



**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY**  
**Guwahati**  
**Course Structure and Syllabus**

**(From Academic Session 2020-21 onwards)**

**M.Voc**  
**Food Processing and Quality Management (CBCS)**

**3<sup>rd</sup> Semester**



# ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

## Course Structure

(From Academic Session 2020-21 onwards)

### M.Voc Food Processing and Quality Management (CBCS)

#### 3<sup>rd</sup> Semester: Course Structure

Theory/ Practical	Sl. No.	Sub Code	Subject	Hrs/Week			Credit C	Marks	
				L	T	P		CE	ESE
<b>Core</b>									
Theory	1	MFP202301	Production and Operation Management	3	0	0	3	30	70
	2	MFP202302	Unit Operation in Food Process Engineering	3	0	0	3	30	70
Practical	1	MFP202313	Lab –I	0	0	4	2	30	70
	2	MFP202314	Minor Project, Presentation and dissertation	0	0	12	6	30	70
	3	MFP202315	Industrial Visit and Presentation	0	0	2	1	-	100
<b>Elective-3 (Any One)</b>									
Theory	1	MFP202E301	Fermentation Technology	5	0	0	5	30	70
Theory	2	MFP202E302	Technology of Milk and Milk Products	4	0	0	4	30	70
Practical		MFP202E312	Technology of Milk and Milk Products Practical	0	0	2	1	30	70
Theory	3	MFP202E303	Food Biotechnology	5	0	0	5	30	70
<b>Total</b>				<b>10/11</b>	<b>0</b>	<b>18/20</b>	<b>20</b>	<b>150</b>	<b>450</b>
<b>Total Contact Hours per Week = 28/31</b>									
<b>Total Credit = 20</b>									

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202301</b>	<b>Production and Operation Management</b>	<b>3-0-0</b>	<b>3</b>

**MODULE 1:**

Nature and scope of production/operation management – objectives, introduction, concept of production, production system, production management, operation management, scope of production and operation management, benefits of production management, responsibility of a production manager, decisions of production managements.

**MODULE 2:**

Production planning and controlling- objectives, introduction, production planning and control meaning, importance of production planning and control, challenges in production planning and control, factors affecting production planning and control, types of production system, types of manufacturing process, steps of production planning and control.

**MODULE 3:**

Inventory management-objectives, introduction, definition, different types of inventory, need for inventory management, Good Inventory Management Practices, inventory management techniques.

**MODULE 4:**

Scheduling – objectives, introduction and meaning of scheduling, selection criteria for the type of scheduling.

**MODULE 5:**

Productivity- introduction, meaning of productivity, definitions, importance of productivity, how to improve productivity, methods of measurement of productivity

**REFERENCES:**

1. Buffa E .S , Modern Production Management, John Wiley, New York; 1973
2. Evertt Adam &RonaalJ.Ebert , Production and Operations Management, PHI, 1992.
3. C.B.Gupta ,Production Management, S.Chand Co.
4. Sridharan Bhatt &Aswathappa: Production and Operations Management HPH
5. O.P.Khanna, Operations Management.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202302	Unit Operation in Food Process Engineering	3-0-0	3

#### MODULE 1:

Introduction to food process engineering; Mass and energy balance, fluid dynamics, fluid flow applications. Newtonian and non-Newtonian fluids; Viscosity and texture- significance in foods; Visco-elastic behaviour of dough/ paste, instruments for measuring viscosity and texture

#### MODULE 2:

Mechanisms of heat transfer- conduction, convection, radiation. Thermal properties of foods, Heat exchangers, evaporators; Thermal processing principles- evaporation, pasteurization, sterilization, distillation, blanching, HTST, UHT. Batch and continuous operations. Types of retorts and pasteurizers; Psychrometry - Principles, air properties; application in drying of foods

#### MODULE 3:

Preliminary unit operations – material handling, cleaning, sorting and grading; Cleaning – types of contaminants found on raw foods, aims of cleaning, methods of cleaning- dry, wet and combination methods; dry cleaning methods - screening, aspiration, magnetic cleaning and abrasive cleaning; wet cleaning methods- soaking, spray washing, flotation washing and ultrasonic washing. Sorting and grading – advantages of sorting and grading, grading factors, methods of sorting and grading.

#### MODULE 4:

Conversion unit operations– size reduction, mixing and filtration. Size reduction- benefits of size reduction, nature of forces used in size reduction, criteria of size reduction; size reduction of solid foods, fibrous foods and liquid foods; effects of size reduction on solid and liquid foods. Mixing – mixing terminology, mixing equipments – mixers for liquids of low or moderate viscosity (Paddle agitators, turbine agitators and propeller agitators), mixers for high viscosity pastes (Pan mixer, horizontal mixer and dough mixer), mixers for dry solids (tumbler mixer & vertical screw mixer); effects of mixing on foods.

#### MODULE 5:

Preservation unit operations-high temperature operations- pasteurization, evaporation and dehydration; Low temperature operations -refrigeration, freezing and freeze drying.

#### REFERENCES:

1. DG Rao, “Fundamentals of Food Engineering” PHI Learning Private Limited, New Delhi.
2. Geankopolis CJ, “Transport Processes and Separation Processes Principles” .Printice Hall India, New Delhi, ISBN-978-81-203-2614-9, 2008
3. Warren,L McCabe, J.C. Smith and Peter Harriot,”Unit Operations of Chemical Engineering “ McGraw Hill International Edition, Singapore, ISBN-007-424740-6, 2005
4. Earle, R.L, “Unit Operations in Food Processing”. Pergamon Press,2nd Edition,UK, 2003

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202313</b>	<b>Lab-I</b>	<b>0-0-4</b>	<b>2</b>

## **PRACTICAL**

1. Psychrometry chart- study and calculation of different parameters.
2. Demonstration of pasteurizer, evaporator, freeze dryer, rheometer.
3. Study of blanching and its effect on preservation.
4. Study and demonstration of mathematical equations on drying.

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202314</b>	<b>Minor Project, Presentation and dissertation</b>	<b>0-0-12</b>	<b>6</b>

Each student will have to carry out a minor project work. The area of the work is to be decided by the advisor. On completion of the project work, students have to submit the work in the form of a dissertation followed by oral presentation in the presence of faculty members and external expert.

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202315</b>	<b>Industrial Visit and Presentation</b>	<b>0-0-2</b>	<b>1</b>

Each student will have to visit different food industries and on completion of the industrial visit, students have to submit a report followed by oral presentation in the presence of faculty members.

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202E301</b>	<b>Fermentation Technology</b>	<b>5-0-0</b>	<b>5</b>

#### **MODULE 1:**

Fermentation, types of fermentation, Fermentation Pathways for Industrial Products: Biochemical pathways of metabolic reactions for utilization of carbon sources and formation of different metabolites by micro organisms; Strain Development -Various techniques of modifying the strains for increased production of industrial products. Use of chemicals, UV rays, genetic engineering to produce newer strains.

#### **MODULE 2:**

Typical media, Media formulation: - Carbon Source, Nitrogen source, Minerals, Growth Factors, Buffers, Precursors and Inhibitors, O<sub>2</sub> requirement and antifoams.

#### **MODULE 3:**

Fermenter design, Instrumentation and control, Types of fermenter (Shake flask, Batch/stir tank, Continuous, Bubble column, airlift and Tower fermenter), Types of fermentation processes, aeration and agitation.

#### **MODULE 4:**

Downstream Processing: Various equipment for product recovery; micro-filters and Ultrafiltration systems for separation of cells and fermentation medium and for concentration of medium containing product; chromatographic systems of separation; extraction of product with solvent; evaporation and crystallization; centrifugation, different types of centrifuges; drying techniques; instrumentation and controls.

#### **MODULE 5:**

Fermentative Production: a) Foods: Processes for preparing fermented products including Yogurt (curd) and other Traditional Indian Products like idli, dosa, dhokla, shrikhand, etc.,Soya based products like soya sauce, natto, etc., Cocoa, Cheese etc.; Alcoholic Beverages based on fruit juices (wines), cereals (whisky, beer, vodka etc.), sugar cane (rum) etc. Process description, quality of raw materials, fermentation process controls etc) Industrial chemicals: Fermentative Production of Organic acids like (Citric Acid, Lactic Acid), Amino Acids (Glutamic acid, Lysine), Antibiotics (Erythromycin, Penicillin), Polysaccharides (Dextran, Xanthan) etc.; steroids transformation; process descriptions and key controls for optimal production.

#### **Text books/References:**

1. Vogel, H.C. and C.L. Todaro, 2005 Fermentation and Biochemical Engineering Handbook : Principles, Process Design and Equipment , 2nd Edition, Standard Publishers.
2. El-Mansi, E.M.T, 2007, Fermentation Microbiology and Biotechnology 2nd Edition, CRC / Taylor & Francis.



3. Joshi, V.K. and Ashok Pandey, 1999, Biotechnology: Food Fermentation, Microbiology, Biochemistry and Technology , Vol. I & vol. II Educational Publisher.
4. Pepler, H.J. and D. Perlman, 2004, Microbial Technology : Fermentation Technology , 2nd Edition, Vol. II Academic Press / Elsevier.
5. Stanbury, P.F., A. Whitaker and S.J. Hall, 2005 Principles of Fermentation Technology ,2nd Edition Aditya Books (P) Ltd.

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202E302</b>	<b>Technology of Milk and Milk Products</b>	<b>4-0-0</b>	<b>4</b>

### **MODULE 1:**

Dairy industry in India: scope, strengths and opportunities for dairy industry; Milk: definition, composition and nutritive value; factors affecting composition of milk; Physico-chemical properties of milk: chemical properties of milk lipids, milk fat structure, fat destabilization; functional properties of milk lipids, milk proteins, their types, precipitation (casein micellar structure and its aggregation); milk enzymes, milk coagulation; lactose; vitamins and minerals in milk. Technology of fluid milk: filtration/clarification, standardization, pasteurization (LTLT, HTST), sterilization, homogenization, UHT processing, aseptic packaging, storage and distribution

### **MODULE 2:**

Technology of recombined and reconstituted milk: composition, process of manufacture, defects Technology of condensed and evaporated milk: composition, process of manufacture, defects (their causes and prevention). Technology of milk powders (WMP, SMP): composition, process of manufacture, defects (their causes and prevention); Technology of Cheese: classification, composition, Nutritive value, process of manufacture of cheddar, mozzarella, cottage and processed cheese, defects (their causes and prevention).

### **MODULE 3:**

Technology of yogurt, Acidophilus milk, bulgaricus milk, kumiss and kefir. Technology of frozen milk products: composition, process of manufacture, defects (their causes and prevention). Technology of indigenous milk products: dahi, butter, ghee, channa, paneer, khoa etc. Newer concepts in dairy products: cream powder, sterilized cream, butter spread, butter powder, cheese spread, whey protein concentrates, Lactose

### **MODULE 4:**

Membrane processing of milk: types of membranes, applications of reverse osmosis, ultrafiltration and microfiltration in dairy industry Utilization of milk industry by-products: Importance / Need and food applications Milk and milk product standards and legislations in India: Grading of milk and criterion of grading, milk adulteration problem, Dairy plant cleaning and sanitation: hygiene in dairy Industry, different types of cleansing and sanitizing agents, their applications.

### **Recommended Books:**

1. Sukumar, De (1994). Outlines of Dairy Technology. Oxford University Press
2. Smith G. (2003). Dairy processing improving quality. Woodhead Publishers
3. Andrews, A.T. (1994). Biochemistry of Milk Products. Woodhead Publishers
4. Technology of Dairy Products by Early, R.
5. Aneja RP, Mathur BN, Chandan RC & Banerjee AK. 2002. Technology of Indian Milk Products. Dairy India Publ.
6. Rathore NS et al. 2008. Fundamentals of Dairy Technology - Theory & Practices Himanshu Publ.
7. Walstra P. (Ed.). 2006. Dairy Science and Technology. 2nd Ed. Taylor & Francis

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202E312</b>	<b>Technology of Milk and Milk Products practical</b>	<b>0-0-2</b>	<b>1</b>

**Practical:**

- 1) Study on basics of reception of milk at the plant;
- 2) Platform tests in milk;
- 3) Estimation of fat and SNF in milk;
- 4) Operation of LTLT & HTST, Pasteurization; Preparation of special milks;
- 5) Cream separation & standardization of milk;
- 6) Study on specific gravity and adulteration in milk;
- 7) Preparation and evaluation of table butter, ice cream, and indigenous milk product such as khoa, chhana, paneer, ghee, rasogulla, gulab jamun, shrikhand, lassi, burfi etc.;
- 8) Visit to dairy plants

<b>Subject code</b>	<b>Subject</b>	<b>Hours per week L-T-P</b>	<b>Credit C</b>
<b>MFP202E303</b>	<b>Food Biotechnology</b>	<b>5-0-0</b>	<b>5</b>

**MODULE 1:**

Basics of Molecular Biology and genetics– Fundamentals of molecular biology and genetics. application of genetic engineering in food science and technology. Genetically modified foods – concept, types and application

**MODULE 2:**

Prospectus of biotechnology- Definition, scope and applications. Application of biotechnology in food

**MODULE 3:**

Traditional applications of food biotechnology - Fermented foods: eg dairy products, oriental fermentations, alcoholic beverages, and food ingredients. Health benefits of fermented foods. Types of fermented foods and importance of food fermentation in food preservation and nutritional enhancement

**MODULE 4:**

Starter cultures – types, designing and development, micro encapsulation and packaging, scopes and challenge; Development and formulation of novel products such as probiotic foods. Nutrogenomics - concept, working, significance and relevance. Biosensors and novel tools and their application in food science

**MODULE 5:**

Ethical issues concerning GM foods; testing for GMOs; current guidelines for the production, release and movement of GMOs; labeling and traceability; trade related aspects; biosafety; risk assessment and risk management. Public perception of GM foods. IPR. GMO Act –2004

**Text books/References:**

1. Lopez, G.F.G. and Canovas, G.V.B. “Food Science and Food Biotechnology” CRC Press, Florida, USA. 2003.
2. Joshi, V.K., and Pandey, A. Biotechnology: Food Fermentation. Vols.I,II. Education Publ. 2002
3. Bains, W. Biotechnology from A to Z. Oxford Univ. Press. 2009.
4. Lee, B.H. Fundamentals of Food Biotechnology.VCH. 2006

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