



**M.S. Ramaiah University of Applied
Sciences**

Programme Specifications

M.Sc. (FST) Food Sciences and Technology

Programme Code: 093

 **2022 onwards**
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M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

**M.S. Ramaiah University of Applied Sciences
Faculty of Life and Allied Health Sciences**





Approved by the 26th Academic Council meeting held on 15 July 2022

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

University's Vision, Mission and Objectives

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

Vision

MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

Mission

Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamwork in all our endeavors. We inspire critical thinking, personal development and a passion for lifelong learning. We serve the technical, scientific and economic needs of our Society.

Objectives

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunities in the society by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of our future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrich the experiences of faculties and students through research and developmental programmes

Programme Specifications: M.Sc. Food Science and Technology

Faculty of Life & Health Sciences

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Page 1 of 13

Faculty	Life and Allied Health Sciences
Department	Food Technology
Programme Code	093
Programme Name	M.Sc. Food Science and Technology
Dean of the Faculty	Dr Krishnamurthy J
Head of the Department	Dr. Lokesh A C

1. **Title of the Award:** M.Sc. Food Science and Technology
2. **Mode of Study:** Full Time
3. **Awarding Institution /Body:** M. S. Ramaiah University of Applied Sciences
4. **Joint Award:** Not Applicable
5. **Teaching Institution:** Faculty of Life and Allied Health Sciences, M. S. Ramaiah University of Applied Sciences, Bengaluru
6. **Date of Programme Specifications:** July 2022
7. **Date of Programme Approval by the Academic Council of MSRUAS:** 14 July 2022
8. **Next Review Date:** August 2023/2024
9. **Programme Approving Regulating Body and Date of Approval:**
10. **Programme Accredited Body and Date of Accreditation:**
11. **Grade Awarded by the Accreditation Body:**
12. **Programme Accreditation Validity:**
13. **Programme Benchmark:**
14. **Rationale of the programme:**

Government of India has set up three Mega food parks in Karnataka State and few more in pipe line. These food parks have been established with view of creating more than ten thousand jobs each across the value chain. In view of this, RUAS started UG course titled B.Sc. (Hons.) Food Processing and Technology in 2018 to develop well trained professional for food Industry. However, UG courses to a large extent help in developing man power suitable for operations /process management. This creates a void in skilled personal suitable for research, new product development or process development. Hence this proposal to start a postgraduate course to meet the requirement of food sector in Karnataka state and across India.

This PG course in food science and technology, would concentrate on the study of food, with an emphasis on creating and researching on reliable, viable, and good quality food products /production processes. Pursuing a research based PG course in food sciences will lead to development of new products and technology. Candidates with a Master of Science in this discipline are uniquely equipped to take on jobs focusing on Quality food production and pursue entrepreneurship as well.

15. Programme Mission

RUAS, a young and progressive University with excellent teaching, learning resources and faculty base would like to offer M.Sc. in Food Science and Technology as a postgraduate programme with a strong aim to acquaint aspiring students with a foundation and first degree training to make them ready for research assistants/associates, manage food production shop floor, food quality analysts, new product development, marketing executives, administrators in food industries and even pursue their career as entrepreneur.

16. Graduate Attributes

- GA-1. Ability to apply fundamental knowledge of Biology, Biochemistry, Food Chemistry, Food Microbiology for developing food products and preservation.
- GA-2. Ability to develop technologies for food processing and preservation
- GA-3. Ability to develop processes for food product development
- GA-4. Ability to test food for quality, safety and nutrition
- GA-5. Ability to develop packaging for preservation and distribution
- GA-6. Ability to perform administrative duties in government, semi-government, private and public sector organizations
- GA-7. Ability to teach in schools, colleges and universities with additional qualification and training
- GA-8. Ability to understand and solve scientific problems by conducting experimental investigations
- GA-9. Ability to apply appropriate tools, techniques and understand utilization of resources appropriately in various laboratories
- GA-10. Ability to understand the effect of scientific solutions on legal, cultural, social and public health and safety aspects
- GA-11. Ability to develop sustainable solutions and understand their effect on society and environment
- GA-12. Ability to apply ethical principles to scientific practices and professional responsibilities
- GA-13. Ability to work as a member of a team, to plan and to integrate knowledge of various disciplines and to lead teams in multidisciplinary settings
- GA-14. Ability to make effective oral presentations and communicate technical ideas to a broad
- GA-15. Ability to adapt to the changes and advancements in science and engage in independent and life-long learning.

17. Programme Outcome (POs)

PO 1. Technical Knowledge: Demonstrate in-depth knowledge of the scientific fundamentals and the modern technical knowledge needed to support Food technology research activities.

PO 2. Design/Development solution: Identify, analyse and understand the problems related to life sciences and find valid conclusions with basic knowledge acquired in the fields.

PO 3. Multidisciplinary approach: Correlate how different sub-systems co-operate with each other into current research and development in the respective fields.

PO 4. Entrepreneurship skills: Analyze manufacturing constituents and complete systems for relevant products and to enable enterprising skills for competing globally.

PO 5. Societal Responsibility: Innovate and develop sustainable solutions and understand their effect on society and environment.



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PO 6. Leadership and Ethics: Apply professional Ethics, Leadership and consensus building skills relevant to the aspects of business enterprise in the respective fields.

PO 7. Lifelong learning: Adopt changes and advancements in science and engage in independent learning.

PO 8. Communication: Communicate the information effectively in scientific writing and oral presentation.

18. Programme Goal

Food Technology is a multidisciplinary subject involving biology, food Chemistry, microbiology, safety, quality, packaging and product distribution, which is employed to develop new technologies. This Programme enables students to develop new product, pursue research, serve in food sector and nurture entrepreneurship.

19. Programme Educational Objectives (PEO):

The objectives of the programme are to enable the students to:

PEO 1. Provide a common platform for students from varied disciplines, to nurture their zeal to enhance knowledge on food science through structured courses and research opportunities.

PEO 2. Enable the students to be proficient in new product development through application of cutting edge technologies in food fermentation, enzymology, and nutraceuticals.

PEO 3. Facilitate students with contemporary knowledge of food quality and safety for development of healthy and safe foods.

PEO 4. Stimulate interdisciplinary research or pursue doctoral programs and enable them for industry and or academia, thus enhancing skilled professionals in food industry.

20. Programme Specific Outcomes (PSO)

PSO 1. Analyze and assess various food processing, preservation and packaging technologies.

PSO 2. Develop technologies for food processing, preservation packaging and quality assessment

PSO 3. Design and develop new food products and sustainable packaging.

PSO 4. Demonstrate entrepreneurship traits to start a new enterprise and work under constraints to meet organizational objectives.

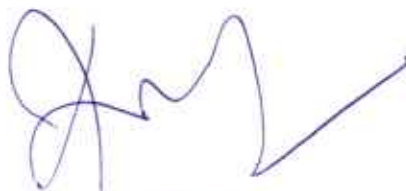


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21. Programme Structure

Semester 1							
S. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	FTC501A	Food Processing and Packaging	3		2	4	100
2	FTC502A	Food Additives and Preservatives	3		2	4	100
3	FTC503A	Biochemistry	3		2	4	100
4	FTC504A	Food Microbiology	3		2	4	100
5	FTC505A	Food Chemistry	3		2	4	100
6	FTC506A	Enzymes in Food Processing	3			3	100
Total			18		10	23	600
Total number of contact hours per week			28 hours				

Semester 2							
S. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	FTC507A	Nutraceuticals and Functional Foods	3		2	4	100
2	FTC508A	Food Quality & Sensory Analysis	3		2	4	100
3	FTC509A	Food Production & Operations Management	3			3	100
4	FTC510A	Advances In Fermentation Technology	3		2	4	100
5	FTC511A	Research Methodology	3			3	100
6	FTE501A FTE502A FTE503A FTE504A	Elective-I (Ref Elective Table)	3		2	4	100
Total			18		8	22	600
Total number of contact hours per week			26 hours				



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Semester 3							
S. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	FTC601A	Innovation and Entrepreneurship	3		-	3	100
2	FTE601A FTE602A FTE603A FTE604A	Elective-II (Ref Elective Table)	3		2	4	100
3	FTP601A	Group Project			20	10	100
Total			6		22	17	300
Total number of contact hours per week			33 hours				
Number of credits can be registered			Minimum	6	Maximum	17	

Semester 4							
S. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	FTI601A	Research Project			10	24	300
Total						24	300
Total number of contact hours per week			30 h				
Total Number of Credits in M.Sc. Programme			86		Total Marks		1800

Elective course

Two Elective courses (E1 & E2) can be chosen from any one of the following streams–

Professional Core Electives (PCEs) Semester 3			
Sl. No.	Course Code	Elective Courses -1	Credits
1	FTE501A	Post-Harvest Technology of Cereals & Pulses	3+1
2	FTE502A	Millet Processing Technology	3+1
3	FTE503A	Fruits and Vegetable Processing Technology	3+1
4	FTE504A	Spices and Flavour Technology	3+1
Sl. No.	Course Code	Elective Courses -2	Credits
1	FTE601A	Advances in Dairy Processing	3+1
2	FTE602A	Dairy Microbiology	3+1
3	FTE603A	Dairy Engineering	3+1
4	FTE604A	Baking and Confectionery Technology	3+1

Group Project - FTI601A:

A group shall have up to 5 students. The purpose of group project is that the group should be able to design and develop a product in their area of specialization. The students are required to exhibit/ demonstrate the working of the product and generate a project report as well. The IPR rights of all such work lies with the University. The students are required to sign an agreement before the commencement of the project. Students can choose a project from the database of projects available with the concerned department and the same should be approved by a committee of examiners.

Dissertation and Publication -19FST600A:

A student chooses a topic for the Dissertation based on relevance and need. The detail procedure of executing and assessing Dissertation is available as a standard template.

22. Course Delivery: As per the Timetable

23. Teaching and Learning Methods

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures
5. Laboratory work/Field work/Workshop
6. Industry Visit
7. Seminars
8. Group Exercises
9. Project Work
10. Project
11. Exhibitions
12. Technical Festivals

24. Assessment and Grading

24.1. Components of Grading

There shall be two components of grading:

Component 1, Continuous Evaluation (CE): This component involves multiple subcomponents (SC1, SC2, etc.) of learning assessment. The assessment of the subcomponents of CE is conducted during the semester at regular intervals. This subcomponent represents the formative assessment of students' learning.

Component 2, Semester-end Examination (SEE): This component represents the summative assessment carried out in the form an examination conducted at the end of the semester.

Component-1 (CE) carries a weightage of 50% and Component -2 (SEE) carries a weightage of 50%

The complete details of Grading are given in the Academic Regulations.

The template for weightage of CE and SEE in percentages for each type of course is indicated in Table a to C

24.2. Theory Courses

The following TWO options are available for each Faculty to perform the CE exercise.

Option 1 for a Theory Course: (Table a)

Option 1 for a Theory Course				
Continuous evaluation				SEE
Component	SC1	SC2	SC3	Semester End Examination
Weightage	25	12.5	12.5	50



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25. Curricular Map

Semester	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
1	Food Processing and Packaging	3	2							3	2		
1	Food Additives and Preservatives			3							3		
1	Biochemistry		2	3								3	
1	Food Microbiology		3								3		
1	Food Chemistry		3								2	1	
1	Enzymes in Food Processing	3									3	1	
Semester	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
2	Nutraceuticals and Functional Foods	2	2							3	2		
2	Food Quality & Sensory Analysis	3	2							2	3		
2	Food Production and Operations Management				3		1			1			3
2	Baking & Confectionery Technology			2	2						2		2
2	Advances In Fermentation Technology	3	2								2		1
2	Research Methodology		1						3		2		
3	Innovation and Entrepreneurship				3				2			2	3
3	Group Project		2	2				1	1			2	3
4	Dissertation & Publication		1	2					3			2	1
ELECTIVE 1													
3	Post-Harvest Technology of Cereals & Pulses		3	2							2	2	




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3	Millet Processing Technology	2	2							2	1	
3	Fruits and Vegetable Processing Technology	3	1	1						1	2	
3	Spices and Flavour Technology		2	3							3	1
ELECTIVE 2												
3	Advances in Dairy Processing	2	2							2	2	
3	Dairy Microbiology	1		3						1		3
3	Dairy Engineering		2	3						2		3
3	Dairy Food Packaging	2	3	1						2		2

26. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposia, paper writing, attending industry exhibitions, project competitions and related activities for enhancing their knowledge and networking.

27. Cultural and Literary Activities

Annual cultural festivals are held to showcase the creative talents in students. They are involved in planning and organizing the activities.

28. Sports and Athletics

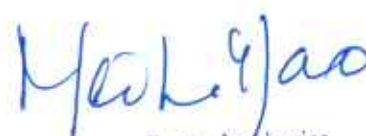
Students are encouraged to take part in sports and athletic events regularly. Annual sports meet will be held to demonstrate sportsmanship and competitive spirit.



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Sciences**

Course Specifications

M.Sc. (FST) Food Sciences and Technology

Programme Code: 093

2022 onwards

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Faculty of Life and Allied Health Sciences**



Handwritten signature and date: 15/07/2022

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Semester-I



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Course Specifications: Food Processing and Packaging

Course Title	Food Processing and Packaging
Course Code	FTC501A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

Aim of this course is to learn cutting-edge food processing and food packaging technologies

Students will understand the emerging food processing technologies. They will be familiarized with supercritical fluid extraction, microwave and radio frequency technologies and hurdle technology. Students will also be thought the advance food packaging technologies like active and intelligent packaging, permeability properties of polymer. MAP technology and its importance

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the semester	42
Number of Laboratory hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain the emerging technology in food processing like membrane technology, HPP, Ultrasound, SCFE
2	Describe Microwave process, radio frequency, IR drying and Hurdle technology
3	Discuss the advance food packing technologies
4	Perform advance food processing and packaging technologies
5	Explain the emerging technology in food processing like membrane technology, HPP, Ultrasound, SCFE

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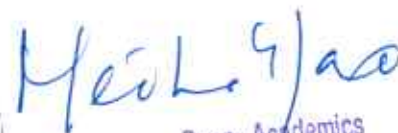
Course Content
Unit I Emerging technology in food processing-membrane technology, HPP, PEF, Ultra sound. Supercritical fluid extraction: Concept, property of near critical fluids NCF and extraction methods. Application of SCFE in food processing
Unit II Microwave and radio frequency, IR drying: Definition, Advantages, mechanism of heat generation, inductive heating in food processing and preservation
Unit III Hurdle technology: Types of preservation techniques and their principles, concept of hurdle technology and its application.
Unit IV Active and intelligent packaging systems, Advances in Active packaging techniques and Intelligent packaging techniques
Unit V Permeability properties of polymer packaging, measurement of permeability –water and gases. Selection criteria of packaging films.
Unit VI Novel MAP gases, Testing novel MAP applications, Novel MAP applications for fresh and prepared food products. Oxygen and ethylene scavenging technology: concept and its food applications
Unit VII Non-migratory bioactive polymers (NMBP) in food packaging, Advantages and limitations
Practical <ol style="list-style-type: none"> 1. To carry out ultrafiltration study on fruit juices 2. To study microwave blanching of fruits and vegetable and determination of blanching efficacy 3. To study super critical fluid extraction system and to carry out extraction of eugenol from Basil leaves 4. Determination of WVTR in different packaging materials 5. Application of MAP packaging in selected foods 6. Development of ethylene scavengers for fresh fruits and vegetables 7. Determination of oxidative changes in packaged foods 8. Comparative evaluation of flexible and rigid packages for fragile foods 9. To study textural characteristics of selected fruit/ vegetable under MAP storage 10. Visit to food packaging material manufacturing industry



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3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72



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4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I		Assignment	Component-II (Examination)
		Mid Term Test	Seminar		
1	Explain the emerging technology in food processing like membrane technology, HPP, Ultrasound, SCFE	X	X		X
2	Describe Microwave process, radio frequency, IR drying and Hurdle technology	X	X		X
3	Discuss the advance food packing technologies		X	X	X
4	Perform advance food processing and packaging technologies		X	X	X
5	Explain the emerging technology in food processing like membrane technology, HPP, Ultrasound, SCFE		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	Laboratory Exercises
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

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1. References

1. Ahvenainen R. 2001. Novel Food Packaging Techniques. CRC.
2. Barbosa-Canovas 2002. Novel Food Processing Technologies. CRC.
3. Gould GW. 2000. New Methods of Food Preservation. CRC.

IV Course Organization

Course Code	Food Processing and Packaging		
Course Title	FTC501A		
Course Leader/s Name	Allotted as per time table		
Course Leader Contact Details	Phone:	080-49066666	
	E-mail:	hod.ft.ls@msruas.ac.in	
Course Specifications Approval Date	June 2022		
Next Course Specifications Review Date:	June 2023		



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Course Specifications: Food Additives and Preservatives

Course Title	Food Additives and Preservatives
Course Code	FTC502A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to introduce students to different additives and preservatives used in food industry. The students will be able to understand the mode of action of additives and preservatives in food products. They will also be familiarized with regulatory requirements of food additives. The course will also educate students regarding chronic toxicity and health implications of food additives

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

4. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1.	Describe the role of food additives and preservatives
2.	Summarize the properties of food preservatives
3.	Explain toxicology and safety evaluation of food additives
4.	Differentiate intentional and unintentional food additives
5.	Discuss about nutritive and non-nutritive sweeteners



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2. Course Content

Course Content
Unit-1 Food Additives: Structure, Chemistry, Function and application of Preservatives, Emulsifying and Stabilizing agents, Sweeteners, buffering agents, bleaching, maturing agents and starch modifiers, Food colors, flavors, anti-caking agent, Antioxidants etc.
Unit 2: Food Preservatives: Natural preservation, chemical preservatives, their chemical action on foods and human system, Antioxidants and chelating agents, their role in foods, types of antioxidants – natural and synthetic, chelating agents, their mode of action in foods with examples, salts, humectants/polyhydric alcohol, firming agent, nutritional and non-nutritional sweeteners; Production of enzymes, leavening agents, fat substitutes, flavor and taste enhancers in food processing; Acidity regulators; Emulsifiers
Unit-3: Naturally occurring food additives: Food colors and dyes: Regulatory aspects of dyes, food color (natural and artificial), pigments and their importance and utilization as food color; Processing of natural and artificial food colorants: nature, properties and functions and mode of action.
Unit-4: Safety of food additives: Safety assessment of Food additives: No-observed Effect Level (NOEL Acceptable daily intake (ADI), Dietary exposure,) in chronic toxicity and health implications
Unit-5: Intentional and unintentional food additives, their toxicology and safety evaluation
Practical: <ol style="list-style-type: none"> 1. Market survey of preserved foods 2. Evaluation of GRAS aspect of food additives 3. Preservation of coconut shreds using humectants 4. Preparation of preserved products from fruits using class I preservatives 5. Preparation of preserved products using class II preservatives 6. Shelf life and sensory evaluation of developed products 7. Market survey of products without added preservatives 8. Detection of alginates in foods (chocolate, ice cream) 9. Isolation, identification and estimation of synthetic food colours 10. Visits to food processing and preservation unit (Optional)



Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72



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Method of Assessment

There are two components for assessment in this course:

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No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Role of food additives and preservatives	X	X		X
2	Properties of food preservatives	X	X		X
3	Toxicology and safety evaluation of food additives		X	X	X
4	Intentional and unintentional food additives		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

- H. D. Belitz, W. Grosch and P. Schieberle. 2009. Food Chemistry. 4th Edition. Springer-Verlag, Berlin, Heidelberg.
- S.N. Mahindru. 2008. Food Additives: Characteristics, Detection and Estimation. Aph Publishing Corporation, New Delhi.
- S.S. Deshpande. 2002. Handbook of Food Toxicology. Marcel and Dekker AG, Basel, Switzerland.
- Baren, A. F. et al (2001). Food additives, 2nd edition, Marcel Dekker.
- George, A. B. (1991). Encyclopaedia of food and colour additives, Vol III, CRC Press.
- Nakai, S. and Modler, H. W. (2000). Food proteins: processing applications, Wiley Robertson

Faculty of Life and Allied Health Sciences

Faculty of Life & Allied Health Sciences
M.S. RAMAIAH UNIVERSITY OF APPLIED SCIENCES
BANGALORE-560 054

Page 10 of 117
Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054



IV. Course Organization

Course Code	Food Additives and Preservatives		
Course Title	FTC502A		
Course Leader/s Name	Allotted as per time table		
Course Leader Contact Details	Phone:	080-49066666	
	E-mail:	hod.ft.ls@msruas.ac.in	
Course Specifications Approval Date	June 2022		
Next Course Specifications Review Date:	June 2023		



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Course Specifications: Biochemistry

Course Title	Biochemistry
Course Code	FTC503A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to introduce students to basic concepts of biochemistry and its significance in food science and technology.

Students will be taught the basics of biochemistry such as macro and micro molecules and their classification, general reactions, digestion, absorption and metabolism. Students will also be taught the importance of biochemistry in understanding food chemistry, food processing and product development. Students will also be carrying out experiments on quantitative analysis of carbohydrates, proteins, lipids, enzymes and vitamins.

2. Course Size and Credits:

Number of credits	2 + 1
Total hours of class room interaction	28
Number of Laboratory hours	24
Number of semester	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain the physico-chemical properties of water, cell structure organization and functions of cellular organelles
2	Outline the classification, chemical properties, general reactions, digestion, absorption and metabolism of carbohydrates, lipids and proteins
3	Summarize biological functions of enzymes, vitamins, minerals, nucleic acids and their application in food processing
4	Illustrate various pathways involved in metabolism of carbohydrates, proteins and lipids
5	Analyze and apply suitable method for quantitative analysis of carbohydrates, proteins, lipid and enzymes

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BANGALORE-560 054

Page 12 of 117
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M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

2. Course Content

Course Content
Unit I Importance of biochemistry in food science and technology Water: Physical and chemical properties of water, Weak interactions in aqueous systems, Ionization of water and Buffers
Unit II The Cell Structure and Function: Prokaryotic and Eukaryotic cell, Plant and Animal cell and its sub cellular organelles- nucleus, endoplasmic reticulum, golgi apparatus, vacuoles, mitochondria, chloroplasts, micro bodies, cytoskeleton, cell wall and their functions
Unit III Carbohydrates: Introduction, classification: Monosaccharides- stereochemistry, nomenclature, cyclic forms, general reactions of monosaccharides, Oligosaccharides and polysaccharides, digestion and absorption
Unit IV Amino acids: Introduction, structure- stereochemistry, classification, chemical properties Proteins: Importance of proteins in living system, diverse roles of proteins, classification, properties of proteins, Denaturation of proteins, structural organization of proteins-Primary, secondary, tertiary and quaternary structures, digestion and absorption
Unit V Lipids: Introduction, classification, Triglycerols, Saturated and unsaturated fats, chemical properties, oxidation reactions, rancidity, digestion and absorption
Unit VI Enzymes: chemical nature, classification and nomenclature, mechanism of action, specificity of enzymes, factor affecting for enzymatic activities
Unit VII Nucleic acids: RNA and DNA; their biological functions, nucleosides and nucleotides, structure and functions, Types of RNA, their characteristics and role. Clover leaf structure of tRNA
Unit VIII Minerals and vitamins: Functions, dietary sources and deficiency disorders
Unit IX Metabolism of Biomolecules: An overview of metabolism, catabolism and anabolism Carbohydrate metabolism: Glycolysis, TCA cycle, Electron transport and oxidative phosphorylation, Pentose phosphate pathway Lipid metabolism: β -Oxidation of fatty acids and energetic Amino acid metabolism: Deamination, transamination and decarboxylation of amino acids
Practical <ol style="list-style-type: none"> 1. Preparation of standard solutions 2. Estimation of total carbohydrates by Phenol sulphuric acid method 3. Estimation of Starch by Anthrone method 4. Estimation of total Proteins by Lowry's method 5. Estimation of total lipids by Bligh and Dyer method 6. Estimation of crude fat by Soxhlet method 7. Determination of saponification number and acid value of an oil/fat 8. Determination of iodine number of an oil/fat 9. Estimation of Ascorbic acid by titrimetry 10. Determination of organic acid content by titrimetry 11. Separation of amino acids by Paper and Thin layer chromatography 12. Estimation of amylase enzymes in food

Course Teaching and Learning Methods

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Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		28
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		20
1. Course Laboratory	20	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		02
1. Case Study Presentation	02	
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Term Test and Written Examination		06
Total Duration in Hours		58

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3. Method of Assessment

There are two components for assessment in this course.

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No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Explain the physico-chemical properties of water, cell structure organization and functions of cellular organelles	X	X		X
2	Outline the classification, chemical properties, general reactions, digestion, absorption and metabolism of carbohydrates, lipids and proteins	X	X		X
3	Summarize biological functions of enzymes, vitamins, minerals, nucleic acids and their application in food processing		X	X	X
4	Illustrate various pathways involved in metabolism of carbohydrates, proteins and lipids		X	X	X
5	Analyze and apply suitable method for quantitative analysis of carbohydrates, proteins, lipids and enzymes		X	X	X

4. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, class tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

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1. David L. Nelson and Michael M. Cox. 2012. Lehninger Principles of Biochemistry, 6th Ed. Macmillan Learning, NY, USA.
2. Donald Voet and Judith G. Voet. 2011. Biochemistry, 4th Ed. John Wiley and Sons, Inc., NY, USA.
3. Reginald H. Garrett and Charles M. Girsham, 2010, 4th Ed, Brooks/Cole Cengage Learning

IV. Course Organization

Course Code	Biochemistry	
Course Title	FTC503A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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Course Specifications: Food Microbiology

Course Title	Food Microbiology
Course Code	FTC504A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

Aim of this course is to comprehend various microbiological examinations and study of different food born infections and diseases.

The students will be able to understand the factors affecting the microbial growth in foods and microbiological examinations. They will also learn the food preservation and application. The course will also educate students regarding Quality Control/Quality Assurance Legislation for food safety and student will equip the knowledge of media preparation, staining and isolation techniques.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	32
Number of Laboratory hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

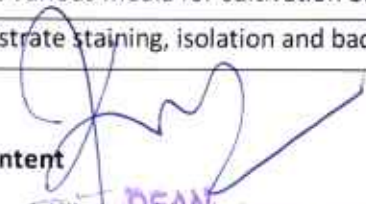
1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain the microbiological examination
2	Describe the microflora of fresh food and food preservation technologies
3	Discuss Quality Control/Quality Assurance Legislation for food safety
4	Prepare various media for cultivation of microorganisms
5	Demonstrate staining, isolation and bacteriological analysis

3. Course Content

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Course Content
Unit I History, scope and importance of food microbiology
Unit II Microorganisms and food: Their primary sources of microorganisms in foods: Airborne bacteria and fungi, Microorganisms in water, normal flora of skin, nose, throat, GI tract
Unit III Factors affecting the survival and growth of microorganisms in food: Intrinsic factors for growth, Moisture, pH & acidity, Nutrient content, Redox Potential.
Unit IV Naturally occurring and added antimicrobials, Competitive micro flora, Extrinsic factors for growth, Effect of time/temperature conditions on microbial growth, Storage/holding conditions, Processing steps
Unit V Microbiological examination- Methods of Isolation and detection of microorganisms or their products in food. Conventional methods, Rapid methods: (Newer techniques), Immunological methods, Fluorescent, antibody, Radio immunoassay, ELISA etc. Chemical methods: PCR (Polymers chain reactions), RT PCR, Microchip based techniques
Unit VI Microflora of Fresh Food: Meat, Poultry, Eggs, Fruits and vegetable, Shellfish and Fish, Milk, Microbial Spoilage of Food, Fresh Foods, Fresh Milk, Canned Foods
Unit VII Food Preservation and application to different types of preservation: Physical methods- Drying, freeze, drying cold storage, heat treatments (pasteurization), TDT, TDP, Irradiation (UV, microwave, ionization), high pressure processing Chemical preservatives and Natural antimicrobial compounds. Biologically based preservation systems
Unit VIII Food borne infections and diseases: Significance to public health Food hazards and risk factors, Bacterial, and viral food-borne disorders, Food borne important animal parasites, Mycotoxins, <i>Bacillus</i> , <i>Campylobacter</i> , <i>Brucella</i> , <i>Staphylococcus</i> , <i>Clostridium</i> , <i>E.coli</i> , <i>Aeromonas</i> , <i>Vibrio cholerae</i> , <i>Listeria</i> , <i>Mycobacterium</i> , <i>Salmonella</i> , <i>Shigella</i>
Unit IX Quality Control/Quality Assurance Legislation for food safety-national and international Criteria, sampling schemes, records, risk analysis QC- microbial source, code Indicators of food safety and quality: Microbiological criteria of foods and their significance.
Unit X The HACCP system and food safety used in controlling microbiological hazards.



Practical	
1.	Preparation of common laboratory media and special media for cultivation of bacteria, yeast & molds.
2.	Staining of Bacteria: Gram's staining, acid -fast, spore, capsule, Motility of bacteria, staining of yeast and molds.
3.	Isolation of microorganisms: Different methods and maintenance of cultures of microorganisms.
4.	Bacteriological analysis of Foods using conventional methods
5.	Coli forms analysis of milk and water samples
6.	To perform various biochemical tests used in identification of commonly found bacteria in foods: IMVIC urease, H 2S, Catalase, coagulase, gelatin and fermentation (Acid/gas)
7.	Determination of thermal death characteristics of bacteria
8.	Demonstration of available rapid methods and diagnostic kits used in identification of microorganisms or their products
9.	Visits to food processing unit or any other organization dealing with methods in food microbiology.

4. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		2
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio	0	
Others		10
1. Case Study Presentation		
2. Guest Lecture	04	
3. Industry/Field Visit	02	
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72



5. Method of Assessment

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There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Explain the microbiological examination	X	X		X
2	Describe the microflora of fresh food and food preservation technologies	X		X	X
3	Discuss Quality Control/Quality Assurance Legislation for food safety		X	X	X
4	Prepare various media for cultivation of microorganisms	X	X		X
5	Demonstrate staining, isolation and bacteriological analysis		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

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M.S. RAMAIAH UNIVERSITY OF APPLIED SCIENCES
BANGALORE-560 054

Faculty of Life and Allied Health Sciences

Page 20 of 117

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

References

1. Pelczar, M.I. and Reid, R.D. (1993) Microbiology McGraw Hill Book Company, New York, 5th Edition.
2. Atlas, M. Ronald (1995) Principles of Microbiology, 1st Edition, Mosby-Year Book, Inc, Missouri, U.S.A.
3. Topley and Wilson's (1983) Principles of Bacteriology, Virology and Immunity, Edited by S.G.
4. Wilson, A. Miles and M.T. Parkar, Vol. I: General Microbiology and Immunity, II: Systematic
5. Bacteriology. 7th Edition. Edward Arnold Publisher.
6. Frazier, W.C. (1988) Food Microbiology, McGraw Hill Inc. 4th Edition,

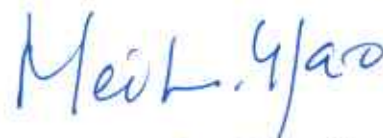
IV Course Organization

Course Code	Food Microbiology	
Course Title	FTC504A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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BANGALORE-560 054



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Course Specifications: Food Chemistry

Course Title	Food Chemistry
Course Code	FTCS05A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to introduce students to the applications of functional properties of carbohydrates, proteins, lipids and vitamins in food product development.

Students will also be taught chemistry of flavour compounds, food additives, pigments, food colorants and anti-nutritional factors. They will also be carrying out experiments on proximate analysis of food samples, antioxidants, smoke point, vitamins and minerals.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the semester	42
Number of tutorial hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

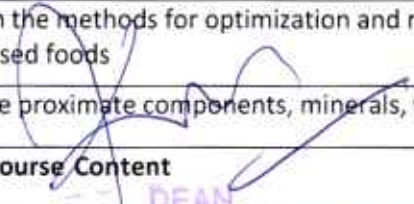
1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain the nature and scope of food chemistry in food science and technology
2	Describe the functional characteristics of lipids, proteins, carbohydrates, and their application in food processing
3	Outline application of various types of enzymes, vitamins, minerals and pigments in food industry
4	Explain the methods for optimization and retention of vitamins, minerals and natural colors in processed foods
5	Analyze proximate components, minerals, vitamins, antioxidants, tannins and pigments

2. Course Content

Faculty of Life and Allied Health Sciences


 DEAN
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 BANGALORE-560 054

Dean - Academic Page 22 of 117


 M.S. Ramaiah University of Applied Sciences
 Bangalore - 560 054



Course Content
<p>Unit I Nature and Scope of food chemistry, role of food chemist. Moisture in foods: Role and type of water in foods, Functional properties of water, role of water in food spoilage, Water activity and sorption isotherm, Molecular mobility and food stability. Water activity: principles, measurement, control, effects, related concepts</p>
<p>Unit II Dispersed systems of foods: Physicochemical aspects of food dispersion system: a) Sol b) Gel c) Foam d) Emulsions. Rheology of diphasic systems.</p>
<p>Unit III Functional properties of carbohydrates, proteins and lipids and their applications in food processing Carbohydrates in foods: Functional characteristics of different carbohydrates (sugars-water relationship, sweetness). Maillard reaction, caramelization, methods to control non enzymatic reactions. Modification of carbohydrates- unmodified and modified starches, modified celluloses. Proteins in foods: Functional properties of proteins in foods – water and oil binding, foaming, gelation, emulsification. Lipids in foods: Role and use of lipids /fat, occurrence, fat group classification, Physicochemical aspects of fatty acids in natural foods, hydrolysis, reversion, polymorphism and its application. Chemical aspects of lipolysis, auto-oxidation, antioxidants</p>
<p>Unit IV Vitamins: structure and properties of vitamins, distribution and morphology of vitamins in foods, changes of vitamins in food processing and storage, Regulation and control of vitamins in foods, relationship of vitamins and food quality.</p>
<p>Unit V Minerals: structure and properties of minerals, distribution and morphology of minerals in foods and processed goods, changes of minerals in food processing and storage, regulation and control of minerals in foods, relationship of minerals and food quality</p>
<p>Unit VI Chemistry of food flavour: Definitions of flavour, Flavourmatics / flavouring compounds, Sensory assessment of flavour, Technology for flavour retention</p>
<p>Unit VII Pigments in animal and plants kingdoms: Heme pigments, Chlorophyll, Carotenoids, Phenolic and flavonoids, Betalins, Effect of processing on pigment behavior, Technology for retention of natural colours of food stuffs. Food colorants: Regulatory aspects –Natural and synthetic permitted food colours. Properties of certified dyes, Use of regulatory dyes. Colour losses during thermal processing.</p>
<p>Unit VIII Anti-nutritional factors: Occurrence, effects and methods of elimination or inactivation- protease inhibitors, lectins, lathrogens, phytates and flatulence factors.</p>
<p>Practical</p> <ol style="list-style-type: none"> 1. Estimation of moisture content and water activity of foods 2. Estimation of reducing sugars and non-reducing sugars 3. Estimation of crude protein by micro Kjeldahl method 4. Determination of essential amino acids i.e. lysine, tryptophan and methionine 5. Determination of refractive index and specific gravity of fats and oils 6. Determination of smoke point and percent fat absorption for different fat and oils

7. Determination of niacin/pyridoxine/thiamine/riboflavin
8. Estimation of total ash, water soluble and acid soluble ash
9. Estimation of calcium in food samples
10. Determination of antioxidants by DPPH method
11. Estimation of total tannins in food samples
12. Estimation of total carotenoids

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72

4. Method of Assessment

There are two components for assessment in this course

Type of Assessment

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No.	Intended Learning Outcome	Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Explain the nature and scope of food chemistry in food science and technology	X	X		X
2	Describe the functional characteristics of lipids, proteins, carbohydrates, and their application in food processing	X	X		X
3	Outline application of various types of enzymes, vitamins, minerals and pigments in food industry		X	X	X
4	Explain the methods for optimization and retention of vitamins, minerals and natural colors in processed foods		X	X	X
5	Analyze proximate components, minerals, vitamins, antioxidants, tannins and pigments		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	Laboratory Exercises
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, class tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

- DeMan, J.M, 1980, Principles of Food Chemistry, New York, AVI

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2. Fennema, Owen R, 1996, Food Chemistry, New York, Marcell Dekke
3. H.-D. Belitz, W. Grosch and P. Schieberle. 2009. Food Chemistry, 4th Ed. Springer-Verlag Berlin Heidelberg

IV. Course Organization

Course Code	Food Chemistry		
Course Title	FTC505A		
Course Leader/s Name	Allotted as per time table		
Course Leader Contact Details	Phone:	080-49066666	
	E-mail:	hod.ft.ls@msruas.ac.in	
Course Specifications Approval Date	June 2022		
Next Course Specifications Review Date:	June 2023		



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Course Specifications: Enzymes in Food Processing

Course Title	Enzymes in Food Processing
Course Code	FTCS06A
Department	Food Processing Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to introduce students to various enzymes and their application in food industry. Students will be taught applications of enzymes in milk production, beverage industry, baking industry, fat and oil processing. They will also be taught commercialization of enzyme processes, types of reaction, sources of enzymes, legal and safety implications.

2. Course Size and Credits:

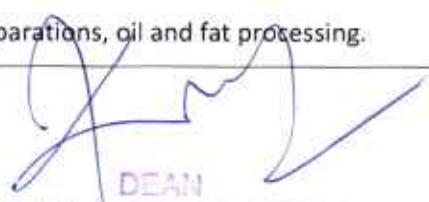
Number of credits	3+0
Total hours of class room interaction during the semester	41
Number of tutorial hours	00
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain enzyme classification, properties, kinetics and characterization of enzymes
2	Describe various sources of enzymes and commercialization of enzyme processes used in food industry
3	Discuss and decide appropriate application of enzymes in milk production, beverage, baking, jam preparations, oil and fat processing.


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 Faculty of Life and Allied Health Sciences 54



2. Course Content

Course Content
Unit I <ul style="list-style-type: none"> Enzymes: Introduction, classification, properties, characterization. Enzyme kinetics - factors affecting the enzymatic activity, enzyme concentration, substrate concentration, environment conditions and enzyme immobilization.
Unit II <ul style="list-style-type: none"> Enzymes in food industry: commercialization of enzyme processes, alternative method to use the enzymes, types of reaction Sources of enzymes, legal and safety implications.
Unit III <ul style="list-style-type: none"> Enzymes in milk production: Enzymes in milk preservation, lactose hydrolysis, Use of enzymes for determining milk quality enzymes in cheese manufacturing. Endogenous microbial enzymes, exogenous enzymes, Coagulant technology, enzymes in cheese preservation.
Unit IV <ul style="list-style-type: none"> Enzymes in beverage: Application of enzymes in tea and cocoa processing Application of enzymes in alcoholic beverages as beer, whisky, wine and ciders. Role of the enzymes in fruit juice production, enzymatic clarification of apple and guava juices, factors affecting the clarity of fruit juices.
Unit V <ul style="list-style-type: none"> Enzymes in baking industry: Introduction, Enzymes for baking industry Use of the proteinases, lipases and pentosans in baking industry, Starch degrading enzymes: sources, analysis and application of starch degrading enzymes.
Unit VI <ul style="list-style-type: none"> Hemicellulase: sources, analysis and application Enzymes in the processing of fats and oils: specificity, stability and application of lipases and related enzymes. Role of enzymes in hydrolysis of triglycerides, inter esterification and randomisation.

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		03
1. Demonstration using Videos	03	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		

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M. S. Ramaiah University of Applied Sciences
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 Page 28 of 117
 Bangalore - 560 054

3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation	02	08
2. Guest Lecture	02	
3. Industry/Field Visit	03	
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations		
Term Test and Written Examination		04
Total Duration in Hours		45

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Explain enzyme classification, properties, kinetics and characterization of enzymes	X	X		X
2	Describe various sources of enzymes and commercialization of enzyme processes used in food industry	X	X	X	X
3	Discuss and decide appropriate application of enzymes in milk production, beverage, baking, jam preparations, oil and fat processing.		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	

11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

1. Flickinger MC & Drew SW. 1999. Encyclopaedia of Bioprocess Technology. A Wiley-Inter Science Publ.
2. Kruger JE. *et al.* 1987. Enzymes and their Role in Cereal Technology. American Association of Cereal Chemists Inc.
3. Nagodawithana T & Reed G. 1993. Enzymes in Food Processing. Academic Press.
4. Tucker GA & Woods LFJ. 1991. Enzymes in Food Processing.
5. Whitehurst R & Law B. 2002. Enzymes in Food Technology. Blackwell Publication

IV Course Organization

Course Code	Enzymes in Food Processing	
Course Title	FTC506A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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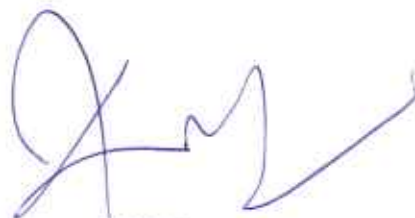
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Semester -II



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Course Specifications: Nutraceuticals and Functional Foods

Course Title	Nutraceuticals and Functional Foods
Course Code	FTC507A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to familiarize students about the role of nutraceuticals and functional foods in health, disease and their importance in food processing industry

Students will be enabled to understand the concept so nutraceuticals, functional foods and their classifications. They will be trained to formulate functional foods for different disease conditions. Students will be educated regarding adverse effects, toxicity, labeling and marketing issues associated with nutraceuticals and functional foods.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of tutorial hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Describe the role of nutraceuticals and functional foods in health and disease
2	Explain the role of nutraceuticals in angiogenesis
3	Describe the manufacturing aspects of nutraceuticals
4	Formulate functional foods
5	Perform sensory evaluation of formulated products

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Course Content
Unit I Introduction to nutraceuticals and functional foods: definitions, synonymous terms, basis of claims for a compound as a nutraceutical, regulatory issues for nutraceuticals
Unit II Classification of functional food, concept of angiogenesis and the role of nutraceuticals/functional foods
Unit III Functional food and nutraceuticals: Polyphenols, Flavonoids, catechins, isoflavones, tannins, Phytoestrogens, Phytosterols, Glucosinolates, Organo sulphur Phytates, Protease and their role in health and disease
Unit IV Manufacturing aspects of nutraceuticals: lycopene, isoflavonoids, glucosamine, phytosterols etc
Unit V Prebiotics, probiotics and Synbiotics: their health benefits, selection criteria, types and food formulations
Unit VI Antioxidants, dietary fiber and their health benefits
Unit VII Clinical testing of nutraceuticals and health foods, adverse effects and toxicity of nutraceuticals
Unit VIII Formulation of functional foods containing nutraceuticals – stability, analytical, labelling and marketing issues.
Practical <ol style="list-style-type: none"> 1. Market survey of existing health foods 2. Development of protein enriched biscuits as a functional food 3. Production of functional food for diabetic patient 4. Determination of dietary fibre content in selected functional food 5. Preparation of symbiotic yoghurt/ dahi 6. Sensory evaluation of symbiotic food 7. Production of flavonoid rich food product 8. Development of labels for health foods 9. Production of carotenoids from pumpkin powder 10. Production of ginger and turmeric oleoresins used in food products 11. Visit to Functional food/ Nutraceuticals manufacturing industry



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3. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in hours	Total Duration in Hours
Face to Face Lectures			30
Demonstrations			02
1.	Demonstration using Videos	02	
2.	Demonstration using Physical Models/Systems		
3.	Demonstration on a Computer		
Numeracy			24
1.	Solving Numerical Problems		
Practical Work			
1.	Course Laboratory	24	
2.	Computer Laboratory		
3.	Engineering Workshop/Course Workshop/Kitchen		
4.	Clinical Laboratory		
5.	Hospital		
6.	Model Studio		
Others			10
1.	Case Study Presentation	04	
2.	Guest Lecture	02	
3.	Industry/Field Visit		
4.	Brain Storming Sessions		
5.	Group Discussions	02	
6.	Discussing Possible Innovations	02	
Term Test and Written Examination			06
Total Duration in Hours			72

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I		Assignment	Component-II (Examination)
Mid Term Test	Seminar				
1	Describe the role of nutraceuticals and functional foods in health and disease	X	X		X
2	Explain the role of nutraceuticals in angiogenesis	X	X	X	X
3	Describe the manufacturing aspects of nutraceuticals		X	X	X
4	Formulate functional foods		X	X	X
5	Perform sensory evaluation of formulated products		X	X	X

5. Achieving Learning Outcomes

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The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	Laboratory Exercises
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources


1. References

1. Neeser JR & German BJ. 2004. Bioprocesses and Biotechnology for Nutraceuticals. Chapman & Hall.
2. Robert EC. 2006. Handbook of Nutraceuticals and Functional Foods. 2nd Ed. Wildman.
3. Shi J. (Ed.). 2006. Functional Food Ingredients and Nutraceuticals: Processing Technologies. CRC Press.
4. Webb GP. 2006. Dietary Supplements and Functional Foods. Blackwell Publ.
5. Tomar S.K. 2011. Functional Dairy Foods Concepts and Applications. Satish Serial Publishing House, Delhi.
6. Mingruo Guo. 2009. Functional food: principle and technology. CRC Press .Woodhead publishing limited. New Delhi.

IV Course Organization

Course Code	Nutraceuticals and Functional Foods		
Course Title	FTC507A		
Course Leader/s Name	Allotted as per time table		
Course Leader Contact Details	Phone:	080-49066666	
	E-mail:	hod.ft.ls@msruas.ac.in	
Course Specifications Approval Date	June 2022		
Next Course Specifications Review Date:	June 2023		




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Course Specifications: Food Quality & Sensory Analysis

Course Title	Food Quality & Sensory Analysis
Course Code	FTC508A
Department	Food Processing Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to introduce student to attributes of quality and their analysis methods. Students are introduced to organoleptic properties such as appearance, flavour, colour, texture and their significance in assessing/measuring quality of food products. Students will also be introduced to modern analytical equipment used for food quality testing.

2. Course Size and Credits:

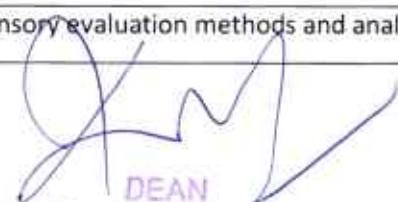
Number of credits	3 + 1
Total hours of class room interaction during the semester	42
Number of Laboratory hours	24
Number of semester weeks	16
Department responsible	Food Processing Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain organoleptic properties of food products
2	Describe sensory evaluation methods used to assess the quality of food products
3	Discuss the significance of quality testing methods and advanced equipment employed
4	Assess quality of food products based on physical attributes, taste, odour, colour and texture
5	Apply sensory evaluation methods and analytical tools for various food products


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 Dean - Academics
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2. Course Content

Course Content
<p>Unit I Introduction: Importance of food quality, Definition of quality, Quality specifications and quality attributes of different foods. Aspects of food quality: Introduction to organoleptic properties- Appearance, colour, taste, flavor, textural factors and additional quality factors, Introduction to sensory evaluation- Types</p>
<p>Unit II Appearance –Size, shape, Texture- gloss, consistency Colour - Introduction to natural and synthetic colours, functions of colour in foods, Optical aspect of colour, perception of colour, objective evaluation, colour measurement using different systems- Munsell colour system, CIE colour system, qualitative and quantitative analysis of colour, reflectance spectrophotometry and Colorimetry</p>
<p>Unit III Texture –Introduction, Definition and classification of texture profile , Subjective evaluation, phases of oral processing, Objective analysis, rheological methods of texture measurement including rheological models , Measurement of texture in various food groups viz. cereals, dairy, fruits and vegetables, meat and meat products</p>
<p>Unit IV Taste- Introduction, organs involved in taste perception- tongue, papillae, taste buds, salivary glands, mechanism of taste perception, chemicals responsible for sweet, salt, sour, and bitter taste their structure and chemical dimensions, Factors affecting taste quality, reaction time and factors affecting it, absolute and recognition threshold, taste abnormalities.</p>
<p>Unit V Olfactory – Introduction and definition, anatomy of nose, mechanism of odour perception, Prerequisites for odour perception, odour classification, chemical specificity of odour. Measurement of odour using different techniques – primitive, double tube olfactometer, Elseberg techniques, Wenzel's olfactometer, sniffing, merits and demerits of each methods, olfactory abnormalities. Food Adulterants and Food contaminants (Physical, chemical and microbiological).</p>
<p>Unit VI Introduction to modern analytical equipment used for food quality testing: Scanning Electron Microscopy, Gas Chromatography-Mass Spectrometry, High Performance Liquid Chromatography, Column chromatography, Thin layer Chromatography, spectrophotometer and electrophoresis, Microbiological methods, ELISA.</p>
<p>Practical</p> <ol style="list-style-type: none"> 1. Training of sensory panel for flavor perception 2. To perform sensitivity tests for four basic tastes 3. Sensory evaluation of milk and detection of flavor defects in milk 4. Sensory evaluation of biscuit samples for textural properties 5. Quality evaluation of product for physical attributes 6. Textural evaluation of various food products using texturometer 7. Simple tests for detection of common adulterants- formaldehyde, starch, cane sugar, hydrogen peroxide, sodium bicarbonate in milk. 8. Extraction of pigments from various fruits and vegetables and influence of heating time and pH 9. Colour estimation by Tintometer 10. Analysis of pesticide residues in fruits and vegetable using GCMS and HPLC

3. Course Teaching and Learning Methods



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Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		04
Total Duration in Hours		72

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			Component-II (Examination)
		Component-I		Assignment	
		Mid Term Test	Seminar		
1	Explain organoleptic properties of food products	X	X		X
2	Describe sensory evaluation methods used to assess the quality of food products	X	X		X
3	Discuss the significance of quality testing methods and advanced equipment employed		X	X	X



4	Assess quality of food products based on physical attributes, taste, odour, colour and texture		X	X	X
5	Apply sensory evaluation methods and analytical tools for various food products		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	Laboratory Exercises
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III.Course Resources

1. References

1. ManoranjanKalia, 2010, Food quality management, Agrotech publishing academy Udaipur G. Woodman., Food Analysis, Axis book
2. InteazAlli. 2004. Food Quality Assurance: Principles and Practices. CRC Press, Boca Raton, FL, USA.
3. Amerine, Pangborn& Roessler, 1965, Principles of sensory evaluation of food, London, Academic Press
4. Meilgard, 1999, Sensory evaluation Techniques, USA, CRC Press LLC
5. Yeshajahu Pomeranz & Clifton E. Meloan, 2002, Food Analysis & Theory & Practice, New Delhi, CBS Publisher & Distributors
6. R.E. Hester and R.M. Harrison. 2001. Food Safety and Food Quality. Royal Society of Chemistry, Cambridge, UK.

IV Course Organization

Course Code	Food Quality & Sensory Analysis
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Page 39 of 117

Course Title	FTC508A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
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Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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Course Specifications: Food Production and Operations Management

Course Title	Food Production and Operations Management
Course Code	FTC509A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to equip students with knowledge and understanding of operations management relating to the design, plan, control and production of food products.

This course in operations management covers key concepts and theories of operations, process and project management. It is designed to introduce students to the challenges faced by organizations from order to delivery of goods and/or services. Students are also to be enabled to address these challenges.

2. Course Size and Credits:

Number of credits	3
Total hours of class room interaction during the semester	41
Number of Laboratory hours	
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Demonstrate knowledge and understanding of principles and concepts of operations management & core operations techniques.
2	Critically analyse and evaluate the advantage and disadvantage of different techniques and approaches of operations management
3	Evaluate operations strategy, supply network design, process redesign
4	Apply techniques and approaches of operations management to solve practical operations management problems

2. Course Content

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Bangalore - Page 41 of 117

Course Content
Unit I An overview of Operations Management: Operations Management: Introduction and Overview, Historical Evolution - Changes & Challenges. Concept of Production, Production System, Classification of Production System. Objectives and Scope of Operations Management. Productivity, Factors Affecting Productivity.
Unit II Operations Strategy: Strategic Role of Operations, Strategic Planning. Product Strategy and integrated product development, Process Strategy. Characteristics of decision and decision methodology. Capacity Planning Decisions. Facilities Location Strategies.
Unit III Product Design and Process Selection: Product design. Process design. Process technology and its choices. Plant Layout, Classification of layout. Job design and work organization.
Unit IV Planning and managing operations: Demand Forecasting. Value chain and Supply chain Management. Purchasing, vendor selection and material management, Inventory Management & Just-in-Time Systems. Materials Requirement, Planning and ERP Scheduling, sequencing and dispatching. Project planning and control.
Unit V Managing Quality: What is quality and why is it so important?. Statistical process control (SPC), Measuring and improving performances, Failure detection and analysis. Total Quality management, Value analysis and Value Engineering.

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		05
1. Solving Numerical Problems		
Practical Work		05
1. Course Laboratory		
2. Computer Laboratory		



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 Page 42 of 117

3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation	2	
2. Guest Lecture		
3. Industry/Field Visit	4	06
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Term Test and Written Examination		04
Total Duration in Hours		45

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I		Assignment	Component-II (Examination)
		Mid Term Test	Seminar		
1	Demonstrate knowledge and understanding of: Principles and concepts of operations management & core operations techniques.	X	X		X
2	Critically analyse and evaluate the advantage and disadvantage of different techniques and approaches of operations management	X	X		X
3	Evaluate operations strategy, supply network design, process redesign		X	X	X
4	Apply techniques and approaches of operations management to solve practical operations management problems		X	X	X



5. Achieving Learning Outcomes

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The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

1. Chary SN (2004), Production and Operations Management, Tata Mc Graw Hill III Edition.
2. Anil Kumar, S and Suresh, N (2009), Operations Management, New Age International (P) Ltd., Publishers, New Delhi
3. Parvinder Bali (2014), Food Production Operations, Oxford University Press, II Edition,
4. Joseph G. Monks(1997), Operations Management Theory and Problems, Mc. Graw Hill III Edition
5. Nigel Slack & Alistair Brandon-Jones (2019) Operations Management, Pearson Education Ltd., Essex, UK
6. Bizmanulz (2008), ISO 22000 Standard Procedures for Food Safety Management Systems

IV. Course Organization

Course Code	Food Production and Operations Management	
Course Title	FTC509A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	

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Page 44 of 117

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Course Specifications: Baking and Confectionery Technology

Course Title	Baking and Confectionery Technology
Course Code	FTE604A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to enable students to understand the technology involved in bakery industries and familiarizing with the factors influencing product quality.

The students will gain knowledge about baking equipment and special utensils required and bulk handling of ingredients in baking industry. They will understand the functions of various raw materials used in baking. They will also be educated about the importance of GMP in manufacture of confectionaries.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the semester	42
Number of Laboratory hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Discuss the role of ingredient in baking
2	Explain the effect of time and temperature on product quality
3	Apply hygiene and sanitation in bakery industry
4	Discuss the challenges of bulk handling of ingredients in processing plant



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Bangalore Page 45 of 117



II. Course Content

Course Content
<p>Unit I Essential ingredients: Flour, yeast, water, salt. Other ingredients: Sugar, colour, flavor, fat, milk and milk powder and bread improvers. Functions of various raw materials in baking: leaveners and yeast foods, shortenings, emulsifiers and antioxidants, Sweeteners and, water and salt, Ingredients from milk, eggs, fruits, vegetables, nuts, Spices, flavors, colors and preservation methods.</p>
<p>Unit II Bakery equipment: utensils and equipment in bakery unit, small and big equipment, bulk handling of ingredients, dough mixing and mixers, dividing, rounding, sheeting, and laminating, fermentation enclosures and brew equipment. Ovens and Slicers, Packaging materials and equipment.</p>
<p>Unit III Bread manufacturing process: Raw materials required and their functional properties. Straight and sponge, accelerated processing. Chorley wood bread process, dough retarding and freezing, stages in processing and advantages and disadvantages of various methods, characteristics of good bread: Internal characters; external characters. Bread defects/faults and remedies. Spoilage of bread, causes, detection and prevention.</p>
<p>Unit IV Biscuits and cookies: Production of 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.</p>
<p>Unit V 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.</p>
<p>Unit VI Confectionery products: Definition, importance of sugar confectionery and flour confectionery. Types of confectionery products: chocolate, boiled sweets, caramels, toffees, fondants. Manufacturing process and spoilage of confectionery products. GMP in baking and confectionery industries. Computerization in processing plant, sanitation and safety.</p>
<p>Practical</p> <ol style="list-style-type: none"> 1. Identification of bakery utensils and equipment 2. Market survey of available lab scale baking equipment 3. Effect of baking time and temperature on product quality 4. Study of characteristics of commercially available breads 5. Preparation of bread by different methods 6. Preparation of biscuits 7. Preparation of cookies 8. Evaluation of baked product quality on storage 9. Preparation of pizza base 10. Preparation of indigenous sweets



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Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72



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4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Explain the emerging technology in food processing like membrane technology, HPP, Ultrasound, SCFE	X	X		X
2	Describe Microwave process, radio frequency, IR drying and Hurdle technology	X	X		X
3	Discuss the advance food packing technologies		X	X	X
4	Perform advance food processing and packaging technologies		X	X	X
5	Explain the emerging technology in food processing like membrane technology, HPP, Ultrasound, SCFE		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	Laboratory Exercises
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

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 Page 48 of 117

1 References

1. Ahvenainen R. 2001. Novel Food Packaging Techniques. CRC.
2. Barbosa-Canovas 2002. Novel Food Processing Technologies. CRC.
3. Gould GW. 2000. New Methods of Food Preservation. CRC

IV. Course Organization

Course Code	Baking and Confectionery Technology		
Course Title	FTE604A		
Course Leader/s Name			
Course Leader Contact Details	Phone:	080-49066666	
	E-mail:	hod.ft.ls@msruas.ac.in	
Course Specifications Approval Date	June 2022		
Next Course Specifications Review Date:	June 2023		



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Course Specifications: Advances in Fermentation Technology

Course Title	Advances In Fermentation Technology
Course Code	FTCS10A
Department	Food Processing Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to enable the students with knowledge of basic fermentation technology and processing of fermented foods and beverages.

The students will be able to understand the fermentation technology and types of fermentation. They will also be familiarized with preparation of fermented food products. The course will also educate students with advance technology of microbiology.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the semester	42
Number of Laboratory hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain the types of fermentation
2	Discuss mushrooms-cultivation and preservation
3	Prepare and demonstrate the various fermented food products
4	Describe the advance technologies in microbiology



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2. Course Content

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Course Content
<p>Unit I Introduction to Fermentation- historical development; fermented food products of India; worldwide fermented food products; classification of fermented food products. Basic principles involved in fermentation; types of fermentation; starter culture; preparation and maintenance of bacterial, yeast and mold cultures for food fermentations.</p>
<p>Unit II Fermented Milk Products- Processing, manufacture, storage and packaging of acidophilus milk, cultured butter-milk and other fermented milk; bio-chemical changes occurring during manufacture of fermented milks; factors affecting these changes and effects of these changes on the quality of finished products.</p>
<p>Unit III Fermented Vegetables Products- Technological aspects of pickled vegetables, sauerkraut, cucumbers; mushrooms-cultivation and preservation.</p>
<p>Unit IV Fermented cereal and Pulse Products- Fermented soy sauce; soy sauce manufacturing methods; miso fermentation- raw materials and microorganism for fermentation; comparison of Indigenous and modern processing; spoilage microbes; tempeh- production and consumption, essential steps of fermentation; indigenous fermented product-idli, dosa, dhokla etc.</p>
<p>Unit V Fermented Fish and Meats Product- fish sauces, fermented fish pastes; fermented sausages process for manufacture of fermented sausage biochemical and microbiological changes during sausage ripening.</p>
<p>Unit VI Alcoholic Fermentation Products- Technology for processing oh wine, cider, beer etc.; microbiological and biochemical aspects.</p>
<p>Unit VII Methods of manufacture for acetic acid/vinegar, baker's yeast, microbial protein, lactic acid etc. Traditional fermented Foods of India: Dahi, lassi, Butter Milk, Jalebi, Khaman, Dhokla, Idli, Wada etc.</p>
<p>Unit VIII Future of Fermented Foods: Advances in microbiology, role of intestinal bacteria in human health in future, regulation and health claims for fermented foods.</p>
<p>Practical</p> <ol style="list-style-type: none"> 1. Preparation of fermented cereal products 2. Preparation of fermented pickles 3. Preparation of Dahi, Lassi and yoghurt 4. Freeze drying of starter culture 5. Preparation of Cheese 6. Study of bacteriophages in starter culture 7. Preparation of Traditional fermented food of India 8. Preparation of Tempeh 9. Preparation of alcoholic products 10. Study of Probiotic bacteria 11. Preparation of symbiotic food



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3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit	02	
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72



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4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Explain the types of fermentation	X	X		X
2	Discuss mushrooms cultivation and preservation	X		X	X
3	Prepare and demonstrate the various fermented food products	X	X		X
4	Describe the advance technologies in microbiology		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No.	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

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1. References

1. B. J. B. Wood (1998), Microbiology of fermented foods, Springer US
2. Robert W. Hutkins(2006), Microbiology and Technology of Fermented Foods, II Edition, IFT Press IFT Press, Ames, Iowa, Blackwell Pub.
3. K. H. Steinkrauss(1995), Handbook of Indigenous Fermented Foods , CRC Press
4. Sukumar De (1996), Outlines of Dairy Technology by, Oxford University Press

IV. Course Organization

Course Code	Advances In Fermentation Technology	
Course Title	FCT510A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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Course Specifications: Research Methodology

Course Title	Research Methodology
Course Code	FCT510A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The course aims at providing students with an insight into the research methodology and the associated responsibilities of a researcher.

This course deals with the principles of research, research methodology, significant phases of research, significant role of Literature Review, expectations from good literature review as well as procedure for systematic literature review. The essential aspects of technical communication to develop desirable writing skills for the preparation of research document including research paper as well as the skills for an effective presentation are also discussed.

2. Course Size and Credits:

Number of credits	3
Total hours of class room interaction during the semester	41
Number of Laboratory hours	-
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

2. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Describe the value, scope, relevance and mandatory steps of research
2	Demonstrate the procedures outlined for a systematic Literature Review
3	Analyze and prepare well-structured research proposal and paper
4	Identify and apply the essential skills desirable for an effective technical presentation




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2. Course Content

Course Content
Unit I Basics of Research – Definitions, Mandatory Steps, Types, Relevance of Research for Innovation and Technology Development, Effective Research and Self Discipline, library resources
Unit II Literature Review – Importance, Constituents, sources, Strategies for Literature Search, search engines, overview of citations, Referencing, Paraphrasing, usage of library resources
Unit III Research methodologies - Quantitative and Qualitative, Descriptive, Survey, Experimentation, etc.
Unit IV Research Design - Sample and Sampling Methodology and its estimation. Development of study tools including data collection methods (questionnaire and checklists)
Unit V Statistical Analysis - Descriptive and Inferential Statistics. Formulation and testing of hypothesis, Usage of T, F, Chi-square, Anova, Co-relation, etc.
Unit VI Research Proposal – Identification of research gap, topic, problem statement, identification of variables and their types, Structure of a Good Research Proposal, Getting Started, Tips for compilation of Good Research Proposal.
Unit VII Technical Communication - Research Paper for Publication- Significance of Problem Statement and its scope, Formulation of Hypothesis, Adequacy of Methodology, Significance of Presentation and Discussion of Results, Relevance and Importance of references.
Unit VIII Effective Presentation – Preparation, Templates, Balance between Good Design and Good Content, Planning and Sequencing, 4P's Rule (Plan, Prepare, Practice and Present), Essentials of Effectiveness, Effective Pausing and Inclusive Answering.

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		26
Demonstrations		
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer	06	
Numeracy		
1. Solving Numerical Problems		
Practical Work		
1. Course Laboratory		

2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation	05	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Term Test and Written Examination		04
Total Duration in Hours		45

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Describe the value, scope, relevance and mandatory steps of research	X	X	X	X
2	Demonstrate the procedures outlined for a systematic Literature Review	X		X	X
3	Analyze and prepare well-structured research proposal and paper	X	X	X	X
4	Identify and apply the essential skills desirable for an effective technical presentation		X	X	X

5. Achieving Learning Outcomes

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The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, class tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

- Booth W. C, Colomb and G.G Williams. (2005) The Craft of Research, Chicago Universit Press
- William M.K and Trochim. (2003) Research Methods, 2nd Edition, Biztantra Publications
- Jonathan Grix. (2004) The Foundation of Research, Palgrave Study Guides
- Wisker Gina. (2001) The Post Graduate Research Handbook, Palgrave
- Rugg G. and Petre M. (2004) The Unwritten Rules of Ph.D research, Open University

IV Course Organization

Course Code	Research Methodology	
Course Title	FCT510A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	

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Page 58 of 117

Semester –III



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Course Specifications: Post-Harvest Technology of Cereals and Pulses

Course Title	Post-Harvest Technology of Cereals and Pulses
Course Code	FTE501A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

Aim of this course is to comprehend various post-harvest process of cereals and pulses and its applications. Students will understand the management of storage structures and losses during storage of cereals and pulses produce and also understand the different drying and conveyors system used in food production plants

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

3. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1.	Explain the importance of post-harvest and causes for post-harvest losses
2.	Describe varies types of drying systems and storage structures
3.	Discuss the different conveyors, elevators and its importance
4.	Perform different physico-chemical properties for cereals and pulses



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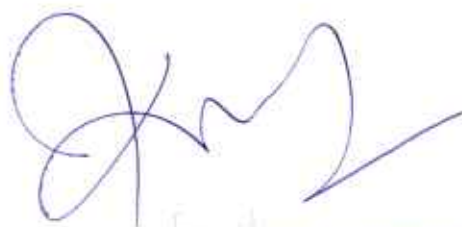
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2. Course Content

Course Content
<p>Unit I Post-Harvest Food losses & management: Importance of post-harvest management of food; Causes of post-harvest losses. Post-harvest quality and quantity losses</p>
<p>Unit II Unit operations in post-harvest technology. Introduction of post-harvest technology: Harvesting, Handling cleaning, grading, sorting, drying, storage, milling, size reduction, expelling, extraction, blending, heat treatment, separation, material handling (transportation, conveying, elevating), washing</p>
<p>Unit III Drying & dehydration of Food: Drying of Cereals and Pulses: importance of drying, principles of drying and factors affecting drying. Types of drying methods, sun drying & artificial drying.</p>
<p>Unit IV Types of dryers: Artificial drying by mechanical means like Continuous Flow Dryers, L.S.V. Dryers, Spray Dryer, Fluidized Bed Dryers, Rotary Dryer, Spouted Beds, Freeze Dryer, Tray And Tunnel Dryers, Psychometric Chart</p>
<p>Unit V Storage of food: Storage of Cereals and Pulse: Introduction, need and importance, general principles of storage. Deep and shallow bins. Traditional and modern storage structures. Losses during storage and their control, space requirement of bag storage structure.</p>
<p>Unit VI Food material Handling & Conveying: Types of material conveying Systems. Belt Conveyor, Bucket Elevator, Screw Conveyor</p>
<p>Practical:</p> <ol style="list-style-type: none"> 1. Determination of physical properties of agricultural materials e.g. size, shape, density 2. Determination of angle of repose of Cereals, Pulses and Oil Seeds 3. Determination of moisture content of grains. 4. Study of different types of dryers. 5. Study on Drying curve of fruits and vegetables and grains 6. Study of domestic grain storage structures 7. Determination of sedimentation value of the Maida 8. Study of rice dehuller or dehukers 9. Determination of alcoholic acidity and water absorption capacity and polenske value of wheat flour. 10. Determination of adulterant (NaHCO₃) in wheat flour/ Maida. 11. Visit to warehouses, Pack houses and cold-storage

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		02
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72



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4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Importance of post-harvest and causes for post-harvest losses	X			X
2	Types of drying systems and storage structures	X			X
3	Different types of conveyors in handling & conveying food		X	X	X
4	Different physico-chemical properties for cereals and pulses		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

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1. References

1. Chakraverty , Post-Harvest Technology of Cereal, Pulses, Oil seeds. Oxford & IBH Publication Co.
2. Dr.K.M. Sahay& K.K Singh, Unit operation of Agro Processing Engineering. Vikas Publications.
3. Kulp, K. and Ponte, J. G. Hand Book of Cereal Science and Technology, (CRC Press, 2000)

IV Course Organization

Course Code	Post-Harvest Technology of Cereals and Pulses	
Course Title	FTE501A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



A handwritten signature in blue ink, appearing to be 'M. S. Ramaiah', is written over the printed name of the Dean.

DEAN

Faculty of Life & Allied Health Sciences
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BANGALORE-560 054

A handwritten signature in blue ink, appearing to be 'M. S. Ramaiah', is written over the printed name of the Dean - Academics.

Dean - Academics

M.S. Ramaiah University of Applied Sciences
 Bangalore - 560 054

Course Specifications: Millet Processing Technology

Course Title	Millet Processing Technology
Course Code	FTE502A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to enable the students with the fundamental knowledge of millet processing technology. Students will be thought millet processing methods, processing equipment and different millet processed products and students will also understand the effect of processing on nutritional value of millets.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

4. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1.	Describe the millet processing equipment
2.	Explain the various millet processing methods and its effect on nutritional quality
3.	Discuss the different traditional and bioprocess technologies
4.	Perform various millet processing methods and prepare millet value added products



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2. Course Content

Course Content
Unit I Types of Millets, Characteristics – nutritional composition
Unit II Processing of millet: Milling machinery , major and minor products; Evaluation of millet processing machinery - cleaners, dehuskers, polishers, popping machines
Unit III Domestic flour milling equipment used for pearling, grinding and flour sifting of sorghum, pearl millet and Finger millet; Popping of coarse millets – technique and equipment
Unit IV Effects of Processing on the Nutritional Quality
Unit V Traditional and bioprocess technologies: Germination or malting, Fermentation and enzymatic hydrolysis, Popping or puffing, Soaking and cooking
Unit VI Food Manufacturing and Formulation Technologies: Conversion into pure-millet food products, Blending into composite flours and food products, Fortification and supplementation
Practical: <ol style="list-style-type: none"> 1. Popping of coarse grains 2. Malting of ragi and preparation of weaning Food. 3. Dehulling studies of millets 4. Pearling studies of sorghum, pearl millet and ragi 5. Preparation of different millet based snacks 6. Malting techniques of millets 7. Finger millet product development 8. Calcium estimation in finger millet 9. Estimation of iron in finger millet by titrimetric method 10. Preparation of millet instant laddu mix 11. Preparation of extruded products from millets



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3. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in hours	Total Duration in Hours
Face to Face Lectures			30
Demonstrations			02
1. Demonstration using Videos	02		
2. Demonstration using Physical Models/Systems			
3. Demonstration on a Computer			
Numeracy			
1. Solving Numerical Problems			
Practical Work			24
1. Course Laboratory	24		
2. Computer Laboratory			
3. Engineering Workshop/Course Workshop/Kitchen			
4. Clinical Laboratory			
5. Hospital			
6. Model Studio			
Others			
1. Case Study Presentation	04		
2. Guest Lecture	02		
3. Industry/Field Visit			
4. Brain Storming Sessions			
5. Group Discussions	02		
6. Discussing Possible Innovations	02		
Term Test and Written Examination			06
Total Duration in Hours			72



4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I		Assignment	Component-II (Examination)
		Mid Term Test	Seminar		
1	Importance of post-harvest and causes for post-harvest losses	X			X
2	Types of drying systems and storage structures	X			X
3	Different types of conveyors in handling & conveying food		X	X	X
4	Different physico-chemical properties for cereals and pulses		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	



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M.S. Ramaiah University of Applied Sciences
Bangalore Page 68 of 117

III. Course Resources

1. References

1. Finger Millet: A Valued Cereal by K S Premavalli.2012, Nova Publishers

IV. Course Organization

Course Code	Millet Processing Technology	
Course Title	FTE502A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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Course Specifications: Fruits and Vegetable Processing Technology

Course Title	Fruits and Vegetable Processing Technology
Course Code	FTE503A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to enable the students with the fundamental knowledge of millet processing technology. Students will be thought millet processing methods, processing equipment and different millet processed products and students will also understand the effect of processing on nutritional value of millets.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain the basic fruits and vegetables processing technologies
2	Discuss the various preservation methods
3	Discuss and apply advanced methods of processing and storage
4	Prepare different processed products using fruits and vegetables or optimize the process



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2. Course Content

Course Content
Unit I Current status and scope of production and processing of fruits and vegetables
Unit II Juice extraction: juice, history of juicing, types of juices, process flow diagram for fruit juice production, juice extraction process- fruit selection, sorting, washing, juice extraction, deaeration, straining/filtration, clarification, adding of sugars, fortification, bottling, sealing and storage; methods of juice preservation, causes of juice spoilage
Unit III Canning: Introduction, canning process - selection of fruits and vegetables, preparation of raw material, blanching, cooling, filling, exhausting, sealing, thermal processing, cooling and storage
Unit IV Minimally processed fruits and vegetables
Unit V MAP and CAP of Fruits and vegetables
Unit VI Quality Control : History of Statutory Provisions in India, FASSAI Guide Lines for Fruits and vegetables
Practical: <ol style="list-style-type: none"> 1. Market survey of preserved fruit and vegetable products. 2. Sterilization of bottles 3. Preparation and packaging, sensory/objective evaluation and economics of ketchup (Tomato). 4. Preparation and packaging, sensory/objective evaluation and Economics of squash (pineapple) 5. Preparation and packaging, sensory/objective evaluation and economics of squash Syrup (rose and almond) 6. Preparation and packaging and labelling, sensory/objective evaluation and economics of jam (mixed fruits) 7. Preparation and packaging, labelling, sensory/objective evaluation and economics of Marmalade (orange) 8. Preparation and packaging of labelling, sensory/objective (TSS, pH) evaluation and costing of Pickle (green chilli, lemon, mixed vegetable) 9. Preparation and packaging of labelling, sensory/objective (TSS, pH)) evaluation and costing of Preserve (carrot) 10. Dehydration of vegetables (green leafy vegetables, other vegetables and tubers) 11. Preparation of innovative products in bulk and organizing an exhibition-cum-sale



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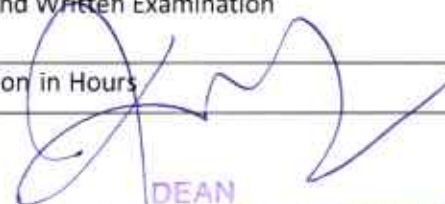
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3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72




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4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			Component-II (Examination)
		Component-I		Assignment	
		Mid Term Test	Seminar	Assignment	
1	Explain the basic fruits and vegetables processing technologies	X			X
2	Discuss the various preservation methods	X		x	X
3	Discuss and apply advanced methods of processing and storage		X	X	X
4	Prepare different processed products using fruits and vegetables or optimize the process		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No.	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	Laboratory Exercises
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	



III. Course Resources**1. References**

1. R. P. Srivastava & Sanjeev Kumar Fruit and Vegetable Preservation: Principles & Practices International book distributing Co. Lucknow.
2. Giridhari Lal, G.S. Siddappa & G.L. Tondon Preservation of Fruits and Vegetables CFTRI, ICAR, New Delhi -12.
3. Y. H. Hui, S. Ghazala, D.M. Graham, K.D. Murrell & W.K. Nip Handbook of Vegetable Preservation and Processing Marcel Dekker (2003)

IV Course Organization

Course Code	Fruits and Vegetable Processing Technology		
Course Title	FTE503A		
Course Leader/s Name	Allotted as per time table		
Course Leader Contact Details	Phone:	080-49066666	
	E-mail:	hod.ft.ls@msruas.ac.in	
Course Specifications Approval Date	June 2022		
Next Course Specifications Review Date:	June 2023		



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Faculty of Life and Allied Health Sciences

Course Specifications: Spices and Flavour Technology

Course Title	Spices and Flavour Technology
Course Code	FTE504A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to equip students with knowledge of basics of flavor and understanding of technologies of flavor extraction and encapsulation. The students will be able to understand the basic knowledge of flavor. They will also be familiarized with the extraction and encapsulation of essential oils. The course will also educate students regarding natural and artificial flavoring substances and effects of cooking on flavor of food products

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is
Attendance requirement	75% attendance is mandatory

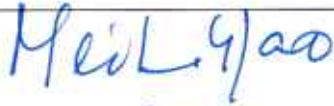
II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Explain the methods of flavour extraction
2	Describe the artificial and natural flavouring compound
3	Discuss the techniques of flavor encapsulation
4	Demonstrate the process of essential oil extraction
5	Analyze the effects of cooking on flavor of food product


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 Page 75 of 117

2. Course Content

Course Content
<p>Unit I Basics of flavour, smell and taste sensation, olfaction, flavor compounds, volatile flavor compounds. Methods of flavour extraction, isolation, separation; Distillation, solvent extraction, enzymatic extraction, static headspace, dynamic headspace etc</p>
<p>Unit II Principal types of flavorings used in foods, natural flavoring substances, Flavour constituents from Onion, garlic, cheese, milk, meat, vegetables, fruits, wine, coffee, tea, chocolate, spices and condiments</p>
<p>Unit III Nature-identical flavoring substances that are obtained by synthesis or isolated through chemical processes intended for human consumption. Artificial flavoring substances not identified in a natural product intended for human consumption, produced by fractional distillation and additional chemical manipulation of naturally sourced chemicals, crude oil or coal tar</p>
<p>Unit IV Artificial Aroma compounds: buttery : Diacetyl, Acetylpropionyl, Acetoin, Banana: Isoamyl acetate, Bitter almond, Cherry: Benzaldehyde, cinnamon: Cinnamaldehyde, fruity: Ethyl propionate, etc. Food acids their tastes and flavours :Glutamic acid salts, Glycine salts, Guanylic acid salts, acetic acid, malic acid etc.</p>
<p>Unit V Effect of processing on aroma and flavour: flavour precursors flavour development on cooking, microwave heating, roasting, baking, smoking, boiling, cooling, freezing, storage Maillard reaction, caramalization and fermentation. Off flavour and off odour.</p>
<p>Unit VI Principles and techniques of flavour encapsulation, types of encapsulation; Factors affecting stabilization of encapsulated flavour and their applications in food industry; Packaging and flavor compounds interaction, Effect of storage, processing, transportation and environmental conditions on flavour components / constituents</p>
<p>Practical:</p> <ol style="list-style-type: none"> 1. Qualitative identification of different flavouring compounds 2. Extraction of essential oil/ flavouring compound of basil leave by hydrodistillation 3. Extraction of essential oil/ flavouring compound of basil leave by SCFE 4. Comparison of the quality of flavouring component obtained by hydrodistillation and SCFE 5. Extraction of essential oil/ flavouring compound of ginger by SCFE 6. Effect of storage conditions on flavouring compound of ginger 7. To study effects of staling on food flavours and its adverse effects 8. Analysis of flavouring compound of ginger by gas chromatography system 9. Sensory evaluation of different flavors 10. To check effect of cooking on flavor of food sample 11. To check effect of fermentation on food flavor



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3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I	Component-II	Component-II	
		Mid Term Test	Seminar	Assignment	(Examination)
1	Explain the methods of flavour extraction	X			X
2	Describe the artificial and natural flavouring compound	X		x	X
3	Discuss the techniques of flavor encapsulation		X	X	X
4	Demonstrate the process of essential oil extraction		X	X	X
5	Analyze the effects of cooking on flavor of food product.		X	X	X

5. Achieving Learning Outcomes

M. L. Y. Rao

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	Laboratory Exercises
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

1. Reineccius, G.(1993), Source Book of Flavors, Springer US
2. Heath, H. B.(1986) Flavour chemistry and technology, Springer.
3. Piggott, J. R., Paterson, (1994) A. Understanding Natural Flavors. Springer US
4. Morton, J. D., Macleod A. J. (1998) Food Flavor, Elsevier
5. Gabelman, A. (1994), Bioprocess Production of Flavor, Wiley
6. Ashurst P. R. (1991) Fragrance and Color Ingredients Food Flavorings.

IV. Course Organization

Course Code	Spices and Flavour Technology	
Course Title	FTE504A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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Meel Gao

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M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Course Specifications: Advances in Dairy Processing

Course Title	Advances in Dairy Processing
Course Code	FTE601A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to equip students with use of bio-protective factors for preservation of raw milk and to understand current trends in cleaning and sanitization of dairy equipment. Students will be thought use of bio-protective factors for preservation of raw milk and students will also understand lethality of thermal processing of milk. Students will also able to determine the pH , water activity and thermal load in milk and milk products

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the semester (theory)	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

2. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1.	Explain the use of bio-protective factors for preservation of raw milk
2.	Describe the methods of determining lethality of thermal processing of milk
3.	Discuss the Principles and equipment used for bacto-fugation and Bactotherm processes
4.	Determine the a_w , pH , thermal load of milk and milk products



3. Course Content

Course Content
<p>Unit I Preservation of raw milk Use of bio-protective factors for preservation of raw milk: Effect of Chilling on physicochemical, microbial and nutritional properties of milk and milk products, present status of preservation of raw milk by chemical preservatives; thermal processing for preservation</p>
<p>Unit II Thermal processing Methods of determining lethality of thermal processing, UHT processed milk products, their properties and prospects, types of UHT plants, aseptic fillers, heat stability and deposit formation aspects, effect on milk quality; techno- economic considerations; retort processing.</p>
<p>Unit III Equipment in dairy industry. Principles and equipment for bacto-fugation and Bactotherm processes, Microfluidization of milk: Principle, equipment, effects and applications, Homogenization and their applications in dairy industry.</p>
<p>Unit IV Dehydration of dairy products Dehydration: advances in drying of milk and milk products, freeze dehydration, spray drying, physicochemical changes during dehydration.</p>
<p>Unit V Storage of dairy products Water activity; sorption behavior of foods, energy of binding water, control of water activity of different milk products in relation to their chemical; microbiological and textural properties; hurdle technology and its application in development of shelf stable and intermediate-moisture dairy products, Use of carbonation in extending the shelf life of dairy products.</p>
<p>Unit VI Cleaning and sanitization of dairy equipment Current trends in cleaning and sanitization of dairy equipment: biological, detergents, Automation, Ultrasonic techniques in cleaning, bio-detergents, development of sanitizers- heat; chemical; radiation, mechanism of fouling and soil removal; Biofilms, assessing the effectiveness of cleaning and sanitization of dairy products.</p>
<p>Practical:</p> <ol style="list-style-type: none"> 1. Lactoperoxidase system for extension of keeping quality raw milk. 2. Determination of pH: HCT profile of milk systems. 3. Measurement of thiocyanate in milk system. 4. Determination of water activity and sorption isotherms of milk products. 5. Determination of thermal load during retort processing of milk and milk products. 6. Heat classification of milk powders. 7. Functional properties of powders; porosity, interstitial air content, occluded air content, flowability. 8. Determination of degree of browning-chemical/physical methods. 9. Freeze drying of milk/milk products, and heat sensitive products.



10. Homogenization efficiency.
 11. Thermal process calculations.
 12. Visit to Dairy / Milk Processing plant

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit	02	
4. Brain Storming Sessions		
5. Group Discussions	01	
6. Discussing Possible Innovations	01	
Term Test and Written Examination		06
Total Duration in Hours		72



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 Bangalore (Page 81 of 117)

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Application of bio-protective factors for preservation of raw milk	X	X		X
2	Describe the methods of determining lethality of thermal processing of milk	X	X		X
3	Principles and equipment used for bacto-fugation and Bactotherm processes		X	X	X
4	Determination of the a_w , pH, thermal load of milk and milk products		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

1. Burton H. 1998. *Ultra-high Temperature Processing of Milk and Milk Products*. Elsevier.
2. Fellow P. 1988. *Food Processing Technology*. Ellis Horwood Ltd.
3. Gould GW. 1995. *New Methods of Food Preservation*. Blackie.
4. IDF Bulletin 1981. *New Monograph on UHT Milk*. Document No. 133, Intern. Dairy Fed., Brussels.
5. Smit G. 2003. *Dairy Processing – Improving Quality*. CRC-Woodhead Publ.
6. Troller JA & Christian HB. 1978. *Water Activity and Food, Food Science and Technology*. A Series of
7. Monograph Academic Press, London.
8. Walstra P, Geurts TJ, Nooten A, Jellema A & Van Boekel MAJS. 1999. *Dairy Technology – Principles of Milk Properties and Processes*. Marcel Dekker.

IV. Course Organization

Course Code	Advances in Dairy Processing	
Course Title	FTE601A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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Bangalore - 560 054

Course Specifications: Dairy Microbiology

Course Title	Dairy Microbiology
Course Code	FTE602A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to introduce students to the concepts of microbial quality, safety and its importance in dairy processing industry. The students will be to understand the microbial aspects of dairy products. They will be able to identify suitable culture for preparation of fermented dairy products. They will also be familiarized about the treatment of dairy effluents and national and internal microbial standards of dairy industry.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

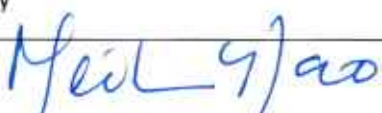
II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1.	Describe the effect of starter cultures on product quality
2.	Differentiate beneficial and harmful bacteria's associated with dairy industry
3.	Explain the bacteriological aspects of milk processing techniques
4.	Describe national and international microbial standards
5.	Describe the effect of starter cultures on product quality


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2. Course Content

Course Content
<p>Unit I Introduction to microbiology Scope, factors influencing microbial growth, newer approaches for classifying microbes, types of microbes in normal and mastitic milk and importance of somatic cell counts, microflora of significance in dairy industry: their morphology, natural, physiological, spoilage and pathogenic characteristics, milk borne diseases associated with dairy industry, microbial and chemical changes in raw milk during chilling and refrigeration. Bacteriological grading of raw and heat-treated milk</p>
<p>Unit II Sources of contamination in raw milk Spoilage: Sources of contamination in raw milk, effect on milk quality during production, collection, transportation and storage, types of spoilages in heat-treated milk</p>
<p>Unit III Bacteriological aspects Bacteriological aspects of milk processing techniques, germination, sporulation, prevention of post-processing contamination in heated milk. Heat induced damage and repair in bacterial cells. Role of resuscitation in recovery of heat injured microbial cells. Naturally occurring preservative systems in milk, Application of bacteriocins as biopreservatives, Effect of residues (antibiotics, detergents, sanitizers, pesticides and aflatoxins) on microbes, biological consequences and mode of action on microbes</p>
<p>Unit IV Microbiological quality of dairy products: Fat rich, frozen, concentrated and dried milks, factors influencing the microbial quality, microbial defects associated, their control, microbiological safety in relation to potential pathogens and their public health significance</p>
<p>Unit V Microbiology of starter cultures: Lactic Acid Bacteria as starters, types of starter cultures and their classification, changes caused, their influence on taste and aroma compounds, judging of starter quality and activity; Starter defects; Starter failure; Intrinsic and extrinsic factors associated; Bacteriophages of dairy starters and their impact on dairy industry; Prevention and control of starter failures.</p>
<p>Unit VI Microbiology of cheese: Role of starters culture and NSLAB in preparation, ripening and in producing varieties of cheese, accelerated ripening, microbial rennet substitutes, defects in cheese, Microbiological safety and their prevention and control, microbiological quality of indigenous dairy products, viz., lassi, ghee, etc. Sources of contamination, spoilage and their microbiological safety, modified packaging: antimicrobial packaging, controlled and modified atmosphere (CAP / MAP) based technologies.</p>
<p>Unit VII Waste Management: Disposal of dairy effluents after microbial treatment; BOD and COD analysis in dairy effluents; Microbiological quality of air and water in Dairy Plants. National and International microbiological standards for dairy products.</p>

Practical:

1. Microbiological examination of raw and heat-treated milk
2. Microbial examination of indigenous dairy product
3. Production and estimation of lactic acid by *Streptococcus* Sp.
4. Production of fermented milk by *Lactobacillus acidophilus*.
5. Isolation of food poisoning bacteria from contaminated dairy product
6. Production of yogurt / cheese
7. Determination of microbial toxins produced in dairy products
8. Preparation of shreekhand
9. Analysing microbial quality of fermented dairy products
10. Identification of microbes present in milk processing unit

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72




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4. Method of Assessment

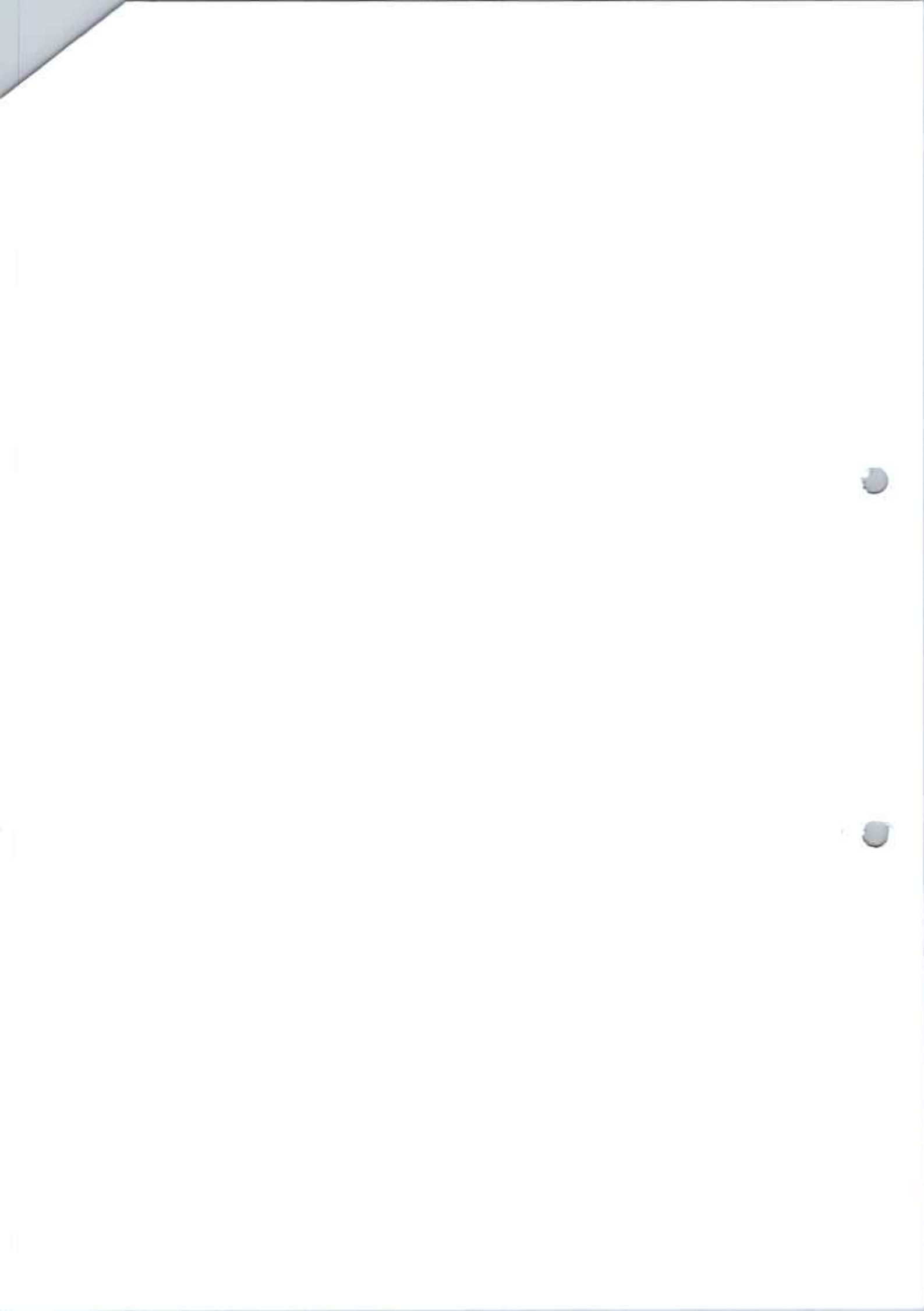
There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Describe the effect of starter cultures on product quality	X	X		X
2	Differentiate beneficial and harmful bacteria's associated with dairy industry	X	X		X
3	Explain the bacteriological aspects of milk processing techniques		X	X	X
4	Describe national and international microbial standards		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, class tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	



III. Course Resources

1. References

1. Food Microbiology. 2nd Edition By Adams
2. Basic Food Microbiology by Banwart George J.
3. Food Microbiology: Fundamentals and Frontiers by Dolle
4. Fundamentals of Dairy Microbiology by Prajapati.
5. Essentials of Food Microbiology. Edited by John Garbult. Arnold International Students Edition.
6. Microbiology of Fermented Foods. Volume II and I, By Brian J. Wood. Elsevier Applied Science Publication.
7. Microbiology of Foods by John C. Ayres. J. Orwin Mundt. William E. Sandinee. W. H. Freeman and Co.
8. Dairy Microbiology by Robinson. Volume II and I.

IV Course Organization

Course Code	Dairy Microbiology	
Course Title	FTE602A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	

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Course Specifications: Dairy Engineering

Course Title	Dairy Engineering
Course Code	FTE603A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

Aim of this course is to comprehend various engineering properties of dairy and food materials and to understand the different processing technologies used in dairy plant. The students will be able to understand the engineering properties of milk and milk products. Students will gain knowledge on the thermal process, evaporation, drying and material handling process used in dairy plant.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Various engineering properties of dairy products
2	Thermal processing and evaporation process used in dairy plant
3	Illustrate the drying and material handling process carried out in dairy plant
4	Demonstrate the dairy processing and handling equipment




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2. Course Content

Course Content
Unit I Engineering properties of dairy and food materials and their significance in equipment design; processing and handling of dairy and food products.
Unit II Homogenization of milk: Principle of homogenization, Effect of homogenization, Technical execution, valves and pumps, single and double stage homogenizers, care and maintenance of homogenizers, Efficiency of homogenization, design principles of homogenizers, operation and maintenance, application of homogenization in dairy industry. Recent advances in homogenization.
Unit III Thermal processing of milk and milk products: Pasteurization; batch, flash and continuous pasteurizer, HTST pasteurizer and design principle and thermal death kinetics, care and maintenance, UHT processing of milk, quality changes during processing of milk and milk products
Unit IV Designs of equipment: Tanks, pumps, stirrer mixtures and centrifugation: Designs and equipment of tank, types of tanks, pumps in dairy industry, Agitation and mixing, construction of agitators and patterns of flow. Factors in mixing, types, operation, mixing gas, liquid and solid, heat transfer in mixers, power requirement, transmission, scale-up of models. Separation by gravity and centrifugal force, clarifiers and separators, centrifugal separator and efficiency of separation, flow rate and power consumption.
Unit V Evaporation: Classification, design of multiple-effect evaporator, temperature distribution, boiling point elevation, operation, feeding methods, condensate and air removal, scale formation and removal, heat and mass balance, vapor recompression, design of recovery system, selection and design of auxiliary equipment.
Unit VI Spray and drum drying: Theory of drying, estimation of drying rates and drying time, drying equipment, particle size calculation, design of spray and drum dryer, skim milk and whole milk powders manufacturing methods. Fluidized bed drying, Principles of fluidized bed method, Types of fluidized bed drier, Drying and cooling times in fluidized bed; Freeze drying; Agglomeration, Problems of reconstitution, Methods of Agglomeration, The effect of drying on milk products. Recent advances in drying. Design data performance and selection and design of dryer
Unit VII Material handling: System and devices, design of screw, belt, flight, apron conveyors, bucket elevators, power requirements, and applications, feeders and feeding mechanism. Dairy plant production planning, operation and maintenances
Practical: <ol style="list-style-type: none"> 1. Study of milk receiving & storage equipment for their constructional, operational and maintenance details. 2. Study of complete set of milk pasteurizing / sterilizing and related equipment.

3. Study of fat handling equipment.
4. Study of condensing / drying equipment.
5. Study of ice-cream and frozen products equipment.
6. Study of cheese and casein equipment.
7. Study of steam generating systems, their construction, operation & maintenance.
8. Study of steam supply & distribution systems.
9. Study of water treatment equipment, water supply & distribution.
10. Study of refrigeration plants, chilled water supply & distribution.
11. Study of compressed air generation, supply & distribution.
12. Demonstration of various heat transfer models & equipment

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72



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4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Various engineering properties of dairy products	X			X
2	Thermal processing and evaporation process used in dairy plant	X			X
3	Illustrate the drying and material handling process carried out in dairy plant		X	X	X
4	Demonstrate the dairy processing and handling equipment		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	



III. Course Resources**1. References**

1. Das H. 2005. Food Processing Operations and Analysis. Asian Books.
2. Fellows PJ. 1988. Food Processing Technology, Principle & Practices. Ellis Horwood.
3. Toledo RT. 2007. Fundamentals of Food Process Engineering. Springer.
4. Ahmed T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal.
5. Gary Krutz, Lester Thompson & Paul Clear. 1984. Design of Agricultural Machinery. John Wiley & Sons.
6. Hall CW & Davis DC. 1979. Processing Equipment for Agricultural Products. AVI Publ.
7. Higgins L & Morrow LC. 1977. Maintenance Engineering Hand-Book. McGraw Hill.
8. Stanier W. 1959. Plant Engineering Hand-Book. McGraw Hill.

IV Course Organization

Course Code	Dairy Engineering	
Course Title	FTE603A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



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 Dean - Academics
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 Bangalore - 560 054

Course Specifications: Dairy Food Packaging

Course Title	Dairy Food Packaging
Course Code	19FST552A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of this course is to enable the students to understand the packaging materials and packaging technology used for dairy products. Students will be thought packing materials and forms of packages used for dairy products. Students will also be familiarized with different packaging machines. Students will also equip in determination of physical properties of packaging materials used for dairy products.

2. Course Size and Credits:

Number of credits	3+1
Total hours of class room interaction during the	42
Number of practical hours	24
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is mandatory
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

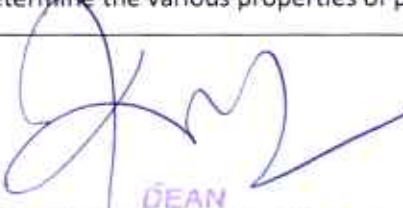
After undergoing this course students will be able to:

No.	Intended Learning Outcome
1.	Explain the various types of packaging materials used for dairy products
2.	Describe the packaging equipment used for dairy products
3.	Discuss the different methods of coding and standards of food packages
4.	Determine the various properties of packaging materials used for dairy products



Registrar

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Course Content
<p>Unit I</p> <p>Packaging materials: Selection of packaging materials, Characteristics of paper, corrugated paper, glass, metals, plastics, Sources of different plastic materials and process of manufacture, forms of plastic materials, foils and laminates- Characteristics and importance in dairy industry, Characteristics of retort pouches.</p>
<p>Unit II</p> <p>Types of packaging in dairy industry.</p> <p>Forms of packages used for packaging of food and dairy products. Safety requirement of packaging materials and products information.</p>
<p>Unit III</p> <p>Packaging of milk and milk products : Pasteurized milk, UHT-sterilized milk, Aseptic packaging, Fat rich dairy products - butter and ghee, Coagulated and desiccated indigenous dairy products and their sweetmeats. Concentrated and dried milk including baby foods.</p>
<p>Unit IV</p> <p>Different methods of package sterilization.</p> <p>Importance of such methods and principles. Different methods of coding and standards of labeling of food packages. Microbial standards, packaging material as sources of contamination. Disposal methods of waste packages. Description of equipment and machines of different packaging systems.</p>
<p>Practical:</p> <ol style="list-style-type: none"> 1. Identification of different types of packaging and packaging materials 2. Determination of water activity and sorption isotherms of milk products. 3. Freeze drying of milk/milk products, and heat sensitive products. 4. Functional properties of powders: porosity and flowability. 5. Determination of tensile strength of given material 6. Determination of tearing strength of paper 7. Measurement of thickness of packaging materials 8. To perform grease-resistance test in plastic pouches. 9. Determination of bursting strength of packaging material 10. Visit to dairy industries/ dairy food packaging units



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3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		24
1. Course Laboratory	24	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation	04	
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		06
Total Duration in Hours		72

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Explain the various types of packaging materials used for dairy products	X			X
2	Describe the packaging equipment used for dairy products	X			X
3	Discuss the different methods of coding and standards of food packages		X	X	X
4	Determine the various properties of packaging materials used for dairy products		X	X	X

5. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Class Tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	



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1. References

1. Gordon L. Robertson. 2014. Food Packaging: Principles and Practice, 3rd Ed. CRC Press, Boca Raton, FL, USA.
2. Crosby NT. 1981. Food Packaging Materials. App. Sci. Publ.
3. Painy FA. 1992. A Handbook of Food Packaging. Blackie

IV Course Organization

Course Code	Dairy Food Packaging	
Course Title	19FST552A	
Course Leader/s Name	Allotted as per time table	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



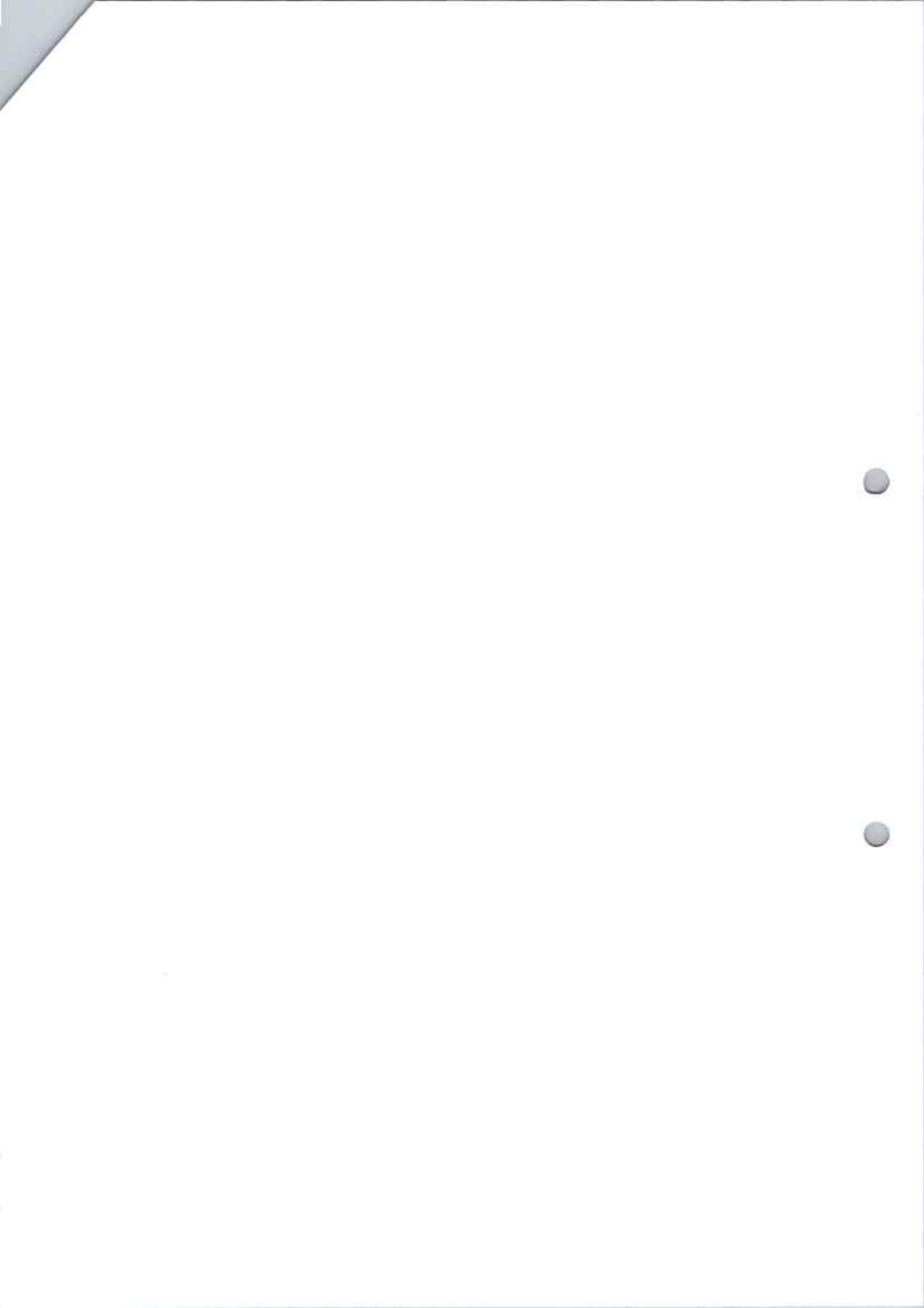
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Course Specifications: Innovation and Entrepreneurship

Course Title	Innovation and Entrepreneurship
Course Code	FTC601A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

This course aims to enable students with product innovation management and entrepreneurial development. The students are taught the concepts of product life cycle management, technological innovation, business opportunity identification, enterprise establishment and development.

2. Course Size and Credits:

Number of credits	03
Total hours of class room interaction during the	41
Number of practical hours	
Number of semester weeks	16
Department responsible	Food Technology
Course marks	As described in the program specification
Pass requirement	A minimum of overall 40% is required for a pass. Attending SEE is
Attendance requirement	75% attendance is mandatory

II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1.	Describe the phases of product life cycle and role of innovation in product management
2.	Apply product and innovation management concepts for product development process
3.	Identify opportunities for new product development
4.	Discuss the entrepreneurial traits and characteristics of an enterprises / businesses
5.	Assess innovative ideas and strategies for nurturing an enterprise



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2. Course Content

Course Content
Unit I Product Life Cycle and Strategy: Phases of Product lifecycle, Product development processes and methodologies, Core functions, Functional applications, Product lifecycle management (PLM), Introduction to Product Data Management (PDM), PDM objectives, PDM benefits, PDM systems, PDM implementation
Unit II Technological Innovation: Types and extent of innovation, Incremental and radical innovation, sources of innovation, measuring innovation & outcomes of innovation
Unit III Innovation Strategy: Types of Innovation Strategy, Formulating Innovation Strategy, Building Innovation Capabilities & Returns from Innovation Strategies, Frugal Engineering
Unit IV Entrepreneurial traits: Entrepreneurial types and characteristics of different entrepreneurial types and their positioning, Qualities and actions of entrepreneur, which influence the success and sustenance of business
Unit V Strategies for nurturing an enterprise: Sources of ideas and its recognition, Idea processing and institutions / NGOs supporting innovation, Search for business idea and commercialization
Unit VI Understanding the role and importance of entrepreneur growth using case studies of successful business houses. Fixed and working capital assessment for project report generation

3. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		
1. Demonstration using Videos	03	
2. Demonstration using Physical Models/Systems		03
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		

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Page 100 of 117

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3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation	02	8
2. Guest Lecture	02	
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions	02	
6. Discussing Possible Innovations	02	
Term Test and Written Examination		04
Total Duration in Hours		45

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Type of Assessment			
		Component-I			Component-II (Examination)
		Mid Term Test	Seminar	Assignment	
1	Describe the phases of product life cycle and role of innovation in product management	X			X
2	Apply product and innovation management concepts for product development process	X		X	X
3	Identify opportunities for new product development		X	X	
4	Discuss the entrepreneurial traits and characteristics of an enterprises / businesses		X	X	X
5	Assess innovative ideas and strategies for nurturing an enterprise			X	X

5. Achieving Learning Outcomes

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The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Assignments, Seminar
4.	Analytical Skills	Assignments, Seminar
5.	Problem Solving Skills	
6.	Practical Skills	
7.	Group Work	
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, class tests
10.	Verbal Communication Skills	
11.	Presentation Skills	Assignment, Seminar
12.	Behavioral Skills	
13.	Information Management	Seminar, Assignment
14.	Personal Management	
15.	Leadership Skills	

III. Course Resources

1. References

1. Mark Dodgson., David Gann., and Ammon Salter, 2008, The Management of Technological Innovation Strategy and Practice, UK, 1st Edition, Oxford University Press
2. Narayanan V K, 2003, Managing Technology and innovation for Competitive Advantage, UAS, 2nd Edition, Pearson Education
3. D.F. Kuratko and T.V. Rao, 2012, Entrepreneurship A South Asian Perspective, New Delhi, 3rd edition, Cengage Learning India Pvt. Ltd

IV Course Organization

Course Code	Innovation and Entrepreneurship	
Course Title	FTC601A	
Course Leader/s Name	Allotted on project basis	
Course Leader Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date:	June 2023	



Course Specifications: Group Project

Course Title	Group Project
Course Code	FTP601A
Department	Food Technology
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

This module is intended to provide students an opportunity to apply theoretical knowledge in solving a problem/ to develop a product. The students will learn skills related to problem identification, planning, management and execution through working in a team. The group project will focus on the application of appropriate techniques/methodology and efficient utilization of resources for execution of the project.

This module will also enable the students to gain practical experience of working in a project mode, requiring interactions with the domain specialist to meet the technical challenges of the project undertaken. The significant feature of the project will be the demonstration of its applicability and quantification of benefits.

2. Course Size and Credits:

Number of credits	10
Total hours of classroom and laboratory interaction during the Course	240 h
Department responsible	Food Technology
Course marks	Total Marks:100 Component-1: Presentations: 50%Weight Component-2: Project Report: 50%Weight
Pass requirement	A student is required to score an overall 40% for successful completion of a Course and earning the credits.
Attendance requirement	75% attendance is mandatory to be eligible for presentation and report submission



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II. Teaching, Learning and Assessment

1. Intended Learning Outcomes (ILO)

After undergoing this course students will be able to:

No.	Intended Learning Outcome
1	Work in a team and undertake a project in their area of specialization
2	Apply appropriate research methodology while formulating a project
3	Apply their theoretical knowledge of food science and technology for executing the project
4	Define specifications, analyze, develop and evaluate a project
5	Prepare and present appropriate forms of audio-visual, verbal presentations and written document to describe the project, its execution and outcome

2. Course Content

Course Content
Need for undertaking a project, Problem identification, development of project, evaluation and presentation
Project Management
Costing, Finance Management, Raw material Procurement, Product Development, Testing, Project Evaluation, Exhibition, Presentation
Team building, Team work, Leadership skills



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Faculty of Life and Allied Health Sciences
BANGALORE - 560 054

3. Course Teaching and Learning Methods

Topics	Teaching methods	Hours
Critical Review, Problem Formulation and stating Objectives	Reading Journal papers , books and Other relevant materials and problem formulation	80
	Presentation to Reviewers	04
Design	Group work with supervisors guidance	25
Analysis	Group work with supervisors guidance	25
Testing and Evaluation	Group work with supervisors guidance	20
Verification/Validation	Group work with supervisors guidance	25
Drawing Conclusions	Group work with supervisors guidance	05
Presentation , Thesis/Report Writing and Viva Voce	Presentation and Viva voce-Group	01
	Thesis/Report writing - Group	50
Tests/Examinations/Presentations		05
Total		240

4. Method of Assessment

There are two components for assessment in this course:

No.	Intended Learning Outcome	Component	
		Component 1	Component 2
1	Work in a team and undertake a project in their area of specialization	X	X
2	Apply appropriate research methodology while formulating a project	X	X
3	Apply their theoretical knowledge of food science and technology for executing the project	X	X
4	Define specifications, analyze, develop and evaluate a project	X	X
5	Prepare and present appropriate forms of audio-visual, verbal presentations and written document to describe the project, its execution and outcome	X	X

There are two components for assessment in this Course:

Presentations

Component- 2: 50%weight

Project Report

The assessment questions are set to test the learning outcomes. In each component a certain learning outcomes are assessed. The following table illustrates the focus of learning Outcome in each component assessed:

5. Meeting Programme Objectives through Course Objectives

The various skills are directly or indirectly imparted to the students using the teaching and learning methods as follows:

S.No	Curriculum and Capabilities Skills	How imparted during the Course
1.	Knowledge	Group Project work
2.	Understanding	Group Project work
3.	Critical Skills	Group Project work
4.	Analytical Skills	Group Project work
5.	Problem Solving Skills	Group Project work
6.	Practical Skills	Group Project work
7.	Group Work	Group Project work
8.	Self-Learning	Group Project work
9.	Written Communication Skills	Report writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Group Project work
13.	Information Management	Group Project work
14.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes



Facu. IIB/L Course Resources
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 Faculty of Life and Allied Health Sciences

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1. Essential Reading

1. Assigned reading relevant to the group project.

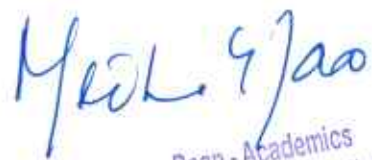
IV. Course Organization

Course Code	FTP601A	
Course Title	Group Project	
Course Supervisors Name	Allotted on project basis	
Course Supervisors Contact Details	Phone:	080-49066666
	E-mail:	hod.ft.ls@msruas.ac.in
Course Specifications Approval Date	August 2019	
Next Course Specifications Review Date:	June 2023	



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Semester –IV



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Course Specifications: Dissertation and Publication

Course Title	Dissertation and Publication
Course Code	FTI601A
Programme	M.Sc. Food Science and Technology
Department	Food Technology
Faculty	FLAHS

I. Course Summary

1. Aim and Summary

This Course is intended to give an insight to the students on application of principles of research methodology, preparation of research project proposal, research project management, execution of research project and effective technical communication and presentation. It also emphasizes the need and the relevance of a structured approach to identify a research topic and undertake research. This Course provides an opportunity for students to apply theories and techniques learnt during programme work. It involves in-depth work in the chosen area of study.

2. Course Size and Credits:

Number of credits	25 (20- For Dissertation + 5-For Publication)
Total hours of interaction during the Course	600 in 16weeks
Department responsible	Food Technology
Course marks	Total Marks: 300 (200 Marks for Dissertation + 100 Marks for Paper publication) Dissertation: 200 marks Component-1: 50% weight Presentations and Viva voce: 50% Weight Component-2: 50% weight Project Thesis: 50% Weight Paper Publication: 100 marks Paper Preparation and Submission: 50 % Weight Paper Submission after peer review: 50% Weight
Pass requirement	A student is required to score overall 40% for successful completion of the course and earning of the credits.
Attendance requirement	75% attendance is mandatory to be eligible for presentation and report submission

1. Intended Learning Outcomes (ILO)

After undergoing this course student will be able to:

No.	Intended Learning Outcome
1	Critically review scholarly literature collected from various sources for the project purpose and formulate a research problem
2	Prepare and present a research proposal
3	Conduct research to achieve research objectives
4	Propose new ideas/methodologies or procedures for further improvement of the research undertaken
5	Create research document and write research papers for publications
6	Defend the research findings in front of scholarly audience

2. Course Contents

The Dissertation will cover the following:

- i. Defining / Identification of the Research Problem
- ii. Literature review/ Information search, retrieval and review
- iii. Framing Research Methodology
- iv. Problem solving - Evaluation, Interpretations and drawing conclusions
- v. Proposing ideas or methods for further work
- vi. Thesis writing
- vii. Oral presentation/ Viva voce

Publishing will cover the following:

- I. Journal / Conference Identification
- II. Writing journal paper based on research findings
- III. Submission to Journal / Conference



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3. Course Teaching and Learning Methods

Topics	Teaching methods	Hours
Information search, retrieval and review, Project definition and project planning	Reading Journal papers, books and other relevant materials and problem formulation	100
	Presentation to Reviewers	40
Use of methodology and execution of experiments	Individual work with supervisors guidance	150
Problem solving and Evaluation	Individual work with supervisors guidance	100
Interpretations and drawing conclusions	Individual work with supervisors guidance	40
Proposing ideas or methods for further work	Individual work with supervisors guidance	10
Presentation, Thesis/Report Writing and Viva Voce, Authoring Research paper	Thesis/Report writing, Authoring research paper	100
	Presentation and Viva voce	10
	Paper Publication	50
Total		600

4. Method of Assessment

There are two components for assessment in this Course:

Component-1: 50% weight

Presentations (Pre, Interim and Final with Viva-Voce and submission of research paper)

Component-2: 50% weight

Project Thesis (will be moderated by a second examiner) and Paper publication presentation to peer-team

The assessment questions are set to test the learning outcomes. In each component a certain learning outcomes are assessed. The following table illustrates the focus of learning outcome in each component assessed:

Intended Learning Outcome	1	2	3	4	5	6
Component-1	X	X	X	X	X	X
Component-2	X	X	X	X	X	X

5. Meeting Programme Objectives through Course Objectives

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The various skills are directly or indirectly imparted to the students using the teaching and learning methods as follows:

S.No	Curriculum and Capabilities Skills	How imparted during the Course
1.	Knowledge	Dissertation work
2.	Understanding	Dissertation work
3.	Critical Skills	Dissertation work
4.	Analytical Skills	Dissertation work
5.	Problem Solving Skills	Dissertation work
6.	Practical Skills	Dissertation work
7.	Group Work	Dissertation work
8.	Self-Learning	Dissertation work
9.	Written Communication Skills	Report writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioural Skills	Dissertation work
13.	Information Management	Dissertation work
14.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes


III. Course Resources

1. Essential Reading

- Lecture Sessions on Dissertation, Thesis Preparation delivered by the concerned Head of Department

IV. Course Organization

Course Code	FTI601A		
Course Title	Dissertation and Publication		
Project Supervisors Name	Allotted on project basis		
Project Supervisors Contact Details	Phone:	080-49066666	
	E-mail:	hod.ft.ls@msruas.ac.in	
Course Specifications Approval Date	June 2022		
Next Course Specifications Review Date:	June 2023		


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