SHIVAJI UNIVERSITY, KOLHAPUR

Accredited By NAAC with 'A' Grade
CHOICE BASED CREDIT SYSTEM

Syllabus For

Bachelor of Science Part - III

FOOD SCIENCE & QUALITY CONTROL

SEMESTER V AND VI

(Syllabus to be implemented from June, 2020 onwards.)

Proposed structure for choice based credit system B.Sc.Part -III

Food Science and Quality Control

Semester	Core course	Ability Enhancement Compulsory Course (AECC) (2)	Soft skill Courses (SSC)(2)	Discipline Specific Elective (DSE)(6)
V	Fermentation atechnology- IX	English	CCC-II (Constitution of India and Local Self Government)	
	Dairy Technology -X			
	Bakery and Confectionery Technology -XI			
	Food Quality control and Waste Management- XII			
	DSE-E			
	DSE-E			
	DSE-E			
	DSE-E			
VI	Food Biotechnogy-XIII	English	SDC-II	
	Meat, Fish and poultry products Technology- XIV			
	Food Hygiene and Sanitation- XV			
	Food Packaging Technology- XVI			
	DSE-F			
	DSE-F			
	DSE-F			
	DSE-F			

SemVI: SDC-II Any one From Following (i) to (v) (2 credits)

i) Interview and personal presentation skill
ii) Entrepreneurship Development Skill
iii) Travel and Tourism
iv) E- Banking and Financial services
v) RTI and Human Right Education, IPR and Patents

B.Sc III Food Science and Quality control – Scheme of examination semesterwise

semester	Course opted	Course name	credit
V	Ability enhancement compulsory course-1	English	2
	DSE- E65	Fermentation Technology- IX	2
	DSE- E66	Dairy Technology -X	2
	DSE- E67	Bakery and Confectionery Technology -XI	2
	DSE- E68	Food Quality control and Waste Management- XII	2
	Core course practical/tutorial	practical's	8
VI	Ability enhancement compulsory course-2	English	2
	DSE- F65	Food Biotechnogy-XIII	2
	DSE- F66	Meat, Fish and poultry products Technology-XIV	2
	DSE- F67	Food Hygiene and Sanitation-XV	2
	DSE- F68	Food Packaging Technology-XVI	2
	Core course practical/tutorial	practical's	8

B.Sc. Food Science and Quality Control
Core papers Food Science and Quality control
Credit: 8(T)+8(P)

Semster V

DSE- E65: Fermentation Technology- IX

(2 Credits)

(Theory 72 Lectures)
Objectives

- To study Fermentation- bacterial, yeast and fungal
- To study biochemistry of fermentation
- To Study Femented products

Contents

Unit - I - Basic of Fermentation (16 L) (10M)

1.1 Introduction to Fermentation

1.2 Basic Structure of Fermentation

1.3 Fermentation media – a) Constituents b) Design of fermentation

1.4 Types of Fermentation process – Batch, Continuous & Dual

1.5 Factors affecting Fermentation process

1.6 Control of contamination in Fermentation

Unit – II – Beneficial aspects for Fermentation (18L) (10M)

2.1 Benefits of Fermentation

2.2 Microorganism involved in Fermentation

2.3 Microbial activities with specific role in Fermentation

2.4 Significance of Fermentation food in Indian diet

2.5 Factors influence growth & Metabolic activities of microbes in food Fermentation

2.6 Purity & Nature of food Fermentation

Unit – III – Fermented Foods (19L)(10M)

3.1 Fermented Milk – Curd , Yoghurt, Buttermilk

3.2 Fermented Cereals – Idli, Dhokla, Bread, Saysause, Miso ,Tempeh

3.3 Fermented Beverages - Wine, Beer, Sake, Distilled Liquors

3.4 Fermented Vegetables – Sauerkrout, Pickles, Green Olives

3.5 Fermentation of Cocca, Tea, Coffee

3.6 Fermentation of Acetic acid, Vit B12 & Glutamic acid

Unit – IV – Down Stream processing (19Lec)(10M)

4.1 Introduction to downstream processes

4.2 Criteria of selection of recovery process

4.3 Removal of Microbial cells – a) Foam Separation b) Precipitation

4.4 Filtration & Centrifugation

4.5 Cell Distruption – a) Physicomechanicalb) Chemical method

4.6 Extraction & Drying

Recommended Books :-

1. Biotechnology – Food Fermentation - Dr. S. K. Singh
2. Industrial Biotechnology - M. S. Rangannath & Shriram Shridhin
3. Food Microbiology - William Frazier, Dannise Westhoff
4. Food Biotechnology –S.N. Tripathy

DSE- E66: Dairy Technology- X

(2 Credits)

(Theory 72 Lectures)
Objectives

- To study the production of milk, management and processing
- To study development of different dairy products
- To study Dairy byproducts

Contents

Unit - 1 - Introduction of Dairy Technology (15L) (8M)

1.1 Development of milk processing industry in India present status & scope.

1.2 Dairy layout for small scale, Dairy design & sanitation layout

1.3 Dairy equipments & sanitation

Unit - 2 – Introduction of milk & primary processes (19L)(10M)

2.1 Food value & Composition of milk.

2.2 Factors affecting Composition of milk.

2.3 Buying, receiving, collection, Transportation of milk, storage & distribution of milk

2.4 Processing of milk, filtration, clarification, cream separation & heat treatment of milk

Unit – 3 – different Milk products (20L) (12M)

3.1 Milk product Processing – cream, Butter, Khoa , Paneer, Ice-cream, condensed milk & evaporated milk

3.2 Judging & grading of milk & its products

3.3 Manufacturing of Cheddar cheese – Introduction, Manufacturing process, packaging, storage, defects and their prevention

3.4 Dried milk products – Buttermilk powder, Whey Powder, IceCream mix Powder , Infant milk food, WMP& SMP

Unit – 4 – Byproducts Utilization(18L)(10M)

4.1 Introduction

4.2 Classification & Composition of byproduct

4.3 Principles & methods of Utilization – Whey utilization & whey based Beverages like lassi & buttermilk.

Recommend Books

1. outline of Dairy technology by Sukumar De
2. Yarpar, WJ & Hall, C. W. 1975 Dairy technology & Engineering AVI Westport
3. Warner J. M, 1976 Principles of Dairy Processing
4. Rosenthal, 1.1991.Milk &milk products. VCH, Newyork

DSE- E67: Bakery & Confectionary Technology- XI
(2 Credits)

(Theory 72 Lectures)
Objectives

- To study raw materials, plant and mationery
- To study the different bakery products and
- To study role of ingredients and processing technology of confectionery products

Contents

Unit – I – Introduction of Bakery raw material(16L) (8M)

1.1 Essential & optional ingredients

1.2 Role of ingredient

1.3 Baking principle -Caramelisation, Maillard browning

1.4 Introduction of bakery products &equipments

1.5 Effect of baking conditions

Unit - II – processing of bakery Products (18L)(10M)

2.1 Cake: Types, formulation & process, Principle of cake characters of cake

2.2 Bread: Formulation & process, principle of cake preparation,

2.3 Biscuits & cookies: Definition, difference, between biscuits & cookies, types of cookies & biscuits, Cracker & general defects

Unit – III – Confectionary products (19L)(11 M)

3.1 Introduction to Confectionary

3.2 Ingredients

3.3 Sugar boiled Confectionary – a) Crystalline b) Amorphous

3.4 Indian Confectionary

Unit – IV – Processing Confectionary products (19L)(11M)

4.1 Chocolate processing – Introduction, Types, methods of manufacture, its use, storage & general defects.

4.2 Hardboiled candy – Raw materials, method, defects & storage

4.3 Chewingum – Raw material, method, packaging

4.4 Indian Confectionary - Burfi, Pedha preparation

Recommended Books -

1. Technology of Confectionary , Chocolate, Toffee, Candy, Chewing gum, Lollipop, Jelly production
2. Food production operation - Ravindra Bali
3. International Cuisine and Food Production management – Parvindarbali
4. Bakery Science & Cereal technology - Neelam khetorpaul, Raj Grewal Sudesh wood
5. The Complete technique book on bakery production by Niir Board

DSE- E68: Food Quality Control & Waste Management-XII

(2 Credits)

(Theory 72 Lectures)
Objectives

- To study food safety and food quality management systems
- To study food analysis and waste management techniques

Contents

Unit – I – Introduction of Quality Control (16L)(10M)

1.1 Definition and importance of Quality control
Principles of Quality
1.2 Control

1.3 Quality attributes of Food – Nutritional quality, Microbial, Sensory

1.4 Sample & Sampling Method of Quality Evaluation

1.5 Quality assurance in Food Services System

Unit – II – Sampling & analysis of Foods (18L)(10M)

3.1 Sampling – Objectives, Guidelines, Methods

3.2 Hazards – Microbial, Physical, Chemical

3.3 Analysis of Food – Chemical: Moisture, Fat, Protein, Crude fibre
Microbial : DMC, Coliform determination

3.4 Ensuring safe Food

Unit – III – Food Standard laws and safety management (19L)(10M)

2.1 Food laws – HACCP, CCP, Codex, alimentarus Commission

2.2 ISO/22000: Food Safety managements system

2.3 Food Quality Management: Quality Management Principles

Unit – IV – Waste Management and Effluent treatment of Food industry(22L)(10M)

4.1 Introduction to Waste Management

4.2 Waste disposal – Types of Waste

4.3 Method of Waste disposal – Land filling, anaerobic, recycling digestion
Measurement of BOD & COD

4.4 Effluent treatment: Disposal in Sea, river, spray, Irrigation, land filling treatment, Trickling filers, Biological aerated filter, Fluidized bed system, Activated sludge process, aerobic & anaerobic digestion

4.5 Safe disposal of waste

Recommended Books :-

1. An introduction to Food Science and Technology & Quality management Devendra Bhatt & Priyanka Tomar
2. Food Quality Management - Manoranjan Kalia
3. Hand book of analysis & Quality Control - Rannanganna

Semester VI

DSE- F65: FoodBiotechnology – XIII

(2 Credits)

(Theory 72 Lectures)
Objectives

- To study applications of Biotechnology in food production and processing
- To study genetic enginnering, enzymes in food production and processing

Contents

Unit – I Biotechnology – Scope & Importance (16L) (10M)

1.1 Definition

1.2 Traditional & Modern biotechnology

1.3 Biotechnology of India & Global trends

1.4 Prevention of misuse of biotechnology

1.5 Potential of biotechnology

Unit – II – Tools of genetic engineering (17L(10M)

2.1 Basic requirement

2.2 Cutting & Joining of DNA

2.3 Cloning vectors

2.4 Techniques of genetic engineering, cloningmethods & DNA analysis

2.5 Genetically modified foods

Unit – III – Single cell protein & mushroom cultivation(19M) (10M)

3.1 Microorganisms used in SCP.

3.2 Substrates used nutritional value cultivation & uses

3.3 Historical Background & present status of Mushroom cultivation

Unit – IV – Enzyme Biotechnology (20M)(10M)

4.1 Definition & Properties of enzymes

4.2 Factors affecting activation & inhibition of enzymes

4.3 Isolation of enzymes producing microorganisms, strain development

Formulation & inoculums preparation

4.4 Purification of enzymes & their immobilization – Different type, Advantages & Disadvantages

4.5 Industrial production of protease, amylase & cellulose

Recommended Books

1. Knorr, D, 1982. Food biotechnology, Masel Dekker
2. Joshi V. K. & Pandey, A. Ed 1999 Biotechnology, Food Fermentation
3. Crueger, W& Crueger A 1984 Biotechnology - A Text book of Industrial Microbiology
4. Banis W. 1993 Biotechnology from A to Z Oxford Univer. Press. Oxford

DSE- F66 : Meat, Fish & Poutry Products Technology – XIV
(2 Credits)

(Theory 72 Lectures)
Objectives

- To study stucture , composition and slaughtering operations af meat, poultry
- To study Postmortem changes and major quality attributes
- Procesiing of meat, fish and poutry products

Contents

Unit – I – Importance of meat products (16L(10M))

1.1 Introduction & Importance of meat products in India

1.2 Chemical Composition & microscopic structure of meat

1.3 Pre-slaughter inspection of animal

1.4 Transportation, feeding of animal before slaughtering

Unit – II – Stunning & slaughter operations(20L)(10M)

2.1 Slaughtering of animal

2.2 Bones & cuts of Carcass

2.3 Quality and grading of meat

2.4 Post Mortom inspections

2.5 Meat tenderization, aging curring & rigour mortis , preservation of meat & Poultry products

2.6 Meat plant sanitation & safety

Unit –III – Egg & Egg products (18L)(09M)

3.1 Structure, composition, Nutritive value & functional properties of egg

3.2 Processing of Egg

3.3 Quality of egg & Egg Products

3.4 Effects of heat on egg proteins

Unit – IV- Seafood (18L)(11M)

4.1 Classification of Seafood

4.2 Types of fish

4.3 Composition and structure of Fish

4.4 Postmortem changes in Fish

4.5 Canning , smoking freezing & dehydration of fish

Recommended Books –

1. Technology of Meat Fish & Poultry products
2. Lawrie, R. A. 1975 meat science 2nd ed
3. Lavie. a. 1980 Meat handbook 4th edition AVI west port
4. Portsmouth J.I. 1979 Commercial Rabit meat production by Saiga Survey England
5. Stadelmen W.J Cotterill O.1977. egg Science &Technology

DSE- F67: Food Hygiene & Sanitation-XV

(2 Credits)

(Theory 72 Lectures)

Objective

- To study different food boen diseases and preventive measures
- To study Food sanitation and personal Hygiene

Contents

Unit – I – Contamination & Food Born Diseases (16L)(10M)

1.1 Introduction of sources of contamination

1.2 Classification of food according to ease which it spoils

1.3 Conditions & signs of spoilage in fresh, dry & Preserved food

1.4 Mode of transmission of disease &food born illness

1.5 Bacterial & Viral food intoxications

1.6 Naturally occurring intoxications

1.7 Food allergies, control of food bornillness

Unit – II – Personal Hygiene & safety (18L)(10M)

2.1 Necessity for personal hygiene, health of staff

2.2 Personal appearance, sanitary practices habits protective clothing

Importance of rest and exercise

2.3 Safety at the work place

Unit – III – Sanitary procedures & pest control (19L)(10M)

3.1 Importance of sanitary procedures in Food processing

3.2 Special Food Operations – Introduction, mobile food units, vending machines, street side foods and diseases

3.3 Cleaning procedures – Cleaning &sanitizing, their importance

3.4 Pest control – Importance, Classification of pest, effect of pesticides on pest & their methods of application, precaution to be taken while handling pesticides

Unit – IV – Food safety management (19L)(10M)

4.6 Introduction

4.7 Good manufacturing practices

4.8 Good laboratory practices

4.9 HACCP

4.10 ISO- 22000

Recommended book –

1. Food Hygiene & Sanitation - S. Roday
2. Hospitality industry handbook on Hygiene & safety – Lisa Gordomn – Davis
3. Principles of food sanitation – Norman G .Marriott & Gravani
4. Essentials of food sanitation – Norman G .Marriott &

DSE- F68: Food Packaging technology- XVI

(2 Credits)

(Theory 72 Lectures)

Objectives

- To study various food packaging materials and techniques
- To sudy handling and packaging of different foods

Contents

Unit – 1 – Introduction of Packaging (16L)(10M)

1.1 Introduction

1.2 Principles of packaging

1.3 Requirements of food packaging

1.4 Characteristics of Packaging materials

1.5 Basic Packaging material – paper, plastic, Polyethylene Aluminum Foil, glass, metals, & edible films, others

1.6 Effect of Packaging on nutritive value of food

Unit – II –General packaging of food products (18L)(10M)

2.1 Packaging of milk & milk product

2.2 Packaging of Fruits & Vegetables

2.3 Packaging of cereal & cereal products

2.4 Packaging of snack foods

2.5 Packaging of sugar & Confectionary

Unit – III – Modern Packaging system (19L(10M)

3.1 Machineries for Food Packaging

3.2 Controlled Atmosphere Packaging

3.3 Aseptic Packaging

3.4 Edible coating films

Unit – IV – Packaging laws & regulation (19L)(10M)

4.1 Introduction

4.2 SWMA

4.3 PFA Rules & AGMARK Rules

4.4 FPO Rules & MPO Rules

Recommended Books –

1. Modern packaging techniques by EIRI board
2. Hand book of Food packaging techniques by Eiri Board
3. Food processing & preservation by G. Subhulakshmi & Vdigir

List of Practical

1. Extraction of Chlorophyll
2. Extraction of Carotenoids
3. Estimation of free amino acids by Ninhydrin Method
4. Estimation of protein content of given food sample by MicroK Jaldhal method
5. Estimation of phenol content of given food sample
6. Estimation of crude fiber by Weendes methods
7. Estimation of pectin content of given food sample
8. Estimation of BOD of given sewage sample
9. Estimation of COD of given sewage sample
10. Estimation of inorganic phosphate by Fisk – Subbarao Methods
11. Determination of MPN (most probable Number) of given water sample
12. Estimation of some common food additives – Sulphur dioxide, Sodium benzoate colors
13. Analysis of wheat flour – alcoholic acidity, granularity of flour, crude gluten, total ash, pH value
14. Analysis of Biscuits – Moisture, ash content, acidity of extracted fat
15. Analysis of tea and roasted coffee – moisture, ash, tannin Caffine ,
16. Methods of analysis for sugar boiled confectionary and chocolates moisture, reducing sugar, Fat.
17. Isolation of *salmonella sp* from given Food sample

18. Isolation of *halophilic bacteria* from given Food sample
19. Isolation of mold from given food sample
20. Isolation of different microorganism from milk
21. Effect of physical and chemical agents on growth of bacteria – pH, temperature, Heavy metals antibiotics
22. Microbial sampling of air from various source e. g. indoor, outdoor, industrial area
23. Analysis of water by Presumptive, Confirmed and completed test
24. Isolation of *E. coli* from food sample and identification by IMVIC tes
25. Bacteriological analysis of milk – SPC
    a. DMC
    b. Reductase test
26. Determination of efficiency of Pasteurization by Phospatase test
27. Classifcation of various packages based pn material and rigidity
28. Measurment of thikness of paper and paper board.
29. Measurment of water absorbtion of paper and paper board.
30. Determination of GSM
31. Determination WVTR of Film
32. Syudy of Slaughtering methods of meat animals
33. Study of postmortem changes in meat
34. Preservation of meat by different methods
35. Quality evaluation of fish or prown
36. Evaluation of eggs for quality parameters
37. Preparation of fish products
38. Preparation of meat products
39. Preparation of egg products
40. Isolation of microorganisms from common food items- curd, bread, pickles and Spoiled foods
41. Effect of pH temp, substrate connection on amylase enzyme
42. Physico-chemical properties of grains
43. Determination of fat of milk by gerber method
44. Determination of SNF by lactometer method
45. Preparation of Cakes
46. Preparation of Cookies

47. Preparations of biscuits
48. Preparation of Bread
49. Preparation of Sugar Boiled Candy
50. Preparation of chocolate
51. Preparation of Paneer
52. Preparation of Rusgulla
53. Preparation of Gulabjamun
54. Preparation of Ice- cream
55. Preparation of Shrikhand
56. Preparation of Khoa
57. Preparation of Banana chips
58. Preparation of Resins
59. Preparation of Toffee
60. Preparation of mango lather
61. Preparation of different Soups
62. Preparation of Fermented food
63. Preparation of Grape wine
64. Preparation of tofu
65. Preparation of Sauerkraut
66. Sensory analysis of different food samples.
67. Preparation of different RTS
68. Preparation of necter
69. Preparation of cordial
70. Preparations of dried vegetables
71. Determination of physical properties of legumes/ oilseeds
72. Preparation of puffed legumes
73. Visit to slaughtring house
74. Visit to bakery and confectionery industry
75. Visit to rice milling industry
76. Visit to waste treatment plants at dairy and food industries
77. Visit to dairy

Nature of theory Examination and distribution of marks (Sem V and VI) (40 marks each Paper)

Q. 1 Multiple choice questions	**08 Marks**
Q. 2 Long answer questions Two out of Three (2x08)	**16 Marks**
Q. 3 Short notes Four out of six (4x4)	**16 Marks**
Total	**40 Marks**

Practical Examination of 200 Marks –

1. The practical examination will be conducted on three days for not less than five hours On each day of practical examination

2. Each candidate must produce a certificate from the head of the department in his / her College stating that he/ she has completed practical course in satisfactory manner on the down from time to time by A. C. on the recommendation of BOS and that laboratory journal has been properly maintained

3. Candidates have to visit at least two places of interest (food industry/ Dairy/ Research lab) Submit the report of their visit at the time of the examination. The report duly certified by Head of the department.

Distribution of marks for practical examination –

Questions Type	Marks
Q. 1. Principle writing	**20 Marks**
Q. 2. Preparation of fermented	**30 Marks**
Q. 3. Preparation of non fermented Food	**30 Marks**
Q. 4. Chemical analysis of food sample	**30 Marks**
Q. 5. Microbial analysis of food sample	**30 Marks**
Q. 6. Oral	**10 Marks**
Q. 7. Journal	**20 Marks**
Q. 8. Tour report	**10 Marks**
Q. 9. Project	**20 Marks**
Total	**200 Marks**