

LIVESTOCK PRODUCTS TECHNOLOGY
Course Structure

<u>COURSE NO.</u>	<u>COURSE TITLE</u>	<u>CREDITS</u>	<u>SEM</u>
LPT 601*	FRESH MEAT TECHNOLOGY	1+1	I
LPT 602	MEAT PROCESSING, PACKAGING, QUALITY CONTROL AND MARKETING	2+1	II
LPT 603*	POULTRY AND FISH PRODUCTS TECHNOLOGY	2+1	I
LPT 604*	EGG AND EGG PRODUCTS TECHNOLOGY	1+1	I
LPT 605	ABATTOIR AND POULTRY PROCESSING PLANT PRACTICES	1+1	II
LPT 606	SLAUGHTER HOUSE BYPRODUCTS TECHNOLOGY	2+1	II
LPT 607	PROCESSING AND MARKETING OF WOOL	2+1	II
LPT 608*	MARKET MILK PROCESSING AND DAIRY PLANT PRACTICES	2+1	I
LPT 609	QUALITY CONTROL OF MILK AND MILK PRODUCTS	1+1	II
LPT 610	TECHNOLOGY OF MILK PRODUCTS	2+1	I
LPT 611	BIOTECHNOLOGY OF FOODS OF ANIMAL ORIGIN	1+1	II
LPT 612	IN-PLANT TRAINING	0+2	SEM Break
LPT 691	MASTER'S SEMINAR	1	I, II
LPT 699	MASTER'S RESEARCH	20	I, II
LPT 701	ADVANCES IN ABATTOIR PRACTICES AND ANIMAL BYPRODUCTS UTILIZATION	2+1	I
LPT 702**	ADVANCES IN FRESH AND PROCESSED MEAT PRODUCTS TECHNOLOGY	3+1	II
LPT 703	ADVANCES IN POULTRY PRODUCTS TECHNOLOGY	2+1	I
LPT 704**	ADVANCES IN MILK AND MILK PRODUCTS TECHNOLOGY	3+1	I
LPT 705	ADVANCES IN QUALITY CONTROL OF LIVESTOCK PRODUCTS	2+0	II
LPT 706	BIOTECHNOLOGICAL TECHNIQUES AND PROCESSES IN ANIMAL PRODUCTS	1+1	II
LPT 791	DOCTORAL SEMINAR -I,	1	I, II
LPT 792	DOCTORAL SEMINAR- II	1	I, II
LPT 799	DOCTORAL RESEARCH	45	I, II

SERVICE COURSE

ABM 523	TECHNOLOGY MANAGEMENT FOR LIVESTOCK PRODUCTS	2+0	
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*Compulsory for Master's programme;

**Compulsory for Doctoral programme

LIVESTOCK PRODUCTS TECHNOLOGY

Course Contents

LPT 601 FRESH MEAT TECHNOLOGY 1+1 SEM - I

Objective:

To impart knowledge about history, current status of meat industry, muscle composition, functions and sensory quality of meat. To educate on factors influencing quality of meat and nutritive value.

Theory:

UNIT-I: History and development of meat science and meat industry, current trends and prospects of meat industry-Structure and chemistry of animal tissues, muscle functions and postmortem changes- Rigor mortis – Effect of transport on meat quality – its veterinary and clinical importance – PSE and DFD in meat quality – Conversion of muscle to meat.

UNIT-II: Composition, nutritional content and general quality characterization and evaluation of meat and its products- meat microbiology –Factors affecting quality of meat – Essential nutrients in meat and poultry meat – Tenderization. Chemical residues in meat, and their effects on the health of the consumer.

Practical

Microbiological sampling and evaluation of meat. Evaluation of physicochemical and sensory properties of meat and meat products. Estimation of pH – Colour - Water holding capacity – ERV – Tyrosine value – Thiobarbituric acid number – Estimation of texture profile of meat – Estimation of glycogen, R-value, myoglobin, proximate analysis of meat and meat products including poultry products – Estimation of drip loss - Determination of Sarcomere length, fibre diameter and myofibrillar fragmentation index. Retail and wholesale cuts.

Suggested Readings

Gracey JF. 1999. *Thornton's Meat hygiene*. 10th Ed. WB Saunders.

Kerry J, Kerry J & Ledward D. 2005. *Meat Processing-Improving Quality*. Woodhead Publishing Ltd., UK.

Pearson AM & Dutson TR. 1999. *Advances in Meat Research*. Vol. IX. *Quality Attributes and their Measurement in Meat, Poultry and Fish Products*. Aspen Publishers, Inc, Maryland, USA.

Swatland H & Campbell T. 2004. *Meat Cuts and Muscle Foods*. Nottingham Univ. Press.

LPT 602 MEAT PROCESSING, PACKAGING, 2+1 SEM - II
QUALITY CONTROL AND MARKETING

Objective

To impart knowledge on preservation methods, product development, quality control and packaging practices in meat.

Theory

UNIT-I: Factors affecting fresh meat quality, ageing, basic principles of preservation, chilling, freezing, thermal processing, dehydration, irradiation and use of chemicals and antibiotics; meat curing and smoking.

UNIT-II: Comminuted meat; preparation of various kinds of fresh and cooked meat products-Canning – Heat processing – Sausages – Ham, Bacon, Tandoori- Barbecueing of Poultry.Senses of taste and olfaction-factors influencing sensory measurements, physical and chemical properties related to sensory evaluation, types of sensory panels, discriminate and descriptive testing.

UNIT-III: Meat adulteration and substitution – Different techniques for meat speciation – Agar gel immuno diffusion techniques – Démonstration of CIE, IEF, ELISA, PCR

UNIT-IV: Principles of packaging- Product characteristics affecting packaging requirements; packaging material and their characteristics - different methods of packaging meat – Vacuum packaging – MAP – Retort pouch processing.

UNIT-V: Marketing of meat, setting up of meat retailing unit and other meat merchandising practices. MFPO, BIS Standards for meat products. National and international specifications and standards.

Practical

Proximate composition of meat, tyrosine value, nitrite content, TBARS value, peroxide value, Formulation of different meat products, emulsion stability, shear force value, cooking determinants, subjective and objective method of sensory evaluations.

Suggested Readings

Kerry J, Kerry J & Ledward D. 2005. *Meat Processing-Improving Quality*. Woodhead Publishing Ltd., UK.

Pearson AM & Dutson TR. 1999. *Advances in Meat Research*. Vol. IX. *Quality Attributes and their Measurement in Meat, Poultry and Fish Products*. Aspen Publishers, Inc, Maryland, USA.

Swatland H & Compbell T. 2004. *Meat Cuts and Muscle Foods*. Nottingham Univ. Press.

LPT 603 POULTRY AND FISH PRODUCTS 2+1 SEM - I TECHNOLOGY

Objective

To impart knowledge on structure, functional quality, microbiology, processing and preservation of poultry meat, eggs and fish.

Theory

UNIT-I: History and development of poultry meat and egg processing industry. Different species of poultry and their production potentials- commonly occurring anti nutrients, and antibiotics in poultry feed ingredients and its effect on egg and meat nutrition – Quality identification, quality maintenance, chemical, nutritional and microbiological quality of poultry meat. Preservation and packing techniques of shelled and liquid eggs. Quality identification of shell eggs and factors influencing the quality.

UNIT-II: Pre-slaughter care, transportation, resting, fasting, ante-mortem examination, methods of slaughter and slaughtering procedure-postmortem inspection, reasons for

condemnation of carcass-yield and grading of dressed chicken, cutup parts and de boned meat.

UNIT-III: Structure, nutritive value, compositional chemistry, microbiology and functional properties of eggs. Low cholesterol eggs, GMP, HACCP procedures for food safety – Codex regulation for food products safety – WTO/GOI regulations for import and export of poultry products. National and international regulations, standards, quality control and marketing of fish and fish products, utilization of fish processing waste.

UNIT-IV: Fishery resources, marine and fresh water fishes, transportation, processing, preservation, grading, standards. Quality control, labeling and marketing of fish and fish products, utilization of fish processing waste.

UNIT-V: Post processing value added meat for export- Integration, poultry and fish processing and marketing-Storage, packaging and chilling, freezing, dehydration, canning, irradiation, curing, smoking, barbecuing, cooking and preparation of further processed poultry and fish products.

Practical

Organization, sanitation and maintenance of poultry processing plants. Slaughtering, antemortem and postmortem inspection, meat cutting, grading, production of ready to eat, smoked and cured poultry meat Comminuted and other poultry based convenient items. Visit to poultry processing plant/egg processing plant. Postmortem inspection, carcass yield and grading. Meat bone ratio, quality maintenance, tenderization, water holding capacity. TBA values and preparation of further processed and freeze dried poultry products. Whole egg powder, shell meal, processing plant waste meal-HACCP-egg powder processing plant. Grading of shelled eggs, liquid eggs, egg powder foaming property , pasteurization of liquid egg, testing microbial load in different foRms of egg, visit of egg powder plant/egg processing plant, poultry and fish products and their Proximate analysis, microbiological and sensory evaluation and poultry meat and fish.

Suggested Readings

Mead GC.1989. *Processing of Poultry*. Elsevier.

Mountney GJ. *Poultry Products Technology*. 2nd Ed. AVI Publ.

Pearson AM & Gillett TA.1996. *Processed Meats*. 3rd Ed. Chapman & Hall.

Stadelman W & Cotterill OJ. 2002. *Eggs Science and Technology*. 4th Ed. CBS.

Suzuki T. 1981. *Fish and Krill: Protein Processing Technology*. Applied Science Publ.

LPT 604 EGG AND EGG PRODUCTS TECHNOLOGY 1+1 SEM - I

Objective

To impart knowledge about composition and marketing of eggs and nutritive value of eggs, preservation methods –quality maintenance, functional and value added egg product development, packaging and standards.

Theory

UNIT-I: Preservation and maintenance of quality of eggs- spoilage of egg and its prevention.-Preparation of fast foods.

UNIT-II: Egg breaking plant lay out and organization- freezing- pasteurization desugarisation- dehydration – quality estimation.

UNIT-III: Principles involved in preparation of egg powder and other egg products- Development of convenient egg based products- packaging of egg and egg products.

UNIT-IV: Specifications, standards and marketing of egg and egg products-Quality control of egg products.

Practical

Evaluation of physical, chemical, functional and microbial quality of egg and egg products. Preservation of eggs- Preparation of dehydrated and convenient egg products- Visit to egg processing plant.

Suggested Readings

Romanoff AL & Romanoff AJ. 1949. *Avian Egg*. John Wiley & Sons.

Stadelman WL & Cotterill OJ. 2002. *Egg Science and Technology*. 4th Ed. CBS.

LPT 605 ABATTOIR AND POULTRY PROCESSING PLANT PRACTICES 1+1 SEM - II

Objective

Teaching about abattoir design, sanitation and basic slaughterhouse practices, effluent treatment and proper disposal of wastes.

Theory

UNIT-I: Layout, designing – operation and maintenance of slaughter houses and processing plants-disposal of slaughter house effluents and different designs of effluent treatment plants - equipments, organization and Slaughter house, maintenance, record keeping and operation-sanitation of slaughterhouse- Sanitary practices in meat plant and their benefits; quality control.

UNIT-II: Pre-slaughter judging, inspection, grading, pre-slaughter care, slaughter of meat animals; Humane slaughter – Principles and methods of stunning – Ritual slaughter of food animals and poultry – Machineries for slaughter and dressing- processing of different kinds of meat animals- Ante-mortem inspection and Post-mortem examination of animals. Disposal and condemnation of unfit materials.

UNIT-III: Carcass quality appraisal, judgment and their grading, meat cutting, measuring yields. Application of HACCP, GMP, ISO 9000, ISO 14000, ISO 22000, BIS Standards and any recent standards for meat and processing industries.

Practical

Visit to slaughterhouse– Plan and outlay of modern abattoir- Procedure for slaughter of food animals and poultry - Ante-mortem and postmortem inspection, slaughtering, grading and meat cutting, carcass yield, meat bone ratio, measurement of effluent characteristics: pH, BOD, COD, suspended solids etc.

Suggested Readings

Gerrard F. 1977. *Meat Technology*. Northwood.

Gracey JF. 1999. *Thornton's Meat hygiene*. 10th Ed. WB Saunders.

LPT 606 SLAUGHTER HOUSE BYPRODUCTS TECHNOLOGY

2+1 SEM - II

Objective

To impart knowledge on animal by-products, processing and industrial utilization.

Theory

UNIT-I: Slaughterhouse byproducts industry in India and abroad – Importance of utilizing slaughterhouse offals – Rendering- Planning a by-product plant - Utilization of blood, bones, hooves, glands, intestines, feathers, glandular byproducts and other minor byproducts for industrial exploitation.

UNIT-II: Meat fat characteristics - Preservation and processing of ruminal contents – Ensiling of ruminal contents – Value added products preparation from slaughterhouse byproducts, processing of animal byproducts for pet foods.

UNIT-III: Flaying - Classification and factors affecting quality of hides and skin- Physical and chemical characteristics of hide and skin- Processing of hide and skin for manufacture of leather- Preparation and quality control of gelatin and glue. Microscopic, physical and chemical characteristics of leather; testing and marketing of leather- Preservation and packaging practices of various kinds of hides and skin.

UNIT-IV: Designing of animal byproduct plant. Collection and scope for further utilization of slaughter house byproducts. Waste treatment and pollution control- Environmental Audits-Regulations on pollution control.

Practical

Identification of quality defects in leather- preparation of sausage casing, blood meal, feather meal and meat meal. Demonstration of carcass meal – Meat meal – Bone meal - Preparation of animal casings – Grading of casings and wool – Preparation of slime meal – Collection and preservation of glandular products – Preparation of pet foods - Visit to local by-products/ processing units. Quality evaluation of rendered animal fat.

Suggested Readings

Dilon M & Griffith C. 2001. *Auditing in the Food Industry - From Safety and Quality to Environmental and other Audits*. Woodhead Publ. Ltd.,UK.

GregoryNG. 1988. *Animal Welfare and Meat Science*. CABI.

Ockerman HW & Hansen CL. 2000. *Animal by-product processing and utilization*.

Technomic Publ. Co. Ltd., Pennsylvania, USA.

Ockerman HW & Hansen CL. 2002. *Animal Byproducts Processing and Utilization*. CRC.

LPT 607 PROCESSING AND MARKETING OF WOOL 2+1 SEM - II

Objective

To impart knowledge on grading, manufacturing process, marketing and specifications of wool and specialty fibers- growth and structure of wool and fiber, their use.

Theory

UNIT-I: Status and prospects of wool -Grading of wool. Faults and impurities in wool and their removal.

UNIT-II: Wool types and their uses. Growth and molecular structure of wool fibre; physical and chemical properties of wool. Characteristics of hair fibres and their use, factors influencing quality of wool and hair fibres - Principles and steps involved in manufacturing processes of wool- specialty hair fibres.

UNIT-III: Physical and chemical testing of wool. Proclaimed wool and secondary raw material - Marketing of wool, specification and regulation for quality control.

Practical

Visit to wool industry and acquaintance with various steps of manufacturing wool and its quality control, physical and chemical testing of wool. Characterization of wool, grading of wool.

Suggested Readings

Bergen WV. 1963. *Wool Hand Book*. Vols. I, II. Inter Science.

LPT 608 MARKET MILK PROCESSING AND DAIRY PLANT PRACTICES **2+1 SEM - I**

Objective

To impart knowledge about milk composition, legislation, milk processing techniques, cleaning and sanitation of dairy equipments.

Theory

UNIT-I: Milk standards and legislation and related agencies.

UNIT-II: Composition of milk, major and minor constituents of milk, physico-chemical, microbial and nutritional properties of milk and preservation of raw milk.

UNIT-III: Layout Designing and organization of dairy plant, Milk procurement, handling and transportation. Chilling, centrifugation, separation, clarification, bacto-fugation and homogenization. Thermal processing- pasteurization, UHT processing, sterilization, bacto-therm and packaging, Storage and distribution of processed milk. Fortified, reconstituted and flavoured milks.

UNIT-IV: Membrane processing and related techniques; application of ultrafiltration, reverse osmosis; nanofiltration and microfiltration in the dairy industry.

UNIT-V: Current trends in cleaning and sanitization of dairy equipment, biological detergents, ultrasonic techniques in cleaning; biodetergents. Disposal of dairy effluents.

Practical

Platform tests. Determination of fat, SNF, TS, protein, lactose and ash contents of milk. Standardization, pasteurization and sterilization. HCT profile of milk systems. Judging of different types of milks. Layout plan of market milk plant.

Suggested Readings

Walstra P, Wouters JTM & Geurts TJ. 2006. *Dairy Science and Technology*. 2nd Ed. Taylor & Francis.

Web BH, Johnson AH & Alford JA. 1987. *Fundamental of Dairy Chemistry*. 3rd Ed. Westport AVI Publ.

LPT 609 QUALITY CONTROL OF MILK AND MILK PRODUCTS 1+1 SEM - II

Objective

To impart knowledge about quality control, TQM, HACCP, SPS, CAC and legal standards.

Theory

UNIT-I: Importance of quality control in dairy industry. PFA Act, BIS standards, AgMark standards and ISO standards of milk products.

UNIT-II: Total quality management in processing of milk products – HACCP and SPS.

UNIT-III: Types of microorganisms associated with milk and milk products-Milk borne diseases.

UNIT-IV: Physico-chemical and microbial changes during procurement, processing and storage of milk and milk products.

UNIT-V: Fundamental rules for sensory evaluation, Hedonic scale, score cards and their use for grading of milk and milk products.

Practical

Determination of pH and acidity, electrical conductivity, viscosity, phosphatase test, MBRT, Resazurin test, DMC, SPC. Analysis of milk and milk products in reference to BIS/PFA standards. Grading of milk and milk products.

Suggested Readings

Jennes R & Patton S. 1969. *Principles of Dairy Chemistry*. Wiley Eastern.

Yadav JS, Grover S & Batish VK. 1993. *Comprehensive Dairy Microbiology*. Metropolitan Publ.

LPT 610 TECHNOLOGY OF MILK PRODUCTS 2+1 SEM - I

Objective

To impart knowledge about techniques for preparation of different milk products.

Theory

UNIT-I: Drying of milk and milk products; freeze dehydration, water activity; sorption behaviour of foods- dried ice cream mix – cream and butter powder.

UNIT-II: Hurdle technology and its application in development of dairy products.

UNIT-III: Manufacture of milk products; butter, evaporated milk, condensed milk, milk powders, ice cream and other frozen desserts. Manufacture of yoghurt-acidophilus milkbulgaricus milk- kumiss-kefir. Manufacture of cheddar-mozzarella- cottage and

processed cheese. Manufacturing of indigenous milk products- paneer- channa- khoa- ghee- dahi and shrikhand.

UNIT-IV: Manufacturing of casein- caseinate- co-precipitates- Whey protein concentrate (WPC) - lactose- dairy whiteners; functional properties of whey proteins, casein-coprecipitates- Ultra Filtration retentate and their modifications.

UNIT-V: Evaluation of functional properties. Packing, storage and marketing of milk products. Defects in milk products, their preventions and remedies.

Practical

Preparation of butter- panneer- channa- ghee- ice cream- cheese-cheddar- Mozzarella and cottage cheese- khoa- dahi- yoghurt- casein- caseinate-coprecipitate- determination of degree of browning chemical/physical methods; measurement of different functional properties of different milk products.

Suggested Readings

Aneja RP, Mathur BN, Banerjee AK & Chandan RC. 2002. *Technology of Indian Milk Products*. Dairy India.

Spreer E. 1993. *Milk and Dairy Products*. Marcel Dekker.

Walstra P, Wouters JTM & Geurts TJ. 2006. *Dairy Science and Technology*. 2nd Ed. Taylor & Francis.

LPT 611 BIOTECHNOLOGY OF FOODS OF ANIMAL ORIGIN

1+1 SEM - II

Objective

To impart knowledge about new techniques of biotechnology for improving food value.

Theory

Role of Biotechnology in productivity of livestock, Meat Speciation and quality control. Use of Biotechnology in production of food additive. Use of biotechnological tools for the processing and preservation and foods of animal origin, use of biotechnology improved enzymes in food processing industry, consumer concerns about risks and values, biotechnology and food safety. Future of food biotechnology in India.

Practical

Introduction of basic biotechnological techniques such as western blotting, enzyme isolation and identification, DNA extraction, amplification, different types of PCR, Acquaintance with RT-PCR, Multiplex PCR, gene identification and characterization.

Suggested Readings

Selected articles from journals.

LPT 612 IN-PLANT TRAINING 0+2 (S/US)

SEM BREAK

Objective

To impart industrial exposure to post graduate students in meat, milk, poultry and fish industry.

Estimation of hydroxy proline - Histological structure of muscle - Estimation of emulsion stability, thawing in meat and meat products– Identification of different packaging material – Agar gel immuno diffusion techniques – Demonstration of CIE, IEF, ELISA, PCR – Different methods of packaging of meat and meat products including poultry products - Visit to different cold stores.Evaluation of carcass quality,Estimation of muscle fiber diameter, Estimation of lipid profile of meat. Organoleptic evaluation of meat- Estiamtion of Nitrate-Preparation of some noval meat products and studies on their shelf life-Total viable count and differential counts of meat and meat products-Visist of meat /poultry processing units.

Suggested Readings

Kerry J, Kerry J & Ledward D. 2005. *Meat Processing-Improving Quality*. Woodhead Publ. Ltd., UK.
Swatland H & Compbell T. 2004. *Meat Cuts and Muscle Foods*. Nottingham Univ. Press.
Selected articles from journals.

LPT 703 ADVANCES IN POULTRY PRODUCTS TECHNOLOGY

2+1 SEM - I

Objective

Discussion on latest development in processing, preservation, quality control, packaging, regulations and standards of poultry meat.

Theory

UNIT-I: Indian scenario of poultry processing industry Advances in poultry dressing, meat yield, preservation, microbiology and quality control methods. Automation in broiler farming, catching, transporting, control of shrinkage and methods of slaughter.

UNIT-II: Preservation techniques, Room temperature preservation of poultry fast foods by multi hurdle technology, critical evaluation of application of refrigeration, tenderization, canning, dehydration, irradiation, curing, smoking and cooking techniques in poultry processing and development of additional processed products.– Regulation of CAC and European standards of poultry meat and meat products.

UNIT-III: Recent trends in packing and marketing of poultry and poultry products. Modified atmosphere packaging- Different packing materials for meat and cooked products.

UNIT-IV: Policies and marketing trends in poultry meat -Regulations, specifications, standards and use of additives in poultry products.

UNIT-V: Poultry product development formulation and profitability.

Practical

Cooked and uncooked meat quality standards- sensory evaluation of poultry meat packaging material- Modified Atmosphere Packaging-Factors influencing meat quality at different freezing temperatures and thawing.

Suggested Readings

Selected articles from journals.

LIVESTOCK PRODUCT TECHNOLOGY

List of Journals

- Advances in Food Research
- Beverage and Food World
- British Poultry Science
- Dairy Foods
- Dairy Indian
- Dairy Industries International
- Dairy Science Abstracts
- Flieshwirtschaft
- Food Processing
- Food Technology
- Food Technology
- Indian Dairy Man
- Indian Food Industry
- Indian Journal of Dairy Technology
- Indian Journal of Food Science and Technology
- Indian Journal of Poultry Science
- Indian Journal of Veterinary Research
- International Dairy Federation
- International Dairy Journal
- International Food Hygiene
- International Journal of Dairy Technology
- Journal of Animal Science
- Journal of Dairy Research
- Journal of Dairy Science
- Journal of Food Protection
- Journal of Food Science
- Journal of Meat Science
- Milk Industry
- Poultry Science
- Processed Food Industry
- Science of Food and Agriculture

e-Resources

- www.meatscience.org
- www.amis.org
- www.meatami.com
- www.mla.org.au
- www.FAO.org
- www.agresearch.co.nz/mirinz
- www.usa.gov
- www.fsis.usda.gov

- www.poultryhelp.com
- www.nddb.org
- www.ndri.res.in
- www.amul.com
- www.idfa.org