।। 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
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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे **CBCS Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७–२०२०**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्यात येत आहेत.

1. B.Sc.-II Year-Biophysics	2. B.Sc.-II Year-Bioinformatics
3. B.Sc.-II Year-Biotechnology	4. B.Sc.-II Year-Biotechnology (Vocational)
5. B.Sc.-II Year-Food Science	6. B.Sc.-II Year-Botany
7. B.Sc.-II Year-Horticulture	8. B.Sc.-II Year-Agro Chemical Fertilizers
9. B.Sc.-II Year-Analytical Chemistry	10. B.Sc.-II Year-Biochemistry
11. B.Sc.-II Year-Chemistry	12. B.Sc.-II Year-Dyes & Drugs Chemistry
13. B.Sc.-II Year-Industrial Chemistry	14. B.C.A. (Bachelor of Computer Application)-II Year
15. B.I.T. (Bachelor of Information Technology)-II Year	16. B.Sc.-II Year-Computer Science
17. B.Sc.-II Year-Network Technology	18. B.Sc.-II Year-Computer Application (Optional)
19. B.Sc.-II Year-Computer Science (Optional)	20. B.Sc.-II Year-Information Technology (Optional)
21. B.Sc.-II Year-Software Engineering	22. B.Sc.-II Year-Dairy Science
23. B.Sc.-II Year-Electronics	24. B.Sc.-II Year-Environmental Science
25. B.Sc.-II Year-Fishery Science	26. B.Sc.-II Year-Geology
27. B.Sc.-II Year-Mathematics	28. B.Sc.-II Year-Microbiology
29. B.Sc.-II year Agricultural Microbiology	30. B.Sc.-II Year-Physics
31. B.Sc.-II Year Statistics	32. B.Sc.-II Year-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–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२०–२१/**३३३**

दिनांक : १५.०७.२०२०.

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 II YEAR

ACADEMIC YEAR 2020-2021

Swami RamanandTeerthMarathwada University, Nanded

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

Faculty of Science (Affiliated Colleges)

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**

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

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	NAME OF TOPIC	MARKS
I UNIT	**Importance of legumes, pulses & oil seeds** • Presents status • Morphology • Chemical composition • Anti- nutritional factors • Classification and Types.	**08**
II UNIT	**Milling** • Principles • Methods and equipment's used for milling • Fermented products of legumes.	**08**

III UNIT	**Removal of anti-nutritional factors** • Soaking- Principles and their methods • Cooking quality of dal	**08**
IV UNIT	**Oil extraction and refining of oil** • Oil extraction- Traditional method- ghani, modern methods-expellers-Principle and structure • Solvent extraction- principles, pre- treatment, • Factors affecting on extraction process • Refining- degumming, neutralization, bleaching filtration and deodorization.	**08**
V UNIT	**New technology in oil seed processing** • Utilization of oil seed, meals for different food uses, high protein products, protein concentrates and protein isolates.	**08**

PRACTICAL

SR.NO	NAME OF EXPERIMENT
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 be 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	NAME OF TOPIC	MARKS
I UNIT	**Importance, development and composition of meat, poultry and fish** • Sources • Physio-chemical properties • Muscle structure • Pre slaughter transport care • Anti- mortem inspection • Abattoir design and layout.	08
II UNIT	**Slaughtering of animals and poultry.** • Postmortem inspection • Grading of meat • Factors affecting post mortem changes • Shelf life of meat	08
III UNIT	**Processing, preservation of meat and Meat plant** • Mechanical deboning	08

	• Aging or chilling • Freezing • Pickling curing • Cooking • Smoking of meat • Principles and methods of meat	
IV UNIT	**Egg** • Structure • Composition • Quality characteristics • Processing Preservation of egg.	**08**
V UNIT	• Fish types • Composition • Quality characteristics • Preservation of fish	**08**

PRACTICAL

SR.NO	NAME OF EXPERIMENT
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 and bakery are required to understand this subject.

UNIT	NAME OF TOPIC	MARKS
I UNIT	**Wheat** • Importance • Production, varieties, types grading, quality, structure, physiochemical, rheological properties and enzymes in wheat.	08
II UNIT	**Conditioning and milling of wheat** • Principles • Methods of conditioning • Roller flour milling process • Break rolls • Reduction rolls • Design and operation	08
III UNIT	**Flour**	08

	• Types • Grades • Supplementations • Fortifications • Additives • Improvers • Bleaching and oxidizing agents	
IV UNIT	**Bakery Products** • 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.	**08**
V UNIT	**Bakery unit** • Setting • Bakery norms • Specifications for raw materials • Packing • Marketing of products • Project report preparation.	**08**

PRACTICAL

SR.NO	NAME OF EXPERIMENT
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	NAME OF TOPIC	MARKS
1	**Introduction to confectionery and Role of ingredients** a) History b) Traditional confectionery goods c) Types of confectionery and classification d) Basic technical consideration (TS, TSS, Ph, invert sugar, ERH, Glucose syrup, RH,) e) Types of ingredients used- sugar, milk and milk products, whipping agent, release agent, thickeners, acidulates, flavours, emulsifiers, additives, starch derivatives and colours.	**08**
2	**Coca and chocolate processing** a) Coca bean processing- roasting, fermentation, production of coco butter, powder and its quality, b) Chocolate processing- ingredients, mixing, refining,	**04**

	conching, tempering, molding, cooling, coating, fat bloom	
3	**Confectionery Processing (High boiled sweets, caramel and toffee, Fondant, Tablet, marshmallow, panning)** a) Definition b) Composition c) Ingredients d) Methods of preparation, recipes e) Faults, factors affecting on quality to quality of product f) Packaging and marketing.	**08**
4	**Introduction and Processing of Milk** a) Definition, b) Composition of milk from different species c) Colostrum d) Physio-chemical properties of milk e) Nutritive value of milk and milk products, f) Classification of milk products g) Pasteurization by LTHT and HTST and UHT-filtration, UF and RO h)Clarification i) Cream separation, j) Standardization homogenization k) Heat processing- Boiling, Sterilization.	**08**
5	**Manufacturing of different milk products** a) Butter and butter oil (ghee) b) Yoghurt c) Cheese d) Ice cream types, roll of ingredients, various methods of preparations e) Fermented milk and milk products	**08**
6	**a) Manufacturing of Indigenous milk products –** Ghee, Khoa, Chenna, paneer, dahi, shrikhand, **b) Indian Milk confectionery-**Khoa and Chenna based sweets etc **c) Types by products and their utilization of dairy Industries** **d) Packaging of milk and milk products.**	**04**

PRACTICAL

SR.NO	NAME OF EXPERIMENT
1	a) Sampling and analysis of milk b) Physio-chemical properties of milk c) Composition of milk d) Presence of adulterants and preservation of milk
2	Study of clarification and separation of milk
3	Study of heat processing of milk- Pasteurization
4	Preparation of Indigenous milk products a)Butter b) Ghee c) Dahi d) Shrikhand e) Lassi f) khoa and its sweets
5	Preparation of chenna, paneer and chenna based sweets
6	Preparation of high boiled sweets (Drops, candy, lollipops etc)
7	Preparation of Caramel Toffee (Fudge, marshmallow and Fondant)
8	Preparation of chocolate
9	Preparation of flour based sweets
10	Preparation of petha
11	Visit to confectionery industry and dairy plant

Reference book

Sr. No.	Name of Book	Name of Author
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	NAME OF TOPIC	MARKS
1	**Nature and concepts of Food Analysis** • Rules and regulations of food analysis, safety laboratory, • Sampling techniques.	**08**
2	**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	**08**

	• Nuclear magnetic resonance and electron spin resonance • Chromatography • Absorption • Column • Partition • Gel-filtration • Affinity • ion- exchange • Size-exclusion method • Gas liquid chromatography.	
3	**Immuno assay techniques in food analysis** • Isotopic and non-isotopicimmune assay • Enzyme immune assay.	**08**
4	**Principle and methodology involved in analysis and evaluation of analytical data** • Rheological analysis, textural profile. • Evaluation of data- accuracy and precision, statistical significance • co relations regression • Computers for data analysis and result interpretation.	**08**
5	**Sensory analysis of food** Objective and Subjective method	**08**

PRACTICAL

SR.NO	NAME OF EXPERIMENT
1	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	Quantitative determination of sugars and fatty acid profile by GLC
9	Study of Quantitative make up of water and fat soluble vitamins using HPLC
10	Gel-electrophoresis for analytic techniques
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	NAME OF TOPIC	MARKS
1	**Material Handling** • Material handling machines • Conveyors • Pre-treatment unit operation (cleaning, dehulling, de husking, sorting, grading, peeling and forming) • Size reduction • Separation • Agitation • Mixing.	**08**

2	**Engineering Properties of Food material** • 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.	**08**
3	**Evaporation, Drying and Thermal Processing** • Principles • Types • Classification • Methods and equipment's • Mass and energy balance	**08**
4	**Mechanical separations, Filtration, expression and Irradiation Process** • Principles • Types • Classification • Equipment's used	**08**
5	**Equipment's used in various food processing** • Baking • Roasting • Frying • Blending • Pulverization.	**08**

PRACTICAL

SR.NO	NAME OF EXPERIMENT
1	Study of centrifugal separators
2	Study of ultra- filtration equipment's
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 red 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

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.

Sr.No.	Name Of Topic	Weightage
Unit 01	**Introduction to fruits and vegetable processing and Preservation-** • 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.	**08**
Unit 02	**Commercial processing technology of fruits (I)** • **Mango** (Pulp, RTS, squash, canned pulp, toffee,	**08**

	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 03	**Commercial processing technology of fruits (II)** • **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).	**08**
Unit 04	**Commercial processing technology of vegetables(I)** • **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)	**08**
Unit 05	**Commercial processing technology of vegetables(II)** • **Carrot** (candy, pickle, jam) • **Cauliflower and cabbage** (Dried,pickles) • **Leafy Vegetables** (Dried- Spinach, fenugreek, coriander leaves, curry leaves) • **Bitter guard** (Pickle, dried bitter guard).	**08**

Practical

Sr. No.	Name of Experiments
01	Study of canning of mango/ Guava/ Papaya
02	Preparation fruit jam –Apple/mango/guava
03	Preparation of frit jelly- wood apple/ sweet orange/guava/ tamarind.
04	Preparation of fruits marmalades
05	Preparation of fruits preserve and candy
06	Preparation of fruits RTS
07	Preparation of fruits Squash
08	Preparation of fruits syrup
09	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.

Sr.No.	Name Of Topic	Weightage
Unit 01	**Microorganism in industries, Fermentation** • Beneficial microorganisms • Screening, types of screening & isolation • Definition of fermentation, types, design of fermenter, accessories with function.	**08**

Unit 02	**Metabolites:** • 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.	**08**
Unit 03	**Production and purification of microbial compou** • Production and purification of microbial enzymes • Polysaccharides • Amino acids, vitamins • Bio-insecticides.	**08**
Unit 04	**Plant cell culture:** • Definition, requirements, media, types of media, • Callus, subculture. • Production of secondary metabolite, • Continuous and batch	**08**
Unit 05	**Fermented foods:** • Fermented dairy products • Alcoholic beverages • Role of baker's yeast, • Angkak production and purification.	**08**

Practicals:

Sr. No.	Name of Experiments
01	Study of production of citric acid.
02	Preparation of ethanol through bioconversion .
03	Study of production of antibiotic penicillin/tetracycline.
04	Study of production of Angkak (Red rice)
05	Study of production, purification and assay of fungal amylase/protease.
06	Study of production of Xanthan/ Pollulan.
07	Study of Callus regeneration
08	Study of production Cheese
09	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
3) Industrial Microbiology	Prescott's and Dunn's
4)Principles of Fermentation Technology	Peter F. Stanburry, Allan Whittaker, Stephen J.
5) Handbook of Food and Beverage Fermentation Technology	Y.H Hui, LisbethMeunier-Goddik
6) Practical Microbiology	Dr. R.C. Dubey, Dr. D. K. Maheshwari

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.

Sr.No.	Name Of Topic	Weightage
Unit 01	**Introduction and post- harvest technology of major spices** • 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)	08

Unit 02	**Processing and utilization minor spices, herbs and leafy Vegetables** 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.	**08**
Unit 03	**Post Harvest Technology:** Introduction, post harvest technology, utilization of--- • Tea • Coffee • Coca • Vanilla	**08**
Unit 04	**Processing:** Introduction, definition, processing and utilization • Spice Oil • Oleoresins	**08**
Unit 05	**Flavors and packaging of spices and its products:** • 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	**08**

Practical

Sr. No.	Name of Experiments
01	Study of identification and characterization of flavouring compounds of spices
02	Study of oil determination of spices
03	Study of extraction of oil from clove, pepper cardamom, chilly
04	Study of extraction of oleoresins- turmeric, ginger, pepper, clove
05	Study of piperine estimation in pepper oleoresins
06	Study of steam distillation of spices
07	Study of determination curcumin content in turmeric
08	Study of chemical analysis of spices, moisture, volatile oil specific gravity, refractive index, acid value
09	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.

Sr.No.	Name Of Topic	Weightage
Unit 01	Intentional and unintentional food additives, their toxicology and safety evaluation	**08**
Unit 02	Naturally occurring food additives and food color (natural and artificial), pigments, importance and utilization of color	**08**
Unit 03	Food preservatives and their chemical action	**08**

Unit 04	Taste and flavor inducer, potentiate	**08**
Unit 05	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

Sr. No.	Name of Experiments
01	Study of evaluation GRAS aspects of food additives
02	Study of identification of food color by TLC
03	Study of isolation and identification of naturally occurring food pigment by paper and TLC
04	Study of spectrometric method of total chlorophyll (A & B)
05	Study of determination of diacetyl content of butter
06	Study of role and mode of action of chelating agents in fruit juice
07	Study of role and mode of action of stabilizer and thickeners in frozen dairy products (ice cream)
08	Study of role and mode of anti-oxidant in frozen fish
09	Study of role of leaving agent in baked food products

Reference book

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 arerequired to learn this subject.

Sr.No.	Name Of Topic	Weightage
Unit 01	• Introduction to subject • Packaging situations in World, India • Need ofpackaging, plastic consumption/use in World, India etc. • Package requirements • Package functions • Hazards acting on package during transportation, Storage and atmospheric package, labeling laws	**08**
Unit 02	• Package Materials: classification packages • Paper as package material itsmanufacture, types,	**08**

	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 03	**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	**08**
Unit 04	**Packaging of Specific Foods** • Packaging of specific foods with its properties, Like bread, Biscuits, Coffee, Milk powder, egg powder, carbonated beverages. Snack foods etc.	**08**
Unit 05	• Mechanical and functional tests on Package - Various mechanical and functional testes perform in laboratories on package boxes and package materials.	**08**

Practicals:

Sr. No.	Name of Experiments
01	Classification of various packages bared on material and rigidity
02	Measurement of thickness of paper, paper boards
03	Measurement of tensile strength of paper , paper boards
04	Determination of gas transmission rate of package films
05	Determination of WVTR of films
06	Determination of coating on package materials
07	Identification of plastic films
08	Prepackaging practices followed for packing fruits and vegetables

Reference book

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.

Sr.No.	Name Of Topic	Weightage
Unit 01	**Computer Fundamentals** • 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	08
Unit 02	**WINDOWS AND MS-WORD** • Features, Terminologies – Desktop, Windows,	08

	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 03	**MS- EXCEL AND MS- POWER POINT** • 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, transitionsetc.	**08**
Unit 04	**DBMS-(Data Base Management System) and MS-ACCESS** • Data, data types, tables, records, field, creating table, working with thetable, adding, editing, deleting, recalling records, • **MS-ACCESS-**Table creation, Editing, deleting the records, Forms	**08**
Unit 05	**INTERNET / E-MAIL AND E-COMMERCE** • 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	**08**

Practicals:

Sr. No.	Name of Experiments
01	Create folders, change date/time, change the desktop settings (Windows)
02	Kot, Logo, Students Resumes (Word)
03	Kot, Report Cards, Pass/Fail esults, Charts, Database of employees (Excel)
04	To download information from the internet as a topic (Internet)
05	To present the above information as a presentation (Power Point)
06	Create a form where all records can be displayed/ edited (Access)

Reference book

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

Sr.No.	Content
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

Sr.No.	Content
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