ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2020-21 onwards)

M.Voc
Food Processing and Quality Management

2nd Semester

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure

(From Academic Session 2020-21 onwards)

M.Voc: Food Processing and Quality Management
2nd Semester: Course Structure

Theory/ Practical	Sl. No.	Sub Code	Subject	Hrs/Week			Credit	Marks	
				L	T	P	C	CE	ESE
Core									
Theory	1	MFP202201	Food Microbiology	3	0	0	3	30	70
	2	MFP202202	Food Product Development and Sensory Evaluation	3	0	0	3	30	70
	3	MFP202203	Food Packaging	3	0	0	3	30	70
	4	MFP202204	Nutraceuticals and Functional Foods	3	0	0	3	30	70
Practical	1	MFP202215	Lab –I	0	0	4	2	30	70
	2	MFP202216	Lab –II	0	0	4	2	30	70
	3	MFP202227	Industrial Internship and Presentation	0	0	0	1	30	70
Elective-2 (Any One)									
Theory	1	MFP202E201	Technology of Meat, Fish, Poultry and Egg	4	0	0	4	30	70
Theory	2	MFP202E202	Bakery Science and Technology	3	0	0	3	30	70
Practical		MFP202E212	Bakery Science and Technology Practical	0	0	2	1	30	70
Theory	3	MFP202E203	Technology of Spices and Plantation Products	4	0	0	4	30	70
Total				16/ 15	0	8/10	**21**	240/ 270	560/ 630
Total Contact Hours per Week: 23/26									
Total Credit: 21									

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202201	**Food Microbiology**	**3-0-0**	**3**

MODULE 1:

History of microbiology; Classification/groups of microorganism; Morphology and structure of bacteria, fungi and algae; Nutritional and physical requirements for growth of bacteria; Bacterial spores and their significance in food microbiology; Microbial growth curve

MODULE 2:

Importance and significance of microorganisms in food science; Micro-organisms importance in food - Factors affecting the growth of micro organisms in food - Intrinsic and Extrinsic parameters that affect microbial growth

MODULE 3:

Sources of microorganism in food (contamination from plants, animals, sewage, soil, water, air, etc.); Food as substrate for microbial growth; Physical, chemical and biological method of microbial destruction; Thermal Death Time, Thermal Death Point, D, Z and F values; Method of microbial examination of foods Beneficial uses of microorganism in foods

MODULE 4:

Principles of food spoilage; Chemical changes caused by microorganisms; Spoilage of milk and milk products, cereals and cereal products; meat and meat products, fish and fish products, poultry and eggs, sugars, spices and salt, canned foods; Indicators of microbial food spoilage

MODULE 5:

Food borne illnesses: Food borne infections, Food borne intoxications, Mycotoxins (sources and prevention); Food sanitation and public health; Control of Food Borne Pathogen

TEXT/REFERENCE BOOKS:

1. Willey, J. M., Sherwood, L., & Woolverton, C. J. (2011). *Prescott's microbiology* (Vol. 7). New York: McGraw-Hill.
2. Pelezar, M.I and Reid, R.D. (2007) Microbiology McGraw Hill Book Company, New York, 5th Edition.
3. James, M.J. (2000) Modern Food Microbiology, 2nd Edition. CBS Publisher
4. Adams, M.R. and M.G. Moss (2009): Food Microbiology, 1st Edition, New Age International (P) Ltd.
5. Frazier, W.C. (2007) Food Microbiology, Mc Graw Hill Inc. 4th Edition.
6. Doyle, P., Bonehat, L.R. and Mantville, T.J (2010): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202202	Food Product Development and Sensory Evaluation	3-0-0	3

MODULE 1:

Food needs and consumer preference, Needs and types of food consumption trends, economic, psychological, anthropological and sociological dimensions of food consumption

MODULE 2:

Designing new products: concepts and definitions, factors in fluency new product development – social concerns, health concerns impact of technology and market place influence (Corporate, market place, technological and governmental influences). Types of new food products: line extension, innovative –creative products, existing products – repositioned, reformulated, new form, new size and new package.

MODULE 3:

Stages in food product development- idea generation, screening –objectives and criterion, development of product prototype- market research , concept testing approaches , product formulation and specification, product optimization, process development and optimization , product attributes, scale up requirements ; product prototype testing – consumer testing , packaging testing, shelf life testing, marketing plans – price structure , place and distribution system , promotional program , market positioning , test marketing, result evaluation

MODULE 4:

Sensory attributes of foods; planning and conducting sensory evaluation, physical setup for conducting sensory analysis, panel development for sensory evaluation – selection and training, , preparation and presentation of samples , score card development, role of sensory analysis in product development and quality control

TEXT/REFERENCE BOOKS:

1. Lyon, D.H.; Francombe, M.A.; Hasdell, T.A.; Lawson, K. (eds) (2002): Guidelines for Sensory Analysis in Food Products Development and Quality Control. Chepman and Hall, London.
2. Lawless, H.T. and Klein, B.P. (2001): Sensory Science Theory and Applications in Foods. Marcel Dekker Inc. New York.
3. Piggott, J.R. (ed) (2008): Sensory Analysis of Foods. Elservier Applied Science, London
4. Ranganna S. 2006. HandBook of Analysis and Quality Control for Fruits and Vegetables Products 2nd Ed. Tata McGraw- Hill Publishing Company Limited. New Delhi

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202203	**Food Packaging**	**3-0-0**	**3**

MODULE 1:

Definition; Package environment; Functions of packaging; Importance and scope of packaging; Classification of packages; Food Labeling and laws

MODULE 2:

Glass as packaging material: Composition; Physical properties of glass; Advantages and disadvantages of glass packaging materials; Types of glass containers; Parts of glass container; Manufacture, annealing and surface treatments.

Metal packaging materials: Tin plate; Chromium coated steel; Aluminium containers and foil; Corrosion of metal containers; Corrosiveness of foods; Effect of processing on corrosion of cans; External corrosion of cans

MODULE 3:

Paper and paper-based packaging materials: Manufacture (pulping, digestion, bleaching, beating, refining, paper making and converting); Types of paper; Physical properties of papers; Paper bags; Cartons; CBB, Advantages and disadvantages of paper and paper-based packaging materials

Plastic and plastic-based packaging materials: Classification of polymers; Properties and application of different plastics; Laminates: Types and properties. Coating on paper and films; Types and methods of coating

MODULE 4:

Aseptic packaging, Vacuum packaging, Intelligent packaging, MAP, CAP, Sterilization of packages and food contact surfaces; Packaging of microwavable foods; Retortable pouch technology, Use of nanomaterials in food packaging

Mechanical and functional tests on packages: Measurement of thickness, weight, water absorption, compression strength, bursting strength, tear resistance, puncture resistance, OTR, WVTR and tensile strength of packaging materials, GSM, moisture content of CBB.

MODULE 5:

Packaging of specific foods: Fruits and vegetables; Dairy products; Cereal products; Snacks; Whole eggs; Meat and meat products; Water; Fruit juices; Beer; Wine; Carbonated beverages

TEXT/REFERENCE BOOKS:

1. Robertson, G.L. 2006 Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis
2. NIIR. (2003). Food Packaging Technology Handbook, National Institute of Industrial Research Board, Asia Pacific Business Press Inc
3. Ahvenainen, R. (Ed.) 2003 Novel Food Packaging Techniques, CRC Press,
4. Han, J.H. (Ed.) 2005 Innovations in Food Packaging, Elsevier Academic Press,
5. Coles, R., McDowell, D. and Kirwan, M.J. (Eds.) 2003 Food Packaging Technology, CRC Press

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202204	**Nutraceuticals and Functional Foods**	**3-0-0**	**3**

MODULE 1:

Concept on Nutraceuticals: Nutraceuticals and functional foods, nutraceutical as new dietary ingredients, biological significance of Nutraceuticals, Nutraceuticals and dietary supplement, world market for nutraceuticals, regulatory issues Nutrigenomics: nutrigenomics an introduction and its relation to nutraceuticals.

MODULE 2:

The role of nutraceuticals/functional foods in disease prevention: angiogenesis and cardiovascular diseases, cancer, diabetes, cholesterol management, obesity and inflammation dosage levels,

MODULE 3:

Health benefits of nutraceuticals, natural pigments (chlorophyll, chlorophyllin, carotenoids) anthocyanins, glucosinolates, isoflavonoids, phytoestrogens, omega-3 and omega-6 fatty acids, antioxidants, phytosterols; dosage for effective control of disease or health benefit with adequate safety

MODULE 4:

Definition, development of functional foods, isolation, storage, processing and stability of phyochemicals/bioactive compounds; Prebiotics and probiotics: usefulness of probiotics and prebiotics in gastro intestinal health and other benefits, beneficial microbes; prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes, resistant starch, fructo-oligosaccharides as probiotic food components

TEXT/REFERENCE BOOKS:

1. Wildman, R.E.C. (2007) Handbook of Nutraceuticals and Functional Foods, second edition. CRC Press.
2. Gibson GR & William CM. Functional Foods - Concept to Product. 2000.
3. Goldberg I. Functional Foods: Designer Foods, Pharma Foods. 2004.
4. Brigelius-Flohé, J & Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.
5. Cupp J & Tracy TS. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press. 2003

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202215	Lab-I	0-0-4	2

PRACTICAL

1. Introduction to the instruments, glass wares and accessories used in microbiological study
2. Preparation of serial dilution, common laboratory media and special media.
3. Microbiological plating techniques, slant preparation and representation of microbial population.
4. Staining: Gram's staining, staining of yeast and molds.
5. Microbiology of hand, area and effect of sanitation
6. Isolation and culture of microorganism

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202216	Lab-II	0-0-4	2

Practical

1. New product development, Quality evaluation, Presentation of a new product development.
2. Identification of different packaging materials and their representation.
3. Quality analysis of packaging material.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202227	Industrial Internship and Presentation	0-0-0	1

Each student will undergo internship in Food industries for 15 to 20 days. He/She has to obtain the certificate of internship from the industries. A report and power point presentation will be given by the students at the end of the internship.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E201	Technology of Meat, Fish , Poultry and Egg	4-0-0	4

MODULE 1:

Status and scope of meat industry in India; Structure and physico-chemical properties of muscle meat: composition and nutritive value, conversion of muscle into meat, post mortem changes in meat, rigor mortis, cold shortening, pre-rigor processing; stunning and slaughtering methods. Aging of meat, meat tenderization- natural and artificial methods; cooking methods for meat: roasting, frying and braising; storage and preservation of meat: chilling, freezing, curing, smoking, dehydration, freeze-drying, irradiation, canning.

MODULE 2:

Cooking, palatability and eating quality of meat, microbial spoilage of meat; restructured meat products (sausages), meat analogs; meat industry by products: importance and applications; intermediate moisture and dried meat products; meat plant hygiene and good manufacturing practices; packaging of meat products.

MODULE 3:

Egg: Structure, composition and nutritive value of eggs, Storage and shelf life problems Quality evaluation of eggs: international and external quality evaluation, candling, albumen index, Haugh unit, yolk index etc. Egg preservation: grading of eggs, whole egg preservation, pasteurization, dehydration, freezing, egg products: egg powder, value added egg products (e.g., Meringues and Foams etc.), packaging of egg and egg products
Poultry products: types, chemical and nutritive value of poultry meat, slaughtering and evaluation of poultry carcasses; poultry cut-up parts and meat/bone ratio; preservation, grading and packaging of poultry meat.

MODULE 4:

Fish processing: factors affecting quality of fresh fish, fish dressing, chilling, freezing, glazing, salting and canning of fish; manufacturing of fish paste, fish oil, fish protein concentrate and fish meal; by-products of fish industry and their utilization.

TEXT/REFERENCE BOOKS:

1. Joshi, B. P. (1994). Meat Hygiene for Developing Country, Shree Almora Book Depot, India.
2. William J. & Owen J., (1977). Egg Science & Technology, AVI Publishing Company, INC. Westport, Connecticut.
3. Lawrie, R.A. (1998). Meat Science. Woodhead Publishers.
4. Mead, G. (2004). Poultry Meat Processing and Quality. Woodhead Publishers.
5. Panda, P.C. (1992). Text Book on Egg and Poultry Technology, Vikas Publishers
6. William J. & Owen J. (1977). Egg Science & Technology, AVI Publishing Company INC. Westport, Connecticut

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E102	Bakery Science and Technology	3-0-0	3

MODULE 1: Introduction

Raw materials required for bread making and their functional properties. Essential ingredients: Flour, yeast, water, salt. Other ingredients: Sugar, color, flavor, fat, milk and milk powder and bread improvers. Functions of various raw materials used in baking industries Materials of Baking. Leaveners and yeast foods, shortenings, emulsifiers and antioxidants, Sweeteners and, water and salt, Ingredients from milk and eggs. Fruits, vegetables, and nuts, Spices, flavors and colors; Preservation methods

MODULE 2: Bakery Equipment

Introduction to utensils and equipments used in bakery unit and their uses, small equipments, big equipments and oven. Bulk handling of ingredients, Dough mixing and mixers, dividing, rounding, sheeting, and laminating, fermentation; Ovens and Slicers, Packaging materials and equipment

MODULE 3: Bread Manufacturing Process

Straight dough fermentation, Sponge and dough, Accelerated processing. Chorley wood bread process, Dough retarding and freezing, Stages in processing of bread and bread making methods and advantages and disadvantages of various methods of bread-making. Characteristics of good bread: Internal characters; external characters. Bread defects/faults and remedies. Spoilage of bread Causes, detection and prevention.

MODULE 4: Biscuits and Cookies

Production of cakes and cookies/biscuits. Types of biscuit dough's – Developed dough, short dough's, semi-sweet, enzyme modified dough's and batters – importance of the consistency of the dough.

Cake making: Ingredients and their function structure builders. Tenderizers, moisteners and flavor enhancers – Selection and preparation of mould Temperature and time required for different type of cake, problems of baking.

MODULE 5:

Good manufacturing practices (GMP) in baking industries; Computerization in plant and laboratory, Sanitation and safety

TEXT/REFERENCE BOOKS:

1. Matz, Samuel A., "Bakery Technology and Engineering", Third Edition, Chapman & Hall, London,
2. Cauvain, Stanley P, and Yound, Linda S., "Technology of Bread Making", Second Edition Aspen publication, Maryland, 2005.
3. Pomeranz. Y. "Modern Cereal Science and Technology". MVCH Publications, New York.2003.
4. Samuel A., Matz., "Equipment for Bakers", Pan Tech International Publication, 2009.
5. Manley, Duncan., "Biscuit Doughs Manual 2", Woodhead Publishing Ltd., England. 2009

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E212	**Bakery Science and Technology Practical**	**0-0-2**	**1**

Practical:

1. Study of ingredients (major and minor): Characteristics of flour, yeast, shortening, sugar, egg and salts.
2. Experiment on leavening action of baking powder, sodium-bicarbonate and ammonium-bi-carbonate.
3. Estimation of gluten content
4. Estimation of water absorption power
5. Determination of yeast-ferment test and dough rising capacity
6. Preparation of bread and quality evaluation
7. Preparation of biscuits and quality evaluation
8. Preparation of cookies and quality evaluation
9. Preparation of cake and quality evaluation
10. GMP in bakery processing

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E203	**Technology of Spices and Plantation Products**	**4-0-0**	**4**

MODULE 1:

Coffee: Occurrence, chemical constituents; harvesting, fermentation of coffee beans; changes taking place during fermentation; drying; roasting; process flow sheet for the manufacture of coffee powder; instant coffee technology; chicory chemistry; quality grading of coffee.

MODULE 2:

Tea: Occurrence, chemistry of constituents; harvesting; types of tea – green, oolong and CTC; chemistry and technology of CTC tea; manufacturing process for green tea and black tea manufacture; instant tea manufacture; quality evaluation and grading of tea.

MODULE 3:

Cocoa: Occurrence, chemistry of the cocoa bean; changes taking place during fermentation of cocoa bean; processing of cocoa bean; cocoa powder; cocoa liquor manufacture; chocolates–types, chemistry and technology of chocolate manufacture; quality control of chocolates

MODULE 4:

Major spices: Pepper, cardamom, ginger, chili and turmeric–Oleoresins and essential oils; method of manufacture; chemistry of the volatiles; enzymatic synthesis of flavor identical; quality control; fumigation and irradiation of spices.

MODULE 5:

Other plantation crops processing: vanilla, coconut, cashew, Oil palm.

TEXT/REFERENCE BOOKS:

1. Banerjee B. 2002. Tea Production and Processing. Oxford Univ. Press.
2. Minifie BW. 1999. Chocolate, Cocoa and Confectionery Technology. 3rd Ed. Aspen Publ.
3. NIIR. 2004. Handbook on Spices. National Institute of Industrial Research Board, Asia Pacific Business Press Inc

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ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2020-21 onwards)

M.Voc

Food Processing and Quality Management (CBCS)

3rd Semester

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure

(From Academic Session 2020-21 onwards)

M.Voc Food Processing and Quality Management (CBCS)

3rd Semester: Course Structure

Theory/ Practical	Sl. No.	Sub Code	Subject	Hrs/Week			Credit	Marks	
				L	T	P	C	CE	ESE
Core									
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
Elective-3 (Any One)									
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
Total				**10/11**	**0**	**18/20**	**20**	**150**	**450**
Total Contact Hours per Week = 28/31 **Total Credit = 20**									

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

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. Geankoplis 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

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202313	**Lab-I**	**0-0-4**	**2**

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.

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

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.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202315	**Industrial Visit and Presentation**	**0-0-2**	**1**

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.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E301	**Fermentation Technology**	**5-0-0**	**5**

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, O2 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. Peppler, 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.

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

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

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

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 specifc 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

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

MODULE 1:

Basics of Molecular Biology and genetics– Fundaments 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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ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2020-21 onwards)

M.Voc

Food Processing and Quality Management (CBCS)

4TH Semester

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure

(From Academic Session 2020-21 onwards)

M.Voc Food Processing and Quality Management (CBCS)

4th Semester: Course Structure

Theory/ Practical	Sl. No.	Sub Code	Subject	Hrs/Week			Credit	Marks	
				L	T	P	C	CE	ESE
Elective-4 (any one)									
Theory	1	MFP202E401	Food Safety, Regulation and Quality Control	3	0	0	3	30	70
Practical		MFP202E411	Food Safety, Regulation and Quality Control Practical	0	0	2	1	30	70
Theory	2	MFP202E402	Waste Management In Food Industries	4	0	0	4	30	70
Theory	3	MFP202E403	Marketing Management and International Trade	3	0	0	3	30	70
Practical		MFP202E413	Marketing Management and International Trade Practical	0	0	2	1	30	70
Core									
Practical	1	MFP202421	Major Project/Internship, Presentation and dissertation	0	0	32	16	30	70
Total				**3/4**	**0**	**34/32**	**20**	**90/ 60**	**210/ 140**
Total Contact Hours per Week = 37/36 **Total Credit = 20**									

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E401	Food Safety, Regulation and Quality Control	3-0-0	3

MODULE 1:

Food safety: definition, concept, urbanization of population and necessity of processed and preserved foods and the necessity of ensuring quality of food to prevent adulteration and maintenance of food safety, importance of food safety in the food processing industry, prosecution for adulteration and punishment.

MODULE 2:

Food Safety Programs: Definitions and importance, Good Manufacturing Practices (GMPs), Pest Control Program, Facility Maintenance, Personal Hygiene, Sanitary Design of Equipment and Infrastructure, Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs)., Product Identification, Tracking and Recalling Program, Preventive Equipment Maintenance Program, Education and Training Program

MODULE 3:

National and international food regulatory agencies, General food laws and food safety regulations, Nutritional labeling regulation (mandatory and optional nutrients, nutritional descriptors and approved health claims); Microbial contamination, Cross-contamination, Chemical contamination, Physical contamination, Allergen contamination

MODULE 4:

Hazard Analysis and Risk Assessment: Physical hazards (metals, glass, etc), Chemical hazards (food additive toxicology, natural toxins, pesticides, antibiotics, hormones, heavy metals and packaging components), Biological hazards (epidemiology of biological pathogens: virus, bacteria and fungi), Evaluation of the severity of a hazard Controlling Food Hazards, Hazard Analysis Critical Control Point (HACCP) system.

MODULE 5:

Food Hygiene Programs: Personal hygiene, Training programs, Infrastructure, Water in the food industry, Water sources, Water uses, Water quality, Treatments, Cleaning and sanitation, Cleaning agents, Sanitizing agents, Equipment and systems, Evaluation of sanitation efficacy, Pest Control, Pest Classification (insects, rodents and birds), Prevention and control, IPM, Disposal of wastes.

MODULE 6:

Food Safety regulations and management systems: National and international food quality regulations, Indian Food regulations – History of Indian Food Regulations: BIS, ISI, FPO, PFA and

FDA. Food Safety and Standards Act 2006, Integrated Food Law - Multi departmental - multilevel to single window control system, consumer protection Act, International food trade, Codex Alimentarius, traceability, EU-regulations on the hygiene and additives of foodstuffs, GAP, Organic farming, GMP, Environmental risk assessment in food safety aspect, ISO certifications for food industry, British Regulatory Consortium(BRC), American Institute of Bakers(AIB), The necessity of harmonised Food Standards for international trade; various aspects and relation with domestic laws; Codex Nodal agency, FAO, WHO, WTO.

Intellectual Property Rights and Trade Marks: Protection of investment and efforts in research and development by patenting; Criteria of patentability; National and international patent; Terms of patents; Copyright.

MODULE 7:

Food quality: Definition, Quality Control and Quality Assurance in food system, TQM, SOP, Sampling, Audit; Importance of testing of ingredients, additives, heavy metals etc; using animals for evaluating safety; Clinical studies. Responsibility of agriculture, food industry & food supply sector; Standards of Weights & Measures, , Important Issues of GM Foods, Fortification, Nutrition Information on Label, Organic Foods, Safety of Additives, Processes etc., 5S, 4M, Maintenance of documents and its importance, Food storage measures.

MODULE 8:

Control on Purchased Product Procurement of various products, evaluation of supplies, Quality Management Organization structure and design, quality function, quality cost, optimization of process parameter and validation, Complain handling, CAPA, Human Factor in quality-Attitude of top management, cooperation of groups, operators attitude, responsibility, Seven statistical tool for quality assessment, Zero defects, Quality Circle, Emergency preparedness.

MODULE 9:

Analysis and Interpretation of sensory scores, Application of sensory evaluation in Quality Management of foods, Instrumental measurements of sensory attribute of foods: Appearance, color, volume, density and specific gravity, Rheological and textural characteristics, Texture profile analysis, Nutrition value analysis.

Text books and Reference materials:

1. Early, R. (2005): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
2. Gould, W.A and Gould, R.W. (2006). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.

3. Pomeraz, Y. and MeLoari, C.E. (2006): Food Analyasis: Theory and Practice, CBS publishers and Distributor, New Delhi.
4. Bryan, F.L. (2000): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organisation, Geneva.
5. FSSAI, FSIS, EU and FAO website for updates
6. Rajesh, M., and George, J. (2005) "Food Safety Regulations, Concerns and Trade : The Developing Country Perspective", Macmillan.
7. Naomi, R., and Watson, D. (2007) "International Standards for Food Safety", Aspen Publication.
8. Newslow, D.L. "The ISO 9000 Quality System: Applications in Food and Technology", John Wiley & Sons, 2007.
9. Hubbard, Merton R. "Statistical Quality Control for the Food Industry", 3rd Edition, Springer, 2003.
10. J.M.DeMan Rheology and Texture in Food Quality.
11. Y.Pomeranz Food Analysis : Theory and practice IS: 6273 (Part-1& Part-2).
12. M.A. Amerine Principles of Sensory Analysis of Food.
13. Food processing waste management by green and Kramer (AVI).
14. By- products from food industries: utilization and disposal by AFSI(I).

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E411	**Food Safety, Regulation and Quality Control Practical**	**0-0-2**	**1**

PRACTICAL:

1. Qualitative tests for detection of adulterants
2. Market sample evaluation and statistical application
3. Study on different logos in food package.
4. Demonstration on audit and report prepare.
5. Preparation of GMP checklist, checksheet.
6. Demonstration on complain handling and report-CAPA making.
7. Making a HACCP plan for Bakery/Milk processing industry.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E402	Waste Management In Food Industries	4-0-0	4

MODULE 1:

Basic considerations: Standards for emission or discharge of environmental pollutants from food processing Industries as per the updated provision of Environment (Protection) Act, 1986. Characterization of food Industry effluents, Physical and chemical parameters, Oxygen demands and their interrelationships, Residues (solids), Fats, Oils and grease, Forms of Nitrogen, Sulphur and Phosphorus, Anions and cations, Surfactants, Colour, Odour, Taste, Toxicity. Unit concept of treatment of food industry effluent, Screening, Sedimentation Floatation as pre and primary reactants.

MODULE 2:

Waste Water Treatment: Waste water sources characteristics - standards for disposal of water, physical, chemical and biological characteristics of waste water; measurement of organic content in waste water; Physical operations in waste water treatment - screening; racks, mixing, flocculation, sedimentation, floatation, elutriation, vacuum filtration, incineration; chemical operations in waste water treatment - reaction kinetics; chemical precipitation, aeration and gas transfer process, rate of gas transfer, adsorption, disinfection; biological operations - aerobic and anaerobic

MODULE 3:

Storage & Disposal of Waste: Types of waste generated; Non- degradable & biodegradable wastes, Solid waste storage and disposal methods- land-filling, burial, incineration, recycling; Biological treatment of food industry wastes, storage and disposal of liquid and gaseous waste; legal aspects related to storage and disposal; environmental laws; pests & their control.

MODULE 4:

Advanced wastewater treatment systems. Physical separations, Micro-strainers, Filters, Ultra filtration and reverse osmosis. Physico-chemical separations: activated carbon adsorption, Ion-exchange electro-dialysis and magnetic separation. Chemical oxidations and treatment, Coagulation and flocculation. Disinfection. Handling disposal of sludge.

MODULE 5:

Utilization of Waste: Methods of utilizing wastes to make value added products. Utilization of by product- Pectin, food colourants, antioxidants from fruit peels (citrus, mango, pomegranate), lycopene from tomato peels, vegetable seed oils, biomolecules and enzymes from meat processing.

Generation of biogas, SCP, microalgae, animal feeds, zero emission plants; recovery & recycling of materials.

REFERENCES:

1. Potter, N.N., and Hotchkiss, J.H. "Food Science", 5th Edition, CBS, 1996.
2. Moorthy, C.K. "Principles and Practices of Contamination Control and Clean rooms", Pharma Book Syndicate, 2003.
3. Roday, S. "Hygiene and Sanitation in Food Industry", Tata McGraw – Hill Publishing, 1999.
4. Wilson, C.L. "Microbial Food Contamination", 2nd Edition, CRC, 2008.
5. J.H. Green Food Processing Waste Management
6. Environment (Protection) Act
7. AFST(I) & CFTRI Proceedings of the Symposium on By-products from food Industries: Utilization and Disposal

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E403	Marketing Management and International Trade	3-0-0	3

MODULE 1:

Concept of marketing, functions of marketing, Concepts of marketing management, scope of marketing management, Marketing management process, Concepts of marketing, elements of marketing, Business Principles, Practices and Policies of Food trade, Mechanism of foreign Exchange.

MODULE 2:

Consumers buying behaviour, consumerism, Marketing opportunities analysis: marketing research and marketing information systems.

MODULE 3:

Concept of market structure, Marketing environment -Micro and macro environments, Market measurement- present and future demand, market forecasting, Market segmentation, targeting and positioning, Allocation and marketing resources

MODULE 4:

Marketing planning process, Product policy and planning: product-mix, product line, product life cycle, New product development process, Product brand, packaging, services decisions,
Marketing channel decisions, Retailing, wholesaling and distribution, Pricing decisions, Price determination and pricing policy.

MODULE 5:

Promotion, Advertising, how advertising works, deciding advertising objectives, Advertising budget, Advertising message, media planning, personal selling, publicity, sales promotion, World consumption of food: Patterns and types of food consumption across the globe

MODULE 6:

International marketing and international trade, salient features of international marketing, Composition & direction of Indian exports, international marketing, environment, Deciding which & how to enter international market

MODULE 7:

Exports- direct exports, indirect exports,Licensing,Joint ventures,Direct investment, Export trends and prospects of food products in India, Government institutions related to international food trade:APEDA, Tea Board, Spice Board, MOFPI, etc. WTO and world trade agreements related to food business, Product Promotion and Pricing, Distribution Channels.

MODULE 8:

Intellectual Properties (IPs) : Historical Perspectives and Need for the Introduction of Intellectual Property Right regime, TRIPs and Provisions in TRIPS Agreement, Intellectual Property Rights (IPR) - *benefits of securing IPRs* Indian Legislations for the protection of various types of Intellectual Properties, Fundamentals of Patents, Copyrights, Geographical Indications, Trade Secrets and Traditional Knowledge, Trademarks, Protection of Plant Varieties and Farmers' Rights Act (PPV & FRA) and National Biodiversity Board, Material Transfer Agreements, Research Collaboration Agreements, License Agreements.

MODULE 9:

Food plant layout & Process planning for the product, Scale of operations of food industry in India. Factors determining fixed capital requirements. Establishing the food product unit. Creativity and innovation problem solving. Personnel management, salaries, wages and incentives, performance appraisal, quality control, Sources and factors of fixed capital and working capital.

Text books and Reference materials:

1. Philip Kotler, Kevin Lane Keller, Abraham Koshy, Mithileshwar Jha. 2013. Marketing
2. Management: A South Asian Perspective, 14th Ed. Pearson Education.
3. Willium J. Stanton. 1984. Fundamentals of Marketing. Tata McGraw-Hill Publication, New Delhi.
4. C.N. Sontakki. Marketing Management. Kalyani Publishers, New Delhi.
5. John Daniels, Lee Radebaugh, Brigham, Daniel Sullivan. International Business, 15th Ed., Pearson Education.
6. Aswathappa. International Business. Tata McGraw-Hill Education, New Delhi.
7. Fransis Cherunilam. International Business: Text and Cases, 5th Ed. PHI Learning, New Delhi.
8. D. David and S. Ericson, *Principles of Agri. Business Management*. Tata Mc Graw
9. Hill Book Co., New Delhi.
10. P.K. Srivastava, *Marketing Management*. Himalaya Publishing House, New Delhi.
11. G.S. Batra and Narinder Kumar, *GATT implications of Denkel proposal*. Azmol Publications, New Delhi.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202E413	**Marketing Management and International Trade Practical**	**0-0-2**	**1**

PRACTICAL:

1. Observation of various OTC products and identification of highly perishable and fast moving in various outlets in your locality.
2. Export quality management in food industry.
3. Project feasibility report and cost benefit analysis for baking industry.
4. Industrial visit to different Food Processing industries.

Subject code	Subject	Hours per week L-T-P	Credit C
MFP202421	Major Project/ Internship, Presentation and dissertation.	0-0-32	16

Each student will have to carry out a major project work or minimum 45 days and maximum 60 days of internship in food industry. On completion of the project work/ internship, 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

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