स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ
नांदेड– ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
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

## ACADEMIC (1-BOARD OF STUDIES) SECTION

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

# परिपत्रक

सर्व संबधितांना या परिपत्रकान्वये कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या विज्ञान व तंत्रज्ञान विद्याशाखेंतर्गत B.Sc. (Food Science) प्रथम वर्ष अभ्यासक्रमाचा CBCS Pattern अभ्यासक्रम (सोबत जोडल्या प्रमाणे) शैक्षणिक वर्ष २०१७–१८ साठी लागु करण्याकरिता मा. कुलगुरू यांनी विद्या परीषदेच्यावतिने मान्यता प्रदान केली आहे.

तरी उपरोक्त प्रमाणे ही बाब सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

''ज्ञानतीर्थ'' परिसर )(
विष्णुपूरी, नांदेड. )( स्वा/–
जा.क्र.शै.०१/प्र.पत्रीका/२०१७–१८/११९२ )( उपकुलसचिव
दिनांक : २३/०९/२०१७ )( शैक्षणिक (अभ्यासमंडळे) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

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

**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 2017

| CourseNo. | Coursetitle | 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 2017

| 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)**

**B.Sc. Food Science**

**I year I semester**

## Subject: Principle of Food Processing Code: CCFSII

## ACredits:02 Marks: 50 (External 40, Internal10)

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**1. Food Processing:-**a) Introduction, scope.b) Sources of food.c) Perishable &non perishable food. d) Causes of foodspoilage
**2. Preservation by Salt & Sugar:-**a) Principle.b) Methods.c) Equipmentsused
d) Effect on food quality.
**3. Preservation by thermal Processing:-**a) Principle.b) Equipmentsused.
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, dehaydration
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 offood
**6. Use of low temperature:-**a) Principle) Equipments'used
c) Methods - chilling. freezing, cold storage.d) Effect on foodquality

### Praticals:-

1) Study of various machineries used inprocessing.
2) Demonstration of effect of blanching on quality offoods.
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 ofjam
5) Preservation of food by usingslat-pickle.
6) Preservation of food by usingchemicals
7) Preservation of bread, cake using moldinhibitors.
8) Drying of Mango/otherpulp.

**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)

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**Unit 1:** Food demand and supply- Qualitative and quantitativerequirements

**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 andmarketing

**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)

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**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**

(i) 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

(i) 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) Interesterification d) Safety use of oils and fats in food formulation

**Unit 7: Enzymes in food industry**

Carbohydrases (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 diphasesystem
**5.** Determination of crude protein by microkjeldhalmethod
**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)

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**1. Microbiology-**
a) Evolution & scope ofmicrobiology

b) Need &Importance
c) General morphological, culturalcharacteristics
d) Reproduction of bacteria, yeasts, moulds, actionomycetes, algae,protooa.

**2.** Nutrient transport phenomenon & physiology ofmicro-organisms

**3.** Genctic recombination, transduction, transformation & bacterial conjugation, mutation&mutagenesis

**4.** Growth curve: Physical & chemical factors influencing growth & destruction of microorganisms including thermal death time, Z,F, & Dvalues.

**5.** Viruses : Structure & replication with perticular reference to food borneviruses
**6.** Control of microorganisms by physical & chemicals, antibiotics & other chemotherapeuticagents

### Practicals:

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

8) Study of growth characteristics ofbacteria
9) Study of anaerobic culturemethods.

**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)

**1. Concepts & content of nutrition-**
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 various age groups**
a) According physiological status, Athletic & sportsman
b) 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 Dietsurveys**
a) Anthropometry
b) Clinical examination
c) Biochemical assessment
d) Additional medical information

**7. In-born errors of metabolism related to**

a) Nutrients
b) Hormones &enzymes
c) Blood constituents
d) Miscellaneous disorders

**8.** Food fad &faddism

**9.** 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 surfacearea
3) Anthropometricmeasurements
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 andblood
6) Nutritionalsurvey

### 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)

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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. Surfacetension

2 **Pressure measuring devices:** Simple, differential, micro, inclined manometer, mechanicalgauges,

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

3 bodies. Equilibrium of floatingbodies

**Fluid flow :**Classification, steady, uniform and non-uniform,

4 laminar and turbulent, Bernoulli's theorem and its applications, Flow through pipes: Loss of headFlow through orifices, discharge losses. Time for emptying a tank. Venturi meter, pitot tube, Rota meter. Water level point gauge, hook gauge. Reynold'snumber

**Pumps :** Classification, reciprocating, centrifugal pump.

5 Pressure variation, work efficiency. Types of chambers, selection andsizing

## 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)

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1. **Biochemistry-**a) Introduction.b) Nature andscope

**2. Cellular Biochemistry-**a) Composition and function of cellorganelle
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 andstructures
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 DNAmetabolism.

**6. Vitamins-**a) Classification and sources.b) Chemistry and metabolicfunctions
c) Efficiency diseasessyndromes

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

## 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)

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**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 houseoperations
**Unit 10:** Principles of transport and commercial transport operations

### Practicals:

1. Studies on morphological features of some selected fruits andvegetables
2. Studies on maturityindices
3. Studies of harvesting of fruits andvegetables
4. Determination ofRQ
5. Studies on pre-cooling and storage of fruits andvegetables
6. Studies on wax coating on apples, Papaya, citrus, mango,aonla

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 andstructures
10. Studies on prepacking offruits
11. Studies on physiological disorders- Chilling injury of banana and custardapple
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 andvegetables.
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, Internal10)

**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 ofcereals
2. Study of physical properties ofcereals
3. Study of chemical properties ofcereals
4. Study of determination of colour ofcereals
5. Study of parboiling ofpaddy

6. Study of cooking quality ofrice
7. Study of milling ofrice
8. Study of conditioning ofwheat
9. Study of production of sorghumflakes
10. Production ofpopcorns
11. Study of preparation of sorghummalt
12. Determination of gelatinization temperature byamylograph
13. Study of extraction of oil from ricebran
14. Visit to cereal processingunit

**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)

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 fromfoods
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/Erwiniacarotovora.*
*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 *Pseudomonasfluorescens*
*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)

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**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 foodprocessing
**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 engineeringproblems
2. Determination of dryness fraction ofsteam
3. To study the boiler installed in modern plant water softening, plant backcock and steam line layouts and steamtraps
4. Visit to sugar Mill or Rice Mill plant with steamutilization
5. Study of solar water heater and biogas plants andappliances

**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)**

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**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 boundry conditions. Introduction to unsteady state heatconduction

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

**Unit 6:** Radiation: Emissivity, absorptivity, transmissivity, Radiation through black and grey surfaces, Determination of shapefactors

**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

Principles of Heat transfer- F. Kretiths and M.S. Bohn (1986) Harper and Row Publishers New York.