

Sant Gadge Baba Amravati University, Amravati

Part A

Faculty: Science & Technology

Programme: B Sc with Food Science

POs:

Students of undergraduate general degree programme at the time of graduation will be able to -

PO1. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, check out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest contexts socio-technological changes.

PSOs:

Students can be able to-

1. Gain insight of food science including the history and fundamental properties of food
2. Acquire the skill in the use and care of basic food Science laboratory equipment
3. Perform basic laboratory procedures in food science.
4. Understand the integral role of food science and different branches of food science related subjects.
5. Acquainted with the basic chemistry of food

Employability Potential of the Programme:

It has been a long felt necessity to align higher education with the emerging needs of the economy so as to ensure that the graduates of higher education system have adequate knowledge and skills for employment and entrepreneurship. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner to produce holistic and well groomed graduates.

Food Science is a branch of science that deals with study of food regarding its chemistry, benefits, nutrition, biochemistry, quality control, processing, etc. It includes the study of food related with basic and applied sciences related with the food industries, adulteration and Government recognized agencies

The cumulative demand for trained and skilled manpower in the area of food science requires in-depth functional knowledge of modern food science and related subject through hands-on training for the students. The syllabus has been prepared to anticipate the requirement of students under the CBCS program. The contents have been drawn to accommodate the widening horizon of the food science discipline and reflect the changing needs of the students. The detailed syllabus for each paper is appended with a list of suggested readings. The degree of Bachelor of Science in Food Science (Choice Base Credit

system) aims to explore various aspects of Food Science and interdisciplinary subject to the students. The program in Food Science as one of the core subjects is designed to cultivate a scientific attribute and interest in the modern area of Food Science and related subjects in particular and life science in general. This will help the students to become critical and curious in their outlook.

The course is designed to impart the essential basics of Food Science at the initial level of graduation. The basic course is infused with application in modern life science, and awareness of Food Science and its influence on human life. The integration of various courses in the program is aimed to develop proficiency in theory as well as practical experiments, common equipment, and laboratory, along with the collection and interpretation, and presentation of scientific data in a proper manner.

Besides this, the students will be equipped with knowledge in the newer area of food science and its application in different sectors like nutrition, food production, processing, and preservation, food adulteration, hygiene, and sanitation, food laws and regulations, food microbiology, and sensory evaluation. This will create awareness about Food Science and its contribution to food science in society. At the end of the course, the students are expected to have good working knowledge in the field of food science and in addition knowledge gained from a course interdisciplinary in nature.

Food Science overcomes challenges in food production, processing, and preservation. The production of value-added food products is the greatest example. Almost all food industries need pure water. The bacterial quality of water is tested by a food scientist. The food industry provides large scope for food Scientists. Our students have occupied jobs in different food industries. Food Scientist always helps in introducing technology that aims to enhance the production, processing, packaging, and preservation of food production.

Students will surely have an urge to continue higher studies in Food science and contribute significantly to the development. The present syllabus is restricted to anticipating the future needs of food Science with more emphasis on imparting hands-on skills. The main thrust is laid on making the syllabus compatible with developments in education, research, Industrial, and Govt. sectors. The theory and Practical course in the new restructured course will lead to impart skill set essential to further food Science.

After completion of the B.Sc. in Food science, students can do post graduation in Food and nutrition, food technology, and Food Science at different institutes and universities. Some examples are Kolhapur University, Paul University, Pune University, SNDT Mumbai and PGTD of Home Science, Sant Gadge Baba Amravati University, Amravati.

Summarized Carrier opportunities after doing B.Sc. with subject food science:

Student opting for B. Sc. Food science subject have opportunities in the field of food and nutrition as well as technology. Some of the avenues are listed below,

1. Teaching: Teaching profession can be chosen in the colleges and other institutions offering the courses related to food science, nutrition, catering and hotel management as well as nursing
2. In food Industries: As shift supervisors, production officers/ managers, quality control analyst, research scientist, purchasing, and marketing personals
3. In hospitals: As dietitians
4. In Government sectors: Food analysts (Food and Drugs)
5. In hotel industries: Chef, supervisors
6. Entrepreneurship: There is huge market of food and food products. Many food manufacturing units can be started in low investment as compared to other industries. So By completing these subjects they can start production of many products such as fruits candies, squash, juices, jams, jelly, ketchup, pickles, canned vegetables, bakery and confectionaries, spices, Indian snacks (Farsan, chevda, shev, chakli, etc.), potato, banana chips, milk and milk products, etc.

Part B
Syllabus Prescribed for 1st Year UG Programme
Programme: B Sc
Semester 1

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
FSC1-T	Fundamentals of Food Science	90

Cos

After completion of this course the student will able to

- Understand different types of foods and their nutritional importance regarding health
- Classify food in different groups and explain its functions
- Calculate body mass index (BMI)
- Understand the unit system and convert the unit in various systems
- Differentiate between types of acids and solutions
- Prepare different solutions of various concentration
- Understand structures of atoms and molecules

Course Module	Unit	Content
DSC	Unit I	Introduction to food science Definitions with examples: food, nutrients, Macro, and Micro nutrients, nutrition, balance diet; Body Mass Index (BMI) calculation and importance; under nutrition and malnutrition; Recommended Dietary Allowance (RDA); Functions of food; Food groups; food pyramid, Units and Quantities: fundamental and derived units (mass, length, time, volume, area, force, pressure, density, temperature, heat, energy, and specific gravity). Introduction to various systems of units (SI, CGS, MKS, FPS) and their inter-conversions (for mass, length, time, volume, and density) with numerical problems (15 periods)
	Unit II	Physical properties of food (Definitions): boiling point, melting point, smoke point, osmosis, reverse osmosis, humidity, vapor pressure, surface tension, viscosity, evaporation, freezing point (their units if applicable) Dispersions: solutions, solute, solvent, suspensions, and colloids, definitions & differences Colloids: sol, gel, emulsions, foams, and their examples Solutions: types of solutions, saturated, unsaturated & supersaturated solutions, Total soluble solids; definition of brix; Introduction of refractometer and its handling (15 periods)
	Unit III	Acids & bases: definitions and examples (organic and inorganic), pH & pH scale, indicators, pH meter, examples of acidic and basic food Buffer: definitions, characteristics, mechanism of buffer action, examples of some important buffers in food science Mole concept: Structure of atom; atomic number and weight; molecular and equivalent weight and their calculation; mole, Avogadro's no. Measurement of concentrations: percent concentration, ppm, molarity,

		normality, molality, and their calculation. (15 periods)
	Unit IV	Cereals, millets, and pulses Introduction, types, composition (important nutrients), general structure, names, identification of cereals in some important languages (scientific, English, Marathi, and Hindi) Wheat- structure, composition, types (Hard, soft, strong, weak) Rice – structure, composition, types Pulses- Introduction, types, structure and composition, names and identification of cereals in Indian languages, toxic constituents in pulses, soaking, germination and decortications of pulses Malting of cereals and legumes- Definition and nutritional advantages (15 periods)
	Unit V	Fruits and vegetables: Introduction, classification, general composition; Names of common fruits and vegetables in important languages; Post harvest changes, ripening of fruits and vegetables; chemical ripening of fruits and effects of chemicals on health Spices, nuts, and oilseeds: Classification, composition, identification, names in important languages, nutritional importance (15 periods)
	Unit VI	Milk: Introduction, composition, and nutrition importance Types of milk: whole milk, skimmed milk, semi-skimmed milk, condensed milk, fortified milk, low fat milk, evaporated milk, dried milk, toned milk, etc. Fermentation and coagulation of milk; whey and its composition; Introduction to milk products such as curd, butter, ghee, butter-milk, paneer, yogurt, and cheese Meat: Introduction, types (beaf, mutton, pork, and chicken), composition, and nutrition; Egg: structure, composition, and nutrition; Characteristics of fresh eggs, Fish and other sea food: Introduction, composition, and nutrition (15 periods)
SEM		<ul style="list-style-type: none"> • Calculation of BMI for different persons • Identification and classification of local food stuffs in the various food groups • Solving the numerical problems based on units and their inter-conversion from one system to another, Normality, Molarity, etc. • Preparation of saturated and supersaturated solutions using different solutes and solubility study • Preparation of buffer solution with different pH • Preparation of solutions of different normality and molarity
	Cos of SEM:	By the end of this module students will be able to 1. Apply the laws of nutrition 2. Analyze and solve the problems related to units, BMI, etc. 3. Classify food in different groups
	**Activities	1.Assignment 2. Seminars 3 Task 4. Project

Course Material/Learning Resources

1. Chemistry, 4th edition, John McMurry, Pearson Education
2. Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers.
3. Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006
4. Nutrition Science; B. Srilakshmi; New Age International Publisher.
5. Fundamental of Biochemistry; Dr. A. C. Deb; Center Book Agency.
6. Fundamental of Biochemistry; J.L. jain, Sanjay Jain; C. Chand.
7. Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited.
8. Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
9. Food Science & Nutrition; Sunetra Roday; Oxford University Press.
10. Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited.
11. Food Chemistry; L. H. Meyer.
12. Food Science; N. N. Potter.
13. Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
14. Nutrition & Dietetics, Edition (I & II), Subhangini Joshi.
15. Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.
16. Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997)

Sant Gadge Baba Amravati University, Amravati
Syllabus Prescribed for First Year UG Programme
Programme: B.Sc.

Semester 1

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicum/hands-on/Activity)	(No. of Periods/Week)
FSC1-P	Food Science	06/week/batch

COs

At the end of the Lab/Practical course, the students will be able to

1. Acquire the skills in the use and care of basic Food Science equipments.
2. Determine the temperature of substances and interconvert them in various systems
3. Prepare standard solutions of various concentrations
4. Perform basic laboratory procedures such as heating, stirring, titrations, etc.
5. Identify various basic food commodities with their common names and groups
6. Understand and Perform germination process

*** List of Practical/Laboratory Experiments/Activities etc.**

1	Calculation of BMI by taking the actual measurements
2	Measurement of density and specific gravity of various liquid food like water, juices, milk, buttermilk, etc.
3	Determination of temperature and their inter conversion in various systems
4	Determination of boiling point of milk, water, etc.
5	Introduction and demonstration of various instruments used in food laboratory like refractometer, pH meter, digital balance, hot air oven, muffle furnace, incubator, etc.
6	Preparation of saturated and supersaturated solutions
7	Preparation of solutions of given normality, molarity, and percentage

8	Standardization of solution
9	Determination of titrable acidity and pH of given liquid food
10	Identification of cereals, legumes, fruits & vegetables, oil seeds, nuts and spices with their names in important languages (Hindi, Marathi, English)
11	Testing of quality of eggs by simple observation methods
12	Study of soaking and germination process of cereals and legumes

Distribution of Marks for Practical Examination:-

Time: 5 hrs (One Day Examination)

Total marks: 50

A) Exercise No. 1	15 Marks
B) Exercise No. 2	15 Marks
C) Viva voce	10 Marks
D) Practical Record	10 Marks

Syllabus Prescribed for 1st Year UG Programme

Programme: B Sc

Semester 2

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
FSC2-T	Fundamentals of Food Chemistry	90

Cos

After completion of this course the student will able to

- Understand importance of carbohydrates, proteins, fats, vitamins, and minerals in diet and health
- Compare the functions and importance of various constituents of food in diet
- Classify the proximate food constituents as well as vitamins and minerals
- Draw the structures of mono, di, poly saccharides
- Compare the functions of various food constituents
- Relate the mono unit with its polymer

Course Module	Unit	Content
DSC	Unit I	Introduction to food chemistry Carbohydrates: Introduction, definition, Functions, and classification (monosaccharide, disaccharide, polysaccharide) Classification & types of monosaccharide, disaccharides, polysaccharides & their example Structure of glucose, fructose, and galactose; Haworth ring structure, Structure of disaccharides (sucrose, maltose, lactose) Importance of glycosidic bond Physical & chemical properties: Sugars & non-sugars difference, reactions of reducing groups, action of alkalies, acids, oxidation, reduction, reaction of hydroxyl group etc. of monosaccharide & disaccharides (15 periods)
	Unit II	Structure of polysaccharides: starch, glycogen, cellulose & hemicelluloses, and pectic substances Physical & chemical properties of polysaccharides (action of alkalies, acids, oxidation, reduction, reaction of hydroxyl group etc.) browning reaction (enzymatic & non-enzymatic browning). Dextrinization, retrogradation, gelatinization, functions of starches (thickeners, emulsifiers, paste clarity etc), modified starches used in industry Pectins and gums: role in food products and applications (15 periods)
	Unit III	Proteins: Introduction, definition, functions (static & dynamic), and food sources Classification- on the basis of functions, properties (simple, conjugated, derived), and nutritional value (complete, incomplete, partially incomplete) Structure of proteins: primary, secondary, tertiary, and quaternary; peptide bond; Physical properties of proteins: denaturation (definition, characteristics, and causes); coagulation of protein; functional properties of proteins Names of proteins found in common foods (milk, meat, eggs, wheat, soy

		etc) and their importance Amino acids: introduction, definition, composition, general structure Essential & non essential amino acid, food sources of essential amino acids (15 periods)
	Unit IV	Lipids: Introduction, definition, composition, and sources Classification: simple, compound, derived, and miscellaneous lipids with examples Physical properties of fats & oils, iodine number and saponification number, difference between fats & oils, deterioration (rancidity) Fatty acids: essential, non essential, saturated, unsaturated fatty acids, general formula for fatty acids, functions of fatty acids & lipids Important physical and chemical properties of fats, oils and fatty acids (15 periods)
	Unit V	Vitamins: definition, introduction & classification of vitamins Functions, sources and deficiency symptoms of vitamins Minerals: definition, introduction & classification of minerals Functions, sources and deficiency symptoms of minerals iron, calcium, phosphorous, sodium, potassium, iodine & magnesium (15 periods)
	Unit VI	Pigments in food like Chlorophyll, Flavanoids, Anthocyanins, Anthoxanthins, and their importance Water: functions of water in body, importance of water in processing of food (as a solvent, catalyst, lubricant, temperature regulator) Composition of ground water, mineral water, distilled water Hardness of water, water activity and shelf life of food, bound and unbound water Phytochemicals: Introduction, importance, and examples (15 periods)
SEM		<ul style="list-style-type: none"> • Handling and caring of different instruments used in Food Science laboratory • Identification and classification of some common sugars • Study of the solubility of sugars • Study of gelatinization of starch • Differentiate between oils and fats based on their properties • Preparation of emulsions from some oils/fats • Study of coagulation of milk protein
	COs:	By the end of this module students will be able to 1. Apply physical properties to identify various proximate components of food 2. Analyze various chemical properties of food
	**Activities	<ol style="list-style-type: none"> 1. Assignment 2. Seminars 3. Task 4. Project

Course Material/Learning Resources

1. Food- Nutrition and Health, Vijaya Khader, Kalyani Publishers.
2. Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co. Ltd, Bangalore. 2006
3. Nutrition Science; B. Srilakshmi, New Age International Publisher.
4. Fundamental of Biochemistry, Dr. A. C. Deb, Center Book Agency.
5. Fundamental of Biochemistry, J.L. Jain, Sanjay Jain, C. Chand.

6. Food Science, Sumati R. Mudambi, Shalini M. Rao, New Age International (P) Limited.
7. Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition, S. Ranganna.
8. Food Science & Nutrition, Sunetra Roday, Oxford University Press.
9. Food Facts & Principle, Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited.
10. Food Chemistry, L. H. Meyer.
11. Food Science, N. N. Potter.
12. Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press – An Imprint of Elsevier, San Diego, California
13. Nutrition & Dietetics, 1st and 2nd Edition, Subhangini Joshi.
14. Basic principle of nutrition, Seema Yadav, Anmol Publication Pvt. Ltd. New Delhi (1997)

Sant Gadge Baba Amravati University, Amravati
Syllabus Prescribed for First Year UG Programme
Programme: B.Sc.
Semester 2

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicu m/hands-on/Activity)	(No. of Periods/Week)
FSC2-P	Food Science	06/week/batch

COs

At the end of the Lab/Practical course, the students will be able to

1. Understand the various methods of estimation of nutrients
2. Differentiate the qualitative and quantitative estimation
3. Understand the principles of chromatography
4. Perform the various types of titrations
5. Measure the hardness of water
6. Evaluate the properties of oil samples

*** List of Practical/Laboratory Experiments/Activities etc.**

1	Estimation of ash content in food samples
2	Qualitative analysis of carbohydrates
3	Qualitative analysis of amino acids
4	Estimation of reducing sugars in food sample
5	Study of the effect of temperature on solubility of sugar
6	Separation of amino acids by chromatography
7	Estimation of acid value of oil sample
8	Estimation of saponification value of oil sample
9	Estimation of total fat by Soxhlet apparatus
10	Estimation of calcium in a food sample
11	Estimation of moisture content of food
12	Determination of hardness of water
13	Estimation of vitamin C

Distribution of Marks for Practical Examination:-

Time: 5 hrs (One Day Examination)	Total marks: 50
E) Exercise No. 1	15 Marks
F) Exercise No. 2	15 Marks
G) Viva voce	10 Marks
H) Practical Record	10 Marks