4. Zeid, I. 2011. *Mastering CAD/CAM with Engineering*. McGraw-Hill Education Pvt. Ltd., New Delhi.

Food Quality and Safety 3 (2+1)

Objectives

To enable the student to know about the concept and aim of food quality and safety, food quality characteristics – physical, chemical and biological properties, different hazards and their prevention, different methods for measuring food quality as well as the food safety management system

Theory

Basics of food quality, safety and food analysis; Concept, objectives and need of food quality; definition, objective measurement of quality and quality and safety indices.

Quality control, quality control tools, statistical quality control; Sampling (Chemical and Microbiological): purpose, sampling techniques, sampling procedures for liquid, powdered and granular materials; Instrumental method for testing food quality, measurement of colour, flavour, consistency, viscosity, texture and their relationship with food quality and composition.

Non-destructive methods for evaluation of food quality. NIR, FTIR and chemometrics theory and application in food quality prediction. Theory and application of X-ray, CT, MRI, Ultrasound for internal quality inspection of fruits and vegetables. Sorting grading using external image analysis, internal biochemical analysis using spectroscopy.

Sensory evaluation methods, panel selection methods, Interpretation of sensory results.

Food hazards and food safety, Food borne infections, contaminants (physical, chemical, biological), adulteration, food safety strategies- Food Safety Management Systems, GAP, GHP, GMP, TQM, TQC; Hazards and HACCP, Sanitation in food industry (SSOP); Food Laws and Regulations, BIS, AGMARK, FSSAI; International Food standards (ISO-22000, CAC); Food Recall, Traceability; Bio safety and Bioterrorism; Sanitation in food industry.

Practical

Study of statistical process control in food processing industry; Study of sampling techniques, tools and protocols used in different types of from food handling, processing and marketing establishments; Study of registration process and licensing procedure under FSSAI; Examination of cereals, oilseeds and pulses from go-downs and market shops in relation to specifications provided by standardization techniques; Detection of adulteration and examination of ghee for various standards of Agmark/ FSSAI; Detection of adulteration and examination of spices for Agmark/ FSSAI standards; Detection of adulteration and examination of milk and milk products for FSSAI standards; Detection of adulteration in fruit products such as jam, jelly, marmalades as per FSSAI specification; Visit to a professional quality control laboratory; Visit to food processing laboratory in an industry and study of records and reports maintained by food processing laboratory.

Suggested Readings

1. Acharya, K. T. 2017. *Everyday Indian Processed foods*. National Book Trust.

2. Gupta, V. (Ed.). 2006. *The Food Safety and Standards Act along with Rules & Regulations*. Commercial Law Publishers (India) Pvt. Ltd.
3. Jha, S. N. 2015. *Rapid Detection of Food Adulterants and Contaminants: Theory and Practice*. Elsevier, USA (ISBN 9780124200845), p266.
4. Jha, S. N. (Ed.). 2010. *Nondestructive Evaluation of Food Quality: Theory and Practice*. Springer – Verlag GmbH Berlin Heidelberg, Germany, ISBN 978-3-642-15795-0, doi 10.1007/978-3-642-15796-7: 288p.
5. Mudambi, S. R., Rao, S. M. and Rajgopal, M. V. 2006. *Food Science*. New Age International Publishers.
6. Negi, H. P. S., Sharma, S. and Sekhon, K. S. 2007. *Hand book of Cereal Technology*. Kalyani Publishers, New Delhi.
7. Potter, N. N. and Hotchikss, J. H. 1995. *Food Science*. Chapman and Hall Pub.
8. Raj, D., Sharma, R. and Joshi, V. K. 2011. *Quality for Value Addition in Food Processing*. New India Publishing Agency, New Delhi
9. Ranganna, S. 1986. *Hand book of Analysis and Quality Control for Fruit and Vegetable Products*. Tata McGraw-Hill Education.
10. Sharma, A. 2017. *A Textbook of Food Science and Technology*. CBS Publishers & Distributors.
11. Srivastava, R. P. and Kumar, S. 2017. *Fruit and Vegetable Preservation: Principles and Practices*. International Book Distributing Company.

Websites and weblinks:

12. https://www.fssai.gov.in/cms/food-safety-and-standards-regulations.php
13. https://www.fssai.gov.in/cms/food-recall.php
14. https://www.fao.org/fao-who-codexalimentarius/en/

Watershed Planning and Management 3 (2+1)

Objective

To acquaint the students with different aspects of watershed planning and management including participatory approaches and also on the integrated watershed management practices

Theory

Watershed- introduction and characteristics; Watershed management- concept, objectives, factors affecting watershed planning based on land capability classes, hydrologic data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index.

Community mobilization and participatory institution building: participatory watershed management, role of watershed associations, user groups and self-help groups; Participatory Rural Appraisal, understanding gender in relation to agriculture.

Water budgeting in a watershed; Management measures - rainwater conservation technologies *in-situ* and *ex-situ* storage, water harvesting and recycling; Dry farming techniques - inter-terrace and inter-bund land management; Integrated watershed management- concept, components, arable