



Syllabus

For

PhD Food Technology

Department of Food Technology

Islamic University of Science and Technology
Awantipora-Kashmir 192122

List of course for Ph.D Food Technology Programme

S.no	Course Code	Name of Subject	Credits	Semester
01	PFT-01	Advances in Food Chemistry	3+0	1 st
02	PFT-02	Advances in industrial Microbiology	3+0	
03	PFT-03	Advances in Food Engineering and Technology	4+0	
04	PFT-04	Research Methodology	4+0	
05	PFT-05	Research and Publication Ethics	2+0	

Advances in Food Chemistry**Course Code (PFT-01)****Credits (3+0)****Objectives:-**

1. To acquaint with the properties and role of various food constituents, their interaction in changes during processing
2. Aim of developing healthy and nutritious foods for normal and special category of population

UNIT- I

Water activity and its relevance to deteriorative processes in foods (chemical, physical and microbial changes). Methods for stabilization of foods by control of water activity. Glass transition and molecular mobility in foods, their relevance to quality and stability of food products.

Unit -II

Modification of carbohydrates especially starches and celluloses, manufacture of maltodextrins and corn syrups. Food applications (nutraceutical and functional properties) of carbohydrates. Interactions of carbohydrates with other food constituents and their implications. Changes in food carbohydrates during processing. Dietary fibre: Sources, types, functional ingredients. Resistant oligosaccharides, modifications

Unit -II

Introduction and definition of lipids and their classification. Structural aspects; Nutritional aspects of food lipids and their sources- omega-3 and omega-6 fatty acids and their significance. Physical and chemical characteristics of various fats and oils. Measurement of lipid degradation parameters during deep-fat frying and storage of foods. Hydrogenation of vegetable oils. Characteristic tests for various oils. Trans-fatty acids- formation during processing and nutritional aspects.

Unit -IV

Protein structure and chemistry; Physico-Chemical properties of protein and their structure. Protein-protein interactions, methods of evaluation of protein quality and amount,

Conventional and novel sources of protein. Protein concentrates/isolates. Functional properties of proteins and their applications. High protein food formulations, Modification of proteins by enzymes, chemical and physical methods. Interactions of proteins with flavours, polysaccharides, lipids and their technological effects. Enzymes-Classification, Properties, Kinetics. Enzymes as processing aid in different food industries.

Unit -V

Vitamins, structure, stability in foods, degradation of vitamins during processing, analysis of vitamins, bioavailability of vitamins. Pigments: Structure and types of various pigments viz Carotenoids, flavonoids, Chlorophylls, quinoids, betalins. Physical and chemical properties, stability during processing.

Suggested Readings

1. Fennema OR.1996. Food Chemistry. Marcel Dekker.
2. Meyer LH. 1987. Food Chemistry. CBS.^[11]_{SEP}
3. John M. DeMann. Principles of Food Chemistry
4. John N. Coupland. An introduction to the physical chemistry of Food.
5. Jan Velisek. The Chemistry of Food.

Advances in INDUSTRIAL MICROBIOLOGY**Course Code (PFT-02)****Credits 3+0****Objective:-**

To acquaint with application of micro-organisms for the production of Industrial products with particular reference to foods and food ingredients and to expose to the recent advances and applications in the area of food microbiology.

UNIT I

Foods as ecological niches, Relevant microbial groups, Microbes found in raw materials and foods that are detrimental to quality, Factors that influence the development of microbes in food, newer and rapid methods for qualitative and quantitative assay demonstrating the presence and characterization of microbes, Stress, damage, adaptation, reparation, death.

UNIT II

Microbial behavior against the newer methods of food processing, Adoption and resistance development, Microbes as test organisms, as sensors and as tools for future applications in energy production and food and non food industrial products. Modern methods of cell culture: synchronous and co- cell culture, continuous cell culture in liquid and solid media, Cell immobilization and applications, Pre and probiotics cultures.

UNIT III

Fermenter design and various types of fermentation systems (submerged, surface and solid state); Fermentation substrates, Principles and production of amino acids, enzymes, nucleotides, organic acids, food colors, bakers yeast, alcoholic beverages, vinegar and acetic acid. Fermented cereal and animal products. Oriental foods.

UNIT IV

Principles and production of microbial proteins, lipids, polysaccharides and vitamins – properties and applications; mushroom cultivation. Utilization and disposal of industrial wastes through microorganisms; use of genetically modified microorganisms in food processing.

Suggested Readings

1. Adams M. 2006. Emerging Food-borne Pathogens. Woodhead Publ.
2. Adams MR & Moss MO. 2000. Food Microbiology. Panima.
3. Easter MC. 2003. Rapid Microbiological Methods in the Pharmaceutical Industry.
4. Harrigan W. 2003. Laboratory Methods in Food Microbiology. University of Reading, UK, Elsevier. James MJ, Loessner MJ & David A. 2005. Modern Food Microbiology. 7th Ed. Golden Food Science Text Series.
5. Pederson CS. 1979. Microbiology of Food Fermentations. AVI Publ.
6. Roberts R. 2002. Practical Food Microbiology. Blackwell Publ.
7. Rossmore HW. 1995. Handbook of Biocide and Preservative.
8. Blackie Wood JBB. 1999. Microbiology of Fermented Foods. Vols. I, II. Blackwell Academic.
9. Yousef AE. 2002. Food Microbiology: A Laboratory Manual. AVI.
10. Perman D. 1977-79. Annual Reports of Fermentation Processes. Vols. I-III.
11. Prescott SC & Dunn CG. 1959. Industrial Microbiology. Mc Graw Hill.
12. Waits MJ. 2001. Industrial Microbiology. Blackwell Science. Ward OP. 1989. Fermentation Biotechnology. Prentice Hall.

Advances in Food Engineering and Technology**Course Code (PFT-03)****(Credits: 4+0)****Objectives:-**

1. To acquaint with advances in food engineering and its food processes for the design of food processing machines
2. To develop an insight among the Scholars /Students about the existing modern techniques and their applications in food industry

Unit I

Green separation technology: Types, mechanism and applications; Hyper baric and hypobaric extraction, Supercritical fluid technology: Design, principle, and application

Unit II

Emerging Food processing Techniques, Design, mechanism and application in foods, Electric field based techniques High pressure processing, Dense phase carbon dioxide technique- Design, mechanism and applications; Advances in Drying and Dehydration: mechanism and applications; Nano-fluids for thermal processing of foods

Unit III

Thermal properties and interpretation, Food flow and its importance, Advances in chromatography and spectroscopy, Food microstructure - Atomic force microscopy (AFM), SEM and TEM, Image acquisition, processing and analysis. Biosensors-Nano-biosensors, design, and applications

Unit IV

Nano techniques in food processing; Bio-based composites: design, testing and applications, Biomimicing in Food technology; 3-D Printing in foods

Suggested Readings:-

1. Barbosa-Canovas 2002. Novel Food Processing Technologies. CRC.
2. Dutta AK & Anantheswaran RC.1999. Hand Book of Microwave Technology for Food Applications.
3. Frame ND. (Ed.). 1994. The Technology of Extrusion Cooking.
4. Blackie. Gould GW. 2000. New Methods of Food Preservation. CRC.
5. Shi J. (Ed.). 2006. Functional Food Ingredients and Nutraceuticals: Processing Technologies. CRC.

6. Charm SE. 1971. Fundamental of Food Engineering. AVI Publ.
7. Cheryan M. 1998. Ultra-filtration and Micro-filtration Handbook. Technomic Publ.
8. Duckworth R. 1975. Water Relations in Foods. Academic Press.
9. Heldman DR & Singh RP.1984. Food Process Engineering. AVI Publ.
10. Hendrickx and Knorr. Rockland LB & Stewart GF. 1991. UHP Treatments of Foods. KA/PP Publ.
11. Mohsenin NN. 1986. Physical Properties of Plant and Animal Materials. Gordon & Breach Science Publ.
12. Rao MA & Rizvi SS.1986. Engineering Properties of Foods.
13. Marcel Dekker. Robertson GL. 1992. Food Packaging (Principles and Practices).
14. Marcel Dekker. Watson EL & Harper JC.1989. Elements of Food Engineering. AVI Publ.

Research Methodology**Course Code (PFT-04)****Credits (4+0)****UNIT-I**

Introduction and overview of research: Definition, philosophy and objective of research; history and types of research; impact of research on society and development Safety issues in research laboratory: physical, chemical and biological perspectives.

UNIT-II

Literature Review and Research Formulation: Primary and secondary sources; use of online literature search tools; evaluating internet and web resources; identifying gap areas from literature review; how to develop a research idea; statement of hypothesis and specific aims

Experimental design, data collection and analysis: Writing background and significance; design of experiments; primary data and secondary data, methods of primary data collection, classification and summarization of data; presentation of data – diagrams and graphs; and statistical analysis; validation; up gradation.

UNIT-III

Scientific/technical writing and research presentation: Types, Structure and components of Scientific Reports; Technical Reports and Thesis; Steps in the preparation of reports and thesis layout, structure and language of typical reports, illustrations and tables, bibliography, referencing and foot notes; components of a good oral research presentation; use of visual aids; importance of effective communication; citation, impact factor, h-index and acknowledgement

UNIT-IV

Ethics in research: Responsible conduct; the regulations and ethics of animal use in research; Research ethics for human subjects; intellectual property rights; patenting of process and products; reproduction of published material; plagiarism

UNIT-V

Components of a good oral research presentation: content, slide preparation, presentation,

interaction, acknowledgement Application of computer in research:Basic principles of Statistical Computation using various softwares; design of experiments and analysis of results using various softwares (MATLAB, ORIGIN, SIGMAPLOT, Design Expert, etc)

Suggested Readings:-

1. Montgomery, D. C., (2001).Design and Analysis of experiments, Fifth Edition, John Wiley & Sons. Kothari, C.R.(2008).
2. Research Methodology: Methods and Techniques.
3. Second Edition. New Age International Publishers, New Delhi, Vining,
4. G. G., Kowalski, S. (2010). Statistical Methods For Engineers.
5. 2nd Edn. Cengage Learning (RS), Boston, USA.

Research and Publication Ethics**Course Code (PFT-05)****Credits (2+0)****Objectives**

This course has total 6 Units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hand-on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc) and Plagiarism tools will be introduced in this course.

UNIT-I**RPE01: PHILOSOPHY AND ETHICS**

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

UNIT-II**RPE02: SCIENTIFIC CONDUCT**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

UNIT-II**RPE03: Publication Ethics**

1. Publications ethics : definition, introduction and importance
2. Best practices/ standards setting initiatives and guidelines: COPE,WAME,etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

UNIT-IV**RPE04: OPEN ACCESS PUBLISHING**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publication developed by SPPU
4. Journal funder / journal suggestion tools viz, JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

UNIT-V

RPE05: PUBLICATION MISCONDUCT

A. Group Discussions

1. Subject specific ethics issues, FFP, authorship
2. Conflicts of interest
3. Conflicts and appeals: examples and fraud from India and abroad

B. Software tools

Use of plagiarism software Like Turnitin, Urkund and other open source software tools

UNIT-VI

RPE05: PUBLICATION MISCONDUCT

A. Databases

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc

B. Research Metrics

1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite score
2. Metrics: h-index, g index i10 index, altmetrics

Suggested Readings:-

1. Bord. A (2006) Philosophy of Science
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London
3. P.Chaddah, (2018) Ethics in Competitive Research : Do not get scooped; do not get plagiarized, ISBN:978-9387480865
4. National Academy of Science, National Academy of Engineering and Institute of Medicine. (2009). On Being a Scientist: A guide to Responsible Conduct in Research: Third Edition. National academies Press.
5. Resnik, D.B (2011). What is ethics in research & why is it important. National Institute of environmental Health Sciences, 1-10, Retrieved from <https://www.niesh.nih.gov/research/resources/bioethics/what/index.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access nature, 489(7415), 179-179 <https://doi.org/10.1038/489179a>
7. Indian national science academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf