

Sant Gadge Baba Amravati University

Faculty of Science and Technology

Syllabus and Scheme

of

Teaching, Learning, Examination and Evaluation

Under NEP-2020

For

B.Sc. in FOOD SCIENCE

(3 Years UG Course)

Semester III and IV

Commenced from 2024-25

Implemented w.e.f. 2025-26

Submitted by Board of Studies

Biochemistry including Microbiology and Food Science

THREE YEARS UNDERGRADUATE PROGRAM

B. Sc. FOOD SCIENCE under FACULTY: SCIENCE AND TECHNOLOGY

Board of Studies in Biochemistry including Microbiology and Food Science

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Sant Gadge Baba Amravati University, Amravati
NEP Syllabus
UG Programme

Faculty: Science and Technology

Programme: B.Sc. (Food Science) (Semester III and IV)

Programme Outcomes (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 centered 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.

Programme Specific Outcomes (PSOs):

After completing the programme with subject Food Science the Students can be able to-

1. Gain insight into 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

➤ **Transferable Skills:**

During the course student will develop skills other than laboratory skills that are transferable across the number of career areas. These are:

- Analytical skill

- Report writing skill
- Presentation skill
- Time management
- Creative thinking
- Problem solving
- Planning
- Observational skill

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 related with 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 food science and related subject through hands-on training. The syllabus has been prepared to anticipate the requirement of students under the NEP-2020. The contents have been drawn to accommodate the widening horizon of the subject 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 with Food Science (NEP-2020) aims to explore various aspects of Food Science and interdisciplinary subjects. The program in Food Science as one of the core subjects is designed to cultivate a scientific attribute and interest in the area of Food Science and related subjects. 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. 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 and its application in different sectors like nutrition, food production, processing, and preservation, adulteration, hygiene & sanitation, food laws and regulations, food microbiology, etc. This will create awareness and contribution of 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 the interdisciplinary courses.

Food Science overcomes the challenges in food sector. 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. 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 the subject 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. with 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.

Hence, Board of Studies in Biochemistry (Including Microbiology and Food Science) in its meeting held on 16/12/2023 resolved to accept the revised syllabus for B. Sc. I Semester I and II (Food Science) based on Choice Based Credit System (CBCS) as per NEP guidelines. The detailed syllabus for each paper is appended with a list of suggested readings.

Examination, Evaluation and Assessment Scheme

Vertical No.	The Vertical	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal			
			Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
a	Major	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	25	10	25	10	50	20
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--					--	--	50	20	50	20
	SEC	Internal	--	--					--	--	50	20	50	20
e	AEC(Eng.& OneMIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS(Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
f	Internship/ Apprenticeship	Internal	Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum 50 marks per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process shall be prescribed separately.											
	FP/CEP													
	CC													

Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)
SECOND YEAR: SEMESTER – III

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/ Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	a.	Major Food Science	Theory 3	116211	Food Chemistry I	2	2	10
			Theory 4	116212	Food Chemistry II	2	2	
			Lab/ Practical-8	116213	Practical approach to food chemistry	2	4	
		IKS- Major specific	Theory	116214	IKS in Food Science	2	2	
	b.	Minor/	Theory 3	116215	Fundamentals of food chemistry	2	2	6
			Lab/ Practical-9	116216	Laboratory techniques in food chemistry	2	4	
	c.	Generic/ Open Elective	Theory 5	116217	Overview to food and nutrition	2	2	2
	d.	VSC	Lab/Practical-10	116218	Techniques in food chemistry	2	4	4
	e.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/ CES	Project	116219	FP/CES in Food Science I	2	4	8
		CC	Outdoor			2	4	
		TOTAL				22	32	32

Course: B.Sc II Semester III (Food Science)

116211 Major Theory 3: Food Chemistry I							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116211	Food Chemistry I	2	30	2Hrs	30

Course Objectives	- To acquaint the students with the basic concepts of food chemistry. - To update the students about chemical composition of food and nutrients - To impart knowledge regarding the chemical properties of Food			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize carbohydrates in different categories - Imagine the structure of carbohydrates and protein - Distinguish between glycosidic and peptide bonds - Classify protein, and amino acids - Identify food sources of carbohydrates and proteins			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Carbohydrates	Introduction and importance of Food chemistry Carbohydrates: Introduction, definition, food sources, Functions, & classification with examples Structure of glucose, fructose, galactose, Structure of disaccharides (sucrose, maltose, lactose) Importance of glycosidic bond Sugars & non-sugars difference, reactions of reducing groups	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Polysaccharides	Structure of polysaccharides: starch, glycogen, cellulose & hemicelluloses, pectic substances Physical & chemical properties of polysaccharides (action of alkalies, acids, oxidation, reduction, etc.) browning reaction; Dextrinization, retrogradation, gelatinization of starch Food sources	7 Hrs	7 Marks	
Unit III Proteins	Proteins: Introduction, definition, functions (static & dynamic), composition, food sources Classification- on the basis of functions, properties (simple, conjugated, derived), nutritional value (complete, incomplete, partially incomplete) Structure of proteins: primary, secondary, tertiary & Quaternary. Denaturation and coagulation of proteins	8 Hrs	8 Marks	

Unit IV Amino acids	Physical and functional properties of proteins, 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	7 Hrs	7 Marks	
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997) • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions 1. Define carbohydrate 2. What is reducing sugar? 3. What is non-reducing sugar? 4. What is total sugar? 5. Give some examples of reducing sugar 6. Give example of non-reducing sugar 7. Give the linear structure of glucose 8. Give the linear structure of fructose 9. What is starch? 10. What is cellulose? 11. Define polysaccharides 12. What are the types of browning reaction? 13. Define protein 14. Name the bond involved in protein 15. What are amino acids? 16. Give any two examples of amino acids 17. What are complete protein Long Answer Questions 1. Differentiate between glucose and fructose 2. Give the ring structure of glucose and fructose 3. Give the structure of sucrose. Why it is a non-reducing sugar?			

	4. Give the classification of monosaccharides 5. Draw the structure of starch 6. Differentiate between starch and glycogen 7. Compare sugars and non-sugars 8. Classify carbohydrates 9. Classify polysaccharides 10. Classify amino acids 11. Classify protein according to their functions 12. Classify protein according to their structure 13. Differentiate between essential and non-essential amino acids 14. Explain the browning reaction with example 15. Compare protein and amino acids 16. State the importance of protein 17. What is denaturation of protein? Explain with example
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Course: B.Sc II Semester III (Food Science)

116212 Major Theory 4: Food Chemistry II							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116212	Food Chemistry II	2	30	2Hrs	30

Course Objectives	- To acquaint the students with the basic concepts of food chemistry. - To update the students about chemical composition of food and nutrients - To impart knowledge regarding the chemical properties of Food						
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize lipids on the basis of structure - Categorize antioxidants, phytochemicals and pigments - Distinguish between the above said food constituents - State the importance of lipids, vitamins, minerals, and other biomolecules - Classify vitamins and minerals						
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies			
Unit I Lipids	Lipids: Introduction, definition, composition, sources Classification: simple, compound, derived and miscellaneous lipids & their examples. Structure of lipids Physical properties of fats & oils, iodine number and saponification number, difference between fats & oils, deterioration (rancidity)	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions			
Unit II Fatty acids	Fatty acids: Introduction, classification (essential, non essential, saturated, unsaturated, mono-saturated, poly-unsaturated) Structure, properties, Functions, importance, and food sources of fatty acids (omega 3,6,9 fatty acids) important physical and chemical properties	7 Hrs	7 Marks				
Unit III Vitamins and minerals	Vitamins: Introduction & classification of vitamins; Functions, sources and deficiency symptoms of vitamins Minerals: Introduction & classification of minerals; Functions, sources and deficiency symptoms of minerals iron, calcium, phosphorous, sodium, potassium, iodine & magnesium	8 Hrs	8 Marks				
Unit IV Antioxidants, phytochem	Introduction to Antioxidants, phytochemicals, and pigments. Definition, classification, types, functions and food sources of	7 Hrs	7 Marks				

icals and Pigments	Antioxidants, phytochemicals, and pigments			
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997) • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions 1. What are triglycerides? 2. What are oils? 3. State saturated fatty acids 4. Give the examples of saturated fatty acids 5. State unsaturated fatty acids 6. Give the examples of unsaturated fatty acids 7. Define pigments 8. Define antioxidants 9. Define phytochemicals 10. Give examples of pigments 11. Give examples of antioxidants 12. Give examples of phytochemicals 13. State the fat soluble vitamins 14. State the water soluble vitamins 15. Give the examples of macronutrients 16. Define vitamins 17. Define minerals 18. What are micro minerals Long Answer Questions 1. State the functions of lipids 2. Classify lipids with examples 3. Compare fats and oils 4. Give the classification of fatty acids 5. What are omega three fatty acids? Give its food sources 6. State the importance of antioxidants in nutrition 7. State the importance of pigments in nutrition 8. State the importance of phytochemicals in nutrition			

	9. Classify phytochemicals with examples 10. Compare fat and water soluble vitamins 11. Give the function, deficiency symptoms, and food sources of vitamin A 12. Give the function, deficiency symptoms, and food sources of vitamin C 13. Give the function, deficiency symptoms, and food sources of any two minerals 14. Give the function, deficiency symptoms, and food sources of calcium 15. Give the function, deficiency symptoms, and food sources of fat soluble vitamins 16. Differentiate between micro and macro minerals 17. Give the food sources of antioxidants, phytochemicals and pigments
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester III (Food Science)

116213 Major Lab 8: Practical approach to food chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116213	Lab 8: Practical approach to food chemistry	2	60	2 Hrs	25+25

Course Objectives	• To train the students in basic techniques in Food Chemistry. • To educate students about constituents of food and their chemistry • To introduce the students to handling and working of common equipments used in the Food Science laboratory.
Course Outcomes	After completion of this course students will be able to • Handle various equipments in Food Science laboratory • Estimate the various constituents in food sample • Determine chemical properties of food • Prepare solutions for various experiments

List of Practical

1. Preparation of solutions
2. Standardization of solutions
3. Study of simple titration
4. Qualitative analysis of carbohydrates
5. Qualitative analysis of amino acids
6. Estimation of reducing sugar
7. Estimation of non-reducing sugar
8. Separation of amino acids by paper chromatography
9. Estimation of vitamin C in given sample
10. Estimation of calcium in given food sample
11. Determination of saponification value of given oil sample
12. Determination of acid value of given oil sample
13. Qualitative analysis of phytochemicals
14. Estimation of calcium

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asian Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc II Semester III (Food Science)

116214 IKS Major Specific Theory: IKS in Food Science							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5	III	116214	IKS in Food Science	2	30	2Hrs	30

Course Objectives	- To understand the indigenous knowledge of food science - To explore ancient food practices and their relevance with modern food science - To impart knowledge regarding classification of food from Indian ancient history - To study the basic concepts of Ayurved and food			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize food on the basis of Ayurvedic knowledge - Describe the types of prakruti and food - Justify the importance of Indian indigenous knowledge and its current relevance - Discuss the classification of food			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Foundatio n of IKS	Introduction to the core principles of IKS. The concept and classification of "Ahara" (food) in ancient philosophy (Vedic & Ayurvedic, Jain, and buddhist) Understanding food combinations (Viruddha Ahara) and their effects. Dinacharya (daily regimen) and Rutucharya (seasonal regimen) in relation to diet	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Principles of Food and Digestion	The Tridosha theory (Vata, Pitta, Kapha) and its relation to food. "Agni" (digestive fire) and its importance in nutrient assimilation. Understanding the concept of "Pathya" (wholesome) and "Apathya" (unwholesome) foods. The importance of fasting (Upvasa) and its spiritual and physical benefits.	7 Hrs	7 Marks	
Unit III Jain and Buddhist Dietary Principles	The concept of "Sattvik" diet in Jainism and its relation to Ahimsa. Detail of permitted and prohibited foods in Jain diet. Understanding the rationale behind avoiding root vegetables. Understanding the connection between diet and the "three poisons" in Buddhism (greed, hatred, delusion). The concept of "middle way" in dietary	8 Hrs	8 Marks	

	habits. Variations in dietary practices across different Buddhist traditions (Theravada, Mahayana, Vajrayana). The significance of vegetarianism and veganism in Buddhist practice.			
Unit IV Traditional Food Processing	Exploration of the nutritional properties of native Indian grains, pulses, fruits, and vegetables. The role of spices and herbs in enhancing nutritional value and promoting health. Ancient Indian methods of food preservation (e.g., fermentation, drying, pickling). Traditional cooking techniques and their nutritional impact. The use of traditional pottery and cooking vessels.	7 Hrs	7 Marks	
References	• Hindu Dietary Practice: Vedic Guidance for Feeding the Body , Mind, and Soul , Kiran Atma and Jai Krishna ponnappan, Paantheon , 2023 • Traditional and Ayurvedic Foods of Indian Origin , Science Direct , 2015 • Monks Cookbook, Himalayan Academy , Himalayan Academy 1997 • Encyclopedia of Hinduisim , Kapil Kapoor, Rupa & co, 2012 • Tridosha theory of Ayurveda: Role of Vata, Pitta, kapha in maintenance of Health , Dr. Kavita Vyas , Independently , 2020. • Tridosha made Easy: The Basic Ayurvedic Principle , Dr. Vaidya Vasant patil , 2019 • The Ayurveda Encyclopedia: Natural Secrets to Healing, prevention and Longevity, Awami Sada Shiva Tirtha , Ayurveda Holistic . 2007 • The spiritual Benefits of Fasting: a Practical handbook, Shanta Durga, Independently, 2023. • The Mind of Clover: Essays in Zen Buddhist Ethics, Robert Aitken, North Point Press, 1984. • Buddhist Vegetarianism: A Noble way of Living , Venerable Master Hsing Yun , Buddha's Light Publishing , 2010. • The Surangama Sutra, Buddhist Text Translation Society , Buddisht Text Translation Society, 2009. • Buddhist Ethics: A Very short Introduction, Damien Keown, Oxford University Press , 2005. • Ahimsa: Buddhism and the Vegetarian Ideal, Bodo Balsys, Motilal Banarsidass, 2004 • The Complete Book on Fruits, Vegetables and Food Processing, NIIR Board of Consultants 7 Engineers, National Institute of Industrial Research, 2006. • Indian Foods: AAPI's guide to Nutrition, Health, and Diabetes, AAPI (American Association of Physicians of Indian Origin), AAPI , 2011. • Traditional Indian Functional Foods, Ramesh V. Bhat and K. V. Raghuram, NIN, India, 1995. • Handbook of Food Preservation, M. Shafiur Rahman, CRC Press, 1999.			

	• Tiffin: 500 Authentic Recipes Celebrating India's Regional Cuisine, Sonal Ved, Roli Books, 2018.
Model Questions	Short Answer Questions 1. Define Ahara as per Jain philosophy 2. Define Ahara as per Hindu philosophy 3. What is Viruddha Ahara? 4. What is Rutucharya? 5. Name the Tridosha 6. What is Kapha? 7. Define Pathya 8. Define Upavas 9. Define Sattvik aahar 10. According to Buddhism what are the three poisons? 11. Which philosophy suggest the middle way in dietary habits? 12. What is Mahayana? 13. Name some traditional spices 14. Name the ancient methods of food preservation 15. Define herbs 16. Name the Indian native grains 17. List the traditional cooking techniques Long Answer Questions 1. Elaborate the concept of Ahara in Jainism 2. Elaborate the concept of Ahara in Buddhism 3. state the effects of Viruddha Ahara 4. Explain Dinacharya and its importance 5. Give the core principles of IKS 6. Explain the Tridosh theory in brief 7. Describe the importance of Agni in digestion 8. Differentiate between Pathya and Apathya 9. Elaborate the physical benefits of Upavas 10. Elaborate the spiritual and mental benefits of Upavas 11. Describe the Sattvik Ahara in brief with examples 12. Justify the importance of avoiding root vegetables 13. Explain the concept of three poisons in Buddhism 14. Explain the dietary practices of different Buddhist tradition 15. Describe the significance of vegetarianism in Buddhism 16. Give the nutritional properties of millets 17. Explain the role of spices in health and nutrition 18. Explain pickeling 19. Describe the ancient methods of food preservation in brief 20. Explain the benefits of copper and iron vessel in cooking 21. Describe the importance of Ghee

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester III (Food Science)

116215 Minor Theory 3: Fundamentals of Food Chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116215	Fundamentals of Food Chemistry	2	30	2Hrs	30

Course Objectives	- To know the need and importance of study of food chemistry - To update the students about chemistry of different types of foodstuffs - To impart knowledge regarding the structure of different food constituents - To recall the students regarding the chemical reactions of food constituents			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize various constituents of food - Explain the importance chemistry of each constituent such as carbohydrate, protein, lipids, vitamins and minerals - Justify the importance of chemical reactions by the various constituents of food. - Discuss the structure of various food constituents - Justify the nutritional and commercial role of these constituents			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Carbohydrates	Introduction to Food chemistry Carbohydrates: Introduction, functions, and classification with examples Structure of glucose and fructose Sugars & non-sugars difference Browning reaction, dextrinization, retrogradation, and gelatinization of starch	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Protein and amino acid	Proteins: Introduction, functions, and food sources Classification- on the basis of functions, properties, and nutritional value Primary, secondary, tertiary & quaternary structure of proteins Amino acids: introduction, structure, and composition; Essential & non essential amino acid	7 Hrs	7 Marks	
Unit III Lipids	Lipids: Introduction, functions, and food sources Classification and Structure Physical properties and difference between of fats & oils Fatty acids: Introduction and classification (essential, non essential, saturated, unsaturated, mono-saturated, poly-unsaturated)	8 Hrs	8 Marks	
Unit IV	Vitamins: definition, introduction &	7 Hrs	7 Marks	

Vitamins and minerals	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			
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions 1. Define carbohydrate 2. What is reducing sugar? 3. What is non-reducing sugar? 4. What is total sugar? 5. Give some examples of reducing sugar 6. Give example of non-reducing sugar 7. Give the linear structure of glucose 8. Give the linear structure of fructose 9. What is starch? 10. Define polysaccharides 11. Define protein 12. Name the bond involved in protein 13. What are amino acids? 14. Give any two examples of amino acids 15. What are complete protein 16. What are triglycerides? 17. What are oils? 18. State saturated fatty acids 19. State unsaturated fatty acids 20. Give the examples of unsaturated fatty acids 21. State the fat soluble vitamins 22. State the water soluble vitamins 23. Give the examples of macronutrients			

	24. Define vitamins 25. Define minerals 26. What are micro minerals? Long Answer Questions 1. Differentiate between glucose and fructose 2. Give the structure of sucrose. Why it is a non-reducing sugar? 3. Give the classification of carbohydrates 4. Differentiate between starch and glycogen 5. Compare sugars and non-sugars 6. Classify polysaccharides 7. Classify amino acids 8. Classify protein according to their functions 9. Classify protein according to their structure 10. Differentiate between essential and non-essential amino acids 11. Explain the browning reaction with example 12. State the importance of protein 13. What is denaturation of protein? Explain with example 14. State the functions of lipids 15. Classify lipids with examples 16. Compare fats and oils 17. Give the classification of fatty acids 18. Give the function, deficiency symptoms, and food sources of vitamin A 19. Give the function, deficiency symptoms, and food sources of vitamin C 20. Give the function, deficiency symptoms, and food sources of any two minerals 21. Give the function, deficiency symptoms, and food sources of calcium 22. Give the function, deficiency symptoms, and food sources of fat soluble vitamins 23. Differentiate between micro and macro minerals
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester III (Food Science)

116216 Minor Lab 9: Laboratory Techniques in food chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116216	Lab 9: Laboratory Techniques in food Chemistry	2	60	2 Hrs	25+25

Course Objectives	- To educate students about food constituents and their chemistry - To train the students in basic techniques in Food Chemistry. - To introduce the students common equipments of Food chemistry laboratory. - To educate the students to determine chemical properties of food
Course Outcomes	After completion of this course students will be able to - Handle various equipments in Food Science laboratory - Estimate the various constituents in food sample - Determine chemical properties of food - Prepare solutions for various experiments

List of Practical

1. Preparation of solutions
2. Standardization of solutions
3. Study of simple titration
4. Qualitative analysis of carbohydrates
5. Qualitative analysis of amino acids
6. Estimation of reducing sugar
7. Estimation of non-reducing sugar
8. Separation of amino acids by paper chromatography
9. Estimation of vitamin C in given sample
10. Estimation of calcium in given food sample
11. Determination of saponification value of given oil sample
12. Determination of acid value of given oil sample

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc II Semester III (Food Science)

116217 Open Elective Theory 5: Overview to Food and Nutrition							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116217	OE-5: Overview to Food and Nutrition	2	30	2Hrs	30

Course Objectives	- To provide fundamental knowledge of food and nutrition - To understand the role of nutrients in human health - To learn about food groups, dietary guidelines and meal planning - To study food safety, preservation m and processing techniques - To explore the relationship between nutrition and disease prevention			
Course Outcomes	After completing this course, students will be able to : - Understand the fundamental principles of food and nutrition - Explain the significance of different nutrients in the human body - Identify sources and functions of macronutrients and micronutrients - Explain deficiency diseases associated with nutrient imbalance - Categorize different food groups and their nutritional importance - Plan a balanced diet for individuals with different nutritional needs - Explain food processing techniques and their effects on nutrition			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Introducti on to nutrition	Introduction to food and nutrition. Energy value of food. Unit of energy. Basic concepts of nutrients: macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins, minerals) Functions of food and importance of a balance diet: Food pyramid	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Macro and micronutri ents	Sources, functions, requirement and deficiency disorders of carbohydrates, proteins and fats Importance of dietary fibers and water	7 Hrs	7 Marks	
Unit III BMR and RDA	Sources, functions, requirement and deficiency disorders vitamins and minerals; Basal metabolic rate: definition, factors influencing BMR Recommended dietary allowance (RDA)	8 Hrs	8 Marks	
Unit IV Food groups and meal planing	Food groups: 5-7 food groups Dietary guidelines for different age groups Meal planning and balanced diet Special dietary considerations for pregnancy, lactation and elderly people Malnutrition and over nutrition	7 Hrs	7 Marks	
References	Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M,			

	The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Contemporary Nutrition; Wardlaw, G. M. Smith, A. M. • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Food Science; Srilakshmi, B. • Fundamentals of Food and Nutrition; Mudambi, S. R. , Rajagopal M. V. • Introduction to Food Science; Parkar, R.S. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.
Model Questions	Short Answer Questions 1. Define food and nutrition 2. What are macronutrients? Give Examples 3. What are the functions of carbohydrates? 4. Name two deficiency diseases caused by vitamins and minerals deficiency 5. List the food groups and their importance 6. What is balanced diet? 7. Explain the term RDA (Recommended Dietary Allowance)What are the Function of dietary fiber? 8. What is the importance of water in the human body 9. Define over nutrition and under nutrition Long Answer Questions 1. Discuss the importance of food and nutrition in human health 2. Explain the functions, sources and deficiency symptoms of proteins , carbohydrates and fats 3. What are micronutrients? Discuss the role of vitamins and minerals in human health 4. Describe the classification and functions of food groups 5. Explain the principles of meal planning and balanced diet formulation 6. Discuss the role of dietary fiber in digestion and overall health Explain the causes and consequences of over nutrition 7. Discuss the significance of hygiene and sanitation in food handling and storage

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester III (Food Science)

116218 VSC Lab/Practical 10 : : Techniques in food chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.0	III	116218	VSC : Techniques in food chemistry	2	60	2Hrs	50

Course Objectives

- To train the students to identify the food sources of various nutrients
- To impart the skill of determining various chemical properties of food
- To make students eligible to prepare solutions for various experiments
- To educate the students to apply the skills in chemical analysis of food

COs: Upon completion of this course successfully, students will be able to

- Do focus on all the above objectives
- Determine chemical composition of food
- Distinguish between the various constituents of food
- Expertise in the preparation of solutions
- Apply the knowledge for chemical analysis of various food items

List of practical

1. Preparation of solutions for the various estimations
2. Study of chemical properties of carbohydrates
3. Demonstration of physical properties of sugars and non-sugars
4. Identification of the carbohydrate present in the given food item qualitatively
5. Identification of the amino acid present in the given food item qualitatively
6. Determination of total sugar in the given fruit juice
7. Identification of the vitamin C rich fruit juice from the given juice samples
8. Identification of the oil sample by its saponification value
9. Identification of pigments in the food by its color
10. Identification of the phytochemicals in the given food sample
11. study of gelatinization of starch
12. Study of denaturation of protein
13. Differentiation between oil and fats from its physical properties

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

Internal Evaluation for VSC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Course: B.Sc II Semester III (Food Science)

116219 Field Project (FP)/ Community Engagement Service (CES): FP/CES in Food Science I							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116219	FP/CES I: FP/CES in Food Science I	2	60	--	50

Course Objectives:	- To provide practical, hands on experience, in the field of study, allowing them to apply theoretical knowledge to real-world situations or address Real-World Problems. - To enhance various skills such as, research, interpretation and analytical skills and strengthening their critical thinking and problem-solving abilities. - To foster engagement with a specific social issue or area of study, address specific challenges or needs within a community. - To Improve Collaboration, Communication among students and facilitate knowledge transfer and Enhance Engagement with Social issues.
Course Outcomes:	Upon successful completion of this course, students will be able to: - FP/CES can help students to develop their practical, technical skills and a deeper understanding of their subject matter and how it applies to real-world situations. - They learn to identify, analysis, and interpretation of complex problems using their knowledge and develop research skills. - Students gain insight into social issues and the role of various governmental schemes for the welfare of people and explore new ideas and approaches. - They learn to work effectively in teams and collaborate with others to achieve common goals and contributing to community's socio-economic improvements

As per NEP 2020, students of B Sc. II of Semester III need to perform a Field Project (FP)/ Community Engagement Service (CES) for TWO (2) credits i.e. 50 Marks. The guidelines/ SoP regarding the FP/CES are as follows:

- 1) The total time allocation for the student to carry out FP/CES is 60 hours.
- 2) Students should participate in FP/CES under the supervision of faculty.
- 3) Assigning the FP/CES topics to individual students or groups of students (4 to 5 students in one group) and one faculty member from the department will act as Guide for the student or group of students.
- 4) CES may include awareness programs, public talk/ lectures, workshops, blood testing camps, vaccination drives in collaboration, surveys etc
- 5) For a SURVEY based FP/CES, related questionnaire (15 or more questions) should be prepared. The departmental coordinator/guide should check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative.
- 6) If the project is related to laboratory work that does not involve survey work, then the questionnaire part can

be replaced accordingly (e.g. Sample collection/Data analysis Experimental). The student should compile all the relevant data and carry out its analysis in laboratory. 7) A project report should be written individually in the standard format (2 Copies): Index, Introduction, Materials, Methods, Result, Conclusion/output, References (Numeric citation type) etc. The report should be of minimum 6 pages (excluding Title page, Certificate, Index, Acknowledgement etc.) Submit the project report with the Guide's signature to the department. 8) Students should maintain the documentation and record properly which includes dairy, photographs, certificates, feedback of beneficiaries, news in local paper if any. 9) A CES report should be written individually in the standard format (2 Copies): Index, Introduction, details of activities, photographs, signature sheets of beneficiaries, feedback of beneficiaries, own feedback, summary /output, etc. It should submit with the Guide's signature to the department. 10) The oral /poster presentation for all the FP/CES should be arranged in the department. To evaluate the project, examiner should be appointed by HoD. 11) The total work for FP/CES including preparation of questionnaire to presentation should be evaluated for 2 credits (50 Marks).	
References	1. https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf 2. https://en.wikipedia.org/wiki/OU_Citizen_Science_Soil_Collection_Program 3.
Model Questions:	NA

Distribution of Marks and the scheme of FP/CES Evaluation as follow:

Sr. No	Evaluation type	Marks
1	Student performance	20
2	FP/CES Report	20
3	Presentation (PPT or Poster)	10
Total		50

Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)
SECOND YEAR: SEMESTER – IV

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	a.	Major Food Science	Theory 5	116220	Food Biochemistry	2	2	8
			Theory 6	116221	Food Microbiology	2	2	
			Lab/ Practical-11	116222	Practical approach to food biology	2	4	
	b.	Minor/	Theory 4	116223	Fundamentals of Food Biology	2	2	6
			Lab/ Practical-12	116224	Simple techniques in food biology	2	4	
	c.	Generic/ Open Elective	Theory 6	116225	Food quality and sensory evaluation	2	2	2
	d.	VSC	Lab/ Practical-10	116226	Techniques in food chemistry	2	4	8
		SEC	Lab/ Practical-11	116227	Skills in Food Science	2	4	
	e.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/ CES	Project	116228	FP/CES in Food Science II	2	4	8
		CC	Outdoor			2	4	
		TOTAL				22	34	34

Course: B.Sc II Semester IV (Food Science)

116220 Major Theory 5: Food Biochemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116220	Food Biochemistry	2	30	2Hrs	30

Course Objectives	• To acquaint the students with the basic concepts of food biochemistry. • To update the students about digestion and metabolism • To impart knowledge and importance of enzymes			
Course Outcomes	Upon completion of this course successfully, students will be able to • Categorize digestion process of different food constituents • Classify the enzymes • Distinguish between the organs in GI tract and their functions • Understand the importance of metabolism • Classify digestion and absorption			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Digestion and absorption	introduction to digestion and absorption Overview of the digestive system (organs and their functions) mechanism of absorption digestion and absorption of carbohydrates, proteins and fats in mouth stomach and intestine with the enzymes involved	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Enzymes	Introduction and some basic definition regarding enzymes specificity and inhibition of enzymes IUB classification of enzymes factors affecting enzyme activity mechanism of enzyme action	7 Hrs	7 Marks	
Unit III Metabolism of lipids and proteins	Introduction to Lipid Metabolism Beta-oxidation: Breakdown of fatty acids for energy production; Synthesis of fatty acids Introduction to protein metabolism Protein synthesis; Deamination and transamination Overview to Urea cycle	8 Hrs	8 Marks	
Unit IV Metabolism of carbohydrates	introduction to the metabolism of carbohydrates cycles of carbohydrate metabolism overview to glycolysis, glycogenesis, glycogenolysis, and gluconeogenesis energetics of carbohydrate metabolism	7 Hrs	7 Marks	
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New			

	Delhi (1997) • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Biochemistry, S. C. Bhatia and Tuhina Verma , Shree Publishers & Dist. • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science; N. N. Potter. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad. • Fundamental of Biochemistry; Dr. A. C. Deb; Center Book Agency. • Fundamental of Biochemistry; J.L. jain, Sanjay Jain; C. Chand. • Textbook of Biochemistry; Dr. Mn Chatterjee, Dr. Rana Shinde; Jaypee Brothers. • Laboratory Techniques in Food Analysis; D. Pearson; Butterworths. • Principle of Biochemistry; Lehninger AL, New Delhi Kalyani • Textbook of Biochemistry; G. R. Agrawal. • Biochemistry Wesr E S Biochemistry , Delhi Oxford New Delhi • A Dictionary of Biochemistry Sharma J L New Delhi CBS Publication • Nutrition & Dietetics 1st and 2nd Edition; Subhangini Joshi.
Model Questions	Short Answer Questions 1. Define digestion 2. What is absorption? 3. Name the digestive juice secreted by liver 4. Name the main enzyme found in saliva 5. Give the name of juice secreted by pancreas 6. Why carbohydrates not digested in stomach? 7. Give the composition of bile salt 8. Give the main enzymes of pancreatic juice 9. Define coenzyme 10. Define apoenzyme 11. In IUB classification of enzymes what is IUB? 12. What is the shape of graph of effect of temperature on enzyme activity 13. Define specificity of enzymes 14. Explain chemical nature of enzyme 15. Define enzyme 16. What is deamination 17. How much energy formed during urea cycle 18. Name the mechanism of absorption of amino acids 19. Name the mechanism of absorption of fatty acids 20. Define glycolysis 21. Define glycogenolysis 22. How much energy formed during glycolysis 23. What is the end product of glycogenesis Long Answer Questions 1. Draw a diagram showing each organelle of digestive tract

	2. Explain the digestion of protein with the name of enzymes 3. Give the names of all organelles in GI tract. Explain the function of liver and pancreas in brief 4. What are the mechanisms of absorption? Explain any one in brief 5. Explain the role of enzymes in digestion 6. Explain digestion and absorption of fatty acids 7. List the factors affecting enzyme action. Explain any one 8. Give the classification of enzyme 9. What is specificity of enzyme? Explain any one 10. State any one mechanism of enzyme action 11. Illustrate the effect of pH on enzyme activity 12. Explain deamination and transamination in brief 13. Explain the role of enzymes in the fatty acid synthesis 14. Explain urea cycle in brief 15. Draw a overview of urea cycle 16. State the significance of cholesterol 17. Give the overview of glycolysis 18. Explain glycogenesis 19. Give the significance of glycogenesis 20. Give the energetic of carbohydrate metabolism in detail
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Course: B.Sc II Semester IV (Food Science)

116221 Major Theory 6: Food Microbiology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116221	Food Microbiology	2	30	2Hrs	30

Course Objectives	• To acquaint the students with the basic concepts of food microbiology. • To update the students about microorganisms related with food • To impart knowledge regarding the effect of microorganism on food			
Course Outcomes	Upon completion of this course successfully, students will be able to • Categorize different microorganisms with their relation with food • Categorize various microorganisms • Distinguish between various microorganisms • Identify the microorganisms related with food			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Introduction to microbes	Food microbiology: introduction, definition; Classification of microorganism, relation of microbes with food Morphology, structure, and Growth of microorganisms Factors affecting growth and growth curve	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Growth and media	Mode of nutrition and nutritional requirement of microorganisms Media preparation: composition, types, preparation and preservation Growth of culture; Introduction to microscopes	7 Hrs	7 Marks	
Unit III Staining	Various staining techniques: simple staining & differential staining Measurement of growth by various methods. Species of bacteria, moulds and yeasts important in food processing with applications ; Single cell proteins	8 Hrs	8 Marks	
Unit IV Food contamination and intoxication	Microbial contamination, causes of contamination, common food borne pathogenic microorganism Common food-borne intoxications and infections- Bacillus cereus, Clostridium botulinum, Clostridium perfringens, Enteropathogenic Escherichia coli, Salmonella, Staphylococcus aureus, Shigella spp.,	7 Hrs	7 Marks	
References	• Microbiology Vol.I &II by C.B. Powar and H.F.Daginawala. • Microbiology by M.A. Pelezar, R.D. Reid & C.S. Chan, Tata Macgraw Hill			

	Publication Co limited, New Delhi. • Food Microbiology by W.C. Fraizer, Tata Macgraw Hill Publication. • Introduction to Microbiology by A.S. Rao • Food Microbiology by Adam Moss • Dairy Microbiology by Parihar & Parihar • Food Microbiology by Bohra Pradeep. Jodhpur Arobios India • Text book of Microbiology Purohit S, Jodhpur Arobios India • Food Microbiology Bohara & Parihar, Jodhpur Agrobias • Industrial Microbiology, Patel A H, Mumbai Mcmillan, Mumbai • General I Microbiology Vol I & II , Dr. Pawar C B Mumbai Mcmillan, Mumbai • Good contaminants origin Propagation and Analysis Mahindra SN New Delhi APH Publication • Applied microbiology Dr. Parihar Pramila , New delhi Swastik Publication • Food and Diary Microbiology Dr Rao M K New Delhi Mangalam publication • Modern Food Microbiology Jay J M , New Delhi CBS Publication • A Dictionary of Microbiology Sharma JL, New Delhi CBS Publication • Basic Food Microbiology , New Delhi CBS Pulication • Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
Model Questions	Short Answer Questions 1. Define food microbiology 2. Define bacteria 3. Name the various types of microorganisms 4. What is yeast? 5. What is fungi? 6. Define generation time 7. Define eubacteria 8. List the factors affecting the growth of microbes 9. Define growth 10. Define aerobic microorganism 11. Define halofiles 12. What is media? 13. Define broth 14. Define microscope 15. Define microbiology 16. State the meaning of staining 17. Define single cell protein 18. Which microorganism used in the preparation of bread? 19. Define pathogenic bacteria 20. State contamination 21. List the factors causing contamination 22. State the significance of Ecoli Long Answer Questions 1. Classify microorganisms

	2. Define bacteria and give its properties 3. Define food microbiology. state its importance in food processing 4. Draw a diagram showing the structure of bacteria 5. What is growth of microorganisms? state the factors affecting growth 6. Draw a diagram showing growth of bacteria 7. Explain each phase in the growth of microorganisms 8. List the factors affecting growth and explain any one in brief 9. Illustrate the various mode of nutrition in bacteria 10. Compare aerobic, anaerobic and facultative bacteria in brief 11. Illustrate the nutritional requirement of microorganism 12. Draw a diagram showing the typicla cell of fungi 13. Outline the various types of media 14. Give the detail of preparation of simple media 15. Give an account of microscope and its use 16. Outline the procedure for preparation of culture 17. Compare simple and differential staining 18. Outline three important species of bacteria in food with their use 19. Outline three important species of fungi in food with their use 20. Illustrate single cell protein with its significance 21. Give various methods of measurement of growth and explain any one 22. Explain serial dilution technique 23. State various causes of contaminatin 24. Give the significance of common food borne microorganisms 25. Give the outline of clostridium botulinum with its significance
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester IV (Food Science)

116222 Lab 11: Practical approach to food biology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116222	Lab 11: Practical approach to food biology	2	60	2 Hrs	25+25

Course Objectives	- To train the students in basic techniques in food biology. - To educate students about food biology practicals - To introduce the students to handling and working of common equipments used for food biology practicals.
Course Outcomes	After completion of this course students will be able to - Handle various equipments in Food biology lab - Evaluate the enzymes - Perform microbiological practicals - Prepare various media

List of Practical

1. Introduction to the equipments used for food biochemistry and microbiology
2. Demonstration of salivary amylase activity
3. Estimation of starch
4. Estimation of glycine
5. Working and handling of microscope
6. Sterilization of the various equipments
7. Preparation and sterilization of media
8. Preparation of agar plate
9. Techniques of aseptic transfer of microbes
10. Isolation of bacteria by streak plate technique
11. Preparation of staining solution
12. Simple staining technique
13. Differential staining technique
14. Staining of yeast
15. Staining of Mould

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004
- Practical handbook of Food Microbiology, Neelam Khetarpaul , Daya Publishing House, 2016
- Food Microbiology0 N. Ramanathan NIPA, 2018
- Laboratory manual in Microbiology, R. C. Dubey & D. K. Maheshwari , S. Chand, 2019

- Microorganisms and Fermentation of traditional Foods, Ramesh C. Ray, CRC Press. 2014.
- Food Microbiology Based Entrepreneurship: making Money From Microbes, Nataraja Amaresan , Springer, 2022.

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc II Semester IV (Food Science)

116223 Minor Theory 4: Fundamentals of Food Biology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116223	Fundamentals of Food Biology	2	30	2Hrs	30

Course Objectives	- To know the need and importance of study of biological aspects of food - To update the students about biochemistry and microbiology of food - To impart knowledge regarding the digestion and metabolism of food - To recall the students regarding the relation of microorganisms with food			
Course Outcomes	Upon completion of this course successfully, students will be able to - Fulfill the above objectives - Explain the importance of study of biochemistry - Discuss the various metabolic reactions - Justify the importance of microorganisms and its impact on various food. - Justify the nutritional and commercial importance of microorganisms			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Carbohydrates	Introduction and some basic definition regarding enzymes specificity and inhibition of enzymes factors affecting enzyme activity introduction to digestion and absorption Overview of the digestive system digestion and absorption of carbohydrates, proteins and fats in mouth stomach and intestine with the enzymes involved	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Protein and amino acid	introduction to the metabolism of carbohydrates cycles of carbohydrate metabolism overview to glycolysis Introduction to Lipid Metabolism (Beta-oxidation) Introduction to protein metabolism (Deamination and transamination) Overview to Urea cycle	7 Hrs	7 Marks	
Unit III Lipids	Food microbiology: introduction; Classification of microorganism Morphology and structure of bacteria Factors affecting growth and growth curve Nutritional requirement of microorganisms Types of media and its composition Introduction to microscopes	8 Hrs	8 Marks	
Unit IV	Various staining techniques: simple	7 Hrs	7 Marks	

Vitamins and minerals	staining Measurement of growth by various methods. Species of bacteria, moulds and yeasts important in food processing with applications ; Single cell proteins Causes of microbial contamination			
References	• Fundamental of Biochemistry; Dr. A. C. Deb; Center Book Agency. • Fundamental of Biochemistry; J.L. Jain, Sanjay Jain; C. Chand. • Textbook of Biochemistry; Dr. Mn Chatterjee, Dr. Rana Shinde; Jaypee Brothers. • Laboratory Techniques in Food Analysis; D. Pearson; Butterworths. • Principle of Biochemistry; Lehninger AL, New Delhi Kalyani • Textbook of Biochemistry; G. R. Agrawal. • Biochemistry West E S Biochemistry , Delhi Oxford New Delhi • A Dictionary of Biochemistry Sharma J L New Delhi CBS Publication • Nutrition & Dietetics 1st and 2nd Edition; Subhangini Joshi. • Microbiology Vol.I &II by C.B. Powar and H.F.Daginawala. • Microbiology by M.A. Peleazar, R.D. Reid & C.S. Chan, Tata Macgraw Hill Publication Co limited, New Delhi. • Food Microbiology by W.C. Fraizer, Tata Macgraw Hill Publication. • Introduction to Microbiology by A.S. Rao • Food Microbiology by Adam Moss • Dairy Microbiology by Parihar & Parihar • Food Microbiology by Bohra Pradeep. Jodhpur Arobios India • Text book of Microbiology Purohit S, Jodhpur Arobios India • Food Microbiology Bohara & Parihar, Jodhpur Agrobias • Industrial Microbiology, Patel A H, Mumbai Mcmillan, Mumbai • General I Microbiology Vol I & II , Dr. Pawar C B Mumbai Mcmillan, Mumbai • Good contaminants origin Propagation and Analysis Mahindra SN New Delhi APH Publication • Applied microbiology Dr. Parihar Pramila , New delhi Swastik Publication • Food and Dairy Microbiology Dr Rao M K New Delhi Mangalam publication • Modern Food Microbiology Jay J M , New Delhi CBS Publication • A Dictionary of Microbiology Sharma JL, New Delhi CBS Publication • Basic Food Microbiology , New Delhi CBS Pulication			
Model Questions	Short Answer Questions 1. Define digestion 2. What is absorption? 3. Name the main enzyme found in saliva 4. Give the name of juice secreted by pancreas 5. Why carbohydrates not digested in stomach? 6. Give the main enzymes of pancreatic juice 7. Define coenzyme 8. Define apoenzyme 9. What is the shape of graph of effect of temperature on enzyme activity?			

10. Define enzyme
11. What is deamination?
12. Define glycolysis
13. How much energy formed during glycolysis
14. What is the end product of glycogenesis
15. Define food microbiology
16. Name the various types of microorganisms
17. What is yeast?
18. Define eubacteria
19. List the factors affecting the growth of microbes
20. Define growth
21. What is media?
22. Define broth
23. State the meaning of staining
24. Define single cell protein
25. Define pathogenic bacteria
26. State contamination
27. List the factors causing contamination

Long Answer Questions

1. Draw a diagram showing each organelle of digestive tract
2. Explain the digestion of protein with the name of enzymes
3. Give the names of all organelles in GI tract
4. Explain the role of enzymes in digestion
5. Explain digestion and absorption of fatty acids
6. List the factors affecting enzyme action. Explain any one
7. Give the classification of enzyme
8. Illustrate the effect of pH on enzyme activity
9. Explain deamination and transamination in brief
10. Explain urea cycle in brief
11. Draw a overview of urea cycle
12. Give the overview of glycolysis
13. Classify microorganisms
14. Define bacteria and give its properties
15. Define food microbiology. state its importance in food processing
16. Draw a diagram showing the structure of bacteria
17. What is growth of microorganisms? state the factors affecting growth
18. List the factors affecting growth and explain any one in brief
19. Illustrate the nutritional requirement of microorganism
20. Outline the various types of media
21. Give the detail of preparation of simple media
22. Outline the procedure for preparation of culture
23. Illustrate single cell protein with its significance
24. State various causes of contamination

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester IV (Food Science)

116224 Minor Lab 12: Simple techniques in food biology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116224	Lab 12: Simple techniques in food biology	2	60	2 Hrs	25+25

Course Objectives	• To train the students in basic techniques in food biology. • To educate students about food biology practicals • To introduce the students to handling and working of common equipments used for food biology practicals.
Course Outcomes	After completion of this course students will be able to • Handle various equipments in Food biology lab • Evaluate the enzymes • Perform microbiological practicals • Prepare various media

List of Practical

1. Introduction to the equipments used for food biochemistry and microbiology
2. Demonstration of salivary amylase activity
3. Estimation of starch
4. Estimation of glycine
5. Working and handling of microscope
6. Sterilization of the various equipments
7. Preparation and sterilization of media
8. Preparation of agar plate
9. Techniques of aseptic transfer of microbes
10. Isolation of bacteria by streak plate technique
11. Preparation of staining solution
12. Simple staining technique
13. Differential staining technique
14. Staining of yeast

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004
- Practical handbook of Food Microbiology, Neelam Khetarpaul , Daya Publishing House, 2016

- Food Microbiology0 N. Ramanathan NIPA, 2018
- Laboratory manual in Microbiology, R. C. Dubey & D. K. Maheshwari , S. Chand, 2019
- Microorganisms and Fermentation of traditional Foods, Ramesh C. Ray, CRC Press. 2014.
- Food Microbiology Based Entrepreneurship: making Moneu From Microbes, Nataraja Amaresan , Springer, 2022.

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc II Semester IV (Food Science)

116225 OE Theory 6: Food Quality and Safety							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116225	Food Quality and Safety	2	30	2Hrs	30

Course Objectives	- To understand the fundamental concept of food quality and its importance - To study various quality parameters, standards and regulatory guidelines - To explore different food quality control methods and techniques - To learn about food adulteration, Contamination and safety measures - To understand the principles and importance of sensory evaluation in food quality assessment			
Course Outcomes	After completing this course, students will be able to : - Gain knowledge of food quality attributes and their significance - Understand food quality assessment methods and their applications - Analyze food safety regulations and their impact on consumer health - Gain knowledge of sensory attributes and their impact on food quality - Understand different sensory evaluation methods and their application			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Introducti on to Food Quality	Definition and importance of food quality Factors affecting food quality Quality attributes: Physical, chemical, microbiological and sensory aspects Role of food quality in consumer perception.	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Sensory evaluation	Sensory attributes (Appearance, texture, flavor, taste, etc.) Sensory evaluation: Introduction, objectives, type of panels, selection and characteristics of panel members, types of tests Subjective and objective sensory evaluation Packaging and labeling standards for food products	7 Hrs	7 Marks	
Unit III Food laws	HACCP: principles, need, and benefits Introduction to National and international food quality standards and acts: PFA, ECA, FSSAI, FDA, ISO, CODEX, BIS, WHO, CPA etc.	8 Hrs	8 Marks	
Unit IV Food Safety	Food spoilage: Definition, causes, factors affecting, types food contamination and causes Packaging; Importance, functions, types, packaging materials	7 Hrs	7 Marks	

	Food labeling: Importance, definitions, principle, categories, mandatory requirements Food safety measures and consumer protection			
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food Hygiene and Sanitation – S. Roday • Food Quality and Sensory Evaluation – Moskowitz • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Safety and Quality Management- Yasmine Motarjemi • Food Science- B. Shrilakshmi • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Handbook of Food Analysis- Leo M. L. Nollet • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad. • Sensory Evaluation of Food – Principles and Practices – Harry T. Lawless • Sensory evaluation techniques- Meilgaard, Civille			
Model Questions	Short Answer Questions 1. Define food quality 2. What are the physical attributes of food quality? 3. What is HACCP? 4. Name two international food quality standards 5. Define sensory evaluation 6. What is the role of FSSAI in food quality? 7. List two methods of food adulteration detection with example 8. Define food adulteration with an example Long Answer Questions 1. Explain the importance of food quality and its attributes 2. Describe the physical, chemical and microbiological aspect of food quality 3. Discuss the role of food quality standards and regulations in consumer safety 4. Explain the HACCP system and its significance in food quality 5. What are the different methods of sensory evaluation of food? 6. Explain how sensory panels are selected and trained 7. How does sensory evaluation help in detecting food spoilage 8. What are food adulterants? List common adulterants and their effects 9. Discuss the functions of food regulatory bodies like FSSAI and FDA			

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester IV (Food Science)

116226 VSC Lab/Practical 13 : : Techniques in food chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.0	IV	116226	VSC : Techniques in food chemistry	2	60	2Hrs	50

Course Objectives

- To train the students to identify the food items of various groups
- To impart the skill of determining various physical properties of food
- To make students eligible to prepare different types of solutions
- To educate the students to apply the skills to prepare the emulsions and foams

COs: Upon completion of this course successfully, students will be able to

- Do focus on all the above objectives
- Perform experiments based on biochemistry and microbiology
- Prepare various types of media
- Isolate the microorganism from different samples
- Apply the knowledge of staining to observe the microorganisms

List of practical

1. Use of various equipments in the food laboratory
2. Determination of salivary amylase activity of various samples
3. Determination of starch content in various food samples
4. Determination of glycine content in various food samples
5. Study of the construction of microscope
6. Preparation and sterilization of media for a particular microorganism
7. Isolation of bacteria from various samples of water/air/food etc.
8. Application of various staining techniques for observing the structure of bacteria
9. Application of various staining techniques for observing the structure of yeast/ mold

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

Internal Evaluation for SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Course: B.Sc II Semester IV (Food Science)

116227 SEC Lab/Practical 14 : : Skills in Food Biology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.0	IV	116227	SEC : Skills in Food Biology	2	60	2Hrs	50

Course Objectives

- To train the students in basic skills in Food Biology laboratory
- To impart the skill of application of various preliminary operations
- To expertise the students on hands on training

Cos: Upon completion of this course successfully, students will be able to

- Do focus on all the above objectives
- Identify the oils by their properties
- Apply methods like blanching, fermentation, etc. for food processing
- Determine and compare the physical properties of food
- Handle the pH meter and Brix meter

List of practical

1. Collecting sample for the salivary amylase activity
2. Preparation of solution for paper chromatography
3. Preparation of solutions of different concentrations
4. Aseptic handling of equipment used in food microbiology practicals
5. Transformation of culture in aseptic condition
6. Preparation of cotton plug for conical flask containing media
7. Sterilization of equipments and other items for microbiology practical
8. Maintaining hygienic conditions in the laboratory
9. Counting of the colonies by colony counter
10. Isolation of the pure culture

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

Internal Evaluation for SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Course: B.Sc II Semester III (Food Science)

116228 Field Project (FP)/ Community Engagement Service (CES): FP/CES in Food Science II							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116228	FP/CES II: FP/CES in Food Science II	2	60	--	50

Course Objectives:	- To provide practical, hands on experience, in the field of study, allowing them to apply theoretical knowledge to real-world situations or address Real-World Problems. - To enhance various skills such as, research, interpretation and analytical skills and strengthening their critical thinking and problem-solving abilities. - To foster engagement with a specific social issue or area of study, address specific challenges or needs within a community. - To Improve Collaboration, Communication among students and facilitate knowledge transfer and Enhance Engagement with Social issues.
Course Outcomes:	Upon successful completion of this course, students will be able to: - FP/CES can help students to develop their practical, technical skills and a deeper understanding of their subject matter and how it applies to real-world situations. - They learn to identify, analysis, and interpretation of complex problems using their knowledge and develop research skills. - Students gain insight into social issues and the role of various governmental schemes for the welfare of people and explore new ideas and approaches. - They learn to work effectively in teams and collaborate with others to achieve common goals and contributing to community's socio-economic improvements

As per NEP 2020, students of B Sc. II of Semester III need to perform a Field Project (FP)/ Community Engagement Service (CES) for TWO (2) credits i.e. 50 Marks. The guidelines/ SoP regarding the FP/CES are as follows:

- 12) The total time allocation for the student to carry out FP/CES is 60 hours.
- 13) Students should participate in FP/CES under the supervision of faculty.
- 14) Assigning the FP/CES topics to individual students or groups of students (4 to 5 students in one group) and one faculty member from the department will act as Guide for the student or group of students.
- 15) CES may include awareness programs, public talk/ lectures, workshops, blood testing camps, vaccination drives in collaboration, surveys etc
- 16) For a SURVEY based FP/CES, related questionnaire (15 or more questions) should be prepared. The departmental coordinator/guide should check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative.
- 17) If the project is related to laboratory work that does not involve survey work, then the questionnaire part can

be replaced accordingly (e.g. Sample collection/Data analysis Experimental). The student should compile all the relevant data and carry out its analysis in laboratory. 18) A project report should be written individually in the standard format (2 Copies): Index, Introduction, Materials, Methods, Result, Conclusion/output, References (Numeric citation type) etc. The report should be of minimum 6 pages (excluding Title page, Certificate, Index, Acknowledgement etc.) Submit the project report with the Guide's signature to the department. 19) Students should maintain the documentation and record properly which includes dairy, photographs, certificates, feedback of beneficiaries, news in local paper if any. 20) A CES report should be written individually in the standard format (2 Copies): Index, Introduction, details of activities, photographs, signature sheets of beneficiaries, feedback of beneficiaries, own feedback, summary /output, etc. It should submit with the Guide's signature to the department. 21) The oral /poster presentation for all the FP/CES should be arranged in the department. To evaluate the project, examiner should be appointed by HoD. 22) The total work for FP/CES including preparation of questionnaire to presentation should be evaluated for 2 credits (50 Marks).	
References	4. https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf 5. https://en.wikipedia.org/wiki/OU_Citizen_Science_Soil_Collection_Program 6.
Model Questions:	NA

Distribution of Marks and the scheme of FP/CES Evaluation as follows:

Sr. No	Evaluation type	Marks
1	Student performance	20
2	FP/CES Report	20
3	Presentation (PPT or Poster)	10
Total		50