



**SOPHIA COLLEGE (AUTONOMOUS)**

Affiliated to

**UNIVERSITY OF MUMBAI**

**Programme: B.Sc.**

**Class: T.Y.B.Sc. Microbiology**

**Course : Applied Component**

**FOOD PRODUCTION AND PROCESSING**

**Programme code :SBSAPC**

(Choice Based Credit System with effect from the year 2018-2019)

Programme Outline: TYBSc APPLIED COMPONENT (SEMESTER V)

Course code	Unit No.	Name of Unit	Credits
SBSAPC503		FOOD PRODUCTION AND PROCESSING (General Principles)	2 Credits
	1	Food Science and Nutrition	
	2	Traditional Production Method	
	3	Principles of Food Processing	
	4	Principles and Methods of Food Preservation	
SBSAPCP503		PRACTICALS	2 Credits
	1	SECTION-1 (Practicals Based On Unit-I, II & III , IV Of SBSAPC503)	

Programme Outline: TYBSc APPLIED COMPONENT (SEMESTER VI)

Course code	Unit No.	Name of Unit	Credits
SBSAPC603		FOOD PRODUCTION AND PROCESSING (APPLICATIONS AND Q.A)	2 Credits
	1	Modern Methods of Food production	
	2	Production of Fermented Food and Beverages	
	3	Food Safety and Quality Assurance	
	4	Food Packaging	

SBSAPCP603		PRACTICALS	2 Credits
	1	(Practicals Based On Unit-I, II & III , IV Of SBSAPC603)	

### Preamble

The department of Microbiology at Sophia College was founded in 1966. Microbiology is the study of life and tentative life forms that cannot be viewed by the unaided eye. The microscopic life encompasses bacteria, protozoa, algae, fungi, and viruses. These organisms impact many aspects of plant, animal and human life and progress. The Undergraduate curriculum provides fundamental and applied aspects of Microbial life that impacts the rest of the biosphere.

The instructions methodology focuses on providing the fundamental basic information on Microbiology and progressing to the advances. Furthermore, there is emphasis on developing critical and analytical thinking and reasoning skills through problem solving in keeping with the changing times. The courses provide training in Genetics, Biochemistry, Medical Microbiology, Immunology, Bioprocess technology, Food Science and Environmental Science. This interdisciplinary approach helps learners meet the requirements of higher education, research and industry.

Applied Component was introduced by the University of Mumbai for the T.Y.B.Sc class in the academic year 1979-80 with a view to enhance essence for employability of the graduates of the University. Several combinations of Applied component subjects are available with Microbiology as a major course in the University of Mumbai. Under autonomy Sophia college students choosing to study Microbiology (both 6 units and 3 units) at T.Y.B.Sc level are offered Food Production and Processing as the applied component subject.

In the syllabus of this applied component, Food Production and Processing, applied topics having commercial importance have been incorporated which further adds to the enhancement of entrepreneurial potential and skills amongst the learners.

As mentioned in the outline of the syllabus, each semester (Semester –V & VI) consists of one theory and one practical course of 100 marks each.

### PROGRAMME OBJECTIVES

PO1	To introduce the learners to Basic and Applied Microbiology.
PO2	To build a strong knowledge base in the learner as well as impart sound practical skills in the subject.
PO3	To provide opportunities for logical thinking, and critical reasoning, such that the learners can handle the demands of higher education, industry and research.
PO4	To impart soft skills in learners thereby enhancing employability.

### PROGRAMME SPECIFIC OUTCOMES

PSO1	The learners will gain and apply knowledge of Genetics, Virology, Microbial Biochemistry, Medical Microbiology, Immunology, Cell Biology, Bioprocess technology, Environmental Microbiology, Food and Dairy Microbiology, etc to solve problems.
PSO2	The learners will acquire basic knowledge about scientific methodology, plan and execute experiments using good laboratory practices, and interpret the experimental results effectively.
PSO3	The students will undertake research projects, internships, visit industries, in order to become ready for higher studies, industry and research.
PSO4	The students will do value added courses in order to enhance their soft skills and employability.

## SEMESTER V

NAME OF THE COURSE	FOOD PRODUCTION AND PROCESSING (General Principles)	
CLASS	TYBSc	
COURSE CODE	SBSAPC503	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	25	75
PASSING MARKS	10	30

### COURSE OBJECTIVES:

CO 1	To revise the knowledge on nutritional values of food and its impact on the human health.
CO 2	To acquaint learners with the importance of a balance diet.
CO 3	To give an overview of the traditional methods of producing food.
CO 4	To give an insight into processing of basic foods.
CO 5	To familiarize learners with basic principles of food spoilage.
CO 6	To equip learners with various traditional, modern and advanced non thermal methods of preservation of foods.

### COURSE LEARNING OUTCOMES:

CLO 1	The learner will be able to acquire knowledge with respect to nutritional requirements of Humans.
CLO 2	The learner will be able to learn the basic principles of balanced diet and will be able to plan a balanced meal.
CLO 3	The learner will be able to relate certain disorders to specific nutritional deficiencies.
CLO 4	The learner will be able to give a comprehensive account of production of traditional foods and describe various techniques of processing of plant and animal based foods.
CLO 5	The learner will be able to choose suitable preservation methods and critically evaluate the effect of different processing on the nutritive value of foods.
CLO 6	The learner will be able to discuss emerging food preservation technologies and their

	potential applications in the food industry.
CLO7	The learner will be able to apply for various post graduate courses in food science/ technology, to build a career in food and allied industry.
CLO8	The learner will be able to engage in practical exercises and case studies to apply theoretical knowledge to real-world scenarios in food science and nutrition.

UNIT 1	Food Science and Nutrition (15 Lectures)
1.1	Chemical Nature, Source and Functions of Nutrients. Examples: Proteins, Carbohydrates, Fats, Minerals, Vitamins, Water, Fibre, Antioxidants and phytochemicals.
1.2	Food Additives – Intentional / Unintentional, general. Examples : Antioxidants, chelating agents, colouring agents, emulsions, flavours and flavour enhancers, flavour improvers, humectants and anticaking agents, leavening agents, nutrient supplements, non nutritive sweeteners, pH controlling agents
1.3	Energy Value of Foods. Methods of measurement of energy, value of nutrients – direct and indirect, basal metabolic rate – measurement and factors affecting BMR.
1.4	Adequate Diet : food guide
1.5	Nutritional Disorders due to deficiency and excess of Nutrients. Vitamin deficiency- pernicious anemia, scurvy, night blindness, rickets. Protein deficiency : Kwashiorkar, Mineral deficiency due to iron, iodine and calcium
UNIT 2	Traditional Production Methods (15 lectures)
2.1	Animal Food Production – Dairy farm management, Poultry farm management, Animal breeding
2.2	Methods of Plantation – Crop rotation, Farming practices, methods of irrigation, fertilizers- chemicals and microbial, Insecticides – Chemical and Microbial, Organic farming, Plant breeding techniques.
2.3	Aquaculture – General Principles, Prawn and Oyster farming
2.4	Foods of Microbial Origin- Mushroom – Agaricus and Pleurotus., SCP – Fungal, algal, bacterial.
UNIT 3	Principles of Processing of Foods (15 lectures)

3.1	Processing of cereal grains- milling, parboiling, flakes, puffs. Malting, starch extraction, gluten extraction. Pasta products.
3.2	Processing of Fruits and vegetables.- Jams, jellies, Squash. Ketchup, pickles and Sauce.
3.3	Processing of Pulses – Soya chunks
3.4	Processing of Oilseeds (extraction of oil)
3.5	Probiotic, Prebiotics, synbiotic foods .
3.6	Processing of Meat, Fish Eggs.- Aging, tenderizing, curing. Fish processing. Egg protein, egg foam.
3.7	Effect of processing on Nutritive Value of Foods- Newer methods of food processing- Microwave, high pressure, Ohmic heating, radiation sterilization, minimally processed foods.
UNIT 4	Principles and Methods of Food Preservation (15 Lectures)
4.1	Physical Methods- Blanching, pasteurization, canning. Chilling, freezing. Irradiation, dehydration.
4.2	Chemical Methods – salt, sugar, Na-benzoate, metabisulfite, citrate, acetate.
4.3	Emerging Preservation Technologies- Natural antimicrobials, hydrostatic pressure, electric pulse, light pulse, high magnetic pulse.

#### REFERENCES:

##### Semester V SBSAPC503

1. Sawhney S. K. And R Singh. 2005. Introductory Practical Biochemistry. Narosa Publ. Pvt Ltd.
2. Mudambi R and Rajagopal M. V. 2001. Fundamentals of food and nutrition. 4t Edi. New Age International Ltd. Publ.
3. Swaminathan M. Principles of Nutrition and Dietetics. 2<sup>nd</sup> Edn
4. Banerjee G. C. 1998. 8<sup>th</sup> Edn. Text book of Animal Husbandry.
5. Manay N. S., and Shadasaraswamy. 2001. Foods – facts and principles. 2<sup>nd</sup> Edn. New Age International Pvt Ltd
6. Sivasankar, B. 2004. Food processing and preservation 1<sup>st</sup> edition. Prentice-Hall of India Pvt.Ltd;
7. Srilaxmi B. 2015 Food Science 6<sup>th</sup> edn New Age International, New Delhi
8. Indian Food Industry. AFST Journals 2007

NAME OF THE COURSE	Applied Component - FOOD PRODUCTION AND PROCESSING (General Principles) Practical	
CLASS	TYBSc	
COURSE CODE	SBSAPCP503	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END PRACTICAL EXAMINATION
TOTAL MARKS	-	100
PASSING MARKS	-	40

#### COURSE OBJECTIVE

CO 1	To enable the learner to estimate the reducing sugar, protein and vitamin content of food.
CO2	To familiarize the learner with microbial species responsible for food spoilage.
CO3	To provide training in rapid platform tests for milk.
CO4	To produce and preserve tomato ketchup and jam.
CO5	To introduce the method for determining the MIC of preservative

#### COURSE LEARNING OUTCOMES



CLO 1	The learner will be able to estimate lactose content of milk & protein content of gram flour by colorimetric method & protein content of milk by titrimetry.
CLO 2	Estimation of Carbohydrates from milk and milk powder. The learner will be able to prepare and preserve tomato ketchup and mixed fruit jam and check the effectiveness of benzoate as added preservative .
CLO 3	Estimation of proteins from milk. The learner will be able to isolate microorganisms responsible for spoilage of various foods.
3	Estimation of Proteins from Gram flour
CLO 4	The learner will be able to perform an experiment to determine the MIC of salt, sugar and preservatives for the spoilage bacteria/yeast.
CLO 5	The learner will be able to perform rapid platform tests and interpret the results to comment on milk quality.
6	MIC of Salt, Sugar and other preservatives.
7	Detection of spoilage causing organisms.
8	RPT of Milk

## ASSESSMENT DETAILS

Internal assessment (25 marks)

Part 1: Test (20 marks)

- Students will be given a written test from any of the units for 20 marks. The duration of the test will be 50 minutes. (Multiple choice questions- 05 marks, Answer in one word/sentence - 05 marks, Subjective questions- HWY, Justify, Differentiate between, Diagrammatically etc. - 10 marks).

Part 2: Attendance (05 marks)

Semester end examination (75 marks)

- The duration of the paper will be two and a half hours.
- There shall be five compulsory questions
- Q1-4 shall correspond to the four units. Q1-4 shall contain an internal choice (attempt any 2 of 3 for Part A and any 5 of 8 for Part B ). Q1-4 shall carry a maximum of 15 marks (10 marks Part A and 05 marks for Part B)
- Q5 shall be from Units 1 to 4. Q5 shall carry a maximum of 15 marks (attempt

any 3 of 4)

Practical Assessment

(A) Internal Examination:-

There will not be any internal examination/ evaluation for practicals.

(B) External (Semester end practical examination) :- 100 marks

- The duration of the practical exam will be two days.
- To appear in the practical exam, students must bring a properly certified journal.

SEMESTER VI

NAME OF THE COURSE	Applied Component - Food Production and Processing (Applications and Q.A)	
CLASS	TYBSc	
COURSE CODE	SBSAPC603	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	25	75
PASSING MARKS	10	30

COURSE OBJECTIVES:

COURSE LEARNING OUTCOMES:

<del>CO 1</del>	The learner will be able to demonstrate an understanding of advanced methods in food production, including plant tissue culture, genetic engineering, and production of transgenic livestock and foods of microbial origin.
CO 2	To minimize the use of genetic engineering techniques in plant and animal based food production.
CLO 2	The learner will be able to list the applications of nanotechnology in food production.
<del>CO 3</del>	To highlight the process for preparation of popular fermented foods and alcoholic beverages, which include wine, beer, cheese, idli and oriental soy products.
CLO 3	The learner will be able to describe the production processes of fermented foods and beverages, which include wine, beer, cheese, idli and oriental soy products.
<del>CO 4</del>	To create awareness about microbial and non-microbial food hazards.
CLO 4	The learner will be able to identify the type and cause of food spoilage and food borne infections and diseases.
CO 5	To the significance of laws and standards related to food safety and quality.
<del>CO 6</del>	The learner will be able to discuss the role and types of food packaging materials and food organizations involved in ensuring food quality and safety.
CLO 6	The learner will be able to give an overview of the HACCP system in the food industry.
<del>CO 7</del>	To highlight the importance of food/nutritional labeling.
CLO 7	The learner will be able to compare the properties of food packaging materials and select suitable packaging material according to the food item.
CLO 8	The learner will be able to comprehend details mentioned on food packages.
CLO 9	The learner will be able to list different types of tests done for food packaging materials.

UNIT 1	Modern Methods of Food Production (15 Lectures)
1.1	General Methodology of Genetic Engineering.
1.2	Applications of Genetic Engineering – Modification of plant nutritional content, modification of plant taste and appearance.- plant yield, fruit ripening, edible vaccine
1.3	Plant Tissue Culture
1.4	Transgenic Animals
1.5	Nanotechnology
UNIT 2	Production of Fermented Foods and beverages (15 lectures)
2.1	Beverages : Wine and Beer

2.2	Milk products : Cheese(Cheeddar Camembert), Yoghurt
2.3	Animal Products : Fermented sausages
2.4	Plant Products: Idli
2.5	Fermented Soyabean Products – miso, tofu, soy sauce
2.6	Nutraceuticals
2.7	Probiotic foods
UNIT 3	Food Safety and Quality Assurance (15 lectures)
3.1	Principles of food spoilage- Physical, Chemical and Microbial
3.2	Microbial Food Hazards : – bacterial, fungal, protozoal, viral, emerging food pathogens.
3.3	Nonmicrobial Food hazards: - adulteration, natural/artificial colouring agents, metals, etc
3.4	Food analysis – Sensory, chemical, microbiological, rapid detection methods, CDC programs – pulseNet, FoodNet.
3.5	Safe Process Design and Operation – GMP, HACCP, Food Hygiene and sanitation, risk assessment, flow sheets
3.6	Food Standards and Laws- National, International legislation and agencies governing food and its quality
UNIT 4	Food Packaging and marketing (15 Lectures)
4.1	Functions and Requirements of Food Packaging
4.2	Types of Packages
4.3	Types of Food Packaging materials
4.4	Food package labeling : types and significance

4.5	Package testing parameters
4.6	Special feature packages

#### REFERENCES:

Semester VI SBSAPC603

1. Glick and Pasternak, 3<sup>rd</sup> Edi. ASM Press. Molecular Biotechnology- Principles and Applications of Recombinant DNA.
2. Kulkarni S. K. Nanotechnology : Principles and Practices. Capital Publ. Co.
3. Potter N. Hotchkiss J.H. 2007. Food Science. Indian edn: Springerlink publication.
4. Adams M. , Moss M., 2007. Introduction to Food Microbiology 3<sup>rd</sup> edn. New age international publishers.
5. Manay N. S., and Shadasaraswamy. 2001. Foods – facts and principles. 2<sup>nd</sup> Edn. New Age International Pvt Ltd

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### COURSE OBJECTIVES

CO 1	To introduce the colorimetric methods of estimating protein and antioxidants
CO2	To introduce the method for testing food samples for potential non microbial hazards.
CO3	To acquaint the learner with stages of Idli batter fermentation.
CO4	To demonstrate the rapid platform tests for milk
CO5	To survey the food packaging materials and forms available in the market for commercial packages.
CO6	To outline the plant tissue culture process

### COURSE LEARNING OUTCOMES

CLO 1	Practical to determine vitamin C content of fruit juices and iodine number of fat by titrimetric method.
CLO 2	The learner will be able to perform rapid platform tests and interpret the results to comment on milk quality.
CLO 3	The learner will be able to perform viable count of idli batter during stages of fermentation.
CLO 4	The learner will be able to perform viable count of idli batter during stages of fermentation. a. Effect of growth promoting substances on plant growth b. Mushroom cultivation
CLO 5	The learner will be able to classify food packages and correlate the physical tests done to evaluate specific properties of packaging materials
CLO 6	Determination of Iodine number. The learner will be able to define the terms related to plant tissue culture
5	Study of Microbial fermentation of Idli batter DMC, SPC, LAB count, Titratable acidity ( 2 to 8 hrs incubation)
6	Food adulteration
7	Types of Packaging material
8	Testing of packaging material
9	Study of Probiotic food samples.

## ASSESSMENT DETAILS

Internal assessment (25 marks)

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