



Course Title with Credit Load Ph.D. in Processing Technology

Major Courses

Course Code	Course Title	Credit Hours
FPT 601	Novel Technologies for Food Processing and Shelf Life Extension	3+0
FPT 602	Food Packaging	3+0
FPT 603	Food Manufacturing Technology	3+0
FPT 604	Plant Food Products	3+0
FPT 605	Food Process Modeling and Scale up	3+0
FPT 606	Animal Food Products	3+0
FPT 607	Special Problem	0+2

Minor Courses

Course Code	Course Title	Credit Hours
FPE 601	Concentration and Drying Engineering	3+0
FPE 603	Food Handling and Storage Engineering	3+0
FSQ 603	Quality Assurance in Food Supply Chain	3+0
FSQ 604	Formulation of Standards of Food Products, Packaging and Labeling	2+0

Supporting

Course Code	Course Title	Credit Hours
FPE 605	Food Analytical Techniques	1+2
FSQ 607	Sensory Evaluation of Foods	2+0

Seminar

Course Code	Course Title	Credit Hours
FPT 698	Seminar I	1+0
FPT 699	Seminar II	1+0



Course Contents

Ph.D. in Processing Technology

- I. Course Title** : **Novel Technologies for Food Processing and Shelf Life Extension**
- II. Course Code** : **FPT 601**
- III. Credit Hours** : **3+0**

IV. Theory

Recent advances in novel food processing technology; Membrane processing, Supercritical fluid extraction, Microwave and radio frequency processing, High Pressure processing, Ultrasonic processing, Ozonization, Plasma Technique, Novel drying techniques. Various techniques to increase shelf life and shelf life prediction.

V. Suggested Reading

- Gould GW. 2000. *New Methods of Food Preservation*, CRC Press.
- Barbosa-Canovas, 2002. *Novel Food Processing Technologies*, CRC Press.
- Dutta AK and Anantheswaran RC, 1999. *Hand Book of Microwave Technology for Food Applications*, CRC Press.
- Sun DW. 2015. *Emerging Technologies for Food Processing*, Elsevier Ltd.
- Kudra T and Mujumbar AS. 2009. *Advanced Drying Technologies*, CRC Press.
- Kilkast D and Subramaniam P. 2000. *The Stability and Shelf Life of Food*. CRC Press.
- Doona C J and Feeherry F E. 2007. *High Pressure Processing of Foods*. Blackwell Publishing Ltd.

- I. Course Title** : **Food Packaging**
- II. Course Code** : **FPT 602**
- III. Credit Hours** : **3+0**

IV. Theory

Recent advances in active and intelligent packaging like Antimicrobial food packaging, Non-migratory bioactive polymers, Freshness indicator, Recycling, biodegradable packaging, Edible Films and Coatings, aseptic packaging, self heating and hydrate packages.

V. Suggested Reading

- Ahvenainen R. 2001. *Novel Food Packaging Techniques*, CRC Press.
- Rooney ML. 1988. *Active Food Packaging*, Chapman & Hall.
- Coles R and Kirwan M. 2011. *Food and Beverage Packaging Technology*, Wiley-Blackwell.
- Han J and Han J. 2005. *Innovations in Food Packaging*, Academic Press.
- Yam K and Lee D. 2012. *Emerging Food Packaging Technologies*, Woodhead Publishing.
- Mihindukulasuriya SDF and Lim LT. 2014. *Nanotechnology Development in Food Packaging-a Review. Trends in Food Science and Technology*, 149-167.
- Souza VGL and Fernando L. 2016. *Nano-particles in Food Packaging-Biodegradability and Potential Migration to Food – A Review. Food Packaging and Shelf Life*, 63-70.



- I. Course Title : Food Manufacturing Technology**
II. Course Code : FPT 603
III. Credit Hours : 3+0

IV. Theory

Manufacturing resource planning, Inventory control, Production planning, Production scheduling, Material requirement planning, Resource planning, Capacity requirement planning. Job scheduling,

V. Suggested Reading

- Badiru AB. 2015. *Global Manufacturing Technology Transfer: Africa-USA Strategies, Adaptations, and Management*, CRC Press.
- Hitomi K. 1996. *Manufacturing Systems Engineering: A Unified Approach to Manufacturing Technology, Production Management and Industrial Economics*, CRC Press.
- Yamane Y and Childs T. 2013. *Manufacturing Technology Transfer: A Japanese Monozukuri View of Needs and Strategies*, CRC Press.

- I. Course Title : Plant Food Products**
II. Course Code : FPT 604
III. Credit Hours : 3+0

IV. Theory

Post-harvest handling of fresh fruits and vegetables, Minimally processed fruits and vegetables, advances in chilling, freezing, and drying, Alcoholic and non-alcoholic beverages; Dough quality measurements; bakery, RTE, RTC products; Hydrogenation, fractionation, winterization, inter-esterification etc. Process for obtaining tailor-made fats and oils; Speciality fats and designer lipids for nutrition and dietetics, Textured Plant proteins.

V. Suggested Reading

- Rodrigues S and Fernandes FAN, 2016. *Advances in Fruit Processing Technologies*, CRC Press.
- Smith DS, Cash JN, Nip WK and Hui YH. 1997. *Processing Vegetables: Science and Technology*, CRC Press.
- Chakraverty A and Singh RP. 2016. *Postharvest Technology and Food Process Engineering*, CRC Press.
- Frame ND. 1994. *Technology of Extrusion Cooking*, Springer US
- O'Brien RD. 2008. *Fats and Oils: Formulating and Processing for Application*, CRC Press.
- Davis B, Lockwood A, Alcott P and Pantelidis L. 2012. *Food and Beverage Management*, CRC Press.
- Dhillon PS and Verma S. 2012. *Food and Beverage: Production Management for Hospitality Industry*, Abhijeet Publications.

- I. Course Title : Food Process Modeling and Scale-up**
II. Course Code : FPT 605
III. Credit Hours : 3+0

IV. Theory

Recent advances in modeling of high and low temperature processing; Kinetic modeling of microbial growth and its destruction, enzyme inactivation, nutrient retention, Scale up of food processing.



V. Suggested Reading

- Tijskens LMM, Hertog MLATM and Nicolai BM. 2001. *Food Process Modelling*, Woodhead Publishing.
- Ozilgen M. 2011. *Handbook of Food Process Modeling and Statistical Quality Control*. CRC Press.
- Bernd H. 2017. *Measurement, Modeling and Automation in Advanced Food Processing*, Springer.
- Valentas KJ, Clark JP and Levin L. 1990. *Food Processing Operations and Scale-up*. CRC Press.

- I. Course Title : Animal Food Products**
II. Course Code : FPT 606
III. Credit Hours : 3+0

IV. Theory

Research and development activities on meat, fish and poultry products. gross and microstructure of muscle, Pre-slaughter care, ante and post mortem, slaughter, handling of offal (edible and inedible). Methods to improve tenderness, Special poultry products, Breaded poultry, packaged precooked chicken, Freeze dried poultry meat. egg preservation, egg powder production. Meat analogues and restructured meat products, production of fish paste, fish oils, sauce, fish protein concentrates. Irradiation of fish and fisheries products, packaging of fish products, quality control and quality assurance. Allergens, toxins and infectious diseases from meat, poultry and fish products.

V. Suggested Reading

- Nollet ML. 2012. *Handbook of Meat, Poultry and Seafood Quality*, Wiley-Blackwell.
- Mountney GJ. 1988. *Poultry Meat and Egg Production*, Springer.
- Robert RJ. 2012. *Fish Technology*, Wiley-Blackwell.
- Mead G. 2004. *Poultry Meat Processing And Quality*, Woodhead Publishing.
- Sahoo J, Sharma DK and Chatli MK. 2016. *Practical Handbook on Meat Science and Technology*, Daya Pub. House.
- Pearson AM and Gillet TA. 1996. *Processed Meat*, Springer.
- Kerry JP, Kerry JF and Ledwood D. 2002. *Meat Processing*, Elsevier.
- Wheaton FW and Lawson TB. 1985. *Processing of Aquatic Food Products*, John Wiley & Sons.