Jamia Hamdard

Deemed to be University

Accredited in 'A' Grade by NAAC

Declared to be designated as Institute of Eminence (IoE) by MHRD, GOI

DEPARTMENT OF FOOD TECHNOLOGY

School of Interdisciplinary Sciences and Technology

Jamia Hamdard, New Delhi-110062

www.jamiahamdard.edu

Detailed Syllabus and Bye Laws
Choice Based Credit System (CBCS)

Programme Name: M Tech Food Technology

Board of Studies (BoS) Approval Date: 09-01-2023
Programme Code: 538

Academic Session of Introduction: 2023-2024
School Name: School of Interdisciplinary Sciences and Technology
Department Name: Department of Food Technology

http://jamiahamdard.edu/Department/Department_FacultyList.aspx?nDeptID=mc

1. Course Details: M. Tech. (Food Technology)
2. Total Seats: 25+5 (General + NRI)
3. Eligibility: B. Tech (Food Technology/Agricultural Engineering/Biotechnology/ Chemical Engineering/Dairy Technology/Oil Technology); B. Pharma; M. Sc. (Food Technology/Post harvest Technology/Nutrition and Dietetics or allied Sciences) with 55% marks in aggregate.
4. Admission Process: Merit of the qualifying exam.
5. Total Semesters: 4

DEPARTMENT OF FOOD TECHNOLOGY

1. About the Department

The Department of Food Technology promotes education and research in Food Sciences, Food Safety, Packaging, Food Product Development, Food Engineering, Bakery, Meat, Dairy sciences and many more. The department provides opportunities to researchers and academicians having specific expertise to cross the boundaries of their respective subject areas and think across them. It encourages researchers to pool their approaches and modify them so that they are better suited to the problems at hand. The department is currently offering B. Tech., M. Tech. in Food Technology & PhD. in Food Technology and Interdisciplinary Sciences. The Department of Food Technology received a substantial grant of Rs. 75 lakhs in 2010 from Ministry of Food Processing Industries to strengthen the laboratories and infrastructure of the Department. As the demand of professionals and trained personnel in the food industry as well as in research and development in government and industrial set-up is immense. The department has funding for research projects from UGC, AICTE, SERB etc. The Department of Food Technology has also been awarded with DST- FIST Grant of Rs 1.5 crore in 2022.

Objectives

As the demand of professionals and trained personnel in the food industry, research government set-up is immense, the Department of Food Technology has the following objectives:

1. To produce professionally competent, proficient, and highly skilled personnel in the field of food technology, with a knowledge of various aspects of food science and technology including raw material quality & packaging standards and methodology, health and hygiene parameters, processing techniques, storage and food value.
2. To enhance institutional capability to develop linkages with Industries and ccommunity based regular and continuing education programs in the relevant areas.
3. To impart techno-managerial skill to the unemployed youth and the agrarian society.
4. To promote R&D in the field and assist in the implementation of the food processing, safety and quality management of the regulating bodies like FSSAI, BIS, ISO, CODEX.
5. To promote R&D in the field and assist in the implementation of the food safety and quality management process of the food regulating bodies.

2. Faculties and Areas of Interest

Prof. Farhan Jalees Ahmad
Dean, School of Interdisciplinary Sciences and Technology (SIST)
Jamia Hamdard

Prof. Sayeed Ahmad
Head, Department of Food Technology
Jamia Hamdard

Dr. Vasudha Sharma
Assistant Professor

Dr. Kulsum Jan
Assistant Professor

Dr Sweta Joshi
Assistant Professor

Er. Jinku Bora
Assistant Professor

Dr Khalid Bashir
Assistant Professor

Dr. Aastha Bhardwaj
Lecturer

Er. Suhaib Hasan
Guest Faculty

Prof. M. Muthukumarappan
Adjunct Faculty

Dr. Dilip Ghosh
Adjunct Faculty

Faculties	Area of Interest
Prof. Farhan J Ahmad Dean, SIST	Nanotechnology, Formulation development, Drug delivery, Nanomedicine, Pharmacology
Prof. Sayeed Ahmad Head, Department of Food Technology	Pharmacognosy, Quality Control of Herbal drugs and Botanicals: Chromatography, Metabolomics
Dr. Vasudha Sharma Assistant Professor	Probiotics, Fermented & Functional Foods, By-product utilization, food safety
Dr. Khalid Bashir Assistant Professor	Starch and Protein Modification, Food Rheology, Probiotics, Food fortification
Dr. Sweta Joshi Assistant Professor	Food Chemistry, Functional foods, Nutraceutical, phytochemicals, extraction techniques,
Dr. Kulsum Jan Assistant Professor	Cereal processing, Edible films, agricultural waste utilization, by-product utilization
Er. Jinku Bora Assistant Professor	Food Engineering, Food Biotechnology, Food Chemistry, Starch modification, Nanotechnology
Dr. Aastha Bhardwaj Lecturer	Biodegradable Food Packaging, Waste Utilization, Functional Foods, Dairy Technology

3. Facilities

The Department is well equipped with processing and analytical equipments and is in the process of procuring many more equipments to make the state of the art facilities. Great emphasis is laid on practical for processing of foods and for analyzing their quality. List of some major equipments available with department and University are as follows: HPLC, Texture Analyser, Rheometer, Hunter Lab Color, Spectrophotometer, UV-Vis Spectrophotometer, Motic Inverted Microscope, Deep Freezer, Moisture analyser, Freeze dryer, BOD Incubator, Rotary Vacuum Evaporator Biohazard Safety Cabinet, Lab. Scale Spray Drier, Tray Drier, Fluidized Bed Drier, Oven, Meat Processing Unit, Bakery lab, Food Juice Processing Equipments, Packaging Equipments, Hammer Mill, Ball mill, Laboratory Pasteurizer, Shrink Packaging Machine, Vacuum Packaging Machine, Viscometer, Infra-red moisture meter, Fruit Crusher, etc.

4. Research Activities

No. of papers published in the year 2015-22: 200+

No. of current Ph.D. scholars: 20.

5. Publications

For the publication details kindly go through the below links, for the individual faculty members.

S. No.	Faculty Name	Profile details
1.	Dr Khalid Bashir	Google scholar: https://scholar.google.co.in/citations?user=vet13fEAAAAJ&hl=en JH website: http://jamiahamdard.edu/Department/Department_FacultyProfile.aspx?nID=iqm&nDeptID=mc
2.	Dr Sweta Joshi	Google scholar: https://scholar.google.com/citations?hl=en&authuser=2&user=N5PsbCkAAAAJ JH website: http://jamiahamdard.edu/Department/Department_FacultyProfile.aspx?nID=iqq&nDeptID=mc
3.	Dr Vasudha Sharma	Google scholar: https://scholar.google.co.in/citations?user=fLe_AG4AAAAJ&hl=en JH website: http://jamiahamdard.edu/Department/Department_FacultyProfile.aspx?nID=iqs&nDeptID=mc\
4.	Dr Kulsum Jan	Google scholar: https://scholar.google.co.in/citations?user=iGNPXxAAAAAJ&hl=en JH website: http://jamiahamdard.edu/Department/Department_FacultyProfile.aspx?nID=iqo&nDeptID=mc
5.	Er. Jinku Bora	Google scholar: https://scholar.google.co.in/citations?user=IPqwYRQAAAAJ&hl=en JH website: http://jamiahamdard.edu/Department/Department_FacultyProfile.aspx?nID=isa&nDeptID=mc
6.	Dr. Aastha Bhardwaj	Google scholar: https://scholar.google.com/citations?user=auhdk0EAAAAJ&hl=en JH website: http://jamiahamdard.edu/Department/Department_FacultyProfile.aspx?nID=isg&nDeptID=mc

6. Programme Code: 538

7. VISION AND MISSION STATEMENTS

Vision Statement: To create an atmosphere for quality education, research and entrepreneurship in the field of food processing.

Mission Statements:

MS1: To mainstream department of food technology into the Food Processing sector.

MS2: To produce professionally competent, proficient, and highly skilled professionals in the field of food technology capable of working as food technologists, research scientists, quality controllers and entrepreneurs.

MS3: To create an environment capable of conducting internationally acclaimed research with a global reputation for excellence.

MS4: To emphasize upon a transformed partnership based on symbiosis between industry and academia is vital for both ends.

8. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

After completion of the M. Tech (Food Technology), the post graduates will be able to:

PEO1: Apply knowledge in solving industry-relevant programs.

PEO2: Carry out quality research in different facets of the program including higher education.

PEO3: Foster abilities to design and fabricate new products or techniques, benefiting the society at large.

PEO4: Combine practical knowledge and abilities with research ability for a better output.

PEO5: Inculcate entrepreneurial skills in aspiring Food Technology professionals

PEO6: Develop leadership skills to be applied in R&D, production and other facets of the profession.

Mapping Program Educational Objectives (PEOs) with Mission Statements (MS)

	MS-1	MS-2	MS-3	MS-4
PEO-1	3	3	3	3
PEO-2	3	3	3	3
PEO-3	3	3	3	3
PEO-4	3	3	3	3
PEO-5	3	3	3	3
PEO-6	3	3	3	3

Level of Mapping: '3' is for 'high-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' mapping.

9. PROGRAMME SPECIFIC OUTCOME (PSO)

After completion of the M. Tech (Food Technology), the post graduates will be able to:

PSO1: Analyse diverse areas of the food industry like manufacturing, R&D, quality assurance, intellectual property rights and regulatory affairs.

PSO2: Determine entrepreneurship abilities in the field of production, R&D, new product development, marketing and sales.

PSO3: Contend as a food technologist, researcher, food safety officers, teachers in in the public and private organizations.

10. PROGRAM OUTCOMES (POs)

After going through the two years Master Program in Food Technology, post graduates will exhibit the ability to:

PO1: Practical Knowledge: Use knowledge of the fundamental elements in sync with updated technologies, tailored food technological application and regulatory requirements pertaining to the development of innovative food products.

PO2: Research and development: Apply skills to generate novel food products and relevant products. Utilize software tools and computer bases programing for research oriented developments.

PO3: Problem investigation: Encourage the problem solving skills observed through practical developments along with meeting the set regulations by applying the concept of critical thinking and in-depth analysis.

PO4: Modern tool usage: Use latest product optimization tools along with statistical analysis during the novel product development.

PO5: Communication: Develop valued credentials, reports and effective presentation. Improve communication skills and the ability to successfully carry out responsibilities related to the development of knowledge in accordance with the demands of the academia and industry.

PO6: Professional identity: Create a profession that is dedicated to providing quality services that exceed the stakeholder's expectations like customers, industries, academia, regulatory bodies and to give direction and contribute to the improvement of services and technologies.

PO7: Leadership skills: Organize and execute the objectives related to research and development within a set timeline. Nurturing the skills from the beginning to manage and utilize the available resources judiciously.

PO8: Planning abilities: Implement the knowledge and **s**kills for proper planning and running different steps which are involved in the time bound deliverables like R&D, production, regulatory submissions and product life cycle management.

PO9: Ethics: Show a high level of morality, honesty and integrity. Implement ethical principles when drawing conclusions and accept responsibility for the consequences if any.

PO10: Environmental sustainability: Uutilise expertise to resolve environmental pollution, harmful industrial waste, along with wastage and also improve

manufacturing processes while maintaining the sustainability practices.

PO11: Life-long learning: Engage in self-governing and ongoing learning in response to evolving needs and scientific advances. Using input from other professionals and identifying learning needs for life-long learning improvement. Recognize the importance of conferences, seminars, and workshops in the advancement of knowledge.

Mapping of Program Outcomes (POs) and Program Specific Outcomes (PSOs) with Program Educational Objectives (PEOs)

	PEO-1	PEO-2	PEO-3	PEO-4	PEO-5	PEO-6
PO-1	3	3	2	3	2	2
PO-2	3	2	3	3	3	3
PO-3	3	3	2	3	3	3
PO-4	2	2	3	3	2	3
PO-5	2	3	2	3	3	3
PO-6	3	2	3	2	3	3
PO-7	3	2	2	3	3	2
PO-8	3	2	2	2	3	3
PO-9	2	2	3	3	2	3
PO-10	3	2	2	3	2	2
PO-11	3	3	3	3	3	3
PSO-1	3	3	3	3	3	3
PSO-2	3	3	3	3	3	3
PSO-3	3	3	3	3	3	3

Level of Mapping: '3' is for 'high-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' map.

CONSOLIDATED SEMESTER WISE PROGRAMME DETAILS

Tables-I: Schemes for internal assessments and end semester examinations semester wise

Semester 1

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks	Credit points
		Continuous mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
	Orientation Programme								
MFTC-101	Food Chemistry and Microbiology	10	30	1 Hr	40	60	3hr	100	3
MFTC-102	Food Processing and Preservation	10	30	1 Hr	40	60	3hr	100	3
MFTC-103	Meat Fish and Poultry Technology	10	30	1 Hr	40	60	3hr	100	3
MFTC-104	Advances in Cereal, Pulses & Oilseeds	10	30	1 Hr	40	60	3hr	100	3
MFTC-105	Food Engineering	10	30	1 Hr	40	60	3hr	100	3
MFTC-106	Lab-I	30	30	3 Hr	60	90	6hr	150	8
MFTD-107	Engineering Properties of Foods	10	30	1 Hr	40	60	3hr	100	3
MFTD-108	Unit Operations in Food Processing	10	30	1 Hr	40	60	3hr		
MFTG-109	Plantation Crops and Spices	10	30	1 Hr	40	60	3hr	100	3
MFTG-110	Fruits and Vegetable Processing	10	30	1 Hr	40	60	3hr		
MFTC-111	Industrial Visit	20	30	1 Hr	50	-	-	50	1
Total								900	30

Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks	Credit points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
MFTC-201	Research Methodology	10	30	1 Hr	40	60	3hr	100	3
MFTC-202	Bakery & Confectionery Technology	10	30	1 Hr	40	60	3hr	100	3
MFTC-203	Food Safety & Quality Management	10	30	1 Hr	40	60	3hr	100	3
MFTC-204	Dairy Technology and Engineering	10	30	1 Hr	40	60	3hr	100	3
MFTC-205	Functional Food and Nutraceuticals	10	30	1 Hr	40	60	3hr	100	3
MFTC-206	Lab-II	30	30	3 Hr	60	90	6hr	150	8
MFTD-207	Food Rheology and Microstructure	10	30	1 Hr	40	60	3hr	100	3
MFTD-208	Advances in Drying Technology	10	30	1 Hr	40	60	3hr		
MFTG-209	Advances in Food Packaging Technology	10	30	1 Hr	40	60	3hr	100	3
MFTG-210	Modern Techniques In Food Analysis	10	30	1 Hr	40	60	3hr		
MFTC-211	Industrial Visit/Educational Tour	20	30	1 Hr	50	-	-	50	1
Total								**900**	**30**

Semester III

Course code	Name of the course	Internal Assessment				End Semester Presentation		Total Marks	Credit points
		Continuous Mode	Presentation/report		Total	Marks	Duration		
			Marks	Duration					
MFTC-301	Industrial Training/Status Report	70	70	1 hr	140	210	1 hr	**350**	**17**
Total								**350**	**17**

Semester IV

Course code	Name of the course	Internal Assessment				End Semester Presentation		Total Marks	Credit points
		Continuous Mode	Presentation/report		Total	Marks	Duration		
			Marks	Duration					
MFTC-401	Project Dissertation	80	80	1 hr	160	240	1 hr	**400**	**18**
Total								**400**	**18**

M. TECH. PROGRAMME IN FOOD TECHNOLOGY DEPARTMENT OF FOOD TECHNOLOGY

1. Programme of study: Master of Technology (M. Tech.) Food Technology

2. Programme code: 538

3. Course abbreviation: MFT

4. Duration: Two years spread over four semesters

M. Tech. Food Technology is a two-year full time academic program of study spread over four semesters. A candidate enrolled in M. Tech. Food Technology shall not be allowed to enroll for any other full-time programme of study and shall not appear in any other examination of a full time course of Jamia Hamdard (JH) or any other university. Each year, new session will start in July, and the four semesters will be as under:

Semester I (1st year) July-Dec (Odd Semester)

Semester II (1st year) Jan-Jun (Even Semester)

Semester III (2nd year) July-Dec (Odd Semester)

Semester IV (2nd year) Jan-Jun (Even Semester)

The number of teaching days in each semester shall not be less than 90 days.

5. Medium of instruction: English

6. Eligibility for admission:

Applicants seeking admission M. Tech. Food Technology must appear in the Entrance Test conducted by Jamia Hamdard each year in the month of May, and fulfill the following criteria:

"A candidate desirous of admission to the course must have passed B. Tech/M.Sc. in Food Science and Technology or allied disciplines including the Bachelor's degree in Pharmacy with at least 55% marks in aggregate"

7. Course Structure:

a) The course, as approved by the Board of Studies and reviewed regularly, shall be

divided into no less than seven theory courses in Semester I, II and thesis/project in Semester III and IV. There may be 7 theory courses of at least 3 credits each and a lab course of 8 credits in first two semester.

b) A minimum of three credits shall be assigned for each theory paper and 8 for the lab work (practical). The lab work may also include a report or industrial visit.

c) One of the papers of at least 3 credits each in semester I and II will be discipline centric elective course offered in the main subject of study, and a student shall have a choice of two papers each to choose from.

d) One of the papers of at least 3 credits each in semester I and II will be Generic elective course which could be chosen from any discipline or subject.

e) One theory credit will be counted as 50-60 min of teaching per week, and two practical hours will be counted as 1 credit per week.

f) There shall be no less than 30 credits for I and II Semesters and no less than 17 and 18 credits for III and IV semester respectively. This includes the lab work also.

g) There shall be a project/thesis work in the third and fourth semester instead of the theory papers. The credit to this course (thesis) should not exceed the maximum limits set for the number of credits in a semester. The thesis work shall include the experimental work on a specified topic and submission of the thesis towards the end of the Semester IV. The project work/thesis shall be evaluated as per the guidelines proposed by the Board of Studies and specified into the syllabus. For the project work/thesis, the Head of the Department/Program Coordinator shall convene a meeting of all teachers of the Department and assign appropriate number of students to each teacher to act as supervisor for the project work. The student in consultation with the supervisor shall select a topic for the project work under the intimation to the Head of the Department/Program Coordinator in writing. The project/thesis work may be carried out in any institute/industry/university other than JH as well. The evaluation of the dissertation, project presentation and viva voce for 3rd SEM will be conducted in presence of Head nominated faculty/external examiner while for 4th SEM the evaluation will be conducted by an external examiner approved through BoS. The project shall comprise of the two components namely Internal and External. Internal marks will be assigned 140 & 160 (for both III & IV SEM respectively) and

will comprise of submission of a project report after completion of the project. External will be assigned 210 marks for III & 240 marks for IV SEM and will comprise of a presentation on the topic of his/her project work carried out in department/industry/institute/research Centre and viva voce examination.

h) The project report of the fourth semester shall comprise the following three components:

- Each student will undertake a project work in the fourth semester under the supervision of either faculty member from Jamia Hamdard or an expert from industry/ institute research centre and under the overall supervision of Dean and Head of the faculty. After the completion of project each student has to submit a project report before the deadline proposed for the same.
- Each student will deliver their research work in two phases; **Phase 1:** The presentation will be evaluated by the internal faculty members and in **Phase 2:** the same presentation will be evaluated by an external examiner on the date and time fixed for the purpose.
- The topic for the IV Semester project dissertation shall be finalized in the III Semester in consultation with the respective supervisor.
- A student shall have to score minimum pass marks (50%) of the total marks for each paper.

8. Attendance

a) 100% attendance is desirable, but 75% attendance is mandatory in each paper for a student to enable him to appear in the Semester examination. In unforeseen contingencies, on the recommendation of the Dean of the Faculty/competent authority, 5% relaxation in attendance may be considered. This 5% condoning may be on account of sickness, provided the medical certificate, duly certified by a Registered Medical Practitioner/Public Hospital had been submitted in the office of the Head of the Department/Program Coordinator at the time of rejoining the classes immediately after the recovery from illness. Head of the Department/Program Coordinator shall forward such cases along with all related documents to the Dean. The relaxation may not be considered as the right of the student.

b) In order to maintain the attendance record of a particular course, a roll call will be taken by the teacher in every scheduled lecture and practical class. For the purpose of attendance, each practical class will count as one attendance unit, irrespective of the number of contact hours. Attendance on account of participation in the prescribed and notified activities such as, NCC, NSS, Inter-university sports, educational tours/field work, shall be granted provided the participation of the student is duly verified by the officer-in-charge and is sent to the Head of the Department/Program Coordinator within two weeks of the function/activity etc.

c) The subject teacher shall consolidate the attendance record for lectures and practical at the end of each month and submit to the Head of the Department/Program Coordinator. At the end of the semester, the teacher shall consolidate the attendance record for the whole semester and submit it to the Head of the Department/Program Coordinator. The statement of attendance of students shall be displayed by the Head of the Department/Program Coordinator on the Notice Board. A copy of the same shall be preserved as record. Attendance record displayed on the Notice Board shall deem to be a proper notification for the students and no individual notice shall be sent to any student.

d) If a student is found to be continuously absent from the classes without any information for a period of 30 days, the concerned teacher shall report the matter to the Head of the Department/Program Coordinator who will report the matter to the Dean for appropriate action that may include striking off the name of such student(s) from the roll. Such a student may, however, apply for re-admission within 7 days from the date of issue of the notice of striking off the name from the rolls. Such a student may, however, apply for re-admission within 7 days from the date of issue of the notice of striking off the name. The request for re-admission may be considered by the Dean of the Faculty. Such a student shall not be eligible for re-admission after the prescribed period of 7 days. The re-admission shall be effected only after the payment of prescribed re-admission fee.

e) A student detained on account of shortage of attendance in any semester may be readmitted to the same class in the subsequent academic year on payment of prescribed fees applicable in that year to complete the attendance requirement of that

course

9. Internal assessment

The performance of the student in each paper will be evaluated both continuously (Internal Assessment) and at the end of semester (Semester Examination). 40% marks for each theory paper will be allocated for internal assessment and 60% marks will be kept for semester examination at the end of each semester. For a paper carrying 100 marks, for example, 40% marks (= 40 marks) allocated for internal assessment will be divided as follows:

There will be

(i) Three sessional tests for each paper (Best two will be counted) totaling 30 marks,

(ii) An assignment of 5 marks, and

(iii) 5 marks will be allocated to attendance and seminar.

As per the guidelines provided by the Office of the Controller of Examination. For practical courses, 40 marks will be allocated for the internal assessment and 60 marks will be kept for semester examination (theory) at the end of each semester. For the evaluation of the lab work, laboratory notebook, practical test/viva voce shall be taken into account. The marks shall be awarded by the respective teacher conducting the practical course. For sessional test, discontinuance of classes will not be permitted and the teacher may take the test in his/her schedule class. Under the compelling circumstance such as sickness of the student or mourning in the family the candidate may be given another chance. For sickness only, a credible medical certificate issued by a hospital shall be considered. In case of causalities, a letter from the parents would be required.

10. Semester examination:

a) Semester examination shall be held at the end of each semester as per schedule given in the Academic Calendar of the Faculty.

b) Up to maximum of seven days preparatory holidays may be given to the examinees before the start of the semester examinations.

c) Each theory paper having 03 credits shall be of 100 marks out of which 60% marks shall be for semester examination and 40% marks for internal assessment.

d) Each practical paper having 08 credits shall be of 150 marks out of which 60%

marks shall be for semester examination and 40% marks for internal assessment.

e) The question paper for semester examinations shall be set either by the external examiner or an internal examiner. The Board of Studies of a department shall draw a panel of name of examiners, both internal and external, for approval by the concerned authorities. If the external examiner is unable to send the question paper by the deadline set by the examination branch of the University, the Head of the Department after consultation with the examination branch shall get the paper set internally by a faculty. The papers set by the examiners can be moderated in consultation with the teacher who taught that course. Teachers appointed on contractual basis with appointment of less than one academic session, may not ordinarily be appointed as examiners. All such teachers, however, will be expected to assist in the practical examination.

f) The question paper shall have five questions. There shall be one question from each of the 4 units of the course and one question shall contain objective type/short answer questions covering all the units of the course. The candidate shall have to answer all the five questions. There shall, however, be internal choice within a unit. The choice shall be given by setting alternative questions from the same unit. The question paper should be such that it covers all the topics of that course.

g) The duration of the semester examination of a theory course shall be three hours. Practical exams of a lab course shall be of at least four hours duration. The practical examination shall be conducted by an internal and external examiner assisted by other teachers.

h) For projects, each student shall submit three typed bound copies of his/her project work to the supervisor(s) by the end of the 4th semester. A student shall not be entitled to submit the project report unless he/she has pursued project work during 4th semester under the guidance of a duly appointed supervisor(s). The report shall embody the candidates own work and an up-to-date review of the subject area. The write-up shall detail a critical assessment of the subject area and indicate in what respect the work appears to advance the knowledge of the subject concerned and future course of investigation required.

i) The project report shall be examined by a Board of Examiners and the student shall have to appear for viva-voce. The Board of Examiners shall consist of the following,

One external examiners

Head of the Department/Program Coordinator

Supervisor(s)

The Board shall examine the project report of all the students and award the marks. A presentation by the student and the viva-voce shall be conducted by one of the external examines along with the other members of the board by and marks shall be awarded by the external examiner for the same. All other teachers of the department will also be invited by the Head of the Department to be present during the examination. In case a student fails to secure the minimum pass marks, he/she may be asked to appear in the viva-voce again, or he/she may be asked to revise the project report in the light of the suggestions of the examiners and resubmit. For this, he/she will have to enroll as an exstudent in the next session. A resubmitted project report will be examined as above and viva voce shall be conducted along with other students.

11. Classification of result:

The letter grades and their equivalent numerical points are listed below:

Range of Percentage of Marks	Grade	Grade Point	Description of Performance
90-100	O	10	Outstanding
80-89	A+	9	Excellent
70-79	A	8	Very Good
65-69	B+	7	Good
55-64	B	6	Above Average
50-54	C	5	Average/Pass
00-49	F	0	Fail
-	AB	0	Absent

A student obtaining Grade 'F' / 'AB' shall be considered as failed and will be required to reappear in the examination.

12. Earned credits (EC):

The credits for the courses in which a student has obtained E (minimum passing grade for a course) or a higher grade in the semester exam shall be counted as credits earned by him/her. Any course in which a student has obtained 'F' or 'I' grade shall not becounted towards his/her earned credits.

13. Evaluation of Performance:

SGPA (Semester Grade Point Average) shall be awarded on successful completion of each semester. CGPA or Cumulative Grade Point Average, which is the Grade Point Average for all the completed semesters at any point in time shall be awarded in each semester on successful completion of the current semester as well as all of the previous semester. In 1 st semester, CGPA is not applicable.

14. Calculation of SGPA and CGPA of A Student in a Semester:

$$SGPA = \frac{\sum (\text{Earned Credits X Grade Point})}{\sum (\text{Course Credits Registered})}$$

$$CGPA = \frac{\sum_{M} (\text{Earned Credits X Grade Point})}{\sum (\text{Course Credits Registered})}$$

Where m is the number of semesters passed

15. Promotion

- Promotion from 1st semester to 2nd semester and from 3rd semester to 4th semester shall be automatic.
- A student shall be promoted to the 3 rd semester of the programme if he/she has passed in each theory and practical courses separately of 1st and 2nd semesters. Provided that student has 50% of the subjects. A candidate will be given a total number of 2 attempts, inclusive of the first attempt, to clear the papers in which he/she

fails. For such students, promotion to the next higher class will be considered subject to rules relating to passing the 1st and 2nd semester examinations within two academic years, Award of degree shall be subject to successfully completing all the requirements of the programme of study within four years from admission. A student who fails in theory papers of end semester examination may be given a chance to appear in 3 papers in Make-up test to clear those papers. In no case shall it be allowed to the students who abstain from appearing in the semester examination.

- Candidates who are unable to appear in the examination because of serious illness at the time of examinations may be given another chance. The request has to be processed through the Head of the Department to the Vice Chancellor. The Vice chancellor may look into the merit of the case and decide accordingly.

16. CLASSIFICATION SHALL BE DONE ON THE BASIS OF FOLLOWING CRITERIA:

The result of successful candidates who fulfill the criteria of the award of degree shall be classified at the end of last semester on the basis of his/her final CGPA.

a) He/she will be awarded "I Division with Distinction" if his/her final CGPA is 7.5 and above and up to 10.

b) He/she will be awarded "I Division" if his/her final CGPA is 6.00 and above and 7<.50.

c) He/she will be awarded "II Division" if his/her final CGPA is 5.00 and above and <6.00.

17. Span Period:

a) 1st and 2nd Semester Exams: Within two years from the first admission to the programme.

b) All requirement of M. Tech. degree within a total period of four years from the date of their first admission.

18. Improvement:

A candidate who wishes to improve the previous performance will be allowed to do so as per the following regulation:

a) A student shall be allowed only once to reappear in the semester examination of up to four theory courses along with regular students of that semester to improve upon the previous performance. The examination fee charged from such candidates shall be double the current examination fee.

b) Such a student shall inform the Head of the Department in writing of his/her intention to improve the performance two months before the date of semester examination is to be held. c) If the student improves the performance, he/she shall be required to submit the earlier mark-sheet/degree. A new mark-sheet and degree shall be issued. The new mark-sheet/degree shall bear the year in which the student improved the grade.

d) In case the grade obtained in improvement is lower than the one obtained earlier, the higher grade shall be retained.

CURRICULUM OF M. TECH. PROGRAMME IN FOOD TECHNOLOGY

M.TECH FIRST SEMESTER (July-Dec)

S. No.	Paper Code	Subject Category	Paper Title	Marks	L	T	P	Credits
			Orientation Programme					
1	MFTC-101	Core	Food Chemistry and Microbiology	100	3			3
2	MFTC-102	Core	Food Processing and Preservation	100	3			3
3	MFTC-103	Core	Meat Fish and Poultry Technology	100	3			3
4	MFTC-104	Core	Advances in Cereal, Pulses & Oilseeds	100	3			3
5	MFTC-105	Core	Food Engineering	100	3			3
6	MFTC-106	Core	Lab-I	150			16	8
7	MFTD-107	Discipline Specific Elective	Engineering Properties of Foods	100	3			3
8	MFTD-108	Discipline Specific Elective	Unit Operations in Food Processing					
9	MFTG-109	Generic Specific Elective	Plantation Crops and Spices	100	3			3
10	MFTG-110	Generic Specific Elective	Fruits and Vegetable Processing					
11	MFTC-V1	Compulsory	Industrial Visit	50				1
	TOTAL			**900**	**21**		**16**	**30**

M.TECH SECOND SEMESTER (Jan-May)

S. No.	Paper Code	Subject Category	Paper Title	Marks	L	T	P	Credits
1	MFTC-201	Core	Research Methodology	100	3			3
2	MFTC-202	Core	Bakery and Confectionary Technology	100	3			3
3	MFTC-203	Core	Food Safety & Quality Management	100	3			3
4	MFTC-204	Core	Dairy Technology and Engineering	100	3			3
5	MFTC-205	Core	Functional Food and Nutraceuticals	100	3			3
6	MFTC-206	Core	Lab-II	150			16	8
7	MFTD-207	Discipline Specific Elective	Food Rheology and Microstructure	100	3			3
8	MFTD-208	Discipline Specific Elective	Advances in Drying Technology					
9	MFTG-209	Generic Specific Elective	Advances in Food Packaging Technology	100	3			3
10	MFTG-210	Generic Specific Elective	Modern Techniques in Food Analysis					
11	MFTC-V2	Compulsory	Industrial Visit/Educational Tour	50				1
	TOTAL			**900**	**21**		**16**	**30**

M.TECH SEMESTER III (July-Dec)

S. No.	Paper Code	Subject Category	Paper Title	Marks	L	T	P	Credits
1	MFTC-301	Core	Industrial Training/Synopsis Report	Internal: 140 External: 210		2	30	17
	TOTAL			**350**				**17**

M.TECH SEMESTER IV (Jan-May)

S. No.	Paper Code	Subject Category	Paper Title	Marks	L	T	P	Credits
1	MFTC-401	Core	Project Dissertation	Internal: 160 External: 240		3	30	18
	TOTAL			**400**				18

Total Credits: 30+30+17+18 = 95

Total Marks: 900 + 900 + 350 + 400 = 2550.

1. Student is required to opt for one Discipline specific elective course of at least 03 credits each in semester I and Semester II.
2. Student is required to opt for one Generic elective course of at least 03 credits each in semester I and Semester II from any discipline/subject of his or her choice offered in any department of the university including his or her own department towards award of M. Tech. in Food Technology.
3. A Core Course offered in any discipline/department may be treated as an elective by the students of other disciplines/departments and such electives will also be referred to as Generic electives.
4. A Discipline specific elective paper will be taught in the department if at least 5 students of the ongoing batch opt for it.
5. A Generic elective course will be taught in the department if more than 5 students opt for it.

DETAILED SYLLABI OF M. TECH. (FOOD TECHNOLOGY)
(FIRST YEAR)

CORE PAPER **SEMESTER I**

Paper Title: Food Chemistry & Microbiology
Paper Code: MFTC-101
Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the ~~of~~ carbohydrate chemistry, chemistry of proteins and lipids in foods and their interaction with other food components (*Cognitive level: Understand*)

CO2: Understand the stability aspects of vitamins, minerals and flavour volatiles during food processing (*Cognitive level: Understand*)

CO3: Understand the concept of Probiotics and prebiotics and discuss the functionality of food additives and their application in food industry. (*Cognitive level: Understand*)

CO4: Gain insight on the principles and procedures involved in inactivating/killing microorganisms in foods/Hurdle technology

CO5: Understand the factors affecting food spoilage and apply procedures for identification of the genera and species of microorganisms responsible for the food quality and safety. (*Cognitive level: Understand and apply*)

CO6: Understand the characteristics of foodborne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification (*Cognitive level: Understand and analyse)*

CO7: Determine the effects of fermentation in food production and its influence on the microbiological quality and status of the food product.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	1	3	2	3	3	3	3	3	3	1	3
CO2	1	2	2	1	3	3	3	3	3	2	3	3	3	3
CO3	1	1	1	1	3	3	3	3	2	1	3	3	3	3
CO4	3	3	3	1	3	3	3	3	1	2	3	3	3	3
CO5	3	1	2	1	2	3	3	3	3	1	3	3	3	3
CO6	3	3	3	1	3	3	3	3	3	1	3	3	2	3
CO7	1	1	1	2	3	2	3	2	3	3	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Introduction: Factors affecting microbial growth. Contamination, spoilage and preservation of fruit and vegetables, meat, egg, dairy products etc. Beneficial microorganisms and their utilization in food fermentation of bread, malt beverages, vinegar, fermented vegetables, fermented dairy and meat products. Food borne diseases, Rapid Methods of Detection of food borne pathogens. Mycotoxins.

UNIT II - Probiotics and prebiotics. Basics of Fermentation: Types of fermentors and applications-batch and continuous processes. Application of enzyme in food industries: milk and cheese industry, baking industry, alcoholic beverages (wine and beer) and fruit juices, starch and sugar industries.

UNIT III - Carbohydrates: Types, Functions, Reactions and properties; interactions of sugars and their role in various aspects of food like flavor, colour, aroma and taste; Enzymatic and Non enzymatic browning. Lipids: Types, functions, reactions and properties: Lipolysis, Auto-oxidation, Rancidity, Role of food lipids in flavour Proteins: Types, Functions, physical and chemical properties of proteins; Chemical reactions and interactions of amino acids and proteins; Denaturation and its implications. Water in Foods, Ice: Structure, Properties, Interactions, Water activity, and stability.

UNIT IV - Vitamins, Minerals: General sources, functions and dietary requirements, deficiency symptoms, Stability and degradation in foods during processing. Enrichment and fortification. Food additives: definitions, classification, functions, Types; Flavour technology: Types of flavours, flavours generated during processing, stability of flavours during food processing, essential oils and oleoresins.

BOOKS RECOMMENDED:

- Banawart GJ. Basic Food Microbiology. 2nd Ed. AVI Publ.
- Frazier J & Westhoff DC. Food Microbiology. 4th Ed. McGraw Hill.
- Garbutt J. Essentials of Food Microbiology. Arnold Heinemann.
- Jay JM, Loessner MJ & Golden DA. Modern Food Microbiology. 7thEd. Springer
- Chakrabarty MM. Chemistry and Technology of Oils and Fats. Prentice Hall.
- Dendy DAV & Dobraszczyk BJ. Cereal and Cereal Products. Aspen.
- Hamilton RJ & Bhati A. Fats and Oils - Chemistry and Technology. App. Sci. Publ.

Teaching-Learning Strategies in brief

- The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

- **Assessment methods and weightages in brief**

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER I**

Paper Title: Food Processing and Preservation
Paper Code: MFTC-102

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the importance, scope and status of food preservation in India (*Cognitive level: Understand*)

CO2: Understand the food processing and preservation techniques employing high and low temperatures (*Cognitive level: Understand*)

CO3: Apply the principles of thermal and non-thermal preservation methods to preserve foods (*Cognitive level: Apply*)

CO4: Analyse the modern techniques and advances in food processing (*Cognitive level: Analyse*)

CO5: Apply the modern techniques and advances in food processing **(***Cognitive level: Apply*)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	1	2	1	1	1	3	3	1	3	2	3
CO2	3	3	2	2	3	1	3	3	1	3	1	2	1	3
CO3	3	3	3	1	3	2	3	3	1	3	1	2	1	3
CO4	2	3	3	2	2	2	2	3	1	1	1	3	1	3
CO5	3	3	3	2	2	2	2	3	1	1	1	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Introduction to Food Processing and Preservation Status of food processing industry in India, National food processing policy of India, Importance and scope of food preservation, Principles of food processing and preservation.

UNIT II - Processing in High and Low Temperature Processing and preservation by heat: blanching, pasteurization, sterilization and ultra high temperature (UHT), canning, extrusion processing, dielectric heating, microwave heating, baking, roasting and frying; Processing and preservation by low-temperature: refrigeration, freezing, controlled atmospheric storage and modified atmosphere.

UNIT III - Modern Processing Techniques – I Membrane technology: microfiltration, ultrafiltration, nanofiltration and reverse osmosis and their industrial application, Supercritical fluid extraction, Radio frequency heating, Oscillating Magnetic Field, Ohmic heating, Infrared heating, Induction heating.

UNIT IV - Modern Processing Techniques - II High Hydrostatic Pressure, Pulsed electric field, Ultrasound, Cold Atmospheric Plasma, High intensity light or Pulsed Light, Ultra Violet Light, Ozone in Food Processing, Food Irradiation, Electron beam Technology, Nanotechnology in food industry.

BOOKS RECOMMENDED:

- Arsdel WB, Copley MJ & Morgan AI. Food Dehydration. 2nd Ed. Vols. I, II. AVI Publ.
- Desrosier NW & James N. Technology of Food Preservation. 4th Ed AVI. Publ.
- Fellows PJ. Food Processing Technology: Principle and Practice. 2nd Ed. CRC.
- Jelen P. Introduction to Food Processing. Prentice Hall.
- Potter NN & Hotchkiss Food Science. 5th Ed. CBS.
- Ramaswamy H & Marcotte M. Food Processing: Principles and Applications.Taylor & Francis.
- Shafiur Rahman M, Handbook of Food Preservation, 2nd edition, CRC.

Teaching-Learning Strategies in brief

1. The teaching learning strategies, followed are chalk-board teaching, ICT tools, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.
2. **Assessment methods and weightages in brief**
3. *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),
4. Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.
5. Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER I**

Paper Title: Meat, Fish and Poultry Technology
Paper Code: MFTC-103

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the major biochemical reactions that affects the quality of meat and meat products.

CO2: Characterize and utilize by-products from poultry, fish and meat industries. Composition from different meat sources.

CO3: Understand the Operational factors affecting meat, poultry and Fish quality

CO4: Get to know about the status of Poultry industry in India

CO5: Understand the GAP and HACCP and Packaging of meat products.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1	1	1	1	2	3	2	1	3
CO2	2	2	2	3	1	1	1	1	2	2	3	2	2	3
CO3	3	3	2	3	2	1	1	2	2	3	3	3	2	3
CO4	2	3	2	3	2	2	1	2	2	3	3	3	2	3
CO5	3	1	1	2	2	1	1	1	1	2	3	2	1	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Meat: composition from different sources; Muscle structure and composition; Postmortem muscle chemistry; Meat colour and flavours; Meat microbiology and safety; Modern abattoirs, Stunning methods.

UNIT II - Steps in slaughtering and dressing; Operational factors affecting meat quality; effects of processing on meat tenderization; Halal, jhatka and kosher meat processing. Chilling and freezing of carcass and meat, Cold storage, freezing and preservation. Canning, cooking, drying, pickling, curing and smoking; Prepared meat products salami, kebabs, sausages, sliced, minced, corned.

UNIT III - Poultry industry in India; Microbiology of poultry meat; Spoilage factors; Layout, sanitation and processing operations of poultry processing. Byproducts: eggs, egg products; Whole egg powder and egg yolk products: manufacture, packaging and storage.

UNIT IV - Fish: structure and composition, post mortem changes, rigor mortis, autolytic changes, bacteriological changes, rancidity, physical changes Meat plant hygiene: GAP and HACCP; Packaging of meat products, Packaging of poultry products, refrigerated storage of poultry meat

BOOKS RECOMMENDED:

- Forrest JC. Principles of Meat Science. Freeman.
- Govindan TK. Fish Processing Technology. Oxford & IBH.
- Hui YH. Meat Science and Applications. Marcel Dekker.
- Kerry J. et al. Meat Processing. Woodhead Publ. CRC Press.
- Levie A. Meat Hand Book. 4th Ed. AVI Publ.
- Mead M. Poultry Meat Processing and Quality. Woodhead Publ.
- Mead GC. Processing of Poultry. Elsevier.
- Pearson AM & Gillett TA. Processed Meat. 3rd Ed. Chapman & Hall.
- Stadelman WJ &Cotterill OJ. Egg Science and Technology. 4th Ed. CBS.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER I**

Paper Title: Advances in Cereal, Pulses & Oilseeds
Paper Code: MFTC-104

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the composition, structure and storage of food grains. Cognitive level: Understand

CO2: Understand the technology of wheat, paddy, corn and pseudo-cereal processing and their products. Cognitive level: Understand

CO3: Understand the traditional and modern milling operations of wheat and technology of bakery and extruded products. Cognitive level: Understand

CO4: Understand the processing of coarse cereals and legume-pulses and their value-added products. Cognitive level: Understand, analyse and apply.

CO5: Understand the processing of oil & oilseeds and utilization of their byproducts. Cognitive level: Understand

CO6: Analysis of physicochemical properties of food grains and production of extruded and bakery products. Cognitive level: Understand and analyse

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1	1	1	1	2	3	2	1	3
CO2	2	2	2	3	1	1	1	1	2	2	3	2	2	3
CO3	3	3	2	3	2	1	1	2	2	3	3	3	2	3
CO4	2	3	2	3	2	2	1	2	2	3	3	3	2	3
CO5	3	1	1	2	2	1	1	1	1	2	3	2	1	3
CO6	3	3	2	3	2	1	1	2	2	3	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Wheat: Structure, Milling; Wheat-based baked products: Bread, biscuit, cakes; Extruded products: pasta, noodles; Quality evaluation of wheat flour: Physicochemical, Rheological.

UNIT II - Rice: structure, milling, parboiling, By-products of rice milling, Factors affecting rice yield during milling. Technology of breakfast cereals: Puffed Rice, flaked rice; Corn: Wet and dry milling; Corn products: Corn flakes, corn syrup and corn starch. Quality aspects of different flours.

UNIT III - Legumes: Milling of pulses. Legume-based products; anti-nutritional factors; utilization of pulses. Millets: Sorghum, pearl millet, finger millet, and kodo millet: structure, composition; milling and malting; barley: milling and malting; Oats: Milling and processing.

UNIT IV - Oilseed: Processing: traditional and modern methods of oil extraction, refining; Applications of different oils and fats in food processing and products.

BOOKS RECOMMENDED:

- Chakrabarty MM. Chemistry and Technology of Oils and Fats. Prentice Hall.
- Dendy DAV & Dobraszczyk BJ. Cereal and Cereal Products. Aspen.
- Hamilton RJ & Bhati A. Fats and Oils - Chemistry and Technology. App. Sci. Publ.
- Kent NL. Technology of Cereals. 4th Ed. Pergamon Press.
- Kulp K & Ponte GJ. Handbook of Cereal Science and Technology. 2nd Ed. Marcel Dekker.
- Lorenz KL. Handbook of Cereal Science and Technology. Marcel Dekker.
- Mathews RH. Legumes Chemistry, Technology and Human Nutrition. Marcel Dekker

Teaching-Learning Strategies in brief

- The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

- **Assessment methods and weightages in brief**

  There are two components of assessment: Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous

mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.
- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER I**

Paper Title: Food Engineering
Paper Code: MFTC-105

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the Innovations in Food Engineering with reference to new techniques and Products. Cognitive level: Understand

CO2: Apply knowledge of engineering principles applied in processing technology. Cognitive level: Understand, apply and Analyze

CO3: Understanding of basic and applied engineering principles used for thermal and Non-thermal Food Engineering Operations. Cognitive level: Understand

CO4: Analyse the Food Processing Technologies and Impact on Product Attributes. Cognitive level: Understand and Analyze

CO5: Recognise the Fluid flow and design of equipments. Cognitive level: Understand

CO6: Understand the Principles of mass transfer, mass balance calculations, Laws of thermodynamics, heat transfer, Nature of heat flow. Cognitive level: Understand and Analyze

CO7: Understand the Refrigeration cycles, performance of refrigeration compressors, refrigeration system balance and multiple evaporation systems. Cognitive level: Understand

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1	1	1	1	2	3	2	1	3
CO2	2	2	2	3	1	1	1	1	2	2	3	2	2	3
CO3	3	3	2	3	2	1	1	2	2	3	3	3	2	3
CO4	2	3	2	3	2	2	1	2	2	3	3	3	2	3
CO5	3	1	1	2	2	1	1	1	1	2	3	2	1	3
CO6	3	3	2	3	2	1	1	2	2	3	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Introduction to food engineering. Thermal Kinetics, Significance of D, Z and F value, Generation time, Spoilage probability. Changes during processing.

UNIT II - Principle of heat and mass transfer, mass balance calculations, modes of heat transfer. Heat conduction in slabs, cylinders & spheres heat generation inside solids, unsteady state heat conduction.

UNIT III - Fluid flow, Reynolds Number, friction losses in pipes, measurement of fluid flow. Moisture content (wet and dry basis) theory and calculations.

UNIT IV - Evaporators: Single & multi effect evaporators, thin layer and thick layer bed drying. Maintenance of equipments, Plant Layout and diagram codes, Refrigeration cycle, performance of refrigeration compressors.

BOOKS RECOMMENDED:

- Heldman DR & Singh RP. Food Process Engineering. AVI Publ
- R.C. Sachdeva. Fundamentals of Engineering Heat and mass transfer.
- Fellows P. Food Processing Technology. VCH Ellis Horwood.
- Brennan JG, Butter JR, Corell ND & Lilly AVE. Food Engineering Operations. Elsevier.
- Charm SE, McCabe WL, Smith JC & Harriott P. Unit Operations of Chem Engineering. McGraw Hills.
- Sahay KM & Singh KK. Unit Operation of Agricultural Processing. Vikas Publ. House

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),
- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.
- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER I**

Paper Title: Lab-I
Paper Code: MFTC-106

Total Credits: 8, Total Hours-240, Maximum Marks: 150 (Internal Assesment-60, Final Exam-90)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Acquire skills to analyse effect of processing on various nutrients.

CO2: Competence to use various equipments for food processing.

CO3: Perform qualitative analysis of protein and minerals.

CO4: Analyze quantitatively and assess cooking losses.

CO5: Demonstrate skills on determination of edible portion, effect of cooking on volume and weight.

CO6: Choose appropriate cooking method to conserve nutrients.

CO7: Acquire skills on different methods of cooking.

CO8: Develop new innovative products by applying knowledge on properties of food.

CO9: Acquire skill on various methods of assessing nutritional status.

CO10: Relate metabolism of macronutrients with health.

CO11: Comprehend the functions of micronutrients with health

CO12: Associate knowledge of nutrients with their deficiencies

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2	3	3	3	3	2	3	3	3
CO2	2	3	2	3	2	3	1	2	2	3	3	3	2	2
CO3	2	3	3	2	2	3	2	1	3	3	3	1	2	2
CO4	3	3	3	3	3	3	3	3	2	3	3	3	3	3
CO5	3	2	3	3	3	2	2	2	3	3	3	2	3	3
CO6	3	3	3	3	3	2	2	2	3	2	1	2	3	3
CO7	3	3	2	3	3	3	3	3	1	3	1	3	3	3
CO8	3	3	3	3	3	3	1	2	3	3	3	3	2	2
CO9	2	2	3	2	2	3	3	1	1	3	2	3	3	2
CO10	2	3	3	3	2	3	2	3	3	3	2	1	2	2
CO11	3	3	2	2	2	3	2	2	2	1	3	2	3	3
CO12	3	3	2	3	3	2	1	2	2	3	3	1	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Practical)

1. Determination of moisture content in meat samples.
2. Determination of fat content in meat samples
3. Determination of protein content.
4. Determination of crude fibre content.
5. Study of Animal Carcass and Meat grading and cutting practices.
6. Study of Smoking on different physico-chemical and sensory characteristics on Meat and meat products.
7. To carry out candling and grading of shell eggs.
8. Visit to a meat processing plant.
9. Preparation of different meat products.
10. Design of Cold storage.
11. Design of Grain storage and Silo.

12. Performance evaluation of different mills.
13. Material balance in food processes.
14. Comparison of tray dryer and vacuum tray drying of food and vegetable.
15. Freeze drying characteristic of food material
16. Particle size analysis of different flours.
17. Determination of viscosity of different foods.
18. To study the engineering properties of different food materials.
19. To calculate the angle of repose of different grains.
20. To calculate the heat penetration in foods.
21. To evaluate texture of raw and processed foods using texture analyser.
22. To analyse the flour quality by Falling Number.
23. To study the glass transition of foods.
24. To study the structure of grains.
25. Determination of TSS of different foods
26. Sensory evaluation: To perform recognition test for four basic tastes and determine sensitivity/threshold tests for four basic tastes.
27. To carry out microbiological assessment of indoor air quality
28. Preparation and quality evaluation of fruit jam / jelly, fruit marmalade; fruit preserve and candy; fruit RTS, squash, syrup;
29. Processing of tomato products;
30. Preparation of pickle/mixed pickle;
31. Physical-tests on wheat and rice;
32. Determination of gluten content in wheat flour;
33. Milling of wheat and rice by laboratory mill;
34. Assessment of degree of polishing;
35. Quality tests of rice; Amylose content determination in rice;
36. Malting of Barley,
37. Extraction of oil using expeller and solvent extraction methods.
38. Study of milling characteristics of Food by Ball mill.
39. Study of milling characteristics of Food by Hammer mill
40. Estimation of tannin content in different fruit products.
41. Determination of ascorbic acid content in the food samples.
42. Study on Zero Energy Cooling Chamber for Shelf-life study of Fruits and Vegetable

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is

of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.
- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

DISCIPLINE SPECIFIC ELECTIVE PAPER **SEMESTER I**

Paper Title: Engineering Properties of Foods
Paper Code: MFTD-107
Total Credits:3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Recognise the Physico-chemical characteristics of foods. Cognitive level: Understand and Analyze

CO2: Determine the electrical resistance and conductance, dielectric constant, energy absorption by different food components and Numerical calculations of the same. Cognitive level: Understand and Analyze

CO3: Understand the different Physical states of Matter, Rheology of food materials. Cognitive level: Understand and Analyze

CO4: Know the application of engineering properties in process development as well as design and operation of equipment and structures associated with handling, processing and storage of raw as well as processed food products. Cognitive level: Apply

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	3	1	2	1	3	2	1	3	3	3	3
CO2	3	3	3	3	1	1	2	2	2	1	3	3	3	3
CO3	2	2	3	3	1	2	1	2	2	1	3	3	3	3
CO4	3	3	3	3	1	2	2	2	2	2	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Physico-chemical characteristics: shape, sphericity, size, volume, density, porosity, surface area, terminal velocity, drag coefficient, coefficients of friction and angle of repose, Reynolds number.

UNIT II - Specific heat, thermal conductivity, thermal diffusivity, electrical resistance and conductance, dielectric constant, energy absorption, Numerical calculations.

UNIT III - Physical states of Matter, Rheology of food materials, Newtonian and Non-Newtonian fluids, rheological models and equations, Linear Visco-elasticity, Creep stress relaxation, Plastic behavior, Texture profile analysis.

UNIT IV - Application of engineering properties in process development as well as design and operation of equipment and structures associated with handling, processing and storage of raw as well as processed food products.

BOOKS RECOMMENDED:

- M.A. Rao & S.S. H. Rizvi. Engineering Properties of Foods. CRC Press.
- J. M. Aguilera & D. W. Stanley. Micro-structural principles of food processing and Engineering.
- N. N. Mohsenin. Physical properties of plant and animal materials.
- Zeki Berk. Food Process Engineering and Technology. Academic Press.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.
- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

DISCIPLINE SPECIFIC ELECTIVE PAPER II **SEMESTER I**

Paper Title: Unit Operation in Food Processing
Paper Code: MFTD-108
Total Credits:3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Learn the material handling and conveyance of food grain and powder in different food industries. Cognitive level: Understand

CO2: Analyse the methods of Cleaning, Size Reduction and principles of laws of size reduction, energy calculations, equipment selection. Cognitive level: Understand and Analyze

CO3: Utilize the technology of mixing and different terminologies used. Cognitive level: Understand

CO4: Analyse the different designing equipments. Cognitive level: Understand and Analyze

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1	1	1	1	2	3	2	1	3
CO2	2	2	2	3	1	1	1	1	2	2	3	2	2	3
CO3	3	3	2	3	2	1	1	2	2	3	3	3	2	3
CO4	2	3	2	3	2	2	1	2	2	3	3	3	2	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Material handling - Theory, classification of various material handling equipment - conveyors, elevators, trucks, cranes and hoists, Conveyance of food grain and powder in screw and vibratory conveyors. Selection of material handling equipments.

UNIT II - Cleaning - Types, aims of cleaning, methods of cleaning, Dry cleaning methods: screening, aspiration, magnetic cleaning and abrasive cleaning. Wet cleaning methods: soaking, spray washing, flotation washing and ultrasonic washing. Sorting and Grading - Advantages of sorting and grading, grading factors, methods of sorting and grading.

UNIT III - Size Reduction: principles and laws of size reduction, energy calculations, equipment selection, Particle size analysis.

UNIT IV - Mixing: Terminology (agitating, kneading, blending, and homogenizing), equipments - mixers for liquids of low or moderate viscosity (Paddle agitators, turbine agitators and propeller agitators), mixers for high viscosity pastes (Pan mixer, horizontal mixer and dough mixer), mixers for dry solids (tumbler mixer and vertical screw mixer), effect of mixing on foods. Power consumption and efficiencies.

UNIT V - Theory and equipment for filtration, Expression, Concentration and Evaporation, Distillation, Sedimentation fluidization and centrifugation

BOOKS RECOMMENDED:

- Geankoplis J Christie. (1999). Transport Process and Unit Operations. Allyn & Bacon.
- Earle R. L. and Earle M.D.. Unit Operations in Food Processing
- McCabe WL & Smith JC. (1999). Unit Operations of Chemical Engineering. McGraw Hill.
- Sahay KM & Singh KK. (1994). Unit Operation of Agricultural Processing. Vikas Publ. House.
- Singh RP and Heldman DR. (1993).Introduction to Food Engineering. Academic Press

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),
- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.
- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

GENERIC ELECTIVE PAPER **SEMESTER I**

Paper Title: Plantation Crops and Spices
Paper Code: MFTG-109
Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the Occurrence, harvesting, processing and chemical constituents of Coffee.

CO2: Understand and differentiate between the processing of different types of tea.

CO3: Determine the chemistry of cocoa bean fermentation, manufacturing of cocoa powder, cocoa liquor and chocolate production

CO4: Review the processing of dates, cashews, almond, raisins.

CO5: Define the Classification, processing and composition of major and minor Indian spices and their adulterants.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	1	3	1	1	1	3	1	2	1	2	3
CO2	2	1	2	1	3	2	1	2	3	1	2	1	2	3
CO3	2	1	2	1	3	3	1	2	3	3	3	2	2	3
CO4	2	3	2	1	3	2	1	2	3	3	3	2	2	3
CO5	1	1	2	1	3	1	1	1	2	2	3	1	2	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Coffee: Occurrence, chemistry of chemical constituents; harvesting, dry and wet coffee processing; flow sheet for conversion of coffee beans into beverage: fermentation of coffee beans; roasting , grinding, drying, extraction; decaffeinated coffee, instant coffee manufacturing; coffee-chicory mixture;
Tea: Occurrence, harvesting, chemistry of constituents: black tea and green tea; manufacturing of green and black tea, oolong; other tea-oloong, pickled, decaffeinated; instant tea manufacture; quality evaluation and grading of tea.

UNIT II - Cocoa: Occurrence, chemistry of the cocoa bean; processing of coffee beans, changes taking place during fermentation of cocoa bean; manufacturing of cocoa powder, cocoa liquor, cocoa butter, chocolates; sugar bloom and fat bloom in chocolates; quality control of chocolates

UNIT III - Spice processing: Definition of spice and classification, Processing and composition of major Indian spices and herbs: Pepper, cardamom, chillies, Turmeric and Ginger; Processing of dates, cashews, almond, raisins.

UNIT IV - Minor spices- ajowan, coriander, cumin, vanilla, asafoetida, cinnamon, fenugreek, garlic, mustard, mace and nutmeg, saffron, onion, tarmarind, mint, cloves, leafy spices, bay; extraction of oleoresins and essential oils, spice adulteration; fumigation and irradiation of spices, microbial contamination

BOOKS RECOMMENDED:

- Banerjee B. Tea Production and Processing. Oxford Univ. Press.
- Minifie BW. Chocolate, Cocoa and Confectionery Technology. 3 rd Ed. Aspen Publ.
- NIIR. Handbook on Spices. National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
- Sivetz M & Foote HE. Coffee Processing Technology. AVI Publ.

- Varnam AH & Sutherland JP. 1994. Beverages: Technology, Chemistry and Microbiology.
- Woodroof JG & Phillips GF.1974. Beverages: Carbonated and Non-Carbonated. AVI Publ.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

GENERIC ELECTIVE PAPER **SEMESTER I**

Paper Title: Fruits and Vegetable Processing
Paper Code: MFTG-110
Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Identify the Importance and scope of post-harvest management of fruits and vegetables.

CO2: Relate the Controlled and modified atmosphere Storages for different fruit.

CO3: Utilize raw materials for Processing for different food items viz., pickles, chutneys, sauces, pulp, puree and concentrates, from different fruits.

CO4: Understand the principles of Dehydration of fruits and vegetables.

CO5: Understand the Intermediate moisture fruits and vegetables.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	1	3	1	1	1	3	1	1	1	1	2
CO2	2	1	2	1	3	3	1	2	3	3	3	2	1	3
CO3	2	3	2	1	3	2	1	2	3	3	3	2	3	3
CO4	1	1	2	1	3	1	1	1	2	2	2	1	1	3
CO5	3	1	2	1	3	1	1	1	3	1	1	1	1	2

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Importance and scope of post-harvest management of fruits and vegetables. Maturity indices and standards for selected fruits and vegetables; Methods of maturity determinations; Quality requirements of raw material for processing; Post harvest losses

UNIT II - Controlled and modified atmosphere Storage, Hypobaric storage; Pre-cooling and cold storage; Prevention of post-harvest diseases and infestation, Fumigation; Minimal processing Hurdle technology. Non thermal processing.

UNIT III - Processing for pickles, chutneys, sauces, pulp, puree and concentrates, from different fruits, RTS fruit beverages; TSS calculations; individual quick freezing; Post-harvest physiological and biochemical changes in fruits and vegetables.

UNIT IV - Dehydration of fruits and vegetables, sun and solar drying, osmotic, tunnel drying, fluidized bed drying, freeze drying, spray drying. Production of fruit powders. Intermediate moisture fruits and vegetables. Canning, Blanching.

BOOKS RECOMMENDED:

- Lal G, Siddappa GS & Tandon GL. Preservation of Fruits and Vegetables. ICAR.
- Salunkhe DK & Kadam SS.,Handbook of Vegetables Science & Technology: Production,
- Composition, Storage and Processing.Marcel Dekker.
- Srivastava RP & Kumar S. Fruit and Vegetable Preservation - Principles and Practices.
- International Book Distributors
- Verma LR & Joshi VK. 2000. Post Harvest Technology of Fruits and Vegetables. Indus Publ.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

COMPULSORY COURSE **SEMESTER I**

Paper Title: Industrial Visit
Paper Code: MFTC-V1

Total Credits: 1; Practical hours: 30, Maximum Marks: 50 (Attendance: 20, Report-30)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: The students will visit the different food processing industries, to acquaint them with different handling, processing and preservation techniques.
CO2: students will understand the different hazards and risks associated with the processing.
CO3: The students get to know about the skills for writing report, which shall include; the layout of the industry, different machineries and their uses, limitations in the processing line and suggestions.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	2	2	2	2	2	3	2	2	2
CO2	2	2	3	2	2	2	2	2	2	3	2	2	2	3
CO3	2	3	3	2	3	3	2	2	3	2	3	3	2	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

The students will visit the different food processing industries, to acquaint them with different handling, processing and preservation techniques. Different hazards and risks associated with the processing will also be explained. The students have to make a report, which shall include; the layout of the industry, different machineries and their uses, limitations in the processing line and suggestions. The report will be evaluated by the internal faculty members.

Assessment methods and weightages in brief

Internal assessment (50marks) Internal assessment consists of continuous mode (20 marks) and report submission (30 marks).

SECOND YEAR)

CORE PAPER **SEMESTER II**

Paper Title: Research Methodology
Paper Code: MFTC-201

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the meaning of research its objectives and types,

CO2: Recognise the criteria of good research, Significance of research, Research and scientific methods.

CO3: Identify Research ethics, research integrity, standards and problems in research ethics, research safety in laboratories, welfare of animals used in research.

CO4: Determine the ways of selecting of research problem, Justification, theory, hypothesis, basic assumptions, limitations and delimitations of the problem.

CO5: Learn the Regression, Significance Level, ANOVA, Co-Relations, Chi square test, T-Test, F-Test, RSM. Introduction to different statistical software's.

CO6: Understand the know-how of funding Agencies: DST, DBT, MoFPI, CSIR, ICMR, SERB, UGC.

CO7: Understand report writing, Research proposal, Bibliography, Impact factor.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	3	1	1	3	2	2	3	2	1	3	3	3	3
CO2	2	3	2	1	2	2	1	3	3	1	3	3	3	3
CO3	1	2	1	1	2	2	2	3	3	1	3	3	3	3
CO4	3	3	2	2	2	2	2	3	2	1	3	3	3	3
CO5	3	3	3	3	2	2	2	3	2	1	3	3	3	3
CO6	1	3	1	1	2	2	2	3	2	1	3	3	3	3
CO7	1	1	1	1	2	2	2	3	2	1	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping.

Detailed Syllabus (Theory)

UNIT I – Research: Meaning, Objectives and types, criteria of good research, Significance of research, Research and scientific methods. Research ethics, research integrity, standards and problems in research ethics, research safety in laboratories, welfare of animals used in research. Selection of research problem, Justification, theory, hypothesis, basic assumptions, limitations and delimitations of the problem.

UNIT II - Sampling techniques, Population and sample, collection and classification of data, Frequency distribution, Diagrammatic Representation of data, Measures of central tendencies– Mean, Median and Mode, Measures of dispersion – Range, Quartile deviation, standard deviation, Skewness and Kurtosis.

UNIT III - Introduction to Regression, Significance Level, ANOVA, Co-Relations, Chi square test, T-Test, F-Test, RSM. Introduction to different statistical software's.

UNIT IV - Introduction to Funding Agencies: DST, DBT, MoFPI, CSIR, ICMR, SERB, UGC.

UNIT V - Report writing, Research proposal, Bibliography, Impact factor

BOOKS RECOMMENDED:

- Kothari, C.K., Research Methodology- Methods and Techniques, (New Age International, New Delhi).

- Trochim, William M.K., Research Methods, (Biztantra, Dreamtech Press, New Delhi).
- Gupta, C.B., An Introduction to Statistical Methods, 23rd Edition, Vikash Publications.
- Gupta, SC & Kapoor, VK. Fundamentals of mathematical Statistics: A modern approach, (2000), Sultan Chand & Sons.
- Aggarwal, BL. 2003. Basic Statistics. New Age Publishers, New Delhi.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER II**

Paper Title: Bakery and Confectionery Technology
Paper Code: MFTC-202

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Recognise the status of bakery industry in India. Raw materials and quality parameters used to be kept for production of bakery products.

CO2: Understand the technology for the manufacture of innovative bakery products.

CO3: Analyse the characteristics, faults and corrective measures of various bakery products.

CO4: Analyse the quality characteristics of confectionery ingredients; technology for manufacture of confectioner.

CO5: Understand the general technical aspects of Industrial sugar confectionery.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1	1	1	1	2	3	2	1	3
CO2	2	2	2	3	1	1	1	1	2	2	3	2	2	3
CO3	3	3	2	3	2	1	1	2	2	3	3	3	2	3
CO4	2	3	2	3	2	2	1	2	2	3	3	3	2	3
CO5	3	1	1	2	2	1	1	1	1	2	3	2	1	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Status and economic importance of Bakery industry in India. Raw materials and quality parameters, role in dough and batter preparation; Functions of Gluten, Dough Development and Chemistry.

UNIT II - Technology for the manufacture of bakery products-bread, biscuits, cakes, muffins, pretzels, buns and wafers. Quality Characteristics of Bakery products; Effect of variations in formulation on the quality of the finished product, faults and corrective measures; Equipments used in Bakery: Dividers, Rounders, Proofers, Moulder and Sheeter, Slicer and Baking Ovens.

UNIT III - Quality characteristics of confectionery ingredients; technology for manufacture of chocolate and hard-boiled candy; colour, flavour and texture of confectionary.

UNIT IV - General technical aspects of Industrial sugar confectionery; Boiled sweets, Caramel, toffee and fudge – Processing, Processing of liquorice paste, cream paste, marshmallow and fondents.

BOOKS RECOMMENDED:

- Matz, (1989). Bakery Engineering and Technology, Vol I and II, CBS Publishers, New Delhi.
- Dubey SC. Basic Baking. The Society of Indian Bakers, New Delhi.
- Manley D. 2000. Technology of Biscuits, Crackers & Cookies. 2nd Ed. CRC Press.
- Pomeranz Y. Modern Cereal Science and Technology. MVCH Publication

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER II**

Paper Title: Food Safety and Quality Management
Paper Code: MFTC-203

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the different quality attributes of food (*Cognitive level: Understand*)

CO2: Analyse the different quality attributes of food (*Cognitive level: Analyse*)

CO3: Understand the principles of food toxicology and methods used in safety evaluation-risk assessments of food toxins (*Cognitive level: Understand*)

CO4: Application of risk assessment to food safety (*Cognitive level: Apply*)

CO5: Understand the national and international food Safety standards and regulations (*Cognitive level: Understand*)

CO6: Evaluate and apply the quality management systems to determine suitability in given context (*Cognitive level: Apply*)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	1	2	1	1	1	1	1	1	3	1	3
CO2	3	3	3	1	2	1	1	1	3	2	1	3	3	3
CO3	2	3	3	2	2	2	1	1	1	2	1	3	2	3
CO4	3	3	2	3	2	2	1	3	3	2	1	3	1	3
CO5	3	3	1	1	2	3	3	3	1	2	1	3	1	3
CO6	3	3	3	3	2	3	3	3	3	3	1	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Quality attributes of food, Gustation: Mechanism of taste perception, Difference tests for sensory evaluation; Olfaction, Colour: CIE (International Commission on Illumination) color system; Image processing techniques for Food Quality Evaluation; Texture.

UNIT II - Food Toxicology: Definition, scope and general principles, Food toxicants: factors affecting toxicity of compounds, Methods used in safety evaluation-risk assessments, Natural toxic constituents in plant foods, Shellfish poisoning, Existing and emerging pathogens due to globalisation of food trade, Testing of food ingredients & additives, Animal studies including LD50, Ames test.

UNIT III - Food Safety standards and regulation: Introduction; Food Safety Standards Authority of India; BIS, Ministry of Consumer Affairs, Codex Alimentarius, United States Food and Drug Administration, European Union norms, FSANZ.

UNIT IV - Quality management systems, Good manufacturing practices; Good hygienic practices; ISO 22000; Good Agricultural Practices, Good Laboratory practices, Hazard analysis critical control points (HACCP); Safe quality food, Halal certification, Halal requirements.

BOOKS RECOMMENDED:

- Amerine MA, Pangborn RM &Rosslos EB. Principles of Sensory Evaluation of Food. Academic Press.
- Early R.Guide to Quality Management Systems for Food Industries. Blackie Academic.
- Furia TE. Regulatory status of Direct Food Additives. CRC Press.
- Jellinek G. Sensory Evaluation of Food - Theory and Practice. Ellis Horwoood.
- Krammer A &Twigg BA. Quality Control in Food Industry. Vol. I, II. AVI Publ.
- Macrae R, Roloson R &Sadlu MJ. Encyclopedia of Food Science & Technology & Nutrition, Vol. XVI. Academic Press.
- Piggot J.R. Sensory Evaluation of Foods. Elbview Applied Science.
- Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, ICT tools, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER II**

Paper Title: Dairy Technology and Engineering
Paper Code: MFTC-204

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the Status of dairy in India and world, and quality evaluation and testing of milk. (Cognitive level: Understand and analyse)

CO2: Gain insight on processing aspects of milk with new technologies and their applications (Cognitive level: Analyse and understand)

CO3: Understand the milk products chemistry and milk microbiology (Cognitive level: Understand).

CO4: Apply the principles of dairy processing to value added milk products development

CO5: Understand the principles of thermal death kinetics and quality changes during processing of milk (Cognitive level: Understand).

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	2	3	2	2	3	3	3	3
CO2	3	3	3	1	3	3	2	3	2	2	1	2	3	3
CO3	2	2	2	1	3	3	2	2	2	1	3	3	3	2
CO4	3	3	3	2	1	2	2	2	2	1	2	3	2	2
CO5	2	2	2	2	1	2	1	2	1	1	2	3	2	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Status of dairy in India and worldwide. Quality evaluation and testing of milk; Procurement, and processing of market milk; flavoured, sterilized, recombined, full fat, reconstituted toned and double toned milk.

UNIT- II - Milk products chemistry and microbiology processing: Condensed milk, Dried milk, Milk Cream, Butter, Ghee, Cheese, Ice cream, yoghurt, dahi, khoa, burfi, kalakand, gulabjamun, rosogolla, srikhand, chhana, paneer, lassi.

UNIT-III - Principle of homogenization, single and double stage homogenizers, application of homogenization in dairy industry, design principles of homogenizers, types of tanks, pumps in dairy industry

UNIT IV - Pasteurization of milk; batch, flash and continuous pasteurizer, HTST pasteurizer and design principle, quality changes during processing of milk, Evaporator, types of evaporator, heat and mass balance in single and multiple effect evaporator, steam economy, estimation of drying rates and drying time, drying equipments, design of spray and drum dryer.

BOOKS RECOMMENDED:

- Aneja RP, Mathur BN, Chandan RC & Banerjee AK. Technology of Indian Milk Products. Dairy India Publ.
- De S. Outlines of Dairy Technology. Oxford Univ. Press.
- Henderson JL. Fluid Milk Industry. AVI Publ.
- Rathore NS et al. Fundamentals of Dairy Technology - Theory & Practices. Himanshu Publ
- Spreer E. Milk and Dairy Products. Marcel Dekker.
- Walstra P. (Ed.). Dairy Science and Technology. 2nd Ed. Taylor & Francis.
- Web BH, Johnson AH & Lford JA. 1987. Fundamental of Dairy Chemistry. 3rd Ed. AVI Publ.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam

(15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER II**

Paper Title: Functional Foods and Nutraceuticals
Paper Code: MFTC-205

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the development of functional foods, its history, concepts, sources and classification.
CO2: Understand pleiotropic Effects of Bioactive Phytochemicals.
CO3: Get to know about the nutraceuticals for infants, adolescent/ pregnant ladies and nursing mothers, geriatrics.
CO4: Understand the foods recommended and restricted in metabolic disorders.
CO5: Understand the nutritional deficiencies and its correction through fortification and supplementation of foods.
CO6: Understand the beneficial effect of spices, honey, spirulina etc.
CO7: Understand the health benefits of PUFA/ gamma linolenic acids, antioxidants (polyphenols), dietary fiber, oligosaccharides, sugar alcohols, peptides and proteins, glycosides, alcohols, iso-prenoides and vitamins, choline.
CO8: Understand the transgenic plant foods with health claims, the use and development of prebiotics and Probiotics,
CO9: Get to know about the regulatory issues for nutraceuticals, Clinical testing of nutraceuticals.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	1	1	1	3	3	1	3
CO2	3	3	3	2	1	3	2	2	1	2	3	2	3	2
CO3	3	3	3	2	1	2	3	2	2	1	3	2	3	3
CO4	3	3	3	2	2	2	3	2	2	1	3	2	3	3
CO5	3	3	3	1	1	2	3	2	2	1	3	2	3	3
CO6	3	3	3	1	1	2	3	2	2	1	3	2	3	3
CO7	3	3	3	1	2	2	3	2	2	1	3	2	3	3

CO8	3	3	3	1	1	2	3	2	2	1	3	2	3	3
CO9	3	3	2	2	1	2	3	2	2	1	3	2	3	2

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping.

Detailed Syllabus (Theory)

UNIT I - Functional food: History and concepts, sources, and classification; Pleiotropic Effects of Bioactive Phytochemicals. Nutraceuticals for infants, adolescent/ pregnant ladies and nursing mothers, geriatrics.

UNIT II - Food recommended and restricted in metabolic disorders: diabetes, obesity; gastrointestinal disorders; liver, and pancreatic disturbances; cardiovascular diseases; urinary and musculoskeletal diseases; allergies. Nutritional deficiencies and its correction through fortification and supplementation of foods.

UNIT III - Beneficial effect of spices, honey, spirulina etc. Health benefits of PUFA/ gamma linolenic acids, antioxidants (polyphenols), dietary fiber, oligosaccharides, sugar alcohols, peptides and proteins, glycosides, alcohols, iso-prenoides and vitamins, choline,

UNIT IV - Transgenic plant foods with health claims. Prebiotics and Probiotics, regulatory issues for nutraceuticals, Clinical testing of nutraceuticals

BOOKS RECOMMENDED:

- Human nutrition: A textbook of nutrition in health and disease. B. T. Burton, Mc Graw Hill, 3rd Edition, 2002.
- Nutrition and Dietetics. S. A. Joshi, Tata Mc Graw Hill Co. Ltd., 2nd Edition, 2003.
- Dietetics. B. Shrilakshmi, New Age International (P) Ltd., New Delhi, 5th Edition, 2005.
- Nutrition and Dietetic Foods, A. E. Bender, Chem. Pub. Co. New York, 2nd Edition, 2004.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode

(10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.
- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

CORE PAPER **SEMESTER II**

Paper Title: Lab II
Paper Code: MFTC-206

Total Credits: 8, Total hours-240, Maximum Marks: 150 (Internal Assesment-60, Final Exam-90)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: To develop different bakery products.

CO2: To assess personal hygiene of food handlers

CO3: To develop various concentrated products by using Open Pan Evaporator and shelf-life study.

CO4: Detection of preservatives and additives.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2	3	3	3	3	2	3	3	3
CO2	2	3	2	3	2	3	1	2	2	3	3	3	2	2
CO3	2	3	3	2	2	3	2	1	3	3	3	1	2	2
CO4	3	3	3	3	3	3	3	3	2	3	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus

LIST OF EXPERIMENTS:

1. Preparation of different bakery products.
2. Visit to a bakery plant.
3. Preparation of sensory score cards based on hedonic scale, paired comp. test, duo trio test.
4. To assess personal hygiene of food handlers.
5. To prepare a HACCP plan for a food processing unit.
6. Preparation of dried ginger; preparation of dried onion and garlic;
7. Preparation of banana and potato wafers; preparation of dehydrated vegetables.
8. Preparation of concentrated products by using Open Pan Evaporator and shelf life study.
9. Determination of titrable acidity, pH and clot on boiling test in milk.
10. Detection of added starch and cane sugar in milk
11. Detection of preservatives: formalin, H2O2 in milk.
12. Detection of presence of neutralizers in milk.
13. Preparation of chana and paneer from milk.
14. Preparation of flavored milk.
15. Preparation of Ice cream.
16. Estimation of salt in butter sample.
17. Demonstration of AAS, GCMS, HPLC, NMR, FTIR, DSC, TGA
18. Design and layout of Dairy plant.
19. Demonstration to design of fermenter.
20. Preparation of whey-based beverages
21. Preparation of iced and flavoured tea beverage
22. Preparation of carbonated and noncarbonated soft drinks
23. To study the drying characteristics of different food materials.
24. To plot drying curve for onion, potato, tomato slices.
25. Moisture Sorption Isotherm of different foods.
26. Calculation of moisture content on dry weight basis and wet weight basis.
27. Model fitting to drying curves.
28. To check the viscosity of different food materials.
29. To prepare a HACCP plan for a dairy processing unit.
30. Identification of different types of packaging and packaging materials
31. Determination of tensile strength of given material
32. Destructive and non-destructive test on glass container, drop test
33. Determination of wax weights, tensile strength of papers, bursting strength
34. WVTR of packaging materials
35. Measurement of thickness of packaging materials
36. Testing of chemical resistance of packaging materials
37. Determination of shelf life of packaged foods; determination of ERH of foods.
38. Introduction of students with the latest trends in packaging from websites and magazines.
39. Shelf life and sensory study of Vacuum packed food products.
40. Shelf life and sensory study of Shrinked packed food products.
41. To determine adulteration in spices.
42. To determine the adulteration in milk samples.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

DISCIPLINE SPECIFIC ELECTIVE PAPER **SEMESTER II**

Paper Title: Food Rheology and Microstructure
Paper Code: MFTD-207
Total Credits:3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the rheology of foods, texture and microstructure. Cognitive level: Understand

CO2: Know about the history of Food Microstructure, Light Microscopy, Transmission Electron Microscopy, Scanning Electron Microscopy. Cognitive level: Understand

CO3: Understand the rheological classification of Fluid Foods. Cognitive level: Understand

CO4: Understand the pasting properties and Linear Viscoelastic Range, Creep recovery. Cognitive level: Understand and Analyze

CO5: Understand the effect of processing and additives (stabilizers and emulsifiers) on food product rheology. *Cognitive level: Understand and Analyze*

CO6: Understand the relationship between instrumental and sensory data. *Cognitive level:* Understand and Analyze

CO7: Understand the effects of processing on rheology and texture. *Cognitive level:* Understand and Analyze

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO2	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO3	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO4	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO5	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO6	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO7	3	2	2	3	2	1	1	2	1	2	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Introduction to rheology of foods, texture and microstructure. History of Food Microstructure, Light Microscopy, Transmission Electron Microscopy, Scanning Electron Microscopy.

UNIT II - Comparative assessment of different types of Viscometers, Rheological classification of Fluid Foods: Newtonian and Non-Newtonian fluids; Mechanisms and relevant models for non-Newtonian flow; Effect of temperature; Compositional factors affecting flow behaviour.

UNIT III - Rheological and textural properties of selected food products. Texture profile analysis, Effect of processing and additives (stabilizers and emulsifiers) on food product rheology; Relationship between instrumental and sensory data.

UNIT IV - Modifying microstructure, glass transition (starch, proteins and fats), effects of processing on rheology and texture.

UNIT V - Rheology in the quality evaluation of raw and processed foods, Pasting properties, Linear Viscoelastic Range, Creep recovery, Farinograph, Alveograph, Extensograph, Falling Number.

BOOKS RECOMMENDED:

- Bourne, M. Food Viscosity and Texture, 2 nd Edition, Academic Press, New York, 2002.
- José Miguel Aguilera. Microstructural Principles of Food Processing Engineering.
- Macosko, Ch.W. Rheology: Principles, Measurements, and Applications (Advances in Interfacial Engineering), Wiley-VCH, 1994.
- Morrison, Faith. Understanding Rheology, Oxford University Press, 2001.
- Donald B. Bechtel. New Frontiers in Food Microstructure.
- Moskowitz. Food Texture.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

DISCIPLINE SPECIFIC ELECTIVE PAPER **SEMESTER II**

Paper Title: Advances in Drying Technology
Paper Code: MFTD-208
Total Credits:3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the theory of drying, bound moisture, free moisture, equilibrium moisture content, critical moisture content, drying rate curves.

CO2: Understand the engineering aspects of different types of drier.

CO3: Understand the Psychometry, Moisture sorption curves, Drying rate periods and their calculation, Heat and mass transfer coefficient calculations, Capillary and diffusion theory.

CO4: Understand the calculations for water activity, moisture content; wet basis and dry basis.

CO5: Understand the physical, chemical and microbiological characteristics of dehydrated foods, Rehydration ratio, size and density, shelf-life, Microbial stability of dried foods.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO2	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO3	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO4	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO5	3	2	2	3	2	1	1	2	1	2	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Drying-Theory of drying, bound moisture, free moisture, equilibrium moisture content, critical moisture content, drying rate curves, engineering aspects of different types of driers including bin drier, tray drier, drum drier, tunnel drier, spray drier, fluidized bed drier, freeze drier. Principle of humidification & dehumidification, humidity chart, wet and dry bulb temperature.

UNIT II - Psychometry, Moisture sorption curves, Drying rate periods – constant and falling rate periods and their calculation, Heat and mass transfer coefficient calculations, Capillary and diffusion theory, Thin layer and deep bed drying, Dryer performance indices – overall thermal efficiency, specific energy consumption, coefficient of performance.

UNIT III - Water activity, moisture content; wet basis and dry basis; calculations, Physical, chemical and microbiological characteristics of dehydrated foods, Rehydration ratio, size and density, shelf-life, Microbial stability of dried foods.

BOOKS RECOMMENDEED:

- Singh RP. 1991. Fundamentals of Food Process Engineering. AVI Publ.
- Singh RP and Heldman DR. 1993.Introduction to Food Engineering. Academic Press.
- Fellows P. 1988.Food Processing Technology: Principle and Practice. VCH Publ.
- Geankoplis J Christie. 1999. Transport Process and Unit Operations. Allyn & Bacon.
- Henderson S & Perry SM. 1976.Agricultural Process Engineering.5th Ed. AVI Publ.
- McCabe WL & Smith JC. 1999. Unit Operations of Chemical Engineering. McGraw Hill.
- Sahay KM & Singh KK. 1994. Unit Operation of Agricultural Processing. Vikas Publ. House

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

GENERIC SPECIFIC ELECTIVE PAPER –I **SEMESTER II**

Paper Title: Advances in Food Packaging Technology
Paper Code: MFTG-209

Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the functions of packaging and packaging materials.

CO2: Understand the types of packaging materials, Biodegradable and recyclable packaging material.

CO3: Understand the active and intelligent packaging techniques, oxygen, ethylene and other scavengers.

CO4: Understand the Non-migratory bioactive polymers in food packaging along with Bioactive compounds, antimicrobial packaging system and its effectiveness.

CO5: Understand the modified atmosphere packaging (MAP), Controlled atmosphere packaging (CAP), combination of MAP and other preservative techniques.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO2	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO3	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO4	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO5	3	2	2	3	2	1	1	2	1	2	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Definitions, Functions of packaging and packaging materials; Types of packaging materials: Rigid, Semirigid and flexible: Paper and types of papers, Glass: composition, properties, types of closures, Metals: Tinplate containers, tinning process, components of tinplate, tin free steel (TFS), types of cans, aluminum containers, lacquers; Plastics: types of plastic films, laminated plastic materials, edible films, Biodegradable and recyclable packaging material.

UNIT II - Active and intelligent packaging techniques, oxygen, ethylene and other scavengers: Oxygen scavenging technology, selection of right type of oxygen scavengers, ethylene scavenging technology, carbon dioxide and other scavengers, Time temperature indicators, freshness indicators, Pathogen indicators.

UNIT III - Introduction to Non-migratory bioactive polymers in food packaging, Bioactive compounds in packaging, antimicrobial food packaging, antimicrobial packaging system, and effectiveness of antimicrobial packaging.

UNIT IV - Modified atmosphere packaging (MAP), Controlled atmosphere packaging (CAP), combination of MAP and other preservative techniques. Aseptic packaging: Sterilization of packaging material. Vacuum packaging in food products, seal and shrink packaging machine; form and fill sealing machines

BOOKS RECOMMENDED:

- Ahvenainen, R. Novel Food Packaging Techniques. Woodhead Publishing Series.
- Robertson, (2005), Principles of Food Packaging. CRC Press, USA
- Scharow, S., and Griffin, R.C. (1980). Principles of Food Packaging, 2nd Edition, AVI
- Publications Co. Westport, Connecticut, USA.
- Yam, KL, Lee, DS and Piergiovanni, L. Food Packaging Science and Technology. CRC Press.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

GENERIC SPECIFIC ELECTIVE PAPER -II **SEMESTER II**

Paper Title: Modern Techniques in Food Analysis
Paper Code: MFTG-210
Total Credits: 3, Total Lectures-50, Maximum Marks: 100 (Internal Assesment-40, Final Exam-60)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Understand the sampling techniques, Importance of sampling in food analysis, Food Safety and toxicity, calibration and standardization of instruments, Accuracy and Precision.

CO2: Understand the Microscopic techniques in food analysis.

CO3: Understand the Biosensors, Artificial tongue, electronic nose etc

CO4: Understand the Basic principles of centrifugation, relation between g and RCF.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO2	2	2	3	3	2	2	1	1	1	2	3	3	3	3
CO3	3	2	2	3	2	1	1	2	1	2	3	3	3	3
CO4	2	2	3	3	2	2	1	1	1	2	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

UNIT I - Sampling techniques, Importance of sampling in food analysis, Food Safety and toxicity, calibration and standardisation of instruments, Accuracy and Precision.

UNIT II - Chromatographic Techniques, Thin layer, Paper chromatography, column chromatography, normal phase and reverse phase chromatography, HPLC, GC, detectors (flame ionization, conductivity, FTIR, photoionization, MS, electron capture, MALDI).

UNIT III - Microscopic techniques in food analysis: Light microscopy, Compound microscopy, Scanning electron microscopy, Transmission electron microscopy.

UNIT IV - Biosensors, Artificial tongue, electronic nose, PCR, ELISA, NMR, Differential scanning calorimetry, Spectroscopic techniques.

UNIT V - Basic principles of centrifugation, relation between g and RCF, gel electrophoresis techniques,

BOOKS RECOMMENDED:

- Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). Principles of instrumental analysis. Cengage learning.
- Nielsen S. (Eds.). 1994. Introduction to Chemical Analysis of Foods. Jones & Bartlett
- Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill
- AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

- *There are two components of assessment:* Internal assessment (40 marks) and End semester examination (60 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -5 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 75: 0 marks; 75-80: 2 mark; 81-85: 3 marks; 86-90: 4 marks and >90: 5 marks),

- Assignments contain 3 marks and Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 15 marks) and one improvement exam (15 marks). The average marks of two best sessional exams are computed out of 30 marks.

- Total Marks are 100 for the subject (Internal Assessment: 40 marks and End Semester Examination: 60 Marks).

COMPULSORY COURSE **SEMESTER II**

Paper Title: Industrial Visit/Educational Tour
Paper Code: MFTC- V2
Credit 1, Maximum Marks: 50 (Attendance: 20, Report-30)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: The students will learn to write review papers.

CO2: The students will learn deliver a presentation.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	2	2	2	2	2	3	2	2	2
CO2	2	2	3	2	2	2	2	2	2	3	2	2	2	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

The students will visit the different food processing industries, to acquaint them with different handling, processing and preservation techniques. Different hazards and risks associated with the processing will also be explained. The students have to make a report, which shall include; the layout of the industry, different machineries and their uses, limitations in the processing line and suggestions. The report will be evaluated by the internal faculty members.

Assessment methods and weightages in brief

Internal assessment (50marks) Internal assessment consists of continuous mode (20 marks) and report submission (30 marks).

SECOND YEAR

COMPULSORY COURSE **SEMESTER III**

Paper Title: Industrial Training/Synopsis Report
Paper Code: MFTC-301

Total Credits 17 (T: 2 & P: 15) Maximum Marks: 350 (Internal 140, External 210)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to

CO1: Learn how to take research problem

CO2: Understand the use of the experimental tools to carry the research experiments.

CO3: Understand the use of instruments and equipments to develop new products and other related work.

CO4: Understand how to write a project report or dissertation or thesis.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	2	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3	2	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

The project shall comprise of the following two components viz Internal of 100 and External of 250 marks given as under.

INTERNAL: Industrial training: Training will be carried out after 2nd semester. The students will submit their reports, which will be evaluated with synopsis of their proposed research work carried out in third semester in consultation with their supervisor. Supervisor will evaluate the report based on its quality and also on the basis of sincerity and punctuality of student during the tenure.

Synopsis: The students will carry research on any topic relevant to Food Technology. The synopsis should cover the Introduction, Review of Literature, Rationale, Methodology, summary of work done and work remaining with Conclusion and future industrial prospects of work proposed, followed by References.

EXTERNAL: Each student will deliver a presentation on the topic of his/her project work proposed to be carried out in department/industry/institute/research centre which will be evaluated by Departmental Research Committee (DRC) consisting of all supervisors and external expert on the date and time fixed for the purpose. Candidates will be evaluated on the basis of quality of work proposed/ done, synopsis submitted, attendance in 3rd semester not less than 450 working hours, presentation upto satisfaction of DRC as well as participation in scientific conferences/ departmental activities.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

There are two components of assessment: Internal assessment (140 marks) and End semester (210 marks) will consist of presentation and viva. The students will carry out project work/ research training for the said semester individually under the guidance of a faculty member or in collaboration with any industry. The project shall consist of research/design/development/ implementation work.. The internal assessment will be carried out by the internal faculties and

the external assessment will be evaluated by an external examiner, as approved in the BoS of the department on the basis of quality of work done, dissertation submitted and presentation made in front of examiners.

COMPULSORY COURSE **SEMESTER IV**

Paper Title: PROJECT DISSERTATION
Paper Code: MFTC- 401

Total credits: 18 (T: 3 & P: 15) Maximum marks: 400 (Internal – 160, External – 240)

COURSE OUTCOMES (COs)

On the successful completion of the course, students will be able to:

CO1: Learn how to take research problem

CO2: Understand the use of the experimental tools to carry the research experiments.

CO3: Understand the use of instruments and equipments to develop new products and other related work.

CO4: Understand how to write a project report or dissertation or thesis.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	2	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3	2	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3	3	3	3	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

The project shall comprise of the following two components viz Internal of 100 and External of 250 marks given as under.

INTERNAL: Each student will undertake a project work in the fourth semester under the supervision of either a faculty from Jamia Hamdard or an expert from the industry/institute/research centre and under the overall supervision of the Head of the Department. After the completion of project each student has to submit a project report by the deadline fixed for the same purpose. All the supervisors have to submit attendance of their students, which should not be less than 80% or 500 working hours to appear for examination.

EXTERNAL: Each student will deliver a presentation on the topic of his/her project work carried out in department/industry/institute/research centre which will be evaluated by an external examiner and DRC on the date and time fixed for the purpose. Candidates will be evaluated on the basis of quality of work done, dissertation submitted, attendance in 4th semester not less than 80% or 500 working hours, presentation upto satisfaction of DRC as well as quality of publications if any, presentation in scientific conferences and departmental activities.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

There are two components of assessment: Internal assessment (160 marks) and End semester presentation and viva (240 marks). Internal and external assessment consists of presentation and viva-voice. The project shall consist of research/design/development/ implementation work. The internal assessment will be carried out by the internal faculties and the external assessment will be evaluated by an external examiner, as approved in the BoS of the department on the basis of quality of work done, dissertation submitted and presentation made in front of examiners.