Syllabus template M.Sc. FOOD SCIENCE & NUTRITION SEMESTER 3

Semester: 3	
Course : Food Science & Nutrition	
Paper Title: Microbial Technology, Artificial Intelligence (AI) and Entrepreneurship in Food Industry	
Paper code: MFSN 4301	**Credits: 6**
Hours/week : 6	
Category: Core/MDC/SEC/VAC : CORE (Major)	
Theory / Practical / Composite : Theory	
No of Modules : 2 Modules	

Course Overview: This course provides an integration of microbial technology, artificial intelligence (AI), and entrepreneurship in the modern food industry. It explores how microorganisms are applied in food production, preservation, quality assurance, and sustainability, while highlighting the transformative role of AI in food processing, supply chain management, product innovation, and food safety. The course also develops entrepreneurial skills required to identify market opportunities, create innovative food-based ventures, and commercialize biotechnology-driven solutions.

Course Outcome:

1. Remember the current knowledge about the microbial technology.

2. Understand the microbial fermentation methods, bioreactor designing and AI tools.

3. Apply the knowledge of AI-powered sensors, electronic noses, and computer vision to detect microbial contamination, foreign objects, and adulteration in real-time.

4. Analyse the Entrepreneurship base economic growth in food industries.

5. Evaluate the role of various microbial technology for the initiation of start-ups.

6. Create and develop new approaches for microbial product development in the industries.

Prerequisites: ***Basic knowledge about any prior course***

SYLLABUS

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I. / I Module I- Microbial Technology	Fermentation and Industrial Microbiology Upstream processing: Media for industrial fermentation-submerged and solid-state fermentation. Sterilization, development of inoculum for fermentation. Screening techniques-primary and secondary, strain	**6**	**CO1,CO4,CO5**	**K1,K4,K5**

	improvement of industrially important microorganisms. Bioreactor design, types and components of fermenter- agitation, aeration, pH, temperature, dissolved oxygen- control and monitoring. Different types of fermenters (Shake flask, Batch/stir tank,Continuous, Bubble column, airlift and Tower fermenter), Types of fermentation processes,aerationand agitation. Techniques of Downstream processes - recovery and purificationfiltration, centrifugation. Purification of intracellular and extra cellular products.			
II. /I	Fermentative production and purification i. Brief account of industrial production of bread, Baker's Yeast and Cheese by microorganisms. ii.Production of amino acids – Lysine, glutamic acid. iii.Production of antibiotics- Penicillin and Streptomycin, iv.Production of food colorants- beta carotene v.Production of organic acids- Citric acid, Acetic acid(Vinegar) vi.Fermentative production & purification of alcoholic beverages: Technology of production and purification of ethyl alcohol, non-distilled beverage (beer, wine), distilled beverage (whisky, rum, champagne) vii. Fermentative production and use of saccharifying agents(amylase, pectinase, etc.) and vitamins (B2 and B12)	**7**	**CO1,CO3,CO4, CO5**	**K1,K3,K4,K5**
III. /I	**Immobilization of enzymes-**Principles behind enzyme immobilization and its application.	2	**CO1,CO3,CO4, CO6**	**K1,K3,K4,K6**
IV. /I	Enzymatic production of glucose, fructose, starch, SCP	2	**CO2,CO3,CO4, CO5**	**K2,K3,K4,K5**
V. /I	Utilization and treatment of Biological waste Agricultural waste (cereal, legume and oil seed-based waste), dairy waste, fruit and vegetable waste, meat, poultry, egg	2	**CO1,CO3,CO4, CO6**	**K1,K3,K4,K6**

	and fish wastes, by-products of fermentation industries, Sugar and bakery industry.			
1 /II **Unit I- Artificial Intelligence in Food Science**	1. Fundamentals of Artificial Intelligence and Machine Learning Definition and evolution of Artificial Intelligence (AI) Difference between AI, Machine Learning (ML), and Deep Learning (DL) Types of machine learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning: Overview of neural networks and decision trees, 2. AI in Food Quality and Safety •Use of image processing for quality grading of agricultural produce •Spectroscopic methods with artificial intelligence for detecting adulterants. •Predictive microbial modelling forecast bacterial growth. •Integration of AI and sensor technology for monitoring food freshness, pH, temperature •AI in automated food inspection systems. 3. AI in Food Product Development and Sensory Analysis •Application of AI in food formulation: optimization of ingredients, nutrition, texture. •Use of ML for predicting consumer preferences from survey or sensory panel data. •AI in flavor and aroma prediction: virtual sensory modelling. 4. AI in Food Supply Chain, Traceability, and Sustainability ▪ Forecasting demand and managing inventory using AI algorithms. ▪ AI in logistics: optimization of distribution routes, cold chain monitoring. ▪ Use of AI for minimizing food waste (e.g., predictive shelf-life estimation). 5. Case Studies, Challenges, and Future Perspectives	**10**	**CO2,CO3,CO4, CO1,CO6**	**K2,K3,K4,K1, K6**

2 / II **Unit-II Entrepreneurship Development in Food Industry**	•Case studies from industries. Startups and innovations using AI in food. •Ethical and regulatory concerns in AI applications: data privacy, transparency. •Future trends: Robotics in food preparation, AI for global food security. 6. AI in Nutrition and Personalized Dietary Planning Case Study: AI for personalized nutrition based on biomarkers and behavior. Predictive nutrition: AI for assessing dietary patterns from food logs and wearable devices Nutrient composition modeling from unstructured data. AI for identifying dietary risk factors and designing public health interventions. Role of AI in developing culturally sensitive, personalized diet plans using genetic, lifestyle, and microbiome data. Emerging AI driven nutrition platforms and related modelling. **1: Entrepreneurial Competence** ▪ Definition, Characterisation, Enterprise Ownership Base Types. ▪ Entrepreneur and Intrapreneur. ▪ Entrepreneurship base economic growth and growth affecting factors, 4 Stage Growth Model **2: Scope of Entrepreneurship Development in the Industry** • Introduction to Entrepreneurship Development in Food Introduction • Feasibility Studies: Concept and Types • Role and Functions of Agri-Business Incubators (ABI) and Investors for Entrepreneurship Development in Value Addition Sector. • Start-ups and Intellectual Property • Trends in Food Processing- An Opportunity to Entrepreneur.	**8**	**CO3, CO4, CO5, CO6.**	**K3,K4,K5,K6**

Text Books

1. Artificial Intelligence: A Real Opportunity in the Food Industry by Aboul Ella Hassanien and Mona Soliman.
2. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas Muller
3. Machine Learning for Absolute Beginners – Oliver Theobald
4. Nature Food, Trends in Food Science & Technology, Journal of Food Engineering.

Suggested readings

1. Kuratko and Rao, Entrepreneurship: A South Asian Perspective, Cengage Learning.
2. Dr.Sandip T. Gaikwad, Entrepreneurship Development in Food Industry, Blue leaf Publications.
3. K.P. Sudheer, V. Indira, Entrepreneurship Development in Food Processing; Routledge.
4. V. Desai, Dynamics of Entrepreneurial Development and management, Himalaya Publishing House.

Web Resources

1.

2.

Evaluation Theory CIA: 20 Semester Exam: 80

Paper Structure for Theory Semester Exam Module :
Full marks 80
Module 1: 40 marks
SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5x2=10
LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS)= 6x5=30

Module 2: 40 marks
SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5x2=10
LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS)= 6x5=30

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	**Remember** the current knowledge about the microbial technology.	K1
CO2	**Understand** the microbial fermentation methods, bioreactor designing and AI tools.	K2
CO3	**Apply** the knowledge of AI-powered sensors, electronic noses, and computer vision to detect microbial contamination, foreign objects, and adulteration in real-time.	K3
CO4	**Analyse** the Entrepreneurship base economic growth in food industries.	K4
CO5	**Evaluate** the role of all biological systems and their interactions.	K5

CO6	**Create** and develop new approaches for microbial product development in the industries.	K6

Syllabus template M.Sc. in Food Science and Nutrition SEMESTER III

Semester: III	
Course : Food Science and Nutrition	
Paper code: MFSN 4302	**Credits: 6**
Paper Title: Food Preservation and Packaging Techniques	
Hours/week : 6	
Category: Core/MDC/SEC/VAC : CORE (Major)	
Theory / Practical / Composite : Theory	
No of Modules : 2	

Course Overview: The Food Preservation and Packaging Techniques course teaches students the scientific principles behind preventing food spoilage and extending shelf life. Students learn to classify food spoilage agents, apply preservation methods (heat, cold, dehydration, fermentation), and design packaging systems that maintain nutritional value and food safety.

Course Outcome:

1. **Remember** the principles of food preservation, packaging, quality, and food safety regulations.
2. **Understand** food preservation methods, packaging technologies, and quality assurance systems.
3. **Apply** appropriate preservation, packaging, and food safety techniques to different food products.
4. **Analyze** factors affecting food spoilage, shelf life, packaging performance, and product quality.
5. **Evaluate** preservation methods, packaging systems, and regulatory compliance for food safety and quality.
6. **Create** sustainable and innovative food preservation and packaging solutions using emerging technologies.

Prerequisites: ***Basic knowledge about any prior course***

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I/I **Principles of Food Preservation**	Food Preservation Methods •Thermal Processing: Pasteurization, sterilization, UHT processing, canning •Non-Thermal Processing: High-pressure processing, pulsed electric field, irradiation •Chemical Preservation: Preservatives, food additives, pH	**10**	**CO1,CO2,CO3, CO4,CO5**	**K1,K2,K3,K 4,K5**

	control •Biological Preservation: Fermentation, probiotics, and biopreservation <u>Traditional and Emerging Preservation Techniques</u> •Freezing, dehydration, freeze-drying •Hurdle Technology for food safety			
II/I **Preservation of Major Food Groups**	<u>Preservation of Cereals, Pulses, and Legumes</u> •Composition, storage characteristics, and causes of spoilage. •Traditional and modern drying methods. •Grain storage systems: hermetic, controlled atmosphere, and modified atmosphere storage. •Prevention of insect infestation, fungal growth, and mycotoxin contamination. •Packaging, quality maintenance, and shelf-life enhancement of cereal and pulse products. <u>Preservation of Fruits and Vegetables</u> •Post-harvest physiology, ripening, and spoilage mechanisms. •Refrigeration, freezing, dehydration, and freeze-drying. •Thermal processing: blanching, pasteurization, canning, and bottling. •Chemical preservation, fermentation, edible coatings, and biopreservation. •Novel technologies: High Pressure Processing (HPP), Pulsed Electric Fields (PEF), cold plasma, and modified atmosphere packaging. <u>Preservation of Dairy and Meat Products</u> •Spoilage of milk, dairy, meat, poultry, and fish products. •Pasteurization, sterilization, UHT processing, chilling, and freezing. •Fermentation, curing, smoking, drying, and hurdle technology.	**18**	**CO1,CO2,CO3, CO4,CO5**	**K1,K2,K3,K 4,K5**

	•Vacuum packaging, modified atmosphere packaging, and irradiation. •Quality assurance, food safety, and shelf-life evaluation. <u>Preservation of Oils and Fats</u> •Composition, stability, and factors affecting deterioration. •Oxidative and hydrolytic rancidity. •Use of natural and synthetic antioxidants. •Storage and packaging techniques for extending shelf life. •Quality assessment through peroxide value, free fatty acids, and oxidative stability tests. •Emerging approaches such as microencapsulation and active packaging systems.			
I/II **Packaging of Food Products**	<u>Food Packaging Materials and Techniques</u> •Historical Background, types of packaging materials (Paper, Plastic, Metal, Glass, Biodegradable) •Properties of packaging materials, manufacturing, properties and application. •Barrier properties (WVTR, GTR & OTR) and shelf-life extension <u>Smart and Active Packaging</u> •Modified Atmosphere Packaging (MAP) •Active and Intelligent Packaging, Smart Packaging •Nanotechnology in food packaging •Edible films and coatings	**15**	**CO1,CO2,CO3, CO4,CO5,CO6**	**K1,K2,K3,K 4,K5,K6**

	Packaging Regulations and Sustainability •FSSAI, Consumer Protection Act and global food packaging regulations •Eco-friendly packaging and waste management regulations •Consumer safety and migration of chemicals from packaging			
II/II **Quality Control, Safety, and Food Regulations**	Food Quality and Safety Standards •HACCP, ISO, GMP, and FSSAI guidelines •Sensory evaluation and food spoilage detection Contaminants and Adulteration in Processed Foods •Heavy metals, pesticide residues, microbial toxins , common adulterants Innovations in Food Processing, Preservation and Packaging •3D food printing, intelligent sensors for spoilage detection •Personalized nutrition and future trends in processed food.	12	**CO1,CO3,CO4, CO5,CO6**	**K1,K3,K4,K 5,K6**

Text Books

1. Fellows, P. J. (2017). Food processing technology: Principles and practice (4th ed.). Woodhead Publishing.
2. Manay, N. S., & Shadaksharaswamy, M. (2010). Foods: Facts and principles (3rd ed.). New Age International Publishers.
3. Sinha, N. K., Sidhu, J. S., Barta, J., Wu, J. S. B., & Cano, M. P. (Eds.). (2010). Handbook of fruits and fruit processing. Wiley-Blackwell.
4. Desrosier, N. W., & Singh, R. P. (2012). Food preservation methods. Springer.
5. Mahalik, N. P. (2014). Processing and impact on active components in food. Academic Press.

Suggested readings

1. Robertson, G. L. (2016). Food Packaging: Principles and practice (3rd ed.). CRC Press.
2. Rahman, M. S. (2007). Handbook of food preservation (2nd ed.). CRC Press.
3. Fundamentals of Packaging Technology, Walter Saroka, IOPP

Web Resources

1.

Evaluation: Theory CIA: 20 Semester Exam:80

Paper Structure for Theory Semester Exam Module :
Theory: 100 Marks (80 End Sem+ 20 CIA)
Question Paper format: Theory end semester
Module 1: 40 marks

SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5x2=10
LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = 6x5=30

Module 2: 40 marks
SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5x2=10

LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = 6x5=30

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember the principles of food preservation, packaging, quality, and food safety regulations.	K1
CO2	Understand food preservation methods, packaging technologies, and quality assurance systems.	K2
CO3	Apply appropriate preservation, packaging, and food safety techniques to different food products.	K3
CO4	Analyze factors affecting food spoilage, shelf life, packaging performance, and product quality.	K4
CO5	Evaluate preservation methods, packaging systems, and regulatory compliance for food safety and quality.	K5
CO6	Create sustainable and innovative food preservation and packaging solutions using emerging technologies.	K6

Syllabus template M.Sc. in Food Science and Nutrition SEMESTER III

Semester: III	
Course : Food Science and Nutrition	
Paper code: MFSN 4303	**Credits: 6**
Paper Title : Clinical and Therapeutic Nutrition	
Hours/week : 6	
Category: Core/MDC/SEC/VAC : CORE (Major)	
Theory / Practical / Composite : Theory	
No of Modules : 2	

Course Overview: The learners can assess a patient's nutritional status, diagnose deficiencies, and design specialized diets to manage diseases, support treatments, and optimize recovery in healthcare settings. Modifying normal diets (e.g., controlling specific macro/micronutrients, altering texture) to accommodate medical needs.

Course Outcome:

1. **Remember** the principles of clinical nutrition, nutritional assessment, and therapeutic nutrition.
2. **Understand** the nutritional assessment tools, nutrition support, and medical nutrition therapy for various diseases.
3. **Apply** nutrition assessment techniques and therapeutic nutrition principles in clinical practice.
4. **Analyze** nutritional problems and clinical data to develop appropriate nutrition care plans.
5. **Evaluate** nutrition interventions and therapeutic strategies for effective disease management.
6. **Create** evidence-based, patient-centered medical nutrition therapy plans for complex clinical conditions.

Prerequisites: ***Basic knowledge about any prior course***

SYLLABUS

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I/I **Advanced Nutritional Assessment and Nutrition Support**	• Comprehensive nutritional assessment using anthropometric, biochemical, clinical, and dietary evaluation methods. • Impact of human lifestyle on Microbiome evolution and nutrition. • Application of nutritional screening and assessment tools including MUST (Malnutrition Universal Screening Tool), GLIM (Global Leadership Initiative	**10**	**CO1,CO2,CO3,CO4,CO5**	**K1,K2,K3,K4,K5**

	on Malnutrition), MNA (Mini Nutritional Assessment), and SGA (Subjective Global Assessment). • Nutrition Care Process (NCP): assessment, diagnosis, intervention, monitoring, and evaluation. • Principles of nutritional genomics, nutrigenetics, nutrigenomics, and personalized nutrition approaches. • Enteral and parenteral nutrition: indications, formulations, administration techniques, monitoring, complications, and clinical management.			
II/I **Medical Nutrition Therapy in Gastrointestinal, Cardio respiratory Disorders, Organ Failure, and Transplantation**	• Medical nutrition therapy for upper and lower gastrointestinal disorders, intestinal obstruction, anastomosis, and the therapeutic role of specific nutrients. • Nutritional management of hepatobiliary and pancreatic disorders including cirrhosis, pancreatitis, hepatic encephalopathy, and Wilson's disease. • Medical nutrition therapy for malabsorption disorders including celiac disease, tropical sprue, intestinal brush border enzyme deficiencies, lactose intolerance • Nutritional care following intestinal surgeries • Nutritional management of renal disorder-chronic kidney disease, acute kidney disease, renal failure, dialysis, and transplantation. • Medical nutrition therapy for cardiovascular diseases,	**18**	**CO1,CO2,CO3,CO4,CO5,CO6**	**K1,K2,K3,K4,K5,K6**

	significance of cardiac enzymes in disease management. • Nutritional management of pulmonary disorders including the effects of malnutrition on respiratory function, chronic obstructive pulmonary disease (COPD), and pneumonia.			
I/II **Advanced Medical Nutrition Therapy for Non-Communicable and Autoimmune Diseases**	• Nutritional management in oncology, cancer therapy, and palliative care. • Medical nutrition therapy for autoimmune disorders including rheumatoid arthritis, systemic lupus erythematosus, and multiple sclerosis. • Nutritional management of obesity and metabolic syndrome. • Medical nutrition therapy for Polyendocrine Metabolic Ovarian Syndrome (PMOS)[formerly known as PCOS; polycystic ovarian syndrome (PCOS)] and associated metabolic complications. • Evidence-based dietary strategies for prevention and management of chronic non-communicable diseases.	15	**CO2,CO3,CO4,CO5,CO6**	**K2,K3,K4,K5,K6**
II/II **Medical Nutrition Therapy in Critical Care and Specialized Clinical Conditions**	• Nutritional management of critically ill patients with trauma, burns, and sepsis. • Medical nutrition therapy for neurological disorders including Alzheimer's disease, Parkinson's disease, and stroke. • Immunonutrition and the role of functional nutrients in critical care settings. • Nutrition support strategies in intensive care units and	12	**CO2,CO3,CO4,CO5,CO6**	**K2,K3,K4,K5,K6**

	specialized clinical conditions.			

Text Books

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
2. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
3. Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
4. Garrow, J.S., James, W.P.T. and Ralph, A. (2000): Human Nutrition and Dietetics, 10th Edition, Churchill Livingstone.
5. Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.
6. Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
7. Walker, W.A. and Watkins, J.B. (Ed) (1985): Nutrition in Pediatrics, Boston, Little, Brown & Co.

Suggested readings

1. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
2. Ritchie, A.C. (1990): Boyd's Textbook of Pathology, 9th Edition, Lea and Febiger, Philadelphia.
3. Fauci, S.A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
4. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer- A Global perspective, Washington E.D. WCRF.

Web Resources

1.

Evaluation Theory CIA: 20 Semester Exam:80

Paper Structure for Theory Semester Exam Module :

Theory: 100 Marks (80 End Sem + 20 CIA)

Question Paper format: Theory end semester

Module 1: 40 marks

SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5x2=10
LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = 6x5=30

Module 2: 40 marks

SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5x2=10

LONG QUESTION: FROM 8 QTNS ANSWER 6 (EACH 5 MARKS) = 6x5=30

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember the principles of clinical nutrition, nutritional assessment, and therapeutic nutrition.	**K1**
CO2	Understand the nutritional assessment tools, nutrition support, and medical nutrition therapy for various diseases.	**K2**
CO3	Apply nutrition assessment techniques and therapeutic nutrition principles in clinical practice.	**K3**
CO4	Analyze nutritional problems and clinical data to develop appropriate nutrition care plans.	**K4**
CO5	Evaluate nutrition interventions and therapeutic strategies for effective disease management.	**K5**
CO6	Create evidence-based, patient-centered medical nutrition therapy plans for complex clinical conditions.	**K6**

Syllabus template M.Sc. FOOD SCIENCE & NUTRITION SEMESTER 3

Semester: 3	
Course : Food Science & Nutrition	
Paper Title: Food Preservation and Therapeutic Nutrition	
Paper code: MFSN4351	**Credits: 6**
Hours/week : 12	
Category: Core/MDC/SEC/VAC : CORE (Major)	
Theory / Practical / Composite : Practical	
No of Modules : No	

Course Overview: This course make the students learn how to analyse the biochemical components of the different food items. Here they learn to perform various qualitative and quantitative analysis with knowledge of different techniques like chromatography, spectrophotometry etc. Also different human body composition tests are also included as part of human physiology. Survey of Nutritional status in different communities is also done as part of the course.

Course Outcome:

1. Remember the optimisation of nutrients and other factors for microbial growth in Bioreactor.

2. Understand the nutritional Assessment and Diet Planning

3. Apply the knowledge of Nutritional Support Techniques for Enteral feeding formulas.

4. Analyse and Interpretion of diagnostic reports and comprehensive diet counselling.

5. Evaluate critically the Diet Management of Hypertension, GI and Hepatic Disorders, cancer and burn cases.

6. Create new approaches & various measures for better food packaging techniques.

Prerequisites: ***Basic knowledge about any prior course***

SYLLABUS

UNIT/ Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I.	1. Collection, identification and preservation of important bacterial/fungal strains of industrial importance. 2. Determination of bacterial growth curve. 3. Effect of different concentrations of salt or sugar solutions on microbial growth. 4. Investigate the effect of different pH on microbial growth by culturing in media adjusted to varying pH values. 5. Propagation of baker's yeast.	**12 /week**	**CO1,CO2,CO3, CO4,CO5,CO6**	**K1,K2,K3 K4,K5,K6**

	6. Production of Citric acid in batch culture. 7. Isolation of antibiotic producing microorganisms and production of antibiotic. 8. Nutritional Assessment and Diet Planning-Interpretation of anthropometric, clinical and biochemical parameters. 9. Nutritional Support Techniques-Enteral feeding formulas and parenteral nutrition planning. 10. Dietary Management of Obesity-Assessment, calorie calculation and low-calorie recipe development. 11. Dietary Management of Diabetes Mellitus and Hypoglycemia-Meal planning, carbohydrate exchange and glycemic control. 12. Dietary Management of Renal Disorders-Diet planning for CKD, nephrotic syndrome, nephrolithiasis and dialysis patients. Preparation of low-protein, low-potassium and low-phosphorus recipes. 13. Dietary Management of Hypertension, GI and Hepatic Disorders, cancer and burn 14. Case Study-Based Clinical Nutrition Exercise-Interpretation of diagnostic reports and comprehensive diet counselling. 15. Temperature modulated Preservation techniques- Food Dehydration and Freeze-Drying 16. Fermentation and Probiotic Food Preparation 17. Food Preservation Using Chemical Preservatives 18. Canning and Bottling of Foods 19. Active and Intelligent Food Packaging , Modified Atmosphere Packaging (MAP) and Vacuum Packaging			

	20. Sensory Evaluation and Shelf-Life Testing 21. Market survey of ergogenic aids 22. Python Basics for Food Data Analysis. 23. Image-Based Food Quality Detection: Using pre-trained image classification models to detect spoilage or classify fruits/vegetables. 24. Mini Project: Literature Review and Project on AI model development.			

Text Books

A Laboratory Manual of Food Analysis by Shalini Sehgal, Year – 2016

2. Gaman, P.M. and Sherrington, K.B. (1996),The science of food, oxford, Butterworth – Heinemann.

3. Potter, Norman N. and Hotchkiss (1996) Food Science, 5th ed. C.B.S. Publication.

Suggested readings

1. Manay, N. Shakuntala and Shadaksharaswami, N. (1987), Foods:Facts and Principles, Wiley Eastern Ltd.
2. 5. Meyer, Lilian H. Ed. (1987), Food chemistry. Indian Ed. CBS Publishers and Distributors.
3. 6. Frazier, Food Microbiology, Tata Mc Graw Hill 1978.

Web Resources

1.

2.

Evaluation Theory CIA: 20 Semester Exam: 80

Paper Structure for Practical Semester Exam Module :
Practical : 100 Marks (20 End Sem + 80 CIA)

Question Paper format: Practical end semester

Viva voce – 20 marks (End Sem)

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	**Remember** the optimisation of nutrients and other factors for microbial growth in Bioreactor.	K1
CO2	**Understand** the nutritional Assessment and Diet Planning	K2
CO3	**Apply** the knowledge of Nutritional Support Techniques for Enteral feeding formulas.	K3
CO4	**Analyse** and Interpretion of diagnostic reports and comprehensive diet counselling.	K4
CO5	**Evaluate** critically the Diet Management of Hypertension, GI and Hepatic Disorders, cancer and burn cases.	K5

CO6	**Create** new approaches & various measures for better food packaging techniques.	K6