SOPHIA COLLEGE FOR WOMEN (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 2023-2024)

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 Methods of Food Production	
	3	Basic Principles of Food Processing	
	4	Food Spoilage and 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 (Advanced methods, Applications and Quality Assurance)	2 Credits
	1	Advanced Methods of Food production	
	2	Contemporary and functional foods	
	3	Food Safety and Quality Assurance	
	4	Food Packaging	
SBSAPCP603		PRACTICALS	2 Credits
	1	SECTION-2 (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, the Sophia college students choosing to study Microbiology 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	Applied Component - 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 TOTAL MARKS PASSING MARKS	INTERNAL ASSESSMENT 50 20	SEMESTER END EXAMINATION 50 20

COURSE OBJECTIVES:

CO 1	To revise the knowledge on nutritional values of food and their 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 methods of preservation of foods.

CO7	To introduce emerging technologies in food preservation and their applications.

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 understand 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 identify the type and cause of food spoilage
CLO 6	The learner will be able to discuss the principle and applications of common food preservation methods and accordingly choose an appropriate method for preserving specific food.
CLO 7	The learner will be able to discuss emerging food preservation technologies and their potential applications in the food industry.

UNIT 1	Food Science and Nutrition (15 Lectures)
1.1	Source and Functions of Nutrients. :Proteins, Carbohydrates, Fats, Minerals, Vitamins, Water, Fibres, Antioxidants and phytochemicals.
1.2	Nutritional Disorders due to deficiency and excess of nutrients.
1.3	Vitamin deficiency- pernicious anaemia, scurvy, night blindness, rickets. Protein deficiency : Kwashiorkor, Mineral deficiency due to iron, iodine and calcium.
1.4	Energy Value of Foods. Methods of measurement of energy, value of nutrients – direct and indirect, basal metabolic rate – measurement and factors affecting BMR.
1.5	Balanced Diet : food guide.
1.6	Effect of processing on nutritive value of food : Food additives (examples of Anti-caking agents Antioxidants, Emulsifiers , Colours, Humectants, Flavours, Flavour enhancers , Thickeners, Stabilisers,

	Glazing agent, Gelling agents, Raising agents) , ill effects of food additives.
UNIT 2	Traditional Methods of Food Production (15 lectures)
2.1	Overview of Agricultural Methods– Crop rotation, Farming practices, methods of irrigation, Plant breeding techniques.
2.2	Fertilisers and Insecticides - chemicals and microbial, Organic farming.
2.3	Animal Food Production – Overview of Dairy farm management and Animal breeding, Poultry farm management.
2.4	Aquaculture – General Principles.
2.5	Production of Fermented foods: Idli, Bread, Alcoholic Beverages (Champagne), Cheese (Swiss), Soya Sauce.
UNIT 3	Basic Principles of Foods Processing (15 lectures)
3.1	Processing of cereal grains - Rice : milling, parboiling, flakes, puffs. Wheat : Pasta products.
3.2	Processing of Fruits and vegetables - Jams, Ketchup.
3.3	Processing of Coffee, Tea, Cocca.
3.4	Oil extraction from seeds, refining, hydrogenated oils.
3.5	Milk processing: Production of butter.
3.6	Processing of Eggs: Mayonnaise
3.7	Newer Techniques of food processing: Microwave Processing, Ohmic heating, Minimal Processing of Fruits and Vegetables.
UNIT 4	Food spoilage and Food Preservation (15 lectures)
4.1	Principles of food spoilage: Types and causes - Physical, Chemical and Microbial spoilage. Overview of factors affecting shelf life of food.

4.2	Physical Method of food preservation: Principle and Applications High temperature - Blanching, Pasteurization, Canning; Low temperature - Refrigeration, Freezing (Quick & slow), Dehydration, Freeze drying.
4.3	Chemical Methods of food preservation : Principle and applications Inorganic and organic chemical preservatives.
4.4	Emerging Preservation Technologies: Use of Irradiation, High hydrostatic pressure, electric pulse, light pulse, Natural antimicrobials.

REFERENCES:

Semester V

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2. Mudambi R and Rajagopal M. V. 2001.**Fundamentals of food and nutrition**. 4th Edn. New Age International Ltd.
3. Manay N. S. and Shadasaraswamy, 2008, **Foods –facts and principles**, 3rd Edn. New Age International Pvt Ltd.
4. Shivshankar B, 2005, **Food Processing and Preservation**, Eastern Economy Edn. Prentice Hall of India Pvt. Ltd.
5. Shrilaxmi B, 2003, **Food Science**, 3rd Edn. New Age International Publishers.
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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 choose appropriate method of preservation for controlling growth of spoilage bacteria (heating / Chemical preservative)
CO4	To produce and preserve tomato ketchup and jam.
CO5	To acquaint the learner with stages of Idli batter fermentation.
CO6	To acquire the skill of writing a diet plan and a report highlighting the drawbacks of food additives.

COURSE LEARNING OUTCOMES

CLO 1	The learner will be able to estimate lactose & protein content of milk, Vitamin C content of fruit juice, and iodine number of fat.

CLO 2	The learner will be able to count total no. of microorganisms, lactic acid bacteria in fermented Idli batter.
CLO 3	The learner will be able to isolate microorganisms responsible for spoilage of various foods
CLO4	The learner will be able to perform an experiment and interpret the TDP , TDT and MIC of preservatives for the spoilage bacteria/yeast.
CLO 5	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 6	The learner will be able to formulate a balanced diet plan for a specific group of people (sportsmen, pregnant women/lactating mothers or diabetic individuals) and Critically evaluate effects of chemical additives in food through a report writing.

Sr. no.	**Title of the Practical**
1	Estimation of lactose content of milk.
2	Estimation of Proteins content of milk.
3	Determination of Iodine number of fat.
4	Estimation of Vitamin C content of fruits.
5	Study of Microbial fermentation of Idli batter : DMC, LAB count, Titrable acidity.
6	Demonstration of Effect of growth promoting substances on plant growth.
7	Detection of organisms causing spoilage of vegetables/fruits/eggs.
8	Determination of TDP and TDT value for spoilage bacteria.
9	MIC of chemical preservatives (benzoate/metabisulphite).
10	Preparation of Ketchup/ Preparation of Jam.
11	Assignments: Report on A) Balanced diet for specific group B) food additives / preservatives present in any one commercial product and their effect on human health. (5+5 =10 marks in practical exam).

ASSESSMENT DETAILS:

Internal assessment (50 marks)

- Test (25 marks)-Students will be given a test from any of the units for 25 marks. The duration of the test will be 50 minutes. (Multiple choice questions- 10 marks, Answer in one word/sentence - 05 marks, Subjective questions - HWY, Justify, Differentiate between, Diagrammatically etc. - 10 marks.)
- An activity for 25 marks would be given in the form of a creative learning process. (Powerpoint presentation, Report, Assignment on question banks, Model making and presentation, Infographic poster presentation and viva, Analytical problems on higher order thinking, constructing crosswords, video making, any other activity)

Semester end examination (50 marks)

- The duration of the paper will be two hours.
- There shall be five compulsory questions.
- Q1-4 shall correspond to the four units. Q1-4 shall contain an internal choice (any two out of four). Q1-4 shall carry a maximum of 10 marks.
- Q5 shall be from Units 1 to 4. Q5 shall carry a maximum of 10 marks (attempt any 5 out of 10)

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 (Advanced methods, Applications and Quality Assurance)	
CLASS	TYBSc	
COURSE CODE	SBSAPC603	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD TOTAL MARKS PASSING MARKS	INTERNAL ASSESSMENT 50 20	SEMESTER END EXAMINATION 50 20

COURSE OBJECTIVES:

CO 1	To impart knowledge on recent trends in food production.
CO 2	To familiarize learners with the use of genetic engineering techniques in plant and animal-based food production.
CO 3	To introduce the concept of functional foods and their health benefits.
CO 4	To create awareness about microbial and non-microbial food hazards.
CO 5	To highlight the significance of contemporary laws and standards related to food safety and quality.
CO 6	To give a comprehensive account of various types of food packaging materials and forms
CO 7	To highlight the importance of food /nutritional labeling.

COURSE LEARNING OUTCOMES:

CLO 1	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.
CLO 2	The learner will be able to list the applications of nanotechnology in food production.
CLO 3	The learner will be able to describe the production processes and quality aspects of contemporary and functional foods, including beverages, milk products, animal products, and functional foods.
CLO 4	The learner will be able to discuss the role and responsibilities of national and international organizations involved in ensuring food quality and safety.
CLO 5	The learner will be able to give an overview of the HACCP system in the food industry.
CLO 6	The learner will be able to compare the properties of food packaging materials and select suitable packaging material according to the food item.
CLO 7	The learner will be able to comprehend details mentioned on food packages.
CLO 8	The learner will be able to list different types of parameters tested for food packages.

UNIT 1	Advanced Methods of Food Production (15 Lectures)
1.1	Plant Tissue Culture: methods and applications in agriculture.
1.2	Genetic Engineering: General Methodology.
1.3	Applications of Genetic Engineering in agriculture: a. Modification of plant nutritional content. b. Modification of plant taste and appearance. c. Plant yield, fruit ripening, d. GM Foods: Brinjal, Tomato, golden rice, e. Edible vaccines.
1.4	Transgenic livestock for enhanced nutrition and food production.
1.5	Foods of Microbial origin: Mushroom production, SCP, Spirulina.
1.6	Applications of Nanobiotechnology: a. Use of nanoparticles for delivery of bioactive constituents, b. Nanoencapsulation.

UNIT 2	Contemporary and Functional foods (15 lectures)
2.1	Beverages: Sports and energy drinks
2.2	Milk products: Frozen desserts.
2.3	Animal Products: Meat processing & Ready to eat products (sausages/ salami)
2.4	Breakfast Cereals, Pulses – Soya chunks.
2.5	Functional Foods and their bioactive constituents: a. Green tea, b. Dark chocolates, c. Flax seeds, d. Fish oils, e. Rice bran oil.
2.6	Prebiotics and Probiotics.
2.7	Artificial sweetners, Gluten free and lactose free formula diet.
UNIT 3	Food Safety and Quality Assurance (15 lectures)
3.1	Food Hazards: a. Microbial – bacterial, fungal, protozoal, viral, emerging food pathogens. b. CDC programs – PulseNet, FoodNet.
3.2	Food hazards: a. Nonmicrobial b. Intentional, Incidental adulteration, c. PFA act
3.3	Food analysis: a. Sensory analysis, b. Microbiological analysis c. rapid detection methods d. Sampling plans.
3.4	Safe Process Design and Operation – HACCP
3.5	Food Standards and Laws: National, International legislation and agencies governing food and its quality. ISI, AGMARK, FSSAI, ICMSF, Codex Alimentarius, ISO22000

UNIT 4	Food Packaging (15 lectures)
4.1	Functions and Requirements of Food Packaging
4.2	Types and forms 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 / Innovative packages

REFERENCES:

Semester VI **SBSAPC603**

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eBook ISBN: 9780128128299 Academic Press and AOCS Press January 18, 2019

Additional References

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2. FSSAI Manuals and booklets :
https://fssai.gov.in/creativecatalogue/display?dispalyTypeId=3
   - o The Purple book- Diet and diseases
   - o Food safety Magic Box
   - o DART
   - o Food Safety on Wheels : Operational manual
   - o Guidance Document On Food Safety Management Systems: HACCP implementation
3. FSSAI video library:
https://fssai.gov.in/fssaivideolibrary/allepisodeList?seriesId=16
4. CDC website: https://www.cdc.gov

Semester VI

NAME OF THE COURSE	Applied Component - Practical FOOD PRODUCTION AND PROCESSING (Advanced methods, Applications and Quality Assurance)Practicals	
CLASS	TYBSc	
COURSE CODE	SBSAPCP603	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD TOTAL MARKS PASSING MARKS	INTERNAL ASSESSMENT - -	SEMESTER END PRACTICAL EXAMINATION 100 40

COURSE OBJECTIVES

CO 1	To acquaint the learner with methods of estimating protein and antioxidants
CO2	To acquire expertise in analyzing food samples for potential microbial and non microbial hazards.
CO3	To familiarize the learner with FSSAI manual for microbiological analysis of food.
CO4	To provide training in rapid platform tests for milk.
CO5	To survey the food packaging materials and forms available in the market for commercial packages.

COURSE LEARNING OUTCOMES

CLO 1	The learner will be able to determine nutritional content of food in terms of its protein content by biuret method /antioxidant content by phosphomolybdate method.

CLO 2	The learner will be able to test food samples for presence of adulterants
CLO 3	The learner will be able to perform rapid platform tests and interpret the results to comment on milk quality.
CLO 4	The learner will be able to develop competence in using the FSSAI manual to analyze microbiological quality of ice cream samples.
CLO 5	The learner will be able to classify food packages and correlate the physical tests done to evaluate specific properties of packaging materials

Sr. no.	**Title of the Practical**
1	Estimation of Protein content of SCP.
2	Estimation of antioxidants by phosphomolybdate method.
3	Mushroom cultivation.
4	Isolation of Probiotic microorganisms in commercial food samples.
5	Microbiological analysis of icecream/kulfi (as per standards).
6	RPT for milk.
7	Detection of Food adulteration.
8	Types of Packages.
9	Testing of packaging material.
10	Detection of organisms responsible for food infection /intoxication from raw foods. (Project work: 10 marks for report in practical exam).
11	Visit to the Plant Tissue Culture Centre.

ASSESSMENT DETAILS:

Internal assessment (50 marks)

- Test (25 marks)-Students will be given a test from any of the units for 25 marks. The duration of the test will be 50 minutes. (Multiple choice questions- 10 marks, Answer in one word/sentence - 05 marks, Subjective questions - HWY, Justify, Differentiate between, Diagrammatically etc. - 10 marks.)
- An activity for 25 marks would be given in the form of a creative learning process. (Powerpoint presentation, Report, Assignment on question banks, Model making and presentation, Infographic poster presentation and viva, Analytical problems on higher order thinking, constructing crosswords, video making, any other activity)

Semester end examination (50 marks)

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