Accredited Syllabus for MSc. Food Science and Technology

Department of Food Science and Technology

College of Science

KNUST

YEAR ONE, SEMESTER ONE

Code	Course Title	T	P	C
FST 551	Food Chemistry	2	0	2
FST 553	Food Microbiology	2	3	3
FST 555	Food Processing and Packaging	2	0	2
FST 557	Food Product Development and Sensory Evaluation	2	3	3
FST 559	Food Analysis Laboratory	1	3	2
FST 571	Food Safety	3	0	3
STAT 559	Statistical Methods for Research	3	0	3
	Minimum Total Credits	**15**	**9**	**18**

YEAR ONE, SEMESTER TWO

Code	Course Title	T	P	C
	Core Courses			
FST 552	Industrial Internship and Research	0	15	5
FST 554	Research Communication and Seminar	2	3	3
FST 556	Research Seminar	0	18*	6*
	Subtotal	**2**	**18**	**8**
	Electives Courses (Must Choose at least two)			
FST 560	Food Quality Assurance Systems	3	0	3
FST 562	Food Engineering	3	0	3
FST 580	Advanced Human Nutrition and Health	3	0	3
FST 582	Advanced Postharvest Technology	3	0	3
	Minimum Total Credits	**8**	**18**	**14**

*Credits of Research Project and Seminar not included in total credits achieved.

1. Course Description:

Provide a short description of the content of the courses in the programme to include:

a. Objective
b. Learning outcomes
c. Content
d. Reading material

YEAR ONE, SEMESTER ONE

FST 551 Food Chemistry (2 0 2)

The aim is to furnish students with the skills needed to understand chemical processes and interactions of all biological and non-biological components of foods.

a) Objective

- To learn the principles of chemical processes and interactions of organic and inorganic components of foods.
- To explain the principles underlying functional properties of food components to students.
- To understand reactions occurring during processed and stored processed foods.

b) Learning outcomes

By the end of lessons students should be able to:

- apply the principles of chemical processes and interactions of organic and inorganic components of foods.
- describe the principles underlying the functional properties of food components.
- differentiate between reactions occurring during the processing and storage of processed foods.

c) Content

The structure of food components, reactions, and their functionality. Structure and properties of water - moisture and water activity; Carbohydrates (monosaccharides, disaccharides, oligosaccharides, polysaccharides/ complex carbohydrates - starch, cellulose, pectin, gums); Proteins and amino acids- structure and reactions; Browning reactions, Acrylamide formation. The functionality of proteins (hydration and solubility, surface-active properties - emulsion and foaming, gelation, dough, texturization, flavor binding). Lipids (fats and oils - fatty acids, acylglycerols, waxes, and sterols); Fat and oils peroxidation mechanisms and role of antioxidants; Interesterification; Hydrogenation and Trans-fat, refining of edible oil. The functionality of lipids-emulsion, crystallinity and polymorphism, palatability. Fat mimetics. Reactions during processing and storage concerning vitamins and minerals. Food colours, flavour, enzymes

d) Mode of delivery

- Lectures/PowerPoint Presentation.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.
- Assignments.

e) Reading materials

1. Belitz, H. D., Grosch, W. and Schieberle, P. (2009). Springer Food chemistry 4th revised and extended Edition. Annual Review Biochemistry, Springer NY.
2. Fennema, O. R., Damodaran, S. and Parkin, K. L. (2017). Introduction to food chemistry. In Fennema's Food Chemistry, CRC Press, USA.
3. DeMan, J. M., Finley, J. W., Hurst, W. J. and Lee, C. Y. (2018). Principles of food chemistry. 4th Ed, Springer, NY.
4. Velisek, J., Koplik, R. and Cejpek, K. (2020). The Chemistry of Food. USA: Wiley.
5. Ramani, A. V. (2019). Food Chemistry. USA: MJP Publisher.

FST 553 Food Microbiology (2 3 3)

Students must be equipped with knowledge of microorganisms and how they inhabit, create, or contaminate food.

a) Objective

- To describe the mechanisms of microorganisms inhabiting, producing, or contaminating foods and their impact on specific food commodities.

b) Learning outcomes

- Students should be able to demonstrate microbial mechanisms for inhabiting, producing, or contaminating foods and their impact on specific food commodities.

c) Content

History and development of food microbiology. Microorganisms found in foods – sources and types. The ecology of foods – Microbial survival and growth in foods. Factors influencing the growth, death, and survival of microorganisms in foods. Microbiology of specific food commodities. Impact of microbial growth in foods – Food spoilage and foodborne illnesses (Foodborne infection and Intoxication). Emerging foodborne pathogens. A critical review of literature on emerging trends in food microbiology.

Practical sessions: Techniques in analyzing microorganisms in food spoilage, foodborne diseases, and food fermentations. Isolation and identification of foodborne microorganisms (biochemical and microscopic analysis). Investigate factors affecting the survival and growth of microorganisms in foods, the microbial examination of food commodities, water quality analysis (MPN test).

d)Mode of delivery

- Lectures/PowerPoint Presentation.
- Practicals.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.
- Assignments.

e) Reading materials

1. Adams, M.R. and Moss, M.O. (2008). Food Microbiology, 3rd Ed RSC Publishing, UK.
2. Ray, B., and Bhunia, A. (2013). Fundamental food microbiology. 4th Ed, CRC Press, USA.
3. Banwart, G. (2012). Basic food microbiology. Springer Science and Business Media, NY.
4. Nevárez-Moorillón, G. V. (2020). Food Microbiology and Biotechnology: Safe and Sustainable Food Production. US: Taylor and Francis Group.
5. Ramesh, K. V. (2019). Food Microbiology. USA: MJP Publisher.

FST 555 Food Processing and Packaging (2 0 2)

In this course, students are presented with an understanding of the principles and technologies in food processing and packaging.

a) Objective

- To discuss the underlying principles and technologies that govern food manufacturing and how those technologies can be used in the processing and packaging food products.

b) Learning outcomes

- By the end of the lessons, students are expected to associate principles and technologies processing ingredients and packaging food products.

c) Content

Principles and concepts of food processing and preservation (chilling, freezing, blanching, refrigeration, thermal processing, concentration, dehydration, and irradiation of foods. Food Fermentation: submerged, solid and surface, types and functions of fermenters. Food rheology: principles and applications, Food plant designs and Economics. Food additives, properties, and applications). Food packaging and shelf-life (functions of packaging, properties, and types of packaging materials, integrated packaging materials, the chemistry of food systems in response to functions, innovative technologies, regulations, chemical kinetics of food matter, shelf-life determination).

d)Mode of delivery

- Lectures/PowerPoint Presentation.
- Assignment.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.

e) Reading materials

1. Sudheer, K. P. and Indira, V. (2007). Post-harvest technology of horticultural crops. New India Publishing, India
2. Ahvenainen, R. (2003). Novel food packaging techniques. Elsevier, Holland
3. Moskowitz, H. R., Porretta, S. and Silcher, M. (2008). Concept research in food product design and development. John Wiley and Sons, USA.
4. Afoakwa, E.O. (2010). Chocolate Science and Technology John Wiley and Sons, USA.
5. Beckett, S.T. (2000). The Science of Chocolate. The Royal Society of Chemistry, UK.

FST 557 Food Product Development and Sensory Evaluation (2 3 3)

This course illustrates the scientific applications required to create quality food essential in the food industry and ensure that the food being produced is acceptable to consumers.

a) Objective

- To describe the principles of the food development process in the food industry.

b) Learning outcomes

- By the end of the lessons students should be able to model food products.

c) Content

Overview of the role and functionality of food constituents and ingredients: proteins, carbohydrates, lipids, and additives. Introduction to food product development. Classification of food products as the basis for innovation, the sociological and technological aspects of food product development. Concepts of new product development, developing an innovation strategy, criteria for new products, critical factors in product success. The role of the consumer in product development. The food product development process. Food standards. Anatomy and physiology of taste, smell, sight; Chemesthesis, mechanism and applications; Texture Evaluation; The testing environment, Test protocol consideration, Experimental design, Panelists, sensory data and processing; Discrimination test, Preference/ Affective test, Hedonic test, and Descriptive Analysis. Scaling; Consumer field test and Questionnaire Design, Quality control and shelf life (Stability) Testing.

d)Mode of delivery

- Lectures/ PowerPoint Presentation.
- Practicals.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.
- Assignments.

e) Reading materials

1. Kemp, S. E., Hollowood, T. and Hort, J. (2011). Sensory Evaluation: A Practical Handbook, John Wiley and Sons Ltd, NJ.
2. Chambers, I.V.E. and Wolf, M. B. (2005). Sensory Testing Methods: 2nd Ed, ASTM International Standards Worldwide, USA.
3. Næs, T., Brockhoff, P. B. and Tomic, O. (2011). Statistics for sensory and consumer science. John Wiley and Sons, NJ.
4. Bordiga, M. and Nollet, L. M. L. (2019). Food Aroma Evolution: During Food Processing, Cooking, and Aging. US: CRC Press (Food Analysis and Properties)
5. Stone, H., Bleibaum, R. and Heather, T. (2012). Sensory Evaluation Practices. 4th Edition, Academic Press. USA.

FST 559 Food Analysis Laboratory (1 3 2)

Food Chemistry laboratory (Selected labs on carbohydrates, fats, and proteins). This course is designed to characterize chemical composition, traceability, safety, quality, and nutritional value.

a) Objective

- To describe the various food components and their respective chemical compositions.
- To analyze food using instrumentation.

b) Learning Outcomes

At the end of this course, students are expected to;

- apply the principles of food analysis instrumentation;
- analyze the components of food;
- provide information about their chemical compositions.

c) Content

Principles of analytical processes of equipment in food analyses; AAS, HPLC, FTIR, Types of chromatographic methods; GC-mass chromatography, Electrophoresis, and TLC; Sampling and sample preparations and storage; Titratable acidity; Analyses of moisture, total solids, ash, and minerals; Proximate analyses; Fat characterization, Protein separation procedures.

d) Mode of delivery

- Lectures/PowerPoint Presentation.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.
- Assignments.
- Practical Sessions.

e) Reading materials

1. Nielsen, S.S. (2010). Food Analysis, Laboratory manual, 4th Edition, Springer NY.
2. Pomeranz, Y. (2013). Food analysis: theory and practice. Springer Science and Business Media.
3. Leo, M.L. (2004). Food Analysis by HPLC, 2nd Edition, Marcel Dekker, Inc. NY.
4. Kontominas, M.G. (2013). Food Analysis and Preservation, 2nd Edition. Apple Academic Press Inc. Canada.
5. Sehgal, S. (2016). A Laboratory Manual of Food Analysis. I K International Publishing House Pvt. Limited. India.

FST 571 Food Safety (3 0 3)

This course enables students to develop the skills to apply food standards to ensure consumer safety.

a) Objective

- To discuss the safety principles involving foodborne illnesses.

b) Learning outcomes

- By the end of the lessons students are expected to apply food safety standards and regulations in multi-systems scenarios.

b) Content

Foodborne diseases and surveillance; Emerging foodborne pathogens; Sanitation, personal hygiene; HACCP; Cleaning compounds and sanitizers; Equipment, waste product handling; Pest control; Quality assurance systems and standards; Regulatory agencies, and enforcement. Dose-response studies; Biotransformation of hazards; Plant-and animal-based hazards; Mycotoxins; Industry-based hazards; Food processing additives; environmental hazards; Food systems risks; Food hazards-identification, characterization, exposure assessment, and quantification;

c)Mode of delivery

- Lectures/PowerPoint Presentation.
- Assignment.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.

d)Reading materials

1. Chris Griffith, U. W. I. C. (2005). Improving compliance with food safety legislation 107 (3). Emerald Group Publishing, UK.
2. Hoyle, D. (2017). ISO 9000 Quality Systems Handbook-updated for the ISO 9001: 2015 standard: Increasing the Quality of an Organization's Outputs. Routledge, UK.
3. Trienekens, J. and Zuurbier, P. (2008). Quality and safety standards in the food industry, developments, and challenges. International Journal of Production Economics, Elsevier, Holland.
4. Hefnawy, M. (2011). Advances in food protection: Focus on food safety and defence. Springer Science and Business Media, Netherlands.
5. Paramithiotis, S. and Patra, J.K. (2019). Food Molecular Microbiology. CRC Press, Boca Raton.

STATS 559 Statistical Methods for Research (3 0 3)

a) Objective

- To demonstrate the concepts of statistical methods and operations required in data collection and processing.

b) Learning outcomes

- After completing this course, the student should be able to determine the appropriate statistical method for collecting and processing data especially using a computer software.

c) Content

Meaning of research; Types of research, defining and determining a problem; Objectives of a research; Research methods and tools for collecting data; Sources (Collection) of Primary and Secondary data; Editing the data and precautions used in the use of data; Sampling Design- Census and sampling survey; Methods of Sampling; Probability and non-probability sampling methods; Size of the sample; Merits and Demerits of each sampling method; Sampling errors and methods of reducing the errors; Measures of central tendency - Mean, Median, Mode, their relative advantages and disadvantages; Measures of dispersion - mean, standard deviation, quartiles, coefficient of variation, percentile; Representation of data - Diagrammatic and Graphic significance; Types of diagrams; Types of graphs; Probability - Theorems, Simple Problems; Distributions – Binomial, Poisson, normal distribution, their properties and simple problems; Association of attributes, contingency table, correlation - coefficient of correlation and its interpretation; Rank correlation; Regression equation and predictions; Hypothesis Testing - Large and Small sample tests – t- test; Chi square test, and F- test - simple problems; Design of Experiments- Completely Randomized Design (One way ANOVA) Randomized Block Designs (Two Way ANOVA) and Latin Squares; Multivariate Analysis- Principal Component Analysis, Discriminant Analysis, MANOVA, ANCOVA.

d) Mode of delivery

- Lectures/ PowerPoint Presentation.
- Assignment.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.

e) Reading materials

1. Abu-Bader, S.H. (2021). Using statistical methods in social science research: With a complete SPSS guide. Oxford University Press, USA.
2. Nemani, R. (2021). Cluster and Factorial Analysis Applications in Statistical Methods. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(3): 5176-5182.
3. Illes, A., Bojtor, C., Szeles, A., Mousavi, S.M.N., Toth, B. and Nagy, J. (2021). Research Article Analyzing the Effect of Intensive and Low-Input Agrotechnical Support for the Physiological, Phenometric, and Yield Parameters of Different Maize Hybrids Using Multivariate Statistical Methods.
4. Bărbulescu, A. and Dumitriu, C.Ș. (2021). Assessing Water Quality by Statistical Methods.
5. Rossel, J.B., Rousson, V. and Eggli, Y. (2021). A comparison of statistical methods for allocating disease costs in the presence of interactions. Statistics in Medicine.

YEAR ONE, SEMESTER TWO

FST 552 Industrial Internship and Research Project (0 15 5)

This course offers a unique opportunity to equip students to gather experience in food industry-based research projects.

a) Objective

- To associate knowledge acquired in classroom to during food industry experiential training.

b) Learning outcomes

- By the end of the training students should be able to evaluate key challenges in specific food industry and critically plan to resolve them.

c) Content

Part one: Each student shall have industrial experiential training lasting not less than 12 weeks. Students shall identify and investigate food science/ technology/ product development /food science and technology-related challenge during this period.

Part two: Each student will submit a report on the research project based on the approved format for both oral and external examinations.

Nature of Project: The programme's research component shall be restricted to usually a single objective or problem of scientific, technological, or entrepreneurial importance. The project shall be of limited challenge and particular in focus. However, despite the limited scope, it should result in a potentially publishable manuscript in a peer-reviewed journal.

d) Mode of delivery

- It involves students' attachment to Food and Beverage production companies and Institutions lasting not less than 12 weeks to ensure that the students are trained practically in specific areas of Food Science and Technology such as production, processing, quality assurance, packaging of food and beverage products.
- Students will be assessed on work ethics by supervisors within the establishment and team of examiners at the Department.
- Students shall be assigned supervisors to guide them according to the regulations spelt out in the Graduate Students' Handbook. First, the research profiles of supervisors shall be published for the benefit of students. Students are expected to align or tailor their research projects to their supervisors for adequate supervision. The HOD acting with the Departmental Board shall finally appoint at least one supervisor (based on their area of specialization) for each student. An arrangement may be made with the HOD to resolve any issues with these assignments for remedial actions. Students are expected to follow this guide to prevent all avoidable issues relating to such matters.
- Supervisors must also ensure that they are not overly loaded with student supervision to avoid excessive stress and low-quality supervision.

e) Reading materials

1. McNiff, J. (2016). You and your action research project. Routledge, US.
2. Peters, M.J., Howard, K. and Sharp, M.J.A. (2012). The management of a student research project. Gower Publishing, Ltd, US.
3. O'Leary, Z. (2009). The Essential Guide to Doing Your Research Project. SAGE Publications.
4. Walliman, N. (2011). Your Research Project: Designing and Planning Your Work. CA: SAGE Publications (SAGE Study Skills Series).
5. Sewell, C. (2020). The No-nonsense Guide to Research Support and Scholarly Communication. Facet Publishing.

FST 554 Research Communication and Seminar (2 3 3)

This course is designed to equip students to use scientific communication processes to gather high-value information on food science and technology and present them.

a) Objective

- To describe the scientific communication process.
- To learn proposal writing skills.
- To learn how to review literature.
- To learn article (thesis/ manuscript) writing skills for publication.

b) Learning outcomes

At the end of the lessons, students should be able to:

- demonstrate the scientific communication processes;
- prepare a proposal;
- review literature and prepare manuscript/ thesis.

c) Content

Idea stage, Strategies of Planning and writing a Proposal, Article Writing strategies, Scientific communication, Research Ethics, and Responsibilities, Patenting Research Findings.

Practical session: Proposal writing, Seminar presentations, Library, and reference tools.

d)Mode of delivery

- Lectures/PowerPoint Presentation.
- Practicals.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.
- Assignments using Books, Periodicals, and online sources.

e) Reading materials

1. Harmon, J. E. and Gross, A. G. (2010). The craft of scientific communication. University of Chicago Press, US.
2. Bowater, L. and Yeoman, K. (2012). Science communication: a practical guide for scientists. John Wiley and Sons, NJ.
3. Gross, A. G. and Buehl, J. (2016). Science and the Internet: Communicating knowledge in a digital age. Routledge, UK.
4. Hofmann, A.H. (2014). Scientific writing and communication: papers, proposals, and presentations. Oxford Univ. Press, UK.
5. Wilkinson, C. and Weitkamp, E. (2016). Creative Research Communication: Theory and Practice. Manchester, England: Manchester University Press.

FST 556 Research Seminar (0 18 6*)

This course is designed to strengthen communication skills. In the beginning, there is a delivery of a synopsis to assess students' ability to handle communication in their respective research interests.

a) Objective

- To learn communication skills relating to research output in the food science and technology research community.
- To comprehend scientific literature, specially related to food science and technology.

b) Learning outcome

- It is expected that candidates would gain the competence required to present a food science and technology related theme within the scientific community.

c) Content

- The content is primarily based on the areas of specialization of students. The scope of the research will also cover the industrial internship.

d) Mode of delivery

- Oral examination of students shall be conducted during seminar presentations based on a format prepared for the assessment as the candidate progresses a report based on the approved format for assessment by the supervisor and a Board of examiners.
- Delivery shall be student-centred, and presentation shall either be by poster presentations or timed oral presentations.

e) Reading materials

1. Germano, W. (2014). From dissertation to book. University of Chicago Press.
2. Bunton, D. (2014). Generic moves in PhD thesis introductions. In Academic discourse (pp. 67-85). Routledge.
3. Rowland, C. (2004). Communication matrix. Oregon Health and Science University.
4. Goodman, K. (2006). First-year seminars increase persistence retention. First-Year Programmes.
5. Aspers, P. (2009). Empirical phenomenology: A qualitative research approach (The Cologne Seminars). Indo-pacific journal of phenomenology, 9(2): 1-12.

FST 560 Food Quality Assurance Systems (3 0 3)

This course aims at delivering a set of coordinated activities to direct and control an organization to continually improve the effectiveness and efficiency of both industrial and service sector enterprises.

a) Objective

- To learn the concepts of quality and its extrinsic and intrinsic attributes used in the food industry.

b) Learning outcomes

- At the end of the lessons students should be able to illustrate the concept of quality and its extrinsic and intrinsic attributes in different scenarios in food industry.

c) Content

Concept of Quality, Quality Control and Assurance, Products Specifications and Quality Assurance Schemes, Total Quality Management, Quality Improvement Tools (Lean Six Sigma, 5S, PDCA cycle, FMEA, QFD), Food Quality Manual, Voluntary Standards, Plant Audits: Quality Monitoring Systems, International Certification Bodies – BRC, IFS, ISO 22000, ISO 17025.

d)Mode of delivery

- Lectures/PowerPoint Presentation.
- Assignment.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.

e) Reading materials

1. Vasconcellos, J. A. (2005). Quality Assurance for the Food Industry: A Practical Approach. Taylor and Francis e-Library, London.
2. Hoyle, D. (2017). ISO 9000 Quality Systems Handbook-updated for the ISO 9001: 2015 standard: Increasing the Quality of an Organization's Outputs. Routledge, UK.
3. Early, R. (2012). Guide to quality management systems for the food industry. Springer Science and Business Media, NY.
4. Swainson, M. (2018). Swainson's Handbook of Technical and Quality Management for the Food Manufacturing Sector. Netherland: Elsevier Science (Woodhead Publishing Series in Food Science, Technology and Nutrition).
5. Lokunarangodage, V. (2018). ISO 22000: 2018 Generic Model: ISO 22000:2018 Food Safety Management System. Amazon Digital Services LLC - Kdp Print Us, US.

FST 562 Food Engineering (3 0 3)

This course aims to equip students with the technological knowledge essential to the cost-effective production and commercialization of food products.

a) Objective

- To learn the principles of unit operations of food processing equipment required in transforming agricultural products.

b) Learning outcomes

- At the end of this course, students should be able to demonstrate the appropriate Unit Operations applications during food processing.

c) Content

Units and Dimensions. Open and closed systems, thermodynamic properties of systems, Material and Energy Balances, steady and unsteady state processes, fluid flow in pipes. General considerations of the nature and properties of materials for the construction of food processing equipment. Design features and functions of equipment used in cleaning, sorting, grading, size reduction and enlargement, mixing and emulsification, filtration, screening, and centrifugation. Unit operations in food processing. Thermal and non-thermal processing technologies.

d) Mode of delivery

- Lectures/PowerPoint Presentation.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.
- Assignments.

e) Reading materials

1. Fellows, P. J. (2009). Food processing technology: principles and practice. 2nd Ed, Elsevier, Holland.
2. Ibarz, A. and Barbosa-Cánovas, G. V. (2002). Unit operations in food engineering. CRC Press, USA.
3. Earle, R. L. (2013). Unit operations in food processing. Elsevier, Holland.
4. Muthukumarappan, K. and Knoerzer, K. (2020). Innovative Food Processing Technologies: A Comprehensive Review. Elsevier Science, Netherland.
5. Malcata, F. X. (2020). Food Process Engineering: Principles and Applications. CRC Press, USA.

FST 580 Advanced Human Nutrition and Health (3 0 3)

Good food is a requirement for well-rounded growth. Thus, when the health of consumers becomes lazed, food insecurity may be brought into sharp focus, and vulnerability to diseases may be increased. Such causes of diseases may be attributed to lack of food and adequate nutrition, unsafe water, and inadequate sanitation. This course has been designed to draw attention to relationships between food sources, nutrition, and health along the food value chain.

a) Objective

- To learn the linkages between healthy nutrition and critical preventable diseases based on improved nutritional status.

b) Learning outcomes

- At the end of the lessons, students are expected to relate nutrition-based disease manifestations to their underlying principles or mechanisms design strategies for control measures.

c) Content

Contemporary Health situation; Human nutrition; Minerals and Cognitive Function; Good nutrition for Children and all ages; Malnutrition causes diarrhea – diarrhea causes malnutrition; Nutrition and Chronic Diseases; Malabsorption; Unhealthy foods; Nutrition and Parkinson Disease; Diet Modifications and Cholesterolemia; Nutrition and Hypertension; Nutrition and Acute and Chronic Renal Failure; Diverticulitis; Diet and biodiversity; A Balanced diet; Food hygiene.

d) Mode of delivery

- Lectures/PowerPoint Presentation.
- Assignment.
- Audio-visuals (videos and infographics).
- Group discussions and presentations.

e) Reading materials

1. Conant, J. and Fadem, P. (2012). A community guide to environmental health. Hesperian health guides, Berkeley, California, USA, pp.600.
2. FAO, IFAD, and WFP. (2015). The State of Food Insecurity in the World. Meeting the 2015 international hunger targets: taking stock of uneven progress. Rome, FAO, pp.62.
3. Food and Agriculture Organization of the United Nations (FAO) (2009). Global agriculture towards 2050. High-Level Expert Forum: how to feed the world in 2050. FAO, Rome.
4. FAO (2004). The state of agricultural commodity markets. Rome.
5. Berdanier, C.D., Berdanier, L.A. and Zempleni, J. (2008). Advanced nutrition: macronutrients, micronutrients, and metabolism. CRC press.

FST 582 Advanced Postharvest Technology (3 0 3)

This course is designed to understand and apply technologies that maintain the quality and extend the shelf-life of fresh produce.

a) Objective

- To learn the technologies that maintain fresh produce through the supply chain to guarantee optimum quality and extended shelf-life.

b) Learning outcomes

- It is expected that students will be able to demonstrate the technologies required to maintain fresh produce for extended period.

c) Content

A critical review of the literature concerning post-harvest losses of agricultural products and Post-harvest handling system of perishable crops; Current methods in Postharvest Physiology and Technology; Life extension of perishable commodities, techniques; Emphasis on the effects of storage facilities and techniques; Quality

evaluation as related to physiological mechanism controlling the maturation; Ripening and senescence of perishable commodities; Principles of storage of fruits and vegetables; Types of storage: natural, ventilated low-temperature storage controlled atmosphere (CA) and modified atmosphere storages (MA).

d) Mode of delivery

- Lecturer/student Interactions.
- Audio-visuals analysis of concepts (videos and infographics).
- Group discussions and presentations.
- Assignments.
- Term paper.
- Critique of research papers.

e) Reading materials

1. Florkowski, W. J., Banks, N., Prussia, S. E., Shewfelt, R. L. and Brueckner, B. (2009). Post-harvest handling: a systems approach. Academic Press. USA.
2. Golob, P., Farrell, G. and Orchard, J. E. (2002). Crop post-harvest: science and technology. Blackwell Science. USA.
3. Lieberman, M. (2012). Post-harvest physiology and crop preservation (Vol. 46). Springer Science and Business Media. The Netherlands.
4. Paliyath, G., Murr, D. P., Handa, A. K. and Lurie, S. (2009). Post-harvest biology and technology of fruits, vegetables, and flowers. John Wiley and Sons. USA.
5. Sudheer, K. P. and Indira, V. (2007). Post-harvest technology of horticultural crops (Vol. 7). New India Publishing. India.

13. Assessment Regulations:

Provide details of:

a. Students' performance and achievement

According to the handbook from the Graduate School, the pass mark for any course shall be 50%. However, a Cumulative Weighted Average (CWA) of 55.00 shall be obtained at the end of the taught courses to proceed with the thesis. Where a student does not maintain the minimum CWA of 55.00 and trails one or more courses, they shall be required to write supplementary examinations to be in good academic standing before starting the research work.

b. Mode of certification

All candidates would be deemed to have satisfactory performance for graduation when they have been graded for continuous assessment throughout the programme and have qualified for Mid-Semester (40%) and End-of-Semester examinations shall (60%) for each course.

c. The certificate awarding institution

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

14. Requirements for graduation:

Provide information on the following requirements for graduation:

a. Course Requirements;

All the core courses listed here must have been successfully passed.

FST 551	Food Chemistry
FST 553	Food Microbiology
FST 555	Food Processing and Packaging
FST 557	Food Product Development and Sensory Evaluation
FST 559	Food Analysis Laboratory
FST 571	Food Safety
STAT 559	Statistical Methods for Research

In addition, the compulsory electives must have been successfully passed.

b. Credits Requirements;

The minimum number of credits required for graduation is **32**.

c. Any additional requirements for graduation, e.g., attendance.

A successful graduate should have passed all courses registered, including practical and written examinations, oral presentations, and completing thesis reports.

15. Assessment Regulations:

Provide details of:

a. Students' performance and achievement

Written examinations, practicals, oral presentations, and the writing of formal reports will contribute towards the final assessment. All passes would be as prescribed by the regulations governing examinations in the University. Students will be given relevant handbooks/policy documents.

b. Mode of certification

All candidates would be deemed to have satisfactory performance for graduation when they have been graded for continuous assessment throughout the programme and have qualified for Mid-Semester (40%) and End-of-Semester examinations (60%) for each course.

c. The certificate awarding institution

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

16. Entry requirements for admission of students:

Candidates must have a BSc degree (minimum of Second Class (Lower Division)) in Food Science, Nutrition, Biochemistry, Biology, Chemistry, Agricultural Science, Agricultural Engineering, Chemical Engineering, Natural Resources Management, and other science-based degree from a recognized university.

A higher-level professional qualification or an advanced degree and relevant work experience in food related establishment may be considered where the candidate has not reached the requirement above. Such candidate shall be assessed through a selection interview or an entry examination.