c) Perishable & non- perishable food. d) Causes of food spoilage

2. Preservation by Salt & Sugar:-a) Principle. b) Methods. c) Equipments used d) Effect on food quality.

3. Preservation by thermal Processing:-

a) Principle. b) Equipments used. C) Methods- Canning, blanching, sterilization, evaporation, pasteurization

4. Preservation by drying, dehydration and concentration:-

a) Principle b) Equipments and machineries used. c) Methods of drying, dehydration d) Methods of concentration- Thermal, freeze, membrane e) Changes in food quality by drying dehydration &concentration

5. Preservation by radiation, chemicals & preservatives:-

a)Principle b) Methods of radiations) Effect on microorganisms) Physical, chemical & biological effects on quality of food

6. Use of low temperature:-

a) Principle, Equipment used
b) Methods - chilling. freezing, cold storage. d) Effect on food quality

Practicals:-

1) Study of various machineries used in processing.
2) Demonstration of effect of blanching on quality of foods.
3) Study of preservation of foods by heat treatment canning-Canning of fruits and vegetables.
4) Preservation of food by high concentration of sugar i.e., preparation of jam
5) Preservation of food by using salt-pickle.
6) Preservation of food by using chemicals
7) Preservation of bread, cake using mold-inhibitors.
8) Drying of Mango/other pulp

Reference Books:

1) Technology ofFoodpreservation N.W.Dersoir and N.W.Dersoir
2) Introduction to Food Science and Technology. G.P. Stewart and M.A. Amerine

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

I year I semester

Subject: Food Production Trends and Programs Code: CCFS III A

Credits: 02 Marks: 50 (External 40, Internal10)

Salient Features:-

This course will help to understand recent trends in food industry and various technologies used to develop quality and quantity of food

Learning Objectives:-

1) To understand the recent trends in food industries.
2) To provide knowledge about Expected technological advances to meet the needs
3) To learn new food products developed programs aimed for making more food availability.

Out-come:-

1) After successful completion of this course students will be able to understand recent trends in food industries, types of food and Expected technological advances to meet the needs.

Prerequisites:-

Basic knowledge of food and food processing industries is required to learn this subject.

Unit 1: Food demand and supply- Qualitative and quantitative requirements

Unit 2: Expected technological advances to meet the needs

Unit 3: Future priorities in food production needs status of food industry in India and abroad

Unit 4: Magnitude and interdependence of food production and processing agencies

Unit 5: Food availability production – Types of foods like processed semi processed, ready to eat foods, fast foods, pet foods

Unit 6: Food characteristics and nutritional significance of major food groups

Unit 7: Present trends of consumption and further requirements

Unit 8: Consumers change of aptitude in food products consumption

Unit 9: New food products developed programs aimed for making more food availability to increasing population and their prospects merits and drawbacks, prospects for future growth in India

Unit 10: National and international trends and programs in food handing, processing and marketing

Unit 11: Potentials and prospects of developing food industry in India

Unit 12: Food losses-factors affecting- programs and strategies to eliminate the losses and meet the required demand.

Unit 13: Global demand of food

Unit 14: World food day – importance and action plans

Reference books:

1. Food Science 3rd Edition: N.N. Potter, AVI Publishing Co Lns west post.USA.
2. Caned Foods Thermal Processing and Microbiology: AC Herson& A.D. Null and J.A. ChurchillLtd.
3. Agricultural administration in India. K.Vijayaraghavan
4. Modern techniques field crops of raising :Chidda Singh, Oxford & IBH Pubco.
5. Agriculture Research systems &21st : K.V. Raman, M.M. Anwer and R.D. Gaddagimeth, Management in the a NAARAM Alumni Association National Academy of Agril, Research management, RajendranagarHyderabad.
6. Food processing industries: B.M. Desai, V.K. Gupta, N.V. Namboodri. Oxford & IBH Publishing Company, PVT.Ltd. 66 Janpath, NewDelhi.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)
B.Sc. Food Science
I year I semester

Subject: Food Chemistry Code: CCFSIV A

Credits: 02 Marks: 50 (External 40, Internal10)

Salient Features:-

Syllabus helps to understand types of food compositions and their functional properties and its role in food processing industries.

Learning Objectives:-

1) To understand various food compositions.

2) To provide knowledge about role of food compositions in food processing industries.

3) To learn effect of various processing methods on food composition.

Out-come:-

After successful completion of this course students will be able to understand nature and scope of food chemistry, dispersion system of foods, food compositions, role of enzymes in food processing industry.

Prerequisites:-

Basic knowledge of chemistry is required to learn this subject.

Unit 1: Nature Scope and development of food chemistry. Role of food chemist

Unit 2: Moisture in Foods

i) Role and type of water in foods, ii) Functional properties of water, role of water in food spoilage iii) Water activity and sorption isotherm iv) Molecular mobility and foods stability

Unit 3: Dispersed systems of foods

(i) Physicochemical aspects of food dispersion system a) Sol b) Gel c) Foam d) Emulations (ii) Rheology of diphase systems

Unit 4: Carbohydrates

(i) Functional characteristics of different carbohydrates (Sugar-water relationship and sweetness) (ii) Maillard reactions, caramelization, methods to control non enzymatic reactions. (iii) Modification of

carbohydrates – unmodified and modified starches, Modified celluloses (iv) Dietary fibres – NDF, ADF, cellulose, hemicelluloses, pectin and carbohydrates digestibility – sugars and starch and their values (v) Functional properties of polysaccharides, natural vegetable gums, carbohydrate composition of various natural foods.

Unit 5: Proteins in foods

Physicochemical properties – ionic properties, denaturation, gelation and hydrolysis (ii) Protein content and composition in various foods- cereal grains, legumes and oilseed proteins, protein of meat, milk, egg and fish. (iii) Functional properties of proteins in foods- water and oil binding, foaming and gelation, emulsification (iv) Effects of processing on functional properties of proteins-heat processing on functional properties of proteins-heat processing, alkali treatments, chilling, freezing, dehydration & radiations. (v) Unconventional sources of proteins- SCP, Fish protein concentrates, leaf proteins.

Unit 6: Lipids of Foods

Role and Use of lipid/fat: Occurrence, fat group classification (ii) Physicochemical aspects of fatty acids in polymorphisms & its application. (iii) Chemical aspects of lipolysis, auto oxidation, antioxidants (iv) Technology of fat and oil processing- a) Refining b) Hydrogenation c) Inter esterification d) Safety use of oils and fats in food formulation

Unit 7: Enzymes in food industry

Carbohydrates (amylases, celluloses, pectinases, invertases) Proteases, lipases & oxidases in food processing. Role of endogenous enzymes in maturation and ripening, Enzymatic browning- mechanism, methods of regulation control.

Practicals:

1. Determination of moisture content of foods using different methods
2. Studies of sorption isotherm of different foods
3. Study of swelling and solubility characteristics of starches
4. Study of rheological properties of diphase system
5. Determination of crude protein by micro kjeldhal method
6. Preparation of mineral solutions by using ash and tri acid methods (Dry and wet oxidations)
7. Estimation of calcium
8.Determination ofiron
9. Estimation ofmagnesium
10. Study of estimation of trypsin inhibitoractivity
11. Study of tannins and phytic acid fromfoods
12. Determination of vitamin A (TotalCarotenoids)
13. Determination of food colors
14.Assessments of various pectinases fromfruits

Reference books:

1. Food chemistry: Vol I FennamaO.R.
2. Food chemistry : MayerL.H.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

I year I semester

Subject: Fundamental of Food Microbiology Code: CCFS V A

Credits:02 Marks: 50 (External 40, Internal10)

Salient Features:-

Syllabus helps to understand role of microbiology in food industry.

Learning Objectives:-

1) To understand need and importance of microbiology.
2) To study the various types of micro -organisms
3) To provide knowledge about role of micro-organisms in food processing industries.
4) To learn effect of heat and other factors on growth of micro-organisms.

Out-come:-

After successful completion of this course students will be able to understand evaluation, scope, need and importance of microbiology, General morphological, cultural characteristics and reproduction of various micro-organisms.

Prerequisites:-

Basic knowledge of microbiology is required to learn this subject.

1. Microbiology-

a) Evolution & scope of microbiology
b) Need &Importance
c) General morphological, cultural characteristics
d) Reproduction of bacteria, yeasts, moulds, actionomycetes, algae.

2. Nutrient transport phenomenon & physiology of micro-organisms
3. Genetic recombination, transduction, transformation & bacterial conjugation, mutation &mutagenesis
4. Growth curve: Physical & chemical factors influencing growth & destruction of microorganisms including thermal death time, Z,F, & D values.
5. Viruses : Structure & replication with particular reference to food borne viruses
6. Control of microorganisms by physical & chemicals, antibiotics & other chemotherapeutic agents

Practicals:

1) Microscopy
2) Micrometry.
3) Cleaning and sterilization of Glassware
4) Preparation of nutrient agar media and techniques of inoculation
5) Staining methods : Monochrome staining, Negative staining, Gram staining.
6) Pure culture techniques (Streak plate / pour plate)
7) Introduction to identification procedures (morphology and cultural characteristics)
8) Study of anaerobic culture methods.

Reference books:

1) Biology of Microrganisms T.D.Brock
2) Microbiology Fundamentals and Applications PurohitSS
3) Microbiology

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System

(CBCS) B.Sc. Food Science

I year I semester

Subject: Human Nutrition Code: CCFS VI A

Credits: 02 **Marks: 50 (External 40, Internal10)**

Salient Features:-
Syllabus includes all important aspects related to food, nutrition and health.

Learning Objectives:-
This course will enable the student to:
1) Understand the relationship between food, nutrition and health.
2) Understand the functions of food.
3) Learn about various food groups and balanced diet.
4) Understand digestion, absorption and function of various nutrients and their sources.

Out-come:-

After successful completion of this course students will be able to understand food and nutrition, balance diet, RDA types of malnutrition, their causes and its preventive measures. Role of National and International agencies working in the field of nutrition.

Prerequisites:-

Basic knowledge of food and nutrition is required to learn this subject.

1. Concepts & content of Ntrition-
- a) Nutrition agencies
- b) Nutrition of community
- c) Nutritional policies & their implementation
- d) Metabolic function of nutrients

2.Water & energy balance
a) Water intake &losses
b) Basal metabolism-BMR Body surface area & factors affecting BMR

3. Formulation of diets
- a. Classification of balanced diet
- b. Preparation of balanced diet for various groups

4.Recommended dietary allowances For

a) various age groups
b) According physiological status,
c) Athletic & sportsman
d) Geriatric persons

5. Malnutrition

a) Type of Malnutrition
b) Multi-factorial causes
c) Epidemiology of under nutrition & over nutrition
d) Nutrition infection &immunity
e) Nutrition education

6. Assessment of nutritional status based on

a) Diet surveys
b) Anthropometry
c) Clinical examination
d) Biochemical assessment
e) Additional medical information

7. Food fad &faddism

8. Potentially toxic substance in human food

Practicals:

1) Role of various national and International Agencies in the field of human nutrition
2) Study of calculation of BMR & body surface area
3) Anthropometric measurements
4) Preparation of balance diets for adolescent girl and pregnant woman-calculate energy value, Protein, iron, calcium and vitamin(A,B,C)
5) Biochemical analysis of urine and blood
6) Nutritional survey

Reference books:

1. CommunityNutrition Mc.Laren
2. ICMRPublications ICMR
3. Food&Nutrition M.Swaminathan
4. Assessment of Nutritional status of community D.B.Jelliffee

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science
I year I semester

Subject: Fluid Mechanics & Hydraulics Code: CCFS VII A

Credits:02 Marks: 50 (External 40, Internal10)

Salient Features:-
Syllabus includes all important aspects related to fluid mechanics and hydraulics.

Learning Objectives:-
This course will enable the student to:

1) Understand the properties of fluids and static pressure of liquids.
2) Understand the pressure measuring devices.
3) Learn about floating bodies and fluid flow.

Out-come:-

After successful completion of this course students will be able to understand Properties of fluids and Static pressure of liquids, Pressure measuring devices, Floating bodies, Fluid flow and types of pumps and chambers.

Prerequisites:-

Basic knowledge of physics and mathematics to learn this subject.

1 **Properties of fluids and Static pressure of liquids :** Hydraulic pressure, absolute and gauge pressure, pressure head of a liquid. Pressure on vertical rectangular surfaces. Compressible and non-compressible fluids. Surface tension

2 **Pressure measuring devices:** Simple, differential, micro, inclined manometer, mechanical gauges.

3 **Floating bodies :**Archimede's principle, stability of floating bodies. Equilibrium of floating bodies

4 **Fluid flow :**Classification, steady, uniform and non-uniform, laminar and turbulent, Bernoulli's theorem and its applications, Flow through pipes: Loss of head Flow through orifices, discharge losses. Time for emptying a tank. Venturi meter, pitot tube, Rota meter. Water level point gauge, hook gauge. Reynold's number

5 Pumps : Classification, reciprocating, centrifugal pump. Pressure variation, Work efficiency. Types Of chambers, selection and sizing

Practicals

1 Study of different tools andfittings

2 To plot flow rate versus pressure drop with U-tubemanometer

3 Verification of Bernoulli'stheorem

4 Determination of discharge co-efficient for

venturi, Orifice,V-Notch

5 Verification of emptying time formula for atank

6 Determination of critical Reynold's number by Reynold'apparatus

7 Study of reciprocating, centrifugalandgear pump

8 Calibration ofRotameter

9 Study of different types ofvalves

REFERENCE BOOKS

1 FluidMechanics V.L. Streeter (1983), McGraw Hill, NewYork

2 FluidMechanics R.S. Khurmi (1994), Sultan Chand Publishers,Delhi.

3 Hydraulics JagdishLal (1987), Metropolitan Publishers, NewDelhi.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

I year II semester

Subject: Biochemistry Code: CCFS II B

Credits:02 Marks: 50 (External 40, Internal10)

Salient Features:-
Syllabus includes all important aspects related to nutrients, enzymes and cellular biochemistry.

Learning Objectives:-
This course will enable the student to:

1) Understand the nature and scope of biochemistry.
2) Understand the cellular biochemistry.
3) Learn about nutrients and enzymes.

Out-come:-

After successful completion of this course students will be able to understand cell structure, metabolism of carbohydrates, classification, structure and metabolic function of proteins, lipids and vitamins.

Prerequisites:-

Basic knowledge of chemistry to learn this subject.

1. Biochemistry-a) Introduction. b) Nature and scope

2. Cellular Biochemistry-a) Composition and function of cell organelle

b) Cell structure - plant and animal) Carbohydrates - occurrence, classification, structures, physiochemical and metabolic functions

d) Metabolism of carbohydrates - glycolysis, TCA cycle, HMP pathway, oxidative phosphorylation and Gluconeogenesis

3. Proteins-a) Occurrence. b) Classification and structures c) physicochemical and metabolic functions

4. **Lipids** -a) Occurrence .b) Classification and structures) Physicochemical and metabolic function. d) Metabolism - degradation of fats,B-oxidation

5. **Nucleic Acids-**a) Classification and structure's) Biosynthesis of Nucleic Acid - RNA and DNA metabolism.

6. **Vitamins-**a) Classification and sources. b) Chemistry and metabolic functions c) Efficiency diseases syndromes

7. **Enzymes-**a) Chemical nature and nomenclature. b) Classification) Solutes and properties. d) Mechanism of action. e) Coenzyme and prosthetic groups

Practicals:-

1) Safety measures in the laboratory.

2) Preparation of various solutions and buffers

3) Qualitative and quantitative estimation ofcarbohydrates.

4) Qualitative and quantitative estimation of aminoacids.

5) Qualitative and quantitative estimation ofproteins.

6) Qualitative and quantitative estimation ofLipids.

Reference books:

1) Osner hawk's PracticalPhysiologicalChemistry Hawk
2) Principlesof biochemistry Lehninger
3) PrinciplesofBiochemistry Voet
4) Practical Biochemistry Thamiah

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

I year II semester

Subject: Post Harvest Management of Fruits and Vegetables Code: CCFS III B

Credits: 02 Marks: 50 (External 40, Internal10)

Salient Features:-

Syllabus includes all important aspects related to post harvesting process of fruits and vegetables.

Learning Objectives:-

This course will enable the student to:

1) Understand the post- harvest technology of fruits and vegetables
2) Understand the morphology structure and compositions of various fruits and vegetables..
3) Learn about harvesting importance of fruits and vegetables.
4) Understand ripening and storage practices of fruits
5) Learn about Handling and packaging of fruits and vegetables
6) Learn about Principles of transport and commercial transport operations

Out-come:-

After successful completion of this course students will be able to understand Post harvest technology of fruits and vegetables, Morphology, structures and composition of fruit and vegetable, Maturity standards, Fruits ripening, Storage practices, Physiological post- harvest diseases, chilling injury and diseases and Principles of transport and commercial transport operations.

Prerequisites:-

Basic knowledge of chemistry, fruits and vegetable harvesting and processing to learn this subject.

Unit 1: Post harvest technology of fruits and vegetables: an overview concept and science, importance of loss reduction, role in export, economy and employment generation

Unit 2: Morphology, structures and composition of fruit and vegetable – Physical, textural characteristics, structure and composition

Unit 3: Maturity standards: Importance, methods of maturity determinations, maturity indices for selected fruits and vegetables

Unit 4: Harvesting of important fruits and vegetable

Unit 5: Fruits ripening – Chemical changes, regulations, methods

Unit 6: Storage practices: controlled atmospheric, Bead atmosphere, hypobaric storage, cool store, zero energy, cool chamber

Unit 7: Commodity pretreatments – chemicals, wax coating, prepacking

Unit 8: Physiological post harvest diseases, chilling injury and diseases

Unit 9: Handling and packaging of fruits and vegetables: Post harvest handling system of citrus, mango, banana, pomegranate, tomato, papaya and carrot packaging house operations

Unit 10: Principles of transport and commercial transport operations

Practicals:

1. Studies on morphological features of some selected fruits and vegetables
2. Studies on maturity indices
3. Studies of harvesting of fruits and vegetables
4. Determination of RQ
5. Studies on pre-cooling and storage of fruits and vegetables
6. Studies on wax coating on apples, Papaya, citrus, mango, amla
7. Studies on use of chemical for ripening and enhancing shelf life of fruits and vegetables
8. Studies on regulation of ripening of banana, mango, papaya
9. Studies on various storage systems and structures
10. Studies on prepacking of fruits
11. Studies on physiological disorders- Chilling injury of banana and custard apple
12. Visit to commercial packing house-grape/mango/pomegranate/banana
13. Visit to commercial storage structures onion, garlic, potato

Reference books:

1. B. Pantastico. Post harvest physiology, handling and utilization of tropical and subtropical fruits and vegetables.
2. R.B. Wills. T.L. Lee and E.G. Hall, L.R. Verma and V.K.Joshi.
Post harvests: An introduction to be physiology and handling of fruits and vegetables
Post harvest technology of fruits and vegetables Vol I.
3. D.K. Singh Hi-techhorticulture
4. Eskin. Biochemistry offoods
5. Townsend Duckworth. Fruit and vegetabletechnology

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science
I year II semester

Subject: Cereal Processing **Code: CCFS IV B**

Credits:02 **Marks: 50 (External 40, Internal 10)**

Salient Features:-
Syllabus includes all important aspects related to post harvesting process of fruits and vegetables.

Learning Objectives:-
This course will enable the student to:

1) Understand the post- harvest technology of fruits and vegetables
2) Understand the morphology structure and compositions of various fruits and vegetables..
3) Learn about harvesting importance of fruits and vegetables.
4) Understand ripening and storage practices of fruits
5) Learn about Handling and packaging of fruits and vegetables
6) Learn about Principles of transport and commercial transport operations

Out-come:-

After successful completion of this course students will be able to understand Post harvest technology of fruits and vegetables, Morphology, structures and composition of fruit and vegetable, Maturity standards, Fruits ripening, Storage practices, Physiological post- harvest diseases, chilling injury and diseases and Principles of transport and commercial transport operations.

Prerequisites:-

Basic knowledge of chemistry, fruits and vegetable harvesting and processing to learn this subject.

Unit 1: Present status and future prospects of cereals
(Rice, wheat, /corn, sorghum, Rye)
Morphology of Rice: Physical properties: Density bulk density, Angle of response- hardness, asperity, porosity, stack of milling and moisture of physical properties. Chemical composition- Distribution of nutrients and Aroma of rice. Drying of paddy- General principles and methods of drying, batch type, continuous type driers.

Unit 2: Parboiling of rice: Milling of rice: Conventional milling, modern milling, advantages and disadvantages of milling machineries, By products of rice milling,

Aging of rice, Enrichment-need of enrichment methods of enrichment, Enrichment levels of fortification of amino acids, processed foods from rice- breakfast cereals, flakes, puffing, canning and instance rice.

Unit 3: Corn morphology, Physicochemical properties, corn milling fractions and preparations of modified starches. Barley-morphology-physicochemical properties and processing (malting)

Unit 4: Sorghum-morphology Physicochemical properties Milling, Malting, Pearling and industrial utilization

Unit 5: Millets-Oat/Rye- Importance of Millet Composition, Processing of millets for food uses.

Practicals:

1. Study of morphological characteristics of cereals

2. Study of physical properties of cereals

3. Study of chemical properties of cereals

4. Study of determination of colour of cereals

5. Study of parboiling of paddy
6. Study of cooking quality of rice

7. Study of milling of rice

8. Study of conditioning of wheat

9. Study of production of sorghum flakes

10. Production of popcorns

11. Study of preparation of sorghum malt

12. Determination of gelatinization temperature by amylograph

13. Study of extraction of oil from rice bran

14. Visit to cereal processing unit

Reference books:

1. Technology of cereals:Kent
2. Post harvest technology of cereals, pulses and oil seeds: A.Chakrawarthy
3. Modern cereal science and technology: Y.Pomeranz
4. Utilization of rice:Luh
5. Post harvest biotechnology of cereals: D.K.Salunkhe
6. Handbook of cereal science and technology: O.R. Fennema, Markus,Karel

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

I year II semester

Subject: Food Microbiology Code: CCFS V B

Credits:02 Marks: 50 (External 40, Internal10)

Salient Features:-

Syllabus helps to understand role of microbiology in food industry.

Learning Objectives:-

1) To understand microbial spoilage of foods.
2) To study the microbiology of various food groups
3) To provide knowledge about role of micro-organisms in food preservation

Out-come:-

After successful completion of this course students will be able to understand role of microbiology in food processing industry, microbiology of various food groups, food spoilage and food preservations.

Prerequisites:-

Basic knowledge of food groups and microbiology is required to learn this subject.

Unit 1: Microbial spoilage of foods

Unit 2: Chemical changes caused by microorganisms

Unit 3: Principles of food preservation

Unit 4: Control of microorganism by use of low and half temperatures

Unit 5: Asepsis, water activity, drying, preservatives, radiations and pressure for control of microorganisms

Unit 6: Microbiology of milk and milk products

Unit 7: Microbiology of fruits and vegetables, Sources of contamination, spoilage and prevention

Unit 8: Microbiology of cereals and cereal products. Sources of contamination, spoilage and prevention

Unit 9: Microbiology of meat and meat products. Sources of contamination, spoilage andprevention

Unit 10: Microbiology of fish and other sea foods. Sources of contamination, spoilage and prevention

Unit 11: Microbiology of poultry and eggs

Unit 12: Microbiology of sugar and sugar products. Sources of contamination, spoilage and prevention

Unit 13: Microbiology of salts and spices products. Sources of contamination, spoilage and prevention

Unit 14: Microbiology of canned foods. Sources of contamination, spoilage and prevention

Practicals:

1. Study of isolation of molds from foods

2. Microbial examination of cereal and cereal products. Identification, isolation and confirmation of *R.nigricans*

3. Study of microbial examination of Vegetables and fruits. Identification, isolation and confirmation of *R. nigricans/Erwinia carotovora.*

4. Microbial examination of meat and meat products. Identification, isolation and confirmation of coliform bacteria/*P.fluorescens*

5. Microbial examination of fish and other sea foods. Identification, isolation and confirmation of *Proteus*

6. Study of microbial examination of eggs and poultry identification, isolation and confirmation of *Pseudomonas fluorescens*

7. Study of microbial examination of milk and milk products. Identification, isolation and confirmation of *S.thermophilus*

8. Study of microbial examination of sugar, salt and spices. Identification, isolation and confirmation of *L. measenteroides/ L.dextranicum*

9. Study of thermal death timedetermination

Reference books:

1. Modern food microbiology. James M.Jay
2. Basic food microbiology G.J.Banwart
3. Applied Microbiology-Singh B.D., Nallariu P., Kavikishore P.B. and Singh R.P.
4. Food microbiology and Labpractice-Bell

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)
B.Sc. Food Science
I year II semester

Subject: Energy generation and conservation Code: CCFS VI B
Credits:02 Marks: 50 (External 40, Internal10)

Salient Features:-
Syllabus includes all important aspects related to energy generation and conservation.

Learning Objectives:-
This course will enable the student to:

1) Understand the basic concepts of units and dimension.
2) Understand the renewable energy sources and there equipment's and machineries .
3) Learn about properties of fuels, steam and boilers.

Out-come:-

After successful completion of this course students will be able to understand Ideal gases, the first law of thermodynamics, Renewable energy sources, Fuels, Properties of steam and Boiler mounting and boiler accessories.

Prerequisites:-

Basic knowledge of physics and mathematics to learn this subject.

Unit 1: Units and dimension, Basic concept: System, processes, cycles, energy, Thezeroth law of thermodynamics
Unit 2: Ideal gases: Equation of state, Compression and expansion of gases
Unit 3: The first law of thermodynamics, internal energy, enthalpy
Unit 4: Renewable energy sources like solar, wind and biogas and their utilization in food processing
Unit 5: Related equipments and their machinaries for Renewable energy sources
Unit 6: Fuels; Chemical properties, air for combustion, calorific value and its determination, Burners, firing of fuels
Unit 7: Properties of steam: Wet, dry, saturated, superheated steam, use of steam tables
Unit 8: Steam generators: Fire tube boilers, Water tube boilers
Unit 9: Boiler mounting and boiler accessories.
Unit 10: Measurement of height of boiler chimney
Unit 11: Condensers- Principle and types
Unit 12: Layout of pipeline and expansion joints
Unit 13: Boiler trial: Codes, Indian boiler regulation acts, Air stage, Air compressors.

Practicals:

1. Application of thermodynamics in engineering problems
2. Determination of dryness fraction of steam
3. To study the boiler installed in modern plant water softening, plant back cock and steam line layouts and steam traps
4. Visit to sugar Mill or Rice Mill plant with steam utilization
5. Study of solar water heater and biogas plants and appliances

Reference books:

1. Engineering thermodynamics – C.P. Gupta RajendraPrakash (1991) Nemi Chand and SonsRoorkee
2. Elements of Heat engines- N.C. Pandya. C.S. Shah (1990) Charotar Publishing houseAnand
3. Indian boiler regulation codes(1991)
4. Dairy Plant Engg. And management: Tufail Ahmed (196). Kitabmahal New Delhi.
5. Thermal engineering: Mathur andMehta

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)
B.Sc. Food Science
I year IIsemester

Subject: Heat and Mass Transfer **CCFSVIIB**

Credits:02 **Marks: 50 (External 40, Internal10)**

Salient Features:-
Syllabus includes all important aspects related to heat and mass transfer.

Learning Objectives:-
This course will enable the student to:

1) Understand the basic heat transfer process.
2) Understand the theory of heat conduction Fourier's law.
3) Learn about convection, radiation and Mass transfer.

Out-come:-

After successful completion of this course students will be able to understand thermal conductivity, Physical properties related to heat transfer Steady state heat conduction, convection, Radiation, Heat exchangers and Mass transfer.

Prerequisites:-

Basic knowledge of physics and mathematics to learn this subject.

Unit 1: Basic heat transfer process, Thermal conductivity, Overall heat transfer co-efficient, Physical properties related to heat transfer

Unit 2: One dimensional steady state conduction: Theory of heat conduction, Fourier's law, Derivation of Fourier's equation in Cartesian coordinates, heat flow through slab, cylinder and sphere with non uniform thermal conductivity

Unit 3: Heat transfer through composite walls and insulated pipelines

Unit 4: Steady state heat conduction with heat dissipation to environment: introduction to extended surfaces of uniform area of cross section. Education of temperature distribution with different boundary conditions. Introduction to unsteady state heat conduction

Unit 5: Convection: Forced and free convection, Use of dimensional analysis for correlating variables affecting convection heat transfer, Concept of Nossolt number, Prandtl number, Reynolds number

Unit 6: Radiation: Emissivity, absorptivity, transmissivity, Radiation through black and grey surfaces, Determination of shape factors

Unit 7: Heat exchangers: General discussion, fouling factors, Jacketed kettles, LMTD, Parallel and plate heat exchangers

Unit 8: Applications of different types of heat exchangers in dairy and food industries

Unit 9: Mass transfer: Fick's Law of Diffusion, steady state diffusion of gases and liquids through solids, isothermal evaporation of water into air, mass transfer coefficient, Applications in dairy and food industry.

Practicals:

1. To study different types of heat exchangers used in dairy and foodindustries
2. Preparation and calibration ofthermocouples
3. Determination of thermal conductivity: Milk, solid dairy foodproducts
4. Determination of overall heat transfer coefficient of : Shell and tube, Plate heat exchangers, Jacketed kettles used in dairy and foodindustries
5. Studies on heat transfer through extendedsurfaces
6. Studies on temperature distribution and heat transfer in HTSTpasteurizer
7. Design problems on heatexchangers

Reference books:

1. A course in Heat Mass Transfer- S. Domkondwar (1993) DanpatRai and Sons NewDelhi
2. Heat transfer- C.P. Gupta (1964) Prentice Hall of India NewDelhi
3. Principles of Heat transfer- F. Kretiths and M.S. Bohn (1986) Harper and Row Publishers New York.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year III semester

Subject: Legume and Oil Seed technology Code: CCFS IIC

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

This course will help to understand present status, processing of legume, pulses and oil seeds.

Learning Objectives:-

1 To understand the morphology and chemical composition of legume, pulses and oil seeds.

2 To provide knowledge about milling process of legumes

3. To learn oil extraction, refining of oil .

Out-come:-

After successful completion of this course students will be able to understand structure, morphology, classification and types of legumes, pulses and oil seeds, milling process of legumes, removal of anti- nutritional factors and methods of oil extraction.

Prerequisites:-

Basic knowledge of legume, pulses, oil seeds, chemistry and nutrients are required to understand this subject.

Unit I : Importance of legumes, pulses & oil seeds **08**

Presents status, morphology, chemical composition, anti- nutritional factors, classification and types.

Unit II :Milling **08**

Principles, methods and equipment's used for milling, fermented products of legumes.

Unit III : Removal of anti-nutritional factors **08**

Soaking- Principles and their methods, Cooking quality of dal

Unit IV : Oil extraction and refining of oil **08**

Oil extraction- Traditional method- ghani, modern methods-expellers- Principle and structure, solvent extraction- principles, pre treatment, factors affecting on extraction process, refing- degumming, neutralization, bleaching ,filtration and deodorization.

Unit V : New technology in oil seed processing **08**

Utilization of oil seed, meals for different food uses, high protein products, protein concentrates and protein isolates.

Practical:

1. Physical properties of legumes and oil seeds
2. Estimation of protein
3. Estimation of fat
4. Study of methods and principles of dehuling
   Application of oil
   Applications of red earth slurry
5. Anti-nutritional factors and methods of illumination
6. Study of soaking, sprouting legume and cooking quality of dal
7. Fermented products of legume –Dosa , idli, wada&dhokla
8. Production of protein rich products
9. Visit to dal mill and oil extraction plant

Reference book:

1) Post-harvest biotechnology of legumes D. K. Solunke et al
2) Post-harvest biotechnology of oil seed D. K. Solunke et al
3) Processed food stuffs A. M. Alschule
4. The chemistry and technology of edible oil and fats A. E. Baily
5. Post- harvest technology of cereals, pulses and oil seeds Chakraborthy A
6. Oil seed processing technology B. D. Shukla

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year III semester

Subject: Meat, Poultry and Fish Technology Code: CCFS IIIC

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

This course will help to understand present status, structure, chemical composition and processing of meat, poultry and fish.

Learning Objectives:-

1 To study the structure and composition of various animal foods
2 To understand need and importance of livestock, egg, poultry and fish industry
3 To study structure, composition and nutritional quality of animal products.
4 To understand technology behind preparation of various animal food products and byproduct utilization.

Out-come:-

After successful completion of this course students will be able to understand structure, composition slaughtering process grading of meat processing of meat poultry and fish.

Prerequisites:-

Basic knowledge of animal sources, chemistry and preservation process are required to understand this subject.

Unit I : Importance, development and composition of meat, poultry and fish **08**

sources, physio-chemical properties , muscle structure, pre slaughter transport, care anti- mortem inspection, abattoir design and layout.

Unit II: Slaughtering of animals and poultry. **08**

Postmortem inspection, grading of meat, factors affecting post mortem changes and shelf life of meat

Unit III: Processing, preservation of meat and Meat plant **08**

Mechanical deboning , aging or chilling, freezing pickling curing ,cooking , smoking of meat, principles and methods of meat

tenderization, meat emulsion and manufacture of meat and poultry products. Meat plant Sanitization, and safety and by product utilization of abettor.

Unit IV : Egg **08**

Structure, composition, quality characteristics processing and Preservation of egg.

Unit V : Fish types, composition quality characteristics & preservation of fish **08**

Practical

1. Pre slaughtering operations of meat animals and poultry birds
2. Study of slaughtering and dressing of meat animals
3. Study of post mortem changes
4. Study of meat cutting and handling
5. Study of evaluation of meat quality
6. Study of preservation of meat by different methods and preparation of meat and poultry products
7. Evaluation of quality and grading of eggs
8. Study of preservation of shell eggs
9. Subjective evaluation of Fresh Fish.
10. Cut out examination of canned fish.(Sardine,Mackerel,Tuna)
11. Fish product formulation/canning.
12. Study of by products utilization

Reference book

Principles of Meat science	F.J. Forrest
Meat handbook	Albert Levie
Developments in Meat Science Vol I & II	Ralston Lawrie
Poultry production	R. A Singh
Meat Technology	Gerard F

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year III semester

Subject: Wheat Milling and Baking Technology Code: CCFS IVC

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

This course will help to understand present status of production of wheat, processing of wheat and establishment of bakery plant.

Learning Objectives:-

1 To study the structure and composition of wheat
2 To understand need and importance of conditioning of wheat.
3 To study types of flour and their fortification.
4 To understand production technology of bakery products..

Out-come:-

After successful completion of this course students will be able to understand structure, composition, physiological and rheological properties of wheat. This course will also help students to know the production technology of bakery products, establishment of bakery plant.

Prerequisites:-

Basic knowledge of food processing, bakery are required to understand this subject.

Unit I : Wheat **08**

Importance, production, varieties, types grading, quality, structure, physiochemical, rheological properties and enzymes in wheat.

Unit II : Conditioning and milling of wheat **08**

Principles, methods of conditioning roller flour milling process , break rolls, reduction rolls, design and operation

Unit III : Flour **08**

Types, grades, supplementations, fortifications, additives, improvers, bleaching and oxidizing agents

Unit IV : Bakery Products **08**

Roll of bakery ingredients(Major &minor), products from hard and soft wheat, bread processing (straight and sponge dough method), quality control, testing of

raw material, bakery products faults and its shelf-life, nutritional improvements of bakery products.

Unit V: Bakery unit **08**

Setting, bakery norms, specifications for a raw materials, packing, marketing of products, project report preparation.

Practical

1. Classification of wheat based on physio-chemical properties
2. Study of quality testing of flour and yeast.
   a)falling numbers and a amylase activities
   sedimentation value
   pelshenk value
   rheological value
3. Study of manufacturing of bread with different types and their types
4. Test baking- biscuits, cookies, crackers, buns
5. Preparation of cakes, pastry and pizza
6. Visit to wheat milling industry and bakery unit

Reference book

1) Bakery science and cereal technology khetarpaout
2) Technology of cereals Kent
3) Bread Spensor
4) Flour milling process Scott

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year III semester

Subject: Milk &Confectionery Technology Code: CCFS VC

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

This course will help to understand confectionery industry, milk processing technology.

Learning Objectives:-

1 To study the history, types and classification of confectionery.
2 To understand chocolate and coca bean processing.
3 To study types and processing of confectionery goods.
4 To understand processing of milk, dairy product production process.

Out-come:-

After successful completion of this course students will be able to understand composition, physiochemical properties of milk, heat processing of milk, dairy and confectionery product manufacturing, byproduct utilization of dairy plant and packaging of milk and milk products.

Prerequisites:-

Basic knowledge of confectionery and dairy processing are required to understand this subject.

Unit I : Introduction to confectionery and Role of ingredients

History, traditional confectionery good, types of confectionery, classification, basic technical consideration (TS, TSS, Ph, invert sugar, ERH, Glucose syrup, RH,),Types of ingredients used- sugar, milk and milk products, whipping agent, release agent, thickeners, acidulents, flavours, emulsifiers, additives, starch derivatives and colours.

Unit II :Coca and chocolate processing

Coca bean processing- roasting, fermentation, production of coco butter, powder and its quality, Chocolate processing- ingredients, mixing, refining, conching, tempering, molding, cooling, coating, fat bloom

Unit III : Confectionery Processing (High boiled sweets, caramel and toffee,Fondant, Tablet, marshmallow, panning)

Definition, composition, ingredients, methods of preparation, recipes, faults, factors affecting on quality, definition, methods of preparation, composition, faults and factors affecting on quality of products, packaging and marketing.

Unit IV : Introduction to Milk and Processing of Milk

Definition, composition of milk from different species, colostrum, physio-chemical properties of milk, nutritive value of milk and milk products, classification of milk products, Pasteurization by LTHT and HTST and UHT- filtration, UF and RO, clarification, cream separation, standardization, homogenization, heat processing, boiling, sterilization.

Unit V :Manufacturing of different milk products

Butter, butter oil (ghee), yoghurt, cheese, ice cream types, roll of ingredients, various methods of preparations and fermented milk and milk products

Unit VI : Manufacturing of Indigenous milk products, Indian Milk confectionery, By products and packaging of milk and milk products.

Ghee, Khoa, Chenna, paneer, dahi, shrikhand, Khoa and Chenna based sweets, Types of by- products of dairy industry and theirutilization, packaging and storage of milk and milk products

Practicals

1. Sampling and analysis of milk- physio-chemical properties and composition, presence of adulterants and preservation
2. Study of clarification and separation of milk
3. Study of heat processing of milk- pasteurization

4. Preparation of butter, ghee,dahi, shrikhand, lassi, khoa and its sweets
5. Preparation of chenna, paneer and chenna based sweets
6. Preparation of high boiled sweets
7. Preparation of toffee and candy
8. Preparation of chocolate
9. Preparation of flour based sweets
10. Preparation of petha
11. Visit to confectionery industry and dairy plant

Reference book

1) Outlines of dairy technology----- Sukmar De,
2) The fluid milk industry--- J. L. publishing company USA
3) Principles of dairy processing---- J . N. warner, wiley Eastern ltd, new delhi
4) Indian dairy products ----- k. s. Rangappa and k. L. Acharya
5) Sugar confectionery and chocolate manufacture R. Less
6) Industrial chocolate manufactory and use S. T. Beeketi
7) Basic baking S. C. Dubey
8) Judging of dairy products ---- J. A. Nelson and traout
9) Milk processing and dairy products industry ----EIRI Board of consultants Engineers Indian Research Institute, Delhi
10) Technology of milk processing ---- Q. A khan, Padamanabhan

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year III semester

Subject: Techniques in Food Analysis Code: CCFS VIC

Credits: 02 **Marks: 50 (External 40, Internal 10)**

Salient Features:-

Syllabus helps to understand concept, principle and methodology of food analysis and its technics.

Learning Objectives:-

1 To understand nature and concept of food analysis.

2 To provide knowledge about pH meter, chromatography, spectrophotometer.

3 To learn Immuno assay techniques in food analysis.

4 To provide knowledge about sensory analysis of food.

Out-come:-

After successful completion of this course students will be able to understand rules and regulation of food analysis, principles and methodology of analytical techniques and methods of sensory analysis of food.

Prerequisites:-

Basic knowledge of chemistry and biochemistry are required to learn this subject.

Unit I : Nature and concepts of food analysis

Rules and regulations of food analysis, safety laboratory,

sampling techniques.

Unit II : Principles and methodology involved in analytical techniques

pH meter and use of ion selective electrodes, spectroscopy, UV visible, florescence, infrared spectrophotometer , Atomic absorption and emission spectroscopy, mass spectroscopy, nuclear magnetic resonance and electron spin resonance, chromatography, Absorption, column, partition, gel-filtration, affinity, ion- exchange, Size-exclusion method, gas liquid chromatography.

Separation techniques- Dialysis, electrophoresis (Paper, SDS gel electrophoresis, immune electrophoresis), sedimentation ultra-filtration, ultra centrifugation, Iso electric focusing, isotopic techniques, monomeric techniques.

Unit III :Immuno assay techniques in food analysis 08

Isotopic and non -isotopicimmune assay, Enzyme immune assay.

Unit IV : Principle and methodology involved in analysis and evaluation of analytical data 08

Rheological analysis, textural profile.
Evaluation of data- accuracy and precision, statistical significance, co relations regression, computers for data analysis and result interpretation.

Unit V : Sensory analysis of food 08

Objective and Subjective method

Practical

1) Analysis of heavy metal using atomic absorption spectrophotometer
2) Estimation of phytic acid trypsin inhibitor activity using spectrophotometer
3) Separation of amino acids by two dimensional paper chromatography
4) Identification of fruit juice sugar using TLC
5) Separation of praline by ion exchange
6) Molecular weight determination using sephadox-gel
7) Identification of organic acids by paper chromatography
8) Gel-electrophoresis for analytic techniques
9) Quantitative determination of sugars and fatty acid profile by GLC
10) Study of Quantitative make up of water and fat soluble vitamins using HPLC
11) Study of determination of rheological characteristics of food sol / gel and sensory evaluation of foods.

Reference Book:

1) Food Analysis- Theory and practical Pomeranze&Melson
2) Methods in food analysis Mayananrd
3) Introduction to practical Biochemistry Plume Thamiah
4) Practical biochemistry

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based Credit System (CBCS)

B.Sc. Food Science

II year III semester

Subject: Food Processing Equipment's Code: CCFS VIIC

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

Syllabus includes all important aspects related to food processing equipment's

Learning Objectives:-

This course will enable the student to:

1) Understand the basic concepts of material handling.
2) Understand the engineering properties of food material
3) Learn about evaporation, Drying, Thermal Processing and equipment's used in various food processing

Out-come:-

After successful completion of this course students will be able to understand material handling machines, pre- treatment unit operation, significance in equipment design, processing and handling of food products, Principles, types, classification, methods and equipment's, mass in thermal processing and Equipment's used in various food processing

Prerequisites:-

Basic knowledge of food processing, physics and mathematics are required to learn this subject.

Unit I :Material Handling 08

Material handling machines, conveyors, pre-treatment unit operation (cleaning, de hulling, de husking, sorting, grading, peeling and forming), size reduction, separation, agitation and mixing.

Unit II :Engineering Properties of Food material 08

Introduction, significance in equipment design, processing and handling of food products, hygienic design of food processing equipment's, sanitary requirements, sanitary pipes and fittings, rheology texture of food material, elastic, plastic and viscous behavior, methods of texture evaluation, subjective, objective measurements.

Unit III : Evaporation, Drying and Thermal Processing 08

Principles, types, classification, methods and equipment's, mass and energy balance

Unit IV : Mechanical separations, Filtration, expression and Irradiation Process 08

Principles, types, classification, and equipments used

Unit V :Equipments used in various food processing 08

Baking, roasting, frying, blending, pulverization.

Practical

1) Study of centrifugal separators
2) Study of ultra- filtration equipments
3) Study of microwave oven, infrared moisture meter and universal moisture meter
4) Study of Instron and working
5) Study on the sorting and grading of materials
6) Study of evaporator, dryer, sterilizer with their design problem
7) Determine flow parameters of Newtonian, non- Newtonian food products by- capillary tube viscometer, Hokke's viscometer

Reference Book

1) Unit operation of chemical engineering- McCobe Smith Harriott
2) Food Engineering Operation-
   Brennan, Butters, Cowell and Lilly
3) Process Heat transfer- Kern
4) Introduction to food engineering- Heldman D. R. & Singh R. P.
5) Fundamental of food engineering- Charm S. E.

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

Spice & Condiments Processing

Credits: 02 **Marks: 50 (External 25, Internal 25)**

Salient Features:-

Syllabus helps students to develop knowledge about spice and condiments processing

Out-come:-

After successful completion of this course students will be able to understand production of various spice, masala and pickle masala powder manufacturing and there packaging techniques.

Leaning Objectives:-

1. To learn the manufacturing process of various spices ,masala and pickle masala powder
2. To understand the various aspects of spice and condiments processing.

Prerequisites:-

Student should have the basic knowledge of food processing, spices food quality and packaging materials.

1) Preparation of Various spice powder -

Preparation of read chilly powder

- Preparation of Turmeric powder -

Preparation of coriander powder -

Preparation of cumin seed powder -

Preparation of pepper powder

- Preparation of Dry ginger powder -

Preparation of Amchur powder

2) Preparation of Various masalas:-

1) Curry Masala

2) Garam Masala

3) Chat Masala

4) Mutton Masala

5) Chicken Masala

6) Fish Masala

7) Chole Masala

8)Samber Masala
9)PaniPuri Masala
10) PavBhaji Masala
11) Tea Masala
12) Milk Masala
13) Pulav Masala
14) Biryani Masala

3) Preparation of various Pickles Masala :-

1) Mango pickle Masala
2) Guava pickle Masala
3) Green chilly lemon pickle masala
4) Mix vegetable pickle masala
5) Lemon crush pickle masala

OR

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based credit System (CBCS)
B.Sc. Food Science
II year III semester
SEC I
Bakery Technology I

Credits: 02 **Marks: 50 (External 25, Internal 25)**

Salient Features:-

Syllabus helps students to develop knowledge about manufacturing of bakery goods

Leaning Objectives:-

1. To learn the manufacturing process of various bakery products
2. To understand the various aspects of bakery processing.

Out-come:-

After successful completion of this course students will be able to understand production of various bakery products role of bakery ingredients and equipment's used in bakery processing.

Prerequisites:-

Student should have the basic knowledge of bakery is required to learn this subject.

1) Role of bakery ingredients used in manufacturing of bakery products
2) Equipment's and utensils used in bakery
3) Preparation of basic bakery products
- **a)** Basic sponge cakes (Vanilla, Chocolate, Plain Butterscotch, fruit)
- **b)** Breads (Plain bread, milk, fruits, wheat)
- **c)** Buns
- **d)** Cup cakes
- **e)** Basic cookies

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year IV semester

Subject: Fruits and Vegetable Processing Code: CCFS II D

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

Syllabus includes all important aspects of fruits and vegetable processing

Learning Objectives:-

1. To impart knowledge of different methods of fruits and vegetable processing
2. To provide knowledge about methods of fruits and vegetable preservation

Out-come:-

Will prepare students to understand various methods of fruits and vegetable preservations. It will also help students to learn the application in industries.

Prerequisites:-

Basic knowledge of fruits, vegetables and preservation techniques are required to learn this subject.

Unit I : Introduction to fruits and vegetable processing and preservation 08

Production and processing scenario of fruits and vegetable in India and world, scope, importance, present constraints, prospects, principles and methods of preservation of fruits and vegetable.

Unit II : Commercial processing technology of fruits (I) 08

Mango (Pulp, RTS, squash, canned pulp, toffee, amchur, pickle, powder), **Banana** (wafers, puree, powder, banana fig), **Papaya** (jam, candy, RTS, nector, squash, papian), **Pomegranate** (Juice, squash, syrup, anardana, anargoli), **Guava** (jelly, juice, canned guava, squash, toffee), **Jamun** (RTS, jelly, syrup, wine, flakes, bar, powder).

Unit III :Commercial processing technology of fruits (II) 08

Grape (Rasins, juice,wine), **Fig**(Pulp, dried fig, toffee, powder, bar), **Citrus fruits** (jelly, marmalades, RTS, squash, candy), **Amala**(jam, candy, juice, squash, powder, dried shreds, chavanprash, pickle, chutney, sauce, muranba), **Tamarind** (Pulp, powder, toffee, bar, RTS), **Wood apple** (Jelly, Marmalades).

Unit IV :Commercial processing technology of vegetables(I) 08

Tomato (ketchup, sauce, puree, soup, chutney, pickle), **Ginger** (Candy, dried, pickle, RTS, Syrup) **Onion** (Dried onion, powder), **Garlic** (Dried onion, powder, pickle), **Potato** (Wafers, starch, papad),

Unit V :Commercial processing technology of vegetables(II) 08

Carrot (candy, pickle, jam), **Cauliflower and cabbage** (Dried, pickles), **Leafy Vegetables** (Dried- Spinach, fenugreek, coriander leaves, curry leaves), **Bitter guard** (Pickle, dried bitter guard).

Practical

1) Study of canning of mango/ Guava/ Papaya
2) Preparation fruit jam –Apple/mango/guava
3) Preparation of frit jelly- wood apple/ sweet orange/guava/ tamarind.
4) Preparation of fruits marmalades
5) Preparation of fruits preserve and candy
6) Preparation of fruits RTS
7) Preparation of fruits Squash
8) Preparation of fruits syrup
9) Study of preparation of grape raisin, dried flg and banana flg
10) Preparation of Pickle, mixed pickle
11) Preparation of dried Ginger
12) Preparation of amchur
13) Preparation of dried onion and garlic
14) Preparation of banana and potato wafers
15) Preparation of dehydrated leafy vegetables

Reference Book :

1) Fruits and vegetable preservation principles and practice— SrivastavaR. P.
2) Post- Harvest Technology of fruits and vegetables---- Sanjeev Kumar
3) Hi tech Horticulture----- Singh D. K.
4) Preservation of Fruits and vegetable------ Khader
5) Fruits and vegetable preservation------ Bhutani R. C.
6) Principle of Fruits Preservation----- Morris, Thomas Normon
7) Preparation of fruits and Vegetables ----- Gridharilal G. S. Siddappa and G. L. Tandon

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year IV semester

Subject: Fermentation and Industrial Microbiology
Code: CCFS III D

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

Syllabus helps to understand role of micro-organism in food and fermentation industry.

Learning Objectives:-

1) To understand need and importance of fermentation.
2) To study the various types of micro –organisms used in fermentation process
3) To provide knowledge about metabolites.
4) To learn about plant cell culture.

Out-come:-

After successful completion of this course students will be able to understand screening process, fermenters, metabolites, production and purification of enzymes

Plant cell culture process and production of fermented foods.

Prerequisites:-

Basic knowledge of food, microbiology and fermentation are required to learn this subject.

Unit I : Microorganism in industries, Fermentation: 08 **08**

Beneficial microorganism, screening, types of screening & isolation. Definition of fermentation, types, design of fermenter, accessories with function.

Unit II : Metabolites: 08

Definition, types of metabolite, Industrially important secondary metabolite-organic acid, antibiotic, probiotic.

Advances in strain improvement for high yields of metabolite.Bacteriocins, biocolour, carotenoids, β-carotene, lycopene.

Unit III : production and purification of microbial compound: 08

Production and purification of microbial enzymes,

polysaccharides, amino acids, vitamins and bio-insecticides.

Unit IV : Plant cell culture: 08 08

Definition, requirements, media, types of media, callus, subculture. Production of secondary metabolite, continuous and batch

Unit V : Fermented foods: 08

Fermented dairy products, alcoholic beverages, roll of baker's yeast, Angkak production and purification.

Practicals:

1)Study of production and assay of citric acid.

2) Study of production and assay of β-carotene.

3) Study of production and assay of antibiotic penicillin/tetracycline.

4)Study of production of Angkak (Red rice)

5)Study of production, purification and assay of fungal amylase/protease.

6)Study of production of Xanthan/ Pollulan.

7) Study of single cell protein.

8)Study of mushroom production

9)Study of preparation of food based fermented product like Miso/ Idli/ Dhokla.

Reference book

1 Microbial Technology Vol-I ----- H.J.Peppler& D. Perlman

2 Microbial Technology Vol-II ----- H.J.Peppler& D. Perlman

SWAMI RAMANAND TEERTH MARATHWADA
UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year IV semester

Subject: Spice and Flavor Technology Code: CCFS IV D

Credits: 02 Marks: 50 (External 40, Internal)

Salient Features:-

Syllabus includes all important aspects of spice processing

Learning Objectives:-

1. To impart knowledge of major and minor spice processing.
2. To provide knowledge about methods spice oil extraction.
3. To provide knowledge of flavoring compounds in food.
4. To learn packaging techniques of spices and its products.

Out-come:-

Will prepare students to understand production and processing scenario of spices, processing of major and minor spices, coca, vanilla tea and coffee processing, extraction of and utilization of spice oil and standard specification and packaging of spices and its products.

Prerequisites:-

Basic knowledge of spices and food processing industry are required to learn this subject.

Unit I : Introduction and post- harvest technology of major spices 08

Production and processing scenario of spices, flavor and plantation crops and its scope, post-harvest technology, processed products and its utilization of various major spices (Ginger, turmeric, chilly, onion, garlic, pepper, cardamom, cashunuts and cocont)

Unit II : Processing and utilization minor spices, herbs and leafy Vegetables 08

Annie, caraway seeds, cassia, cinnamon, clove, coriander, cumin, dill seed, fern seed, nutmeg, saffron, asafetida, sweet basil, marjoram, mint, sage, savory, thyme, ajawan, curry leaves.

Unit III : Tea, coffee, Coca, Vanilla Processing 08

Introduction, post harvest technology, utilization

Unit IV : Spice oli and oleoresins **08**

Introduction, definition, processing and utilization

Unit V :Flavours and packaging of spices and its products **08**

Flavouring compounds in food, separation, purification and identification of natural flavouring materials, synthetic flavouring agents and their stability, standard specifications of spices and flavours, packaging of spice and its products

Practical

1) Study of identification and characterization of flavouring compounds of spices
2) Study of oil determination of spices
3) Study of extraction of oil from clove, pepper cardamom, chilly
4) Study of extraction of oleoresins- turmeric, ginger, pepper, clove
5) Study of piperine estimation in pepper oleoresins
6) Study of steam distillation of spices
7) Study of determination curcumin content in turmeric
8) Study of chemical analysis of spices, moisture, volatile oil specific gravity, refractive index, acid value
9) Study of standard specification of spice
10) Preparation of curry powder
11) Preparation of Indian masala for different food
12) Visit to spice industry

Reference book

1) Spices Vol II---- Parry J. W.
2) Spice and condiments--- Pruthy J. S.
3) Herbs and spices---- Rosemeryhemphill
4) The book of spices---- Rosen Gartan, F. and Living ton
5) Spices and herbs for the food industry ---- Lewies Y. S

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year IV semester

Subject: Food Additives Code: CCFS V D

Credits: 02 Marks: 50 (External 40, Internal)

Salient Features:-

Syllabus includes all important aspects of food additives used in food industry

Learning Objectives:-

1. To impart knowledge of food additives.
2. To provide knowledge about food preservatives.
3. To provide knowledge of food colour and flavoring compounds used.

Out-come:-

Will prepare students to understand intentional and unintentional food additives, food preservatives, taste and flavor inducer, role of thickener's, stabilizers etc.

Prerequisites:-

Basic knowledge of chemistry, food preservatives, food groups are required to learn this subject.

Unit I : Intentional and unintentional food additives, their toxicology and safety evaluation 08

Unit II : naturally occurring food additives and food color (natural and artificial), pigments, importance and utilization of color 08

Unit III : Food preservatives and their chemical action 08

Unit IV : Taste and flavor inducer, potentiate 08

Unit V : Role and mode of action of salt, chelating agents, stabilizers and thickeners, polyhydric alcohol, anti-caking agent, firming and coloring agent, flour anti caking agent, anti-oxidants, non – nutritional sweetness and anti-microbial agents, spices, condiments 08

Practical

1) Study of evaluation GRAS aspects of food additives
2) Study of identification of food color by TLC
3) Study of isolation and identification of naturally occurring food pigment by paper and TLC
4) Study of spectrometric method of total chlorophyll (A & B)
5) Study of determination of diacetyl content of butter
6) Study of role and mode of action of chelating agents in fruit juice
7) Study of role and mode of action of stabilizer and thickeners in frozen dairy products (ice cream)
8) Study of role and mode of anti-oxidant in frozen fish
9) Study of role of leaving agent in baked food products

Reference books

1) Food chemistry Vol I------- Fennama O. R.
2) Food chemistry ------- Mayer L. H

SWAMI RAMANAND TEERTH MARATHWADA
UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science
II year IV semester

Subject: Food Packaging Code: CCFS VI D

Credits: 02 (Marks: 50 (External 40, Internal 10)

Salient Features:-

Syllabus includes all important aspects of food packaging

Learning Objectives:-

1. To impart comprehensive overview of the scientific and technical aspects of food packaging
2. To provide knowledge of packaging machinery, systems, testing and regulations of packaging..

Out-come:-

Will prepare students to understand need of packaging, package functions, packaging materials, lamination coating, packaging of specific foods and mechanical and functional tests of package.

Prerequisites:-

Basic knowledge of food processing industry are required to learn this subject.

Unit I : Introduction to subject, Packaging situations in World, India, need of packaging, plastic consumption/use in World, India etc. Package requirements, package functions, Hazards acting on package during transportation, Storage and atmospheric package, labeling laws

Unit II : Package Materials: classification packages, paper as package material its manufacture, types, advantages corrugated and paper board boxes etc. Glass as package material, Manufacture, Advantages, disadvantages. Metal as package material-manufacture, Advantages, disadvantages, Aluminum as package material,. Its advantages and disadvantages, plastic as package material classification of polymers, properties of each plastics, uses of each plastics, chemistry of each plastic such as polyethylene, Polypropylene, polystyrene, polycarbonate, PVC, PVDC, Cellulose acetate, Nylon etc.

Unit III : Lamination Coating and Aseptic packaging

Lamination, need of lamination, types, properties, advantages & disadvantages of each type

Coating on paper & films, types of coatings. Need of coating, methods of coatings. Aseptic packaging-Need, Advantaged, process, comparison of conventional &aseptic packaging, system of aseptic packaging and materials used in aseptic packaging. Machineries used in Packing foods

Unit IV : Packaging of Specific Foods

Packaging of specific foods with its properties, Like bread, Biscuits, Coffee, Milk powder, egg powder, carbonated beverages. Snack foods etc.

Unit V : Mechanical and functional tests on Package -Various mechanical and functional testes perform in laboratories on package boxes and package materials

Practicals:

1) Classification of various packages bared on material and rigidity
2) Measurement of thickness of paper, paper boards
3) Measurement of tensile strength of paper of paper boards
4) Determination of gas transmission rate of package films
5) Determination of WVTR of films
6) Determination of coating on package materials
7) Identification of plastic films
8) Prepackaging practices followed for packing fruits and vegetables

REFERENCE BOOKS

1	Handbook of Package Engineering	Joseph F. Hanlon
2	Fundamentals of Packaging	F.A. Paine
3	Food Packaging	Sacharow and Griffin
4	Principles of Food Packaging	R. Heiss
5	Flexible Packaging of Foods	A.L. Brody
6	Food Packaging and Preservation	M. Mathouthi

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year IV semester

Subject: Computer Fundamental Code: CCFS VII D

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

Syllabus includes all important aspects of computer applications.

Learning Objectives:-

1. To learn features of computer system.
2. To provide knowledge of computer handling.

Out-come:-

Will prepare students to understand features of computer system, applications software. Microsoft office, internet Email and E commerce.

Prerequisites:-

Basic knowledge of computer handling is required to learn this subject.

Unit 1:- Computer Fundamentals **08**

Features of computer System, Block Diagram, Hardware & software, Operating System (Overview = WINDOWS), Application Software, Viruses and Their Types, Precautions to take – e.g. Trojans, Worms, (Names of anti-virus software) etc., Networking Concept- Advantages, Topologies, Types

Unit 2:- WINDOWS AND MS-WORD **08**

Features, Terminologies – Desktop, Windows, Icons, etc, Explorer – (Assignment with files, folders), Accessories- paint, notepad,

MS –WORD- File commands, print, page setup, Editing – cut, copy, paste, find, replace etc, Formatting commands, Spell check, Table, columns, drawing options, Hyperlinks, templates

Unit 3:- MS- EXCEL AND MS- POWER POINT **08**

Features, rows, columns, sheets, auto fill etc, Formulae, function (Math / stat, if)

Charts Data bases (create, sort, auto filter, subtotal) **MS-POWER POINT**- Layouts, templates, clipart, custom animations, transitions etc

Unit 4:- DBMS-(Data Base Management System) and MS-ACCESS 08

Data, data types, tables, records, field, creating table, working with the table, adding, editing, deleting, recalling records,

MS-ACCESS-Table creation, Editing, deleting the records, Forms

Unit 5:- INTERNET / E-MAIL AND E-COMMERCE 08

History, Dial up, Domains, Browsers etc, Services, E-Mail, Outlook Express Hours Surfing By Students, Introduction of E-commerce, Electronic Commerce over the internet, Introduction to EDI (Electronic Data Interchange), Electronic Payment System, payment gateway, Internet banking, Concept of B to B & B to C

SUGGESTED PRACTICLE ASSIGNMENTS

1. Create folders, change date/time, change the desktop settings (Windows)
2. Kot, Logo, Students Resumes (Word)
3. Kot, Report Cards, Pass/Fail Results, Charts, Database of employees (Excel)

4 To download information from the internet as a topic (Internet)

5 To present the above information as a presentation (Power Point)

6 Create a form where all records can be displayed/ edited (Access)

RECOMMENDED BOOKS:-

1. Computer Fundamentals – P.K. Sinha
2. A first course in Computers- Sanjay Saxena
3. Mastering In MS- Office- Lonnie E. Moseley & Davis M Boodey(BPB Publication

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

II year IV semester

SEC II

Bakery Technology II

Credits: 02 **Marks: 50 (External 25, Internal 25)**

Salient Features:-

Syllabus helps students to develop knowledge about manufacturing of bakery goods

Leaning Objectives:-

1. To learn the manufacturing process of various advance bakery products
2. To understand the various aspects of bakery processing.

Out-come:-

After successful completion of this course students will be able to understand production of various advance bakery products.

Prerequisites:-

Student should have the basic knowledge of bakery is required to learn this subject

1) Preparation of advance bakery products.
2) Advance cakes with Icing
3) Advance Cookies
4) Muffins
5) Khari & toast
6) Advance Icing techniques

OR

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Choice Based credit System (CBCS)
B.Sc. Food Science
II year IV semester
SEC II
Dairy Products Development

Credits: 02 **Marks: 50 (External 25, Internal 25)**

Salient Features:-

Syllabus helps students to develop knowledge about manufacturing of dairy products

Leaning Objectives:-

1. To learn the manufacturing process of various dairy products

Out-come:-

After successful completion of this course students will be able to understand production of various dairy products.

Prerequisites:-

Student should have the basic knowledge of cooking and dairy products are required to learn this subject

1) Fermented milk products:-

- Curd, Shrikhand, lassi& their types, paneer

2) Chenna Based:-

- Rasgulla, sandesh, Kalakand, Rasmalai

3) Khoa Based:-

-Gulabjamun, Peda. Various types of burfi

4) Whole milk products:-

- Rabri, Various kheers, milk shakes, Ice cream, kulfi

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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)**

Salient Features:-

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

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

Out-come:-

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

Prerequisites:-

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

UNIT I	Prospectus of Bio-Technology Fundamentals of molecular biology with special reference to chemistry and biology and DNA structures	**08**
UNIT 2	Biological role of DNA in cell metabolism Genetic recombination mechanisms and technique used for improvement in microbial Strains	**08**
UNIT 3	Recombinant-DNA technology (plasmids and cloning) Cell and tissue culture Continuous cultures	**08** **08**

UNIT 4	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	
UNIT 5	Application of Biotechnology in food (Food industries), pharmaceuticals and agriculture, Bio technology approach for the exploitation of food and industrially important Microorganisms	**08**

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	Isolation of chromosomal / genomic DNA from *E.coli and Bacillus cereus*
6	Study of Replica Plate Technique
7	Introduction of ELISA / Southern blot / DNA finger printing etc
8	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)	Peppler and Perlman
7	Microbial Technology-Vol-I I (Fermentation Technology)	Peppler and Perlman

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

III year V semester

Subject: PRODUCT DEVELOPMENT AND FORMULATION

Code: CCFS III E

Credits: 02 **Marks: 50 (External 40, Internal 10)**

Salient Features:-

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

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.

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

Prerequisites:-

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

UNIT-I **08**

Introduction to the Product development and formulation - Need for Product development. New food product -

Definition - General characteristics of New food product - Classes ofnew Food products - Line extensions -

Repositioning of existing products - New form of existing product - Reformulation - New packaging - Innovative

products and Creative products and Value added products. Difference between Market and Market places;

Customers and Consumers;

UNIT-II **08**

Marketing Characteristics of the product , Product Life cycle - profit picture. Factors affecting food product

development - Corporate factors - Market place factors - technological pressures - Governmental issues and

legislations. Stages/Phases of new product development - Company objectives - Perceived needs of
Market - Ideas - Screening - Feasibility studies - Consumer research - Financial review
Development - Production - Consumer trials -Test market . Generation of Food product Ideas - Sources of new
product ideas - The market places - types of market places - With in the company - Outside the market place

UNIT-III **08**

Consumer studies - types of studies, methods of data collection - Surveys and polling -
telephone and mail surveys - focussed group discussions - dephic oracle and Market place
analysis and external environment as a source of ideas. Organizing for new product development - Concepts of
research and development - Creativity. Criteria of screening - general criteria for screening - Constraints - financial
and technical constraints

UNIT-IV **08**

. Development of Strategy from Marketing's Perspective - Marketing functions, market research, Sales and
marketability of the product. Standardization of product formulation and product design; Adaptable suitable
technology role of Engineering in the development process. Process design, Scale - up and In - process
specifications, Manufacturing plant and Technical
aspects and-production trials

UNIT-V **08**

Market testing - methods of testing - Evaluation
Quality assessment of new developed products
Costing/pricing and economic evaluation of the product
Product launch and commercialization of the product

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
	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 Product Design and Development Moskowitz, Blackwell Publishing Oxford UK

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

III year V semester

Subject: By-products and Waste Utilization of Food Industry

Code: CCFSIV E

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

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

Learning objectives:-

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

Out-come:-

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

Prerequisites:-

Basic knowledge of food industrial by- product and waste material

UNIT 1	Industrial byproducts and waste. Potentials and prospects of developing by-products industry in India. By products utilization of cereals, legumes, oil seeds.	**08**
UNIT 2	By products utilization of fruit and vegetables processing industries, By products utilization of dry fruits (cashew nut, almond, walnut, coconut, pista)	**08**
UNIT 3	By products utilization of meat, poultry and egg, fish processing units.	**08**
UNIT 4	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.	**08**
UNIT 5	By products utilization of dairy, fermentation, sugar and bakery industries.	**08**

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 Ed.
3	Technology of Fish Utilization	Kreuyer

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

III year V semester

Subject: CARBONATED BEVERAGE TECHNOLOGY Code: CCFSV E

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

This course will help to understand concept of carbonated beverage.

Learning objectives:-

i) To provide knowledge about techniques used in water softening in beverage industries

ii) To help students to learn the various aspects of beverage industry.

Out-come:-

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

Prerequisites:-

Basic knowledge about food chemistry, microbiology food quality

No. of Units	Topics	
UNIT 1	History and types of soft drinks, Water treatment and quality, Specification for beverage water. Alkalinity reduction, filtration of water, water softening.	**08**
UNIT 2	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	**08**
UNIT 3	Clouding and Flavoring agents used in soft drink. Carbon dioxide and carbonation for soft drink	**08**
UNIT 4	Equipment's and machineries used in soft drink. Packaging aspects in soft drink	**08**
UNIT 5	Quality control in soft drink –Chemical, sensory and Microbiological Quality	**08**

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

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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)

Salient Features:-

Syllabus helps to understand fermentation process with kinetics

Learning objectives:-

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

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.

Prerequisites:-

Basic knowledge of fermentation and bioconversion.

UNIT 1	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.	**08**
UNIT 2	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	**08**
UNIT 3	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	**08**

UNIT 4	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	**08**
UNIT 5	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	**08**

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

1	Biochemical Engineering	Shuichi Alba, Arthur E. Humphrey Nancy F. Millis
2	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 CCFSVIIE

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

Syllabus helps to develop entrepreneurial skills in the students .

Learning objectives:-

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

Out-come:-

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

Prerequisites:-

Basic knowledge of business and marketing

UNIT 1	**Foundation Of entrepreneurship Development** Introduction to Entrepreneurship Development. Concept of Entrepreneurship Types of Entrepreneurship Entrepreneurship as a career	**08**
UNIT 2	The changing role of the Entrepreneur. **Requirement of entrepreneurship** Attributes Required for Entrepreneurship Entrepreneurship in India Concept and function of woman Entrepreneurship	**08**
UNIT 3	**Entrepreneurship motivation and process of Entrepreneurship** What is motivation Motivation theories Motivation factors	**08**
UNIT 4	4 C's of Entrepreneurship **Assessing the Market** Information gathering techniques Principle of Market Survey Analysis of Survey data Resource Mobilization	**08**
UNIT 5	**Entrepreneurship Programme, SWOT analysis and budget** 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	**08**

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 and Management — Y.K. Bhushan(1987) 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 CCFSVIIIE ---

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Salient Features:-

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

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

Out-come:-

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

Prerequisites:-

Student should have basic knowledge of competitive examination and communication skill

UNIT 1 Gate Exam Preparation: Orientation of GATE Curriculum for students, Providing information regarding literature of GATE Examination. Solving some sample question papers of GATE Examination.

UNIT 2 Information regarding Technical MPSC Examination and Recruitment procedure of Graduate students with detail curriculum, Literature and Guidance

UNIT 3 Technical Post, Curriculum and authentic literature of RRB, BSRB examination

UNIT 4 Information Regarding Higher Education in Foreign Universities, Preparation of Pre requirements like SAT,PTE, LSAT,ACT, CAE,CPE GMAT, GRE, IELTS and the TOEFL.

UNIT 5 Preparation for PG entrance examination – Curriculum and information of entrance examination to IIM and other MBA collages.

UNIT 6 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 Learning Programme (ELP)

Credits: 02 **Marks: 50 (External 25, Internal 25)**

Salient Features:-

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

Leaning 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
3.

Out-come:-

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

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 sale20 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)**

Salient Features:-

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

Learning objectives:-

a) To develop the skill of fortification process

b) To help the students to learn and develop the various fortified food products

c)

Out-come:-

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

Prerequisites:-

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

- **Development of fortified Food products under following heads**
  - Weaning foods
  - Snacks
  - Milk products
  - Bakery products

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

III year VI semester

Sub: Specialty Foods CCFSIF

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

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

Learning objectives:-

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

Out-come:-

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

Prerequisites:-

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

UNIT 1 Need and scope of specialty foods **08**

Specialty food based on ease in preparation for cost health benefits

i. Functional foods
ii. Convenience food
iii. Health care and medical benefits
iv. Nutritional status
v. Low cost foods

UNIT 2 Specialty foods based on sources **08**

- Cereals and millets
- Legumes and pulses
- Fruits and vegetables
- Animal food sources
- Probiotics
- By product based
- Non conventional foods

UNIT 3 Specialty foods based on process **08**

- Innovative process technology
- Food additives basis
- Bioactive components
- Packaging techniques (Nano-technology, Smart packaging)
- Adaptable technology basis
- Fast and PET foods

UNIT 4 Specialty food based on genetics **08**

1. Genetically modified foods
2. Transgenic foods
3. Biotechnological aspects of detoxification

Proprietary foods

Supplementary foods

Therapeutic foods

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

UNIT 5 Specific consumer oriented foods and Specialty foods based on growing condition **08**

- organic , inorganic farming

Defense persons

Space / astronaut

High altitude mountain climbers

Disaster situation – crises, care, maintenance

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 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

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

III year VI semester

Subject: Code: EXTRUSION TECHNOLOGYCCFS II F

Credits: 02 **Marks: 50 (External 40, Internal 10)**

Salient Features:-

This course helps to understand processing of extruded food products.

Learning objectives:-

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

Out-come:-

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

Prerequisites:-

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

UNIT 1 Extrusion Technology **08**

Importance, principles of extrusion cooking, methods of extrusion cooking

Extruders-

Types of extruders, single screw, twin screw, their applications, effects of dependent and independent variables on the product quality.

UNIT 2 Extruded products- **08**

Raw materials, process of manufacture, properties, quality, evaluation, packaging requirement, marketing, Processing of Pasta, Vermicelli, Noodles.

Legumes and oilseed foods

Isolate, concentrate, and substitute to milk, variation in composition and nutritive value.

UNIT 3 Food proteins **08**

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.

UNIT 4	Meat Analogue, commercial development, nutritional aspect, marketing aspect.	**08**
UNIT 5	New protein foods, tofu, miso, texturized vegetable protein, hydrolyzed vegetable protein, formulation and quality control	**08**

Practicals

No.of Units	Topics
a)	Physicochemical properties of proteins, protein rich products, weaning foods, beverages
b)	Texturized products, protein rich bakery products
c)	Type of food extruders, preparation of extruded products
d)	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.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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)**

Salient Features:-

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

Learning objectives:-

a. To understand importance of food hygiene and microbial standards
b. To understand sanitization practices in food industries
c. To learn effect of presence of toxins in food

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.

Prerequisites:-

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

UNIT 1	Principles of Food Hygiene, Food handling habits and personal hygiene Types of Soil (Food residues on equipment surfaces) and its properties.	**08**
UNIT2	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, phonolic compounds as sanitizers. Advantages and disadvantages of these sanitizers.	**08**

UNIT 3	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	**08**
UNIT 4	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.	**08**
UNIT 5	Risk assessment and management during food preparation.	**08**

Practicals

No. of Units	**Experiments**
1	Microbial quality of air
2	Microbial load of palm/ fingers, nose secretions of workers TPC/ *E.Coli* / 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	Study of HACCP for food industries
8	Study of national and international microbial quality standards
9	Isolation and identification of *E. Coli*/*Listeria*
10	Visit to District public health laboratory
11	Visit to restaurents/ local food industries
12	Visit to export oriented food processing industry

REFERENCE BOOK

1	Guide to improving Food Hygiene	- Ed Gaston & Tiffney
2	Practical Food Microbiology and Technology (2nd edition)	- HarryH.Weiser,J.mountney and W.W.Gord
3	Food Poisoning and Food Hygene (3rd 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

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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)

Salient Features:-

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

Learning objective:-

a) To understand the importance and role of instrumentation process control in food industries

b) To learn basic technics of measurements in instrumentation and process control

Out-come:-

Will capable students to handle instrumentation process at industrial level

Prerequisites:-

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

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

electrical control
Systems

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 Process instruments and controls	Austin E. Fjribance
3	Handbook	Considine

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based Credit System (CBCS)

B.Sc. Food Science

III year VI semester

Subject: Food Plant Design & Layout Code:-CCFS V F

Credits: 02 Marks: 50 (External 40, Internal 10)

Salient Features:-

This course helps students to gain the knowledge of plant designing and layout.

Learning Objectives:-

To understand the designs and layout of various Food processing industries

Out-come:-

Will be able to understand different parameters related designing and layout of various food plants

Prerequisites:-

Student should have the basic knowledge of measurements, drawing, and climatic conditions.

UNIT 1	Overall design of an enterprise : Plant design, sales planning for plant design Strength of material – engineering materials, material science, use of various metals, including plastic, glass, etc in food industry, selection and specification – material design, concepts and manufacturing of various equipment's and machineries for food processing plant	**08**
UNIT 2	Plant Location, levels of Plant location. Location of layout : location factors, plant site selection. Location theory and models, industrial buildings and Grounds Classification of Dairy and Food Plants, farm level collection and chilling center, space requirement	**08**

UNIT 3	Preparation of a Plant Layout: Plant Layout problem, importance, objectives, classical types of layouts. Evaluation of Plant Layout. Advantages of good layout. Organizing for Plant Layout, Data forms	**08**
UNIT 4	Common Problems in Plant Layout and Process scheduling Siting of Process sections, Equipment selection and capacity determination	**08**
UNIT 5	Arrangement of process, and service equipment. Estimation of Services and Utilities Office layout, line balancing, Flexibility. Practical Layouts Maintenance of Food Plant Building, Illumination and ventilation, Cleaning and sanitization, painting and color coding, Fly and insect control	**08**

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
Engineering for Dairy and Food	A.W. Faral (1980). Rebert E.,
3. Products	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)**

Salient Features:-

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

Learning Objectives:-

a) To provide the knowledge of food laws and regulations
b) To give the importance and application process of food laws and regulations in food industries**.**

Out-come:-

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

Prerequisites:-

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

UNIT1	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	**08**
UNIT2	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	**08**

UNIT3 Other Mandatory acts **08**

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)

UNIT4 Food Product Orders **08**

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)

UNIT5 Optional food standards **08**

-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

Codex Alimentarius Commission

-Scope of codex standards, codex standards for cereals, pulses, fruit & vegetables, Meat & Poultry products, Recommended international code of hygiene for various products

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. Professional Book Publishers, New Delhi

2ThePreventionofFoodAdulteration Act

.

3 Quality Control in Food Industry Vol. 1 S.M. Herschdoerfer

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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)**

Salient Features:-

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

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

Out-come:-

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

Prerequisites:-

Student should have the basic knowledge of food industrial parameters.

UNIT1	Quality inspection, quality control, quality management and quality Assurance Quality Circles, SQC., ISO System	**08**
UNIT2	Total quality management • Good manufacturing practices • Good agricultural practices • Good laboratory practices • Quality management systems (QMS)	**08**
UNIT3	HACCP, principles, implementation	**08**
UNIT4	Auditing, surveillance Audit, mock audit, third party quality certifying audit, Auditors and Lead auditors. Plan documentation, types of records	**08**
UNIT5	Certification, certification procedures, certifying bodies, accrediting bodies, international bodies.	**08**

Practicals

No. of Units	Topics
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)**

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

61. year VI semester

SEC IV

PROCESSING OF NUTRITIOUS BIZARRE FOODS

Credits: 02 **Marks: 50 (External 25, Internal 25)**

Salient Features:-

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

Learning objectives:-

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

Out-come:-

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

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

1 Cereal and millets
2 Legume and pulses
3 Oil seeds
4 Fruits and vegetable

OR

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Choice Based credit System (CBCS)

B.Sc. Food Science

61 year VI semester

SEC IV

PROCESSING OF FERMENTED FOOD PRODUCTS

Credits: 02 **Marks: 50**
(External 25, Internal 25)

Salient 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

1) Cereal based
2) Fruits & vegetable based
3) Dairy based
4) Beverages (Alcoholic & Non- Alcoholic)