SELF ASSESSMENT REPORT

submitted to

NATIONAL BOARD OF ACCREDITATION

for the accreditation of

MASTER OF TECHNOLOGY

in

FOOD ENGINEERING AND TECHNOLOGY

PART A & B

Department of Food Engineering and Technology
Institute of Chemical Technology
University under Section 3 of UGC Act 1956
Elite Status and Centre of Excellence, Government of Maharashtra
Nathalal Parekh Marg, Matunga (E), Mumbai 400 019, India

October 2019

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CRITERIA SUMMARY

Program: Master of Technology in Food Engineering and Technology

Criteria No.	Details	Mark	Institute Mark
1.	Program Curriculum and Teaching-Learning Processes	125	125
2.	Program Outcomes	75	75
3.	Students' Performance	75	73
4.	Faculty Contributions	75	75
5.	Laboratories and Research Facilities	75	75
6.	Continuous Improvement	75	75
	Total	500	498

PART A: Institutional Information

1. Name and Address of the Institution:

Institute of Chemical Technology, Mumbai
University under section 3 of UGC Act 1956 Estd.1933,
Elite Status and Centre of Excellence-Govt. of Maharashtra
ICT, Nathalal Parekh Marg, Matunga, Mumbai – 400019
Tel: +91-22-33612312, Fax: +91-22-33611020
Website: www.ictmumbai.edu.in

2. Name and Address of the Affiliating University, if applicable:

3. Year of establishment of the Institution: 1933

4. Type of the Institution:

Institute of National Importance	☐
University	☐
Deemed University	☑
Autonomous	☐
Affiliated Institution	☐
Any other (Please specify)	☐

5. Ownership Status:

Central Government	☐
State Government	☑
Government Aided	☐
Self-financing	☐
Trust	☐
Society	☐
Section 25 Company	☐
Any Other (Please specify)	☐

6. Vision of the Institution:

We shall perennially strive to be a vibrant institute with continuously evolving curricula to brighten the future of the chemical, biological, materials and energy industries of the nation, and rank amongst the very best in the world through active participation and scholarship of our faculty, students and alumni. We shall be creators of sprouting knowledge and design cutting-edge technologies that will have the greatest impact on society and benefit mankind at large.

7. Mission of the Institution:

We shall generate and sustain an atmosphere conducive to germinating new knowledge at every available opportunity. The education we shall impart will enable our students to devise new solutions to meet the needs of all segments of society with regard to material and energy, while protecting the environment and conserving the natural resources. Our endeavours, while extending well beyond the confines of the classroom, will aim to enhance public welfare and our attempts to disseminate knowledge will spread to a greater multi- and cross-disciplinary platform to conduct research, discovery, technology development, service to industry and entrepreneurship, in consonance with India's aspirations to be a welfare state. We will team scientists and engineers with professionals in other disciplines to arrive at better solutions. We will provide all our students with a strong foundation to encourage them to be our ambassadors in the professional activities that they choose to undertake in service of society at national and international levels. Through our vision, we will serve the profession and society and strive to reach the summit as a team, and ultimately serve as role models to the younger generation.

8. Details of all the programs offered by the institution:

Sr. No.	Program Name	Name of the Department	Year of Start	Intake	Increase/Decrease in intake, if any	Year of Increase/Decrease	AICTE Approval	Accreditation Status*
1.	B. Chemical Engineering	Chemical Engineering	1933	30	1996	75	F.No. Western/1-4259324925/2019/EOA	27/12/2016 to 30/06/2022
2.	B.Tech - Dyestuff Technology	Dyestuff Technology	1944	16	1995	20	F.No. Western/1-4259324925/2019/EOA	27/12/2016 to 30/06/2022
3.	B.Tech- Food Engineering and Technology	Food Engineering and Technology	1943	16	N.A.	N.A.	F.No. Western/1-4259324925/2019/EOA	27/12/2016 to 30/06/2022
4.	B.Tech- Fibres and Textile Processing Technology	Fibres and Textile Processing Technology	1933	34	N.A.	N.A.	F.No. Western/1-4259324925/2019/EOA	27/12/2016 to 30/06/2022
5.	B.Tech- Oils, Oleochemicals and Sufactant Technology	Oils, Oleochemicals and Sufactant Technology	1943				F.No. Western/1-4259324925/2019/EOA	27/12/2016 to 30/06/2022
6.	B.Tech- Pharmaceuticals Chemistry and Technology	Pharmaceutical Sciences and Technology	1943	10	-	18	F.No. Western/1-4259324925/2019/EOA	14/01/2017 to 30/06/2020
7.	B.Tech Polymer Engineering and Technology	Polymer and Surface Engineering	1946				F.No. Western/1-4259324925/2019/EOA	27/12/2016 to 30/06/2022
8.	B.Tech Surface Engineering & Technology	Polymer and Surface Engineering	1946				F.No. Western/1-4259324925/2019/EOA	27/12/2016 to 30/06/2022
9.	B. Pharmacy	Pharmaceutical Sciences and Technology	1959				F.No. Western/1-4259324925/2019/EOA	22/09/2016 to 30/06/2021
10.	M. Chemical Engineering	Chemical Engineering	1958	18	Not Applicable		F.No. Western/1-4259324925/2019/EOA	28/09/2016 to 30/06/2021
11.	M.Tech- Dyestuff Technology	Dyestuff Technology	1961	4	N.A.	N.A.	F.No. Western/1-4259324925/2019/EOA	01/07/2015 to 30/06/2020
12.	M.Tech.-Food Engineering &Technology	Food Engineering and Technology	1945	8	N.A.	N.A.	F.No. Western/1-4259324925/2019/EOA	08/11/2013 to 30/06/2018

13.	M.Tech- Fibres and Textile Processing Technology	Fibres and Textile Processing Technology	1961	Variable	N.A.	N.A.	F.No. Western/1-4259324925/2019/EOA	01/07/2015 to 30/06/2020
14.	M.Tech- Oils, Oleochemicals and Sufactant Technology	Oils, Oleochemicals and Sufactant Technology	1966				F.No. Western/1-4259324925/2019/EOA	01/07/2015 to 30/06/2018
15.	M.Tech- Pharmaceuticals Sciences and Technology	Pharmaceutical Sciences and Technology	1961	6	N.A.	N.A.	F.No. Western/1-4259324925/2019/EOA	08/11/2013 to 30/06/2016
16.	M.Tech- Polymer Engineering and Technology	Polymer and Surface Engineering	1966				F.No. Western/1-4259324925/2019/EOA	01/07/2015 to 30/06/2020
17.	M.Tech- Surface Engineering & Technology	Polymer and Surface Engineering	1966				F.No. Western/1-4259324925/2019/EOA	01/07/2015 to 30/06/2020
18.	M.Tech- Food Biotechnology	Food Engineering and Technology	2008	2	2009	10	F.No. Western/1-4259324925/2019/EOA	28/09/2016 to 30/06/2021
19.	M.Tech- Bioprocess Technology	DBT-ICT Center of Biosciences	1994				F.No. Western/1-4259324925/2019/EOA	08/11/2013 to 30/06/2018
20.	M.Tech- Perfumery and Flavor Technology	Dyestuff Technology	1992	5	N.A.	N.A.	F.No. Western/1-4259324925/2019/EOA	01/07/2015 to 30/06/2020
21.	M.Tech. Green Technology	Green Technology	2010				F.No. Western/1-4259324925/2019/EOA	28/09/2016 to 30/06/2021
22.	M. Tech. Pharmaceutical Biotechnology	Pharmaceutical Sciences and Technology	2017				F.No. Western/1-4259324925/2019/EOA	
23.	M.E. (Plastic Engineering)	General Engineering	1972				F.No. Western/1-4259324925/2019/EOA	
24.	M.Sc. (Chemistry)	Chemistry						
25.	M.Sc. (Textile Chemistry)	Fibres and Textile Processing Technology	2010	Variable	N.A.	N.A.		
26.	M.Sc. (Engineering Mathematics)	Mathematics						
27.	M.Sc. (Physics)	Physics						
28.	M. Pharmacy	Pharmaceutical Sciences and Technology	1965				F.No. Western/1-4259324925/2019/EOA	01/07/2014 to 30/06/2017
29.	Ph.D(Tech.) Chemical Engineering	Chemical Engineering	-	-	-			

30.	Ph.D (Tech.) Bioprocess Technology		1943	2	2009	10		
31.	Ph.D (Tech.) Polymer Engineering and Technology	Polymer and Surface Engineering						
32.	Ph.D (Tech.) Surface Engineering & Technology	Polymer and Surface Engineering	-	5	N.A.	N.A.		
33.	Ph.D (Tech.) Nanotechnology							
34.	Ph.D (Tech.) Plastic Engineering	General Engineering						
35.	Ph.D (Tech.) Pharmaceutical Technology	Pharmaceutical Sciences and Technology	1947	2	N.A.	N.A.		
36.	Ph.D (Tech.) Pharmaceutics	Pharmaceutical Sciences and Technology						
37.	Ph.D (Tech.) Pharmacology	Pharmaceutical Sciences and Technology						
38.	Ph.D (Tech.) Pharmacognosy	Pharmaceutical Sciences and Technology						
39.	Ph.D (Tech.) Pharmaceutical Chemistry	Pharmaceutical Sciences and Technology						
40.	Ph.D (Tech.) Civil Engineering	General Engineering						
41.	Ph.D (Tech.) Dyestuff Technology	Dyestuff Technology						
42.	Ph.D (Tech.) Oils, Oleochemicals and Sufactant Technology	Oils, Oleochemicals and Sufactant Technology						
43.	Ph.D (Tech.) Green Technology	Green Technology						
44.	Ph.D (Tech.) Fibres & Textile Processing Technology	Fibres and Textile Processing Technology	-	Variable	N.A.	N.A.		
45.	Ph.D (Tech.) Food Biotechnology	Food Engineering and Technology	2010	2	2009	10		

46.	Ph.D (Tech.) Food Engineering & Technology	Food Engineering and Technology	1943	2	2009	10		
47.	Ph.D (Tech.) Mechanical Engineering	General Engineering						
48.	Ph.D (Tech.) Electrical Engineering	General Engineering						
49.	Ph.D (Tech.) Electrical Engineering	General Engineering						
50.	Ph.D. (Tech.) in Electronic Engineering	General Engineering						
51.	Ph.D. (Tech.) in Perfumery & Flavour Technology	Dyestuff Technology	-	Variable	N.A.	N.A.		
52.	Ph.D. (Sci.) in Mathematics	Mathematics						
53.	Ph.D (Sci.) Textile Chemistry	Fibres and Textile Processing Technology						
54.	Ph.D (Sci.) Biotechnology							
55.	Ph.D (Sci.) Physics	Physics						
56.	Ph.D (Sci.) Food Science	Food Engineering and Technology						
57.	Ph.D (Sci.) Chemistry	Chemistry	1971	2	N.A.	N.A.		
58.	Ph.D (Sci.) Biochemistry	Chemistry						

Table: A.8.1

**** Write applicable one:***

- Applying first time
- Granted provisional accreditation for two/three years for the period (specify period)
- Granted accreditation for 5/6 years for the period (specify period)
- Not accredited (specify visit dates, year)
- Withdrawn (specify visit dates, year)
- Not eligible for accreditation
- Eligible but not applied

Note: 1. Add rows as needed. 2. Separate tables for UG and PG Programs to be prepared.

9. Programs to be considered for Accreditation vide this application

S. No.	Program Name	Current Year Sanctioned Intake	Current Year Admission (in Nos.)
1.	Master of Technology in Bioprocess Technology	30	21
2.	Master of Technology in Food Engineering and Technology	18	18
3.	Master of Technology in Oils, Oleochemicals and surfactants Technology	18	18
4.	Master of Technology in Pharmaceutical Sciences and Technology	18	17
5.	Master of Engineering in Plastic Engineering	18	8

10. Contact Information of the Head of the Institution and NBA coordinator, if designated:

i. Name: Prof. A. B. Pandit
Designation: Vice-Chancellor
Mobile No: 9820408037
Email id: vc@ictmumbai.edu.in

ii. NBA coordinator
Name: Professor S S Bhagwat
Designation: Dean, IQAC
Mobile No: 9322303480
Email id: ss.bhagwat@ictmumbai.edu.in

iii. NBA co-coordinator
Name: Dr. C S Mathpati
Designation: Nodal Officer
Mobile No: 9322602298
Email id: cs.mathpati@ictmumbai.edu.in

Part B: Departmental Information

Department of Food Engineering and Technology

1. State the Vision and Mission of the Department

Vision of Department

To establish a center of excellence to provide demand driven, value based and quality technical education to make India a developed country through socio-economic transformation.

Mission of Department

1. To improve food especially Indian traditional food in terms of nutrition, safety and functionality employing fundamental and applied sciences.
2. To produce trained personnel of highest standards for the benefit of the industry and society in the field of Food Engineering & Technology and Food Biotechnology.
3. To provide leadership qualities in areas of education, research, innovations and solutions in food and biotech sciences, technology and engineering in order to direct overall activity towards economic growth of India.

2. Justification of consistency of the Department Vision and Mission with the Institute Vision and Mission

Vision of the Institution:

We shall perennially strive to be a vibrant institute with continuously evolving curricula to brighten the future of the chemical, biological, materials and energy industries of the nation, and rank amongst the very best in the world through active participation and scholarship of our faculty, students and alumni. We shall be creators of sprouting knowledge and design cutting-edge technologies that will have the greatest impact on society and benefit mankind at large.

Mission of the Institution:

We shall generate and sustain an atmosphere conducive to germinating new knowledge at every available opportunity. The education we shall impart will enable our students to devise new solutions to meet the needs of all segments of society with regard to material and energy, while protecting the environment and conserving the natural resources. Our endeavours, while extending well beyond the confines of the classroom, will aim to enhance public welfare and our attempts to disseminate knowledge will spread to a greater multi- and cross-disciplinary platform to conduct research, discovery, technology development, service to industry and entrepreneurship, in consonance with India's aspirations to be a welfare state. We will team scientists and engineers with professionals in other disciplines to arrive at better solutions. We will provide all our students with a strong foundation to encourage them to be our ambassadors in the professional activities that they choose to undertake in service of society at national and international levels. Through our vision, we will serve the profession and society and strive to reach the summit as a team, and ultimately serve as role models to the younger generation.

The consistency between Department Vision and Mission with the Institute Vision and Mission has been justified in Fig. B1. The three missions of the department are well connected to specific components of mission components for the institute as shown below.

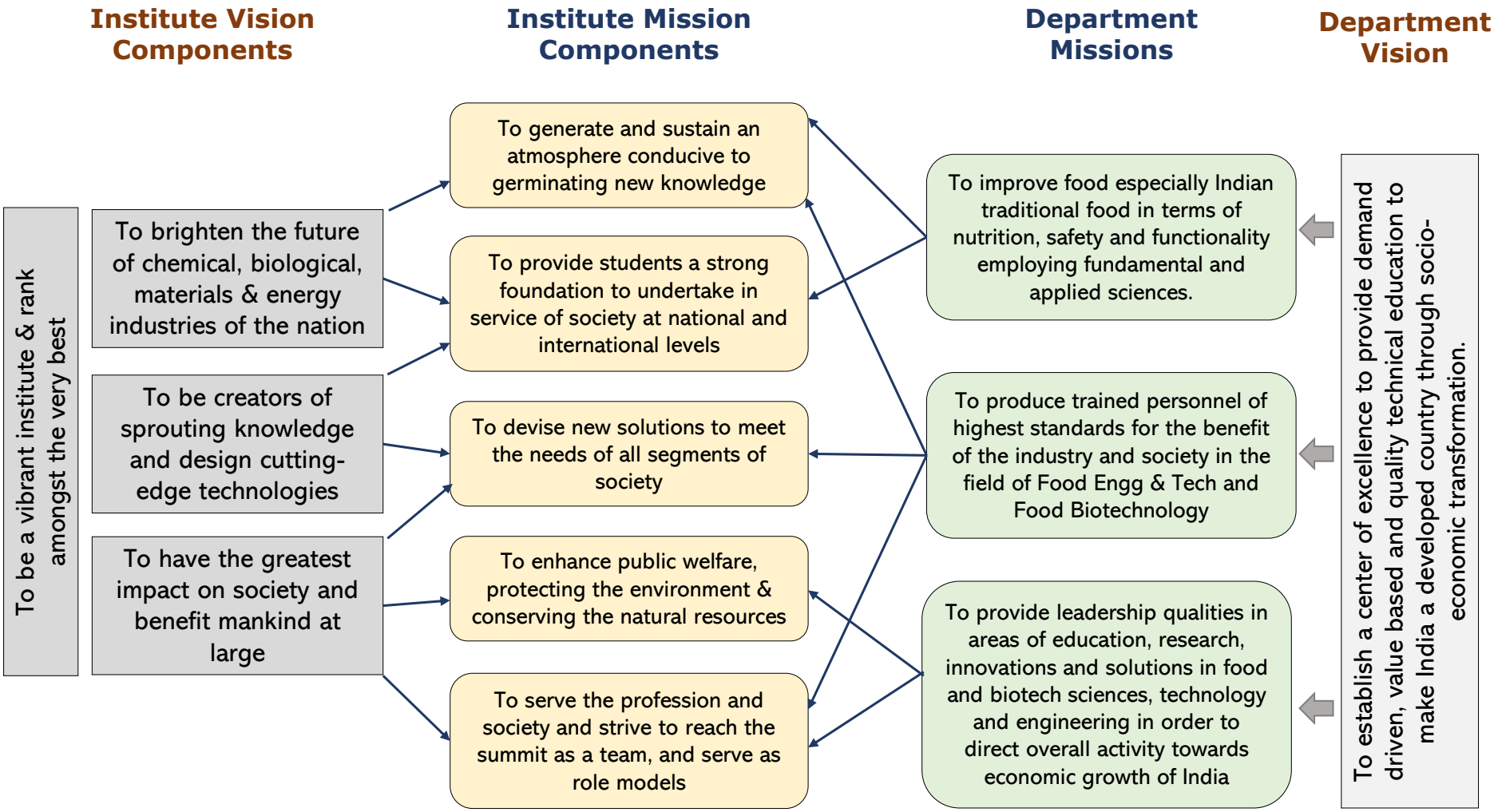


Fig. B1: The justification of the consistency between Department Vision and Mission with the Institute Vision and Mission

3. Details of all UG & PG Programs offered by the department

S. No.	Program Name	Corresponding UG Program Name	Current Year Sanctioned Intake	Current year Admission (in Nos.)
1	Bachelor of Technology in Food Engineering and Technology		16	18
2	Master of Technology in Food Engineering and Technology	Bachelor of Technology in Food Engineering and Technology	18	18
3	Master of Technology in Food Biotechnology		10	10

4. State the Program Educational Objectives (PEOs) for the PG program(s) under consideration for accreditation.

Program under Consideration

Master of Technology in Food Engineering and Technology

Program Educational Objectives (PEOs)

1. **Successful Career:** Post-graduates from the programme will have successful technical or professional careers in food industry
2. **Higher Study:** Post-graduates from the programme will continue to do research related to food engineering and technology in top institutes across the world
3. **Lifelong Learning:** Post-graduates from the programme will continue to learn and adopt in a world of constantly evolving technology in the domain of food engineering and technology

Consistency with PEOs with Department Mission

	PEO1: Successful Career	PEO2: Higher Study	PEO3: Lifelong Learning
M1: To improve food especially Indian traditional food in terms of nutrition, safety and functionality employing fundamental and applied sciences.	**2**	**2**	**3**
M2: To produce trained personnel of highest standards for the benefit of the industry and society in the field of Food Engineering & Technology and Food Biotechnology.	**3**	**2**	**3**
M3: To provide leadership qualities in areas of education, research, innovations and solutions in food and biotech sciences, technology and engineering in order to direct overall activity towards economic growth of India.	**3**	**3**	**2**

3, 2, 1 refers strong, medium and weak correlations, respectively

Program Outcomes (POs)

No.	PROGRAM OUTCOMES (POS)	Level
1	An ability to independently carry out research or investigation and development work to solve practical problems	K5
2	An ability to write and present a substantial technical report or document	K6
3	An ability to demonstrate a degree of mastery over the area of food engineering and technology	K5
4	An ability to use and evaluate modern techniques or tools applied in food processing, analysis and packaging	K5
5	An ability to provide solution to the issues related to nutrition, food safety and regulatory affairs	K4

K1, remembering; K2, understanding; K3, applying; K4, analyzing; K5, evaluating; K6, creating.

Consistency with PEOs with Program Outcomes (POs)

POs	Program Outcome Statement	PEO1: Successful Career	PEO2: Higher Study	PEO3: Lifelong Learning
PO1	An ability to independently carry out research or investigation and development work to solve practical problems	**2**	**3**	**2**
PO2	An ability to write and present a substantial technical report or document	**2**	**3**	**2**
PO3	An ability to demonstrate a degree of mastery over the area of food engineering and technology	**3**	**2**	**3**
PO4	An ability to use and evaluate modern techniques or tools applied in food processing, analysis and packaging	**3**	**3**	**2**
PO5	An ability to provide solution to the issues related to nutrition, food safety and regulatory affairs	**3**	**2**	**3**

3, 2, 1 refers strong, medium and weak correlations, respectively

CRITERION 1	Program Curriculum and Teaching – Learning Processes	125

1.1 Program Curriculum (35)

1.1.1 State the process for designing the program curriculum (10)

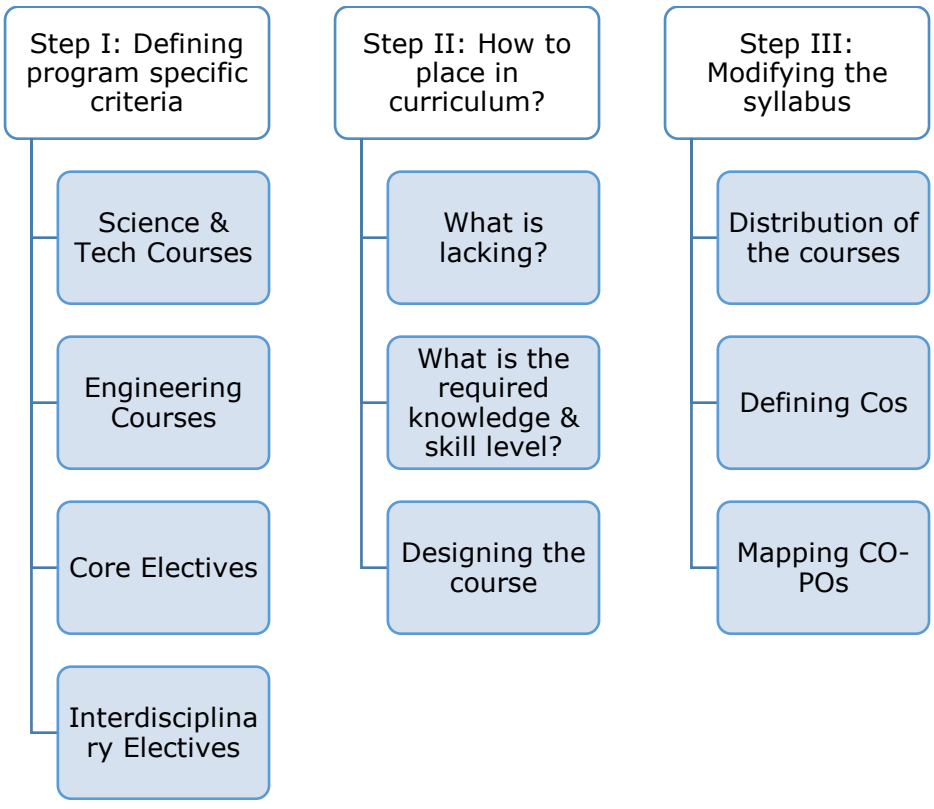
The curriculum for M. Tech. in Food Engineering and Technology is developed by taking into consideration:

I. The needs of the learner while they are in master's degree in this field.
II. The content in terms of M.Tech. in Food Engineering and Technology
III. Instructional methodology for learning master level courses

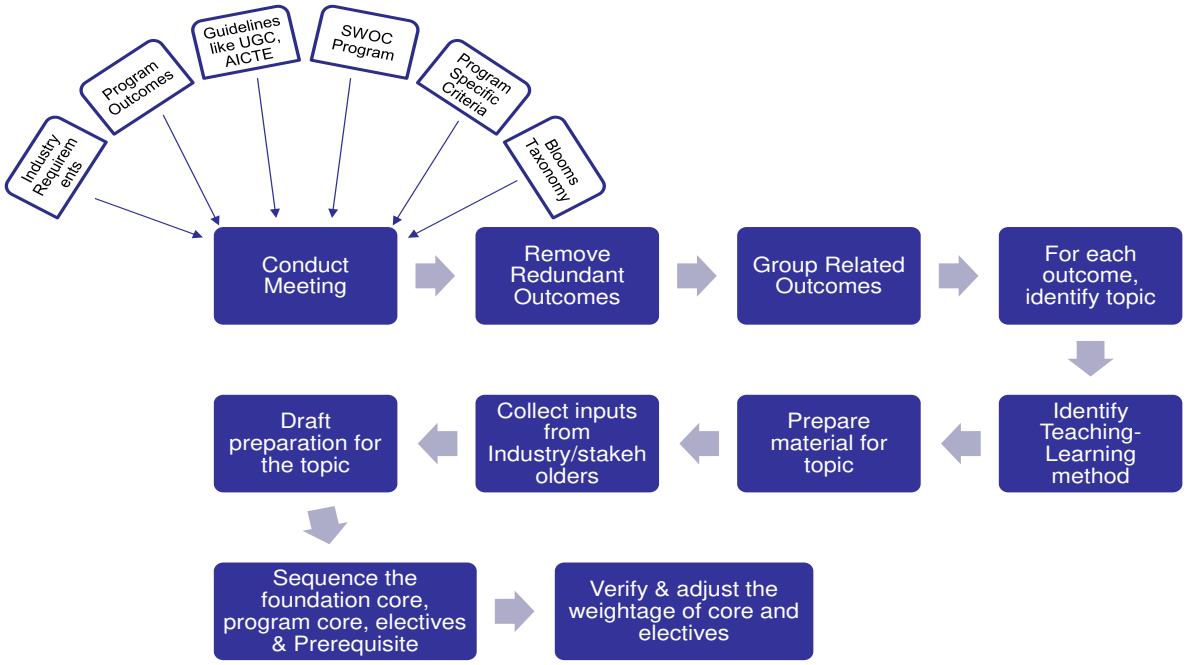
The criteria for defining curriculum are:

1. Should satisfy Program Specific Criteria
2. Basic knowledge in science, mathematics and computing
3. Basic and core knowledge in Food Engg &Tech domain areas to level of design experience
4. In depth and broad knowledge in Food Engg &Tech
5. Balance between theory, practical and tutorial
6. Total credits, distribution of credit for different components and domains
7. Literature study, Seminar, internship, projects and presentation
8. Should meet the requirements of Program Outcomes (POs)

The steps for developing curriculum is given below:



Decision Making Loop



Programme Curriculum is revised on the basis of:

- Changing needs related to developments in the field.
- Improvements based on feedback from students, alumni.
- Feedback from industry based on their requirements.
- SWOC analysis from faculty members, experts from Industry and Experts from other institutes/universities.

The SWOC analysis are periodically reviewed in PGPC and faculty common room meetings.

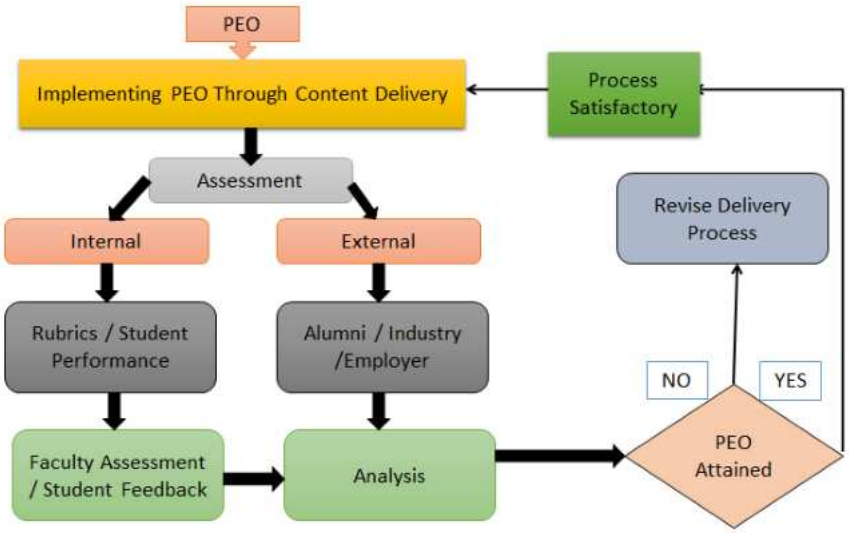
The evolution of program curriculum is the formation of the departmental syllabus committee.

Based on the discussion, the needs and curriculum is revised. The minor changes are incorporated immediately. Major changes are put in Board of Management Meeting and incorporated after the approval.

The syllabus of the top US, European as well as Indian schools is also analyzed in particular to check the distribution of the different courses.

Visiting Faculty members and speakers from various Institutions bring in new ideas and thinking which are positively absorbed in the curriculum. Such modifications are communicated to the Stake-holders

Inputs from the faculty of the Department to revamp the syllabus	Suggests the norms for evaluation especially for the continuous assessment.



Following the above decision-making loop, appropriate changes are incorporated.

- Course improvements are made every five years.
- Based on lacunae in the previous course the course structure is revised.
- New subject modules are introduced to ensuring the syllabus is state of art.
- Laboratory courses are designed based on current happenings in the field.
- Suggestions from existing students, different course teachers, passed-out students and industry people are taken.

1.1.2. Structure of Curriculum

Master of Technology in Food Engineering and Technology

Semester I

Component	Course code	Course title	Total number of contact hours				Credits
			Lecture (L)	Tutorial (T)	Practical (P)	Total h/wk	
Core I	FDT 2001	Advances in Food Technology	2	1	N.A.	3	3
Core II	FDT 2005	Carbohydrate Chemistry & Technology	2	1	N.A.	3	3
Core III	FDT 2008	Comprehensive Techniques in Food Analysis	2	1	N.A.	3	3
Program Elective I	FDT 2023	Food Packaging Science and Technology	2	1	N.A.	3	3
Open Elective I	FDT 2021	Food Standards and Safety Regulations	2	1	N.A.	3	3
Practical	FDP 2014	Food Analysis Lab	N.A.	N.A.	6	6	3
Seminar	FDP 2016	Seminar and Critical Review of Research Paper	N.A.	N.A.	6	6	3
Project	FDP 2017	Research I	N.A.	N.A.	12	12	6

Seminars, project works may be considered as practical. 'N.A.' stands for not applicable.

Semester II

Component	Course code	Course title	Total number of contact hours				Credits
			Lecture (L)	Tutorial (T)	Practical (P)	Total h/wk	
Core I	FDT 2004	Advances in Food Engineering	2	1	N.A.	3	3
Core II	FDT 2002	Food Safety & Toxicology	2	1	N.A.	3	3
Core III	FDT 2003	Advances in Nutrition	2	1	N.A.	3	3
Program Elective I	FDT 2013	Experimental Design and Optimization in Food Processing	2	1	N.A.	3	3
Open Elective I	FDT 2058	Bioprocess Engineering and Technology	2	1	N.A.	3	3
Practical	FDP 2015	Food Process Engineering Lab	N.A.	N.A.	6	6	3
Project	FDP 2018	Research II	N.A.	N.A.	12	12	9

Semester III

Component	Course code	Course title	Total number of contact hours				Credits
			Lecture (L)	Tutorial (T)	Practical (P)	Total hours	
Training	FDP 2019	Industrial training	N.A.	N.A.	40 hr (15 weeks)	40 hr (15 weeks)	30

Semester IV

Component	Course code	Course title	Total number of contact hours				Credits
			Lecture (L)	Tutorial (T)	Practical (P)	Total hours	
Project	FDP 2020	Research, Thesis and Open Defense	N.A.	N.A.	40 hr (15 weeks)	40 hr (15 weeks)	30

List of Other Electives

Component	Course code	Course title	Total number of contact hours				Credits
			Lecture (L)	Tutorial (T)	Practical (P)	Total h/wk	
Program Elective	FDT 2025	Food Process and Equipment Design	2	1	N.A.	3	3
	FDT 2027	Supply Chain Management in Food Industry	2	1	N.A.	3	3
	FDT 2077	Enzymes in Food and Feed Industry	2	1	N.A.	3	3
Open Elective	FDT 2022	Advances in Commodity Technology	2	1	N.A.	3	3
	FDT 2026	Separation Techniques in Food Industry	2	1	N.A.	3	3

1.1.3. State the components of curriculum (10)

Program curriculum grouping based on course components

Course component	Total number of credits	Total number of contact hours	Curriculum content (% of total number of credits of the program)
Program core (×6)	18	18 hr/ week = 385 hr	15.8%
Program electives (×2)	6	18 hr/ week = 385 hr	5.3%
Open electives (×2)	6	18 hr/ week = 385 hr	5.3%
Practical (×2)	6	12 hr	5.3%
Seminar	3	6 hr	2.6%
Internship	30	40 hr	26.3%
Major project	45	12 + 12 + 40 = 64	39.5%
Total	114	1,277 hr	

1.1.4 Overall quality and level of program curriculum (10)

Benchmark considered for developing the curriculum is discussed is summarized below.

Course component	**Curriculum content (% of total number of credits of the program)**			
Institute	**ICT Mumbai**	**IIT Kharagpur**	**NIT Rourkela**	**ETH Zurich**
Stream	**Food Engg & Tech**	**Food Process Engg**	**Food Process Engg**	**Food Processing**
Program core	15.8	17.0	17.0	28.8
Program electives	5.3	17.0	10.2	9.6
Open electives	5.3	7.4	6.8	9.6
Practical	5.3	8.5	9.0	9.6
Seminar	2.6	7.4	6.8	-
Internship	26.3	-	4.5	-
Optional	-	-	-	13.4
Major project	39.5	42.5	45.4	28.8
Total credit	114	94	88	104

Assessment is based on improvement in terms of ranks/score in GATE examination

Gate Score	2018-19	2017-18	2016-17
Highest Score	733	704	624
Minimum Score	230	306	195

The placement scenario of the students from this program is 90-100% in any academic year.

1.2 Teaching learning Process

1.2.1 Quality of end semester examination, internal semester question papers, assignments and evaluation (20)

The weightages of different modes of assessments are:

	In-Semester		End-Semester-Exam	Components of continuous mode
	Continuous mode	Mid Semester - Exam		
Theory	20%	30%	50%	Quizzes, class tests (open or closed book), home assignments, group assignments, *viva-voce* assignments, discussions
Practical	50%	-	50%	Attendance, *viva -voce*, journal, assignments, project, experiments, tests
Seminar/ Research			100%	Continuous evaluation not applicable, End semester evaluation will be based on written report evaluation and presentation in front of the external examiner within the Department

Continuous Evaluation

-The continuous evaluation is conducted at least two times for each subject, typically for 10 marks for a 50-mark subject (3-credits).

-The types of continuous evaluation include Quizzes, class tests, home assignments, group assignments

-The continuous evaluation encompasses each of course outcomes for the subject.

One of the examples of continuous evaluation covering the Course Outcomes are presented in ***Annexure 1.2.1 – Continuous Evaluation.***

Mid Semester Examination

-The Mid semester is one theory examination conducted once for each subject, typically for 15 marks for a 50-mark subject (3-credits).

-The Mid semester question paper encompasses each of course outcomes for the subject.

End Semester Examination

-The End semester is one theory examination conducted once for each subject, typically for 25 marks for a 50-mark subject (3-credits).

-The End semester question paper encompasses each of course outcomes for the subject.

1.2.2. Quality of student projects (30)

-All the student projects are relevant to the needs of the food engineering and technology.

-A student project is evaluated from Semester I, II and IV.

-Research I include the Literature Survey, Planning and Preliminary Trials
-Research II include the Experimental Part with proper design and Data Analysis
-Research IV is Thesis Submission and Viva Voce
-A typical thesis consists of five chapters viz. Introduction, Literature Review, Materials & Methods, Results and Discussion, Summary and Conclusion.
-The Thesis is evaluated by External Examiner and the students defend their thesis in front of large gathering.
-The thesis is evaluated of 500 marks and the **Rubrics** for evaluation is given below.

Details	**Max. Marks**	**Internal Examiner**	**External Examiner**
Understanding of Research Area	70		
Problem formulation/Experimental design/Mathematical Modelling	70		
Quality of Work done	70		
Analysis and Interpretation of Results	70		
Quality of Thesis Submitted	70		
Quality of Presentation	70		
Answer to Question raised during Open Defence	80		
Total	**500**		

Recommendation
The MTech thesis submitted by candidate is:
- Acceptable, may be regarded as final in present form.
- Acceptable, but with minor revisions.

FDP 2020: Research III – Thesis Submission and Open Defense

Course Outcomes (students will be able to…)

1. Perform experiments systematically to accomplish the set objectives (K3)
2. Evaluate critically the experimental data and draw meaningful inferences (K5)
3. Develop skills to defend own research effectively (K6)
4. Develop skills for writing scientific documents (K6)

CO-PO Mapping

		PO1	**PO2**	**PO3**	**PO4**	**PO5**
		K5	K6	K5	K5	K4
CO1	K3	2	2	2	2	3
CO2	K5	3	3	3	3	3
CO3	K6	3	3	3	3	3
CO4	K6	3	3	3	3	3
Course	**K6**	**3**	**3**	**3**	**3**	**3**

3, 2, 1 represent strong, moderate and weak correlation; '-' refers to no correlation.

Quality
-The student projects are conducted in a planned and methodological manner.
-Their objectives are well defined and appropriate technical terms have been indicated in the projects. The projects are clearly designed to set a plan for the experiments to be conducted. Good quality literature survey has been done and cited. The projects are well presented along with valid justification of the results obtained. One of the examples of synopsis of the MTech thesis is presented in **Annexure 1.2.2 – Sample Synopsis**.

1.2.3. Initiatives related to industry interaction including industry internship/summer training (10)

A. Industry supported laboratories

-Prof. DV Rege Laboratory is sponsored by HIMEDIA Lab., India
-Food Analysis lab has been renovated by Goodwill Industries Ltd., India
-PTC Research Lab renovated by Goodwill Industries Ltd., India
-Smart Classroom is sponsored by Fine Organics Ltd., India

B. Industry involvement in the program design and Curriculum

-The program curriculum has been designed considering the feedback from industry personal such as
a) Dr. V. Ramni
b) Dr. Sudhir Tamne
c) Dr. SV Bhalkar

C. Industry involvement in partial delivery of any regular courses for students

-In each academic year of MTech Food Engineering and Technology, 6 visiting faculties from industry take the courses.

AY 2016-17

Sr No	Name of Visiting faculty	Subject	Hour/wk
1	Dr Rashmi Kolhe	FDT2021: Food Standards, Safety & Regulations	3
2	Dr. Jyoti Baliga	FDT 2005: Food Packaging	1
3	Dr JR Bandekar	FDT 2002: Food Safety & Toxicology	1
4	Dr Veena Yardi	FDT 2003: Advances in Nutrition	1
5	Dr. Parag Saudagar	FDT 2077: Enzymes in Food Industry	2
6	Dr. Rashmi Dhake	Intellectual Property Rights	3

AY 2017-18

Sr No	Name of Visiting faculty	Subject	Hour/wk
1	Dr. Subha Nishtala	FDT2021: Food Standards, Safety & Regulations	3
2	Dr. Jyoti Baliga	FDT2023: Food Packaging Science & Technology	1
3	Dr JR Bandekar	FDT 2002: Food Safety & Toxicology	1
4	Dr Veena Yardi	FDT 2003: Advances in Nutrition	1
5	Dr. Shantanu Samant	FDT2005: Carbohydrate Chemistry & Technology	2
6	Dr. Rohit Upadhay	FDT2001: Advances in Food Technology	2
7	Dr. Lambert Rodrigues	FDT2055: Biotechnology of Fermented Foods	1

AY 2018-19

Sr No	Name of Visiting faculty	Subject	Hour/wk
1	Dr. Subha Nishtala	FDT2021: Food Standards, Safety & Regulations	3
2	Dr. Jyoti Baliga	FDT2023: Food Packaging Science & Technology	1
3	Dr. Shantanu Samant	FDT2005: Carbohydrate Chemistry & Technology	1
4	Dr. Veena Yardi	FDT2003: Advances in Nutrition	1
5	Dr. Sagar Gokhale	FDT2002: Advances in Food Engineering	1

D. Industrial training/tours for students

Industry Visit or tours are conducted for students each year for MTech students. The examples include:

- Nestle, Bicholim, Goa
- Dr. Kurade's Button Mushroom Plant, Goa
- United Breweries, Ponda, Goa
- MAPRO, Mahabaleshwar
- Trilok Food Industry, SATARA

E. Industrial training of 4-6 months and post training Assessment

2016-2017 Batch

S. No.	Name of the student	Internship Industry
1	Abhisheka Pandian T	SNP Dairy Pvt Ltd
2	Kakoli Pegu	General Mills Pvt. Ltd
3	Kishori Panmand	Paradigm Services Pvt Ltd
4	Rishab Dhar	Innovertus Nutrition Technologies Pvt Ltd
5	Kapil Rai	Tata Chemicals Ltd
6	Niveditha N V	Diageo India Pvt Ltd
7	Shubham Goyal	NA
8	Krutika Bhangale	Mondelez
9	Sneha Awasti	Mondelez
10	Harshal	Mondelez

2017-18 Batch

Sr No.	Name of the student	Internship Industry
1	Omkar Soma Sawant	Chitale Bandhu Mithaiwale
2	Sujay Ayachit	VKL Seasoning Pvt Ltd
3	Admajith M Kaimal	Omniactive Health Technologies
4	Naveen Kumar	Mapro Foods Pvt Ltd
5	Megha Dhingra	Marico Pvt Ltd
6	Sagar Mahale	Chitale Bandhu Mithaiwale
7	Prateek Kataria	Tastybite Eatables Pvt Ltd
8	Oindrila Ghosh	Tetrapak Pvt Ltd
9	Aditi Rungta	Sensient India Pvt Ltd
10	Madan Dhulgande	Tastybite Eatables Pvt Ltd

2018-19 Batch

Sr. No.	Name of the student	Internship Industry
1	G. Vigneshwaran	Equinox Labs
2	Muhammad Salman Chukkan	Mondelez
3	Nachal N	ITC Limited
4	Datla Nishitha	Mondelez

5	Sukitha A	Godesi Mandi Pvt Ltd
6	Bharati Bhagat	Mondelez
7	Kavya sood	Mondelez
8	Nissy Mary Prasad	Jus Amazing Foods and Beverages Pvt Ltd
9	Johnsy K J	Innovertus Nutrition Technologies Pvt Ltd
10	Anjali Barlea	Innovertus Nutrition Technologies Pvt Ltd
11	Mohit Kumar	Mondelez
12	Rupali Purushottam Katekhaye	C P Kelco India Pvt Ltd
13	Annapoorna R P	Bauli India Pvt Ltd
14	Taniya Jha	ITC Ltd
15	Shubham Mishra	Wrigley India Pvt Ltd
16	Ashutosh Rai	Fizzy Foodlabs Pvt Ltd
17	Akash Kshirsagar	Equinox Labs
18	Nishank Waghmare	Vista Processed Foods Ltd

F. Impact analysis of industrial training

-The industrial training is being evaluated for 30 credits (450 Marks) in Semester III of MTech in Food Engineering and Technology. The rubrics is given below.

Criteria	**Details**	**Max. Marks**
Attendance	- Attendance certificate duly signed - Regularity and Punctuality - Attentiveness and responsiveness - Communication, networking, personal grooming and professional conduct	50
Work done (based on presentation)	- Work done in various domains such as production, QA, inventory management, waste management etc	50
	- Work done in R and D, process or product or package improvement or development	50
	- Marketing - Regulatory aspects and labelling - Understanding of business and finance	50
	- Overall Involvement and initiative taken - Analytical methods performed, instruments/ equipment used - Innovation/ contribution to Industry	50
Learning (based on presentation)	- Based on questions asked# and answers given during presentation	50
Presentation	- Quality of slides (format, aesthetics) - Technical content and correctness of slides - Oral delivery - Time management	50
Report	- Representation of all given assessment criteria of IPT (as specified above) - Correctness of the document (spelling, grammar, punctuations, format etc)	50
	- Technical content of report - Overall learning through IPT inferred and recommendations/ suggestions given in the conclusion	50

1.2.4. Participation of Industry professionals in curriculum development, as examiners, in major projects (10)

Following are the list of Examiners for the MTech Final Year Students

Graduating Year : 2017

No	Name	Guide Name	Referee Name	Referee from Academician/ Industry
1	Vrushti Shah	Dr. L. Ananthanarayan	Dr. Ashlesha Paschure	Industry
2	Aroshi Sharma	Prof. U.S. Annapure	Dr. A. K. Sahoo	Industry
3	Bulbul Rajinder Vij	Prof. U.S. Annapure	Dr. N. N. Misra	Industry
4	Ashwani Jawahar Kumar	Prof. R.S. Singhal	Dr. Shantanu Samant	Industry
5	Vardan Singh	Prof. S.S. Lele	Dr. Pratima N. Shastri	Academician
6	Niharika Abhay Soni	Prof. R.S. Singhal	Dr. Shantanu Samant	Industry
7	Swarnali Tarunkumar Das	Dr. L. Ananthanarayan	Dr. Jyoti Baliga	Academician
8	Divya Mahalingaiah M.	Dr. S.S. Arya	Dr. Roji Waghmare	Academician
9	Cheryl Allen Fernandes	Dr. S.S. Arya	Mr. Prakash S. Jagtap	Industry

Graduating Year : 2018

No	Name	Guide Name	Referee Name	Referee from Academician/ Industry
1	Abisheka Pandian	Snehasis Chakraborty	Dr. Abhishek Gupta	Industry
2	Harshal	Smita Satish Lele	Dr. Ashlesha Parchure	Industry
3	Kakoli Pegu	Shalini S. Arya	Dr. Roji Waghmare	Academician
4	Kapil Rai	Rekha S. Singhal	Dr. Hormaz Patva	Industry
5	Kishori Balu Panmand	L. Ananthanarayan	Dr. Ashlesha Paschure	Industry
6	Krutika Anil Bhangale	Uday S. Annapure	Dr. A. K. Sahoo	Industry
7	Niveditha N.V.	Uday S. Annapure	Dr. Sudhir Tamne	Industry
8	Rishab Dhar	Snehasis Chakraborty	Dr. Sumit Gupta	Academician
9	Shubham Goyal	Shalini S. Arya	Dr. Roji Waghmare	Academician
10	Sneha Awasthi	Rekha S. Singhal	Dr. Ashlesha Paschure	Industry

1.2.5. Quality of laboratory work given (20)

The experiments to be conducted in the laboratory have been well defined and the lab manuals have been provided to the students. The students are grouped in pairs to conduct the experiment which allows them to learn independently. The results are discussed in class.

FDP 2015 Food Process Engineering lab

No.	Syllabus	Equipment	Stu/grp
1	Milling, Particle size reduction and sieve analysis of cereal and wheat flour	Sieve, miller, dehusker	2
2	Homogenization, Rheological Study and mixing index in a food mixture	Homogenizer, Rheometer	2
3	Kinetics in thermal process design: Retort processing & pasteurization of liquid food	Autoclave, water bath, spectrophotometer	2
4	Effect of process and product parameters on baking of bread & biscuit	Baking oven, dough mixer, kneader and sheeter, texture analyzer, colorimeter	2

5	Effect of Process and product parameters on quality of fruit products	Cutter, shredder, spectrophotometer, texture analyzer, colorimeter, pH meter, refractometer, water activity meter, moisture analyzer	2
6	Effect of Process and product parameters on quality of dairy products	lactometer, butyrometer, pH meter, refractometer, water activity meter	2
7	Effect of material and air properties on tray & spray drying of food materials	tray drier, spray drier	2
8	Non-thermal processing of food	ultrasound, pulse light, Autoclave, water bath, spectrophotometer	2
9	Study of extraction of oleoresins from spices using liquid carbon dioxide	super critical fluid extraction, spectrophotometer	2

FDP 2016 Food Analysis Lab

No.	Syllabus	Equipment required	Stu/grp
1	Proximate composition in food	muffle furnace, kjeldahl, soxhelt, oven	2
2	Analysis of milk and dairy products & Detection of adulterants in milk (liquid)	lactometer, butyrometer	2
3	Analysis of wheat flour; Determination of damaged starch from whole wheat flour	Baking oven, dough knider and sheeter, texture analyzer	2
4	Analysis of tea and coffee	muffle furnace, kjeldahl, soxhelt, oven	2
5	Estimation of phenolics, antioxidant activity, chlorophyll and carotenoids	spectrophotometer	2
6	Analysis of Food adulteration with respect to specific foods dairy, cereal, muscles food etc.	spectrophotometer, colorimeter	2
7	Microbial and Enzyme assay	laminar air flow, spectrophotometer	2
8	Discriminative and Descriptive Sensory analysis of Foods		2
9	Demo of colorimeter, texture analyzer, DSC, HPLC, GC-MS etc.	colorimeter, texture analyzer, DSC, HPLC, GC-MS	2

Specific Features of Lab Experiments

-Each practical is performed in a group of two students with at least 9 different types of samples (formulations or treatment conditions)
-The data analysis is performed together (all data together for optimization purpose
-The students submit lab notebook (journal) for each experiment.
-For each experiments the students write: Background/ Relevance, Experimental design, Observations, Results, and Inference.
-One Sample instruction Sheet for a Lab experiment has been shown in ***Annexure 1.2.5 – Lab Instruction Sheet (Sample)*.**

CRITERION 2	Program Outcomes	75

2.1. Establish the connect between the courses and the POs

No.	PROGRAM OUTCOMES (POS)	Level
1	An ability to independently carry out research or investigation and development work to solve practical problems	K5
2	An ability to write and present a substantial technical report or document	K6
3	An ability to demonstrate a degree of mastery over the area of food engineering and technology	K5
4	An ability to use and evaluate modern techniques or tools applied in food processing, analysis and packaging	K5
5	An ability to provide solution to the issues related to nutrition, food safety and regulatory affairs	K4

K1, remembering; K2, understanding; K3, applying; K4, analyzing; K5, evaluating; K6, creating.

Code	Course	Strongly Connected to				
		PO1	PO2	PO3	PO4	PO5
FDT 2001	Advances in Food Technology			√	√	
FDT 2002	Food Safety & Toxicology			√		
FDT 2003	Advances in Nutrition			√		√
FDT 2004	Advances in Food Engineering			√	√	
FDT 2005	Carbohydrate Chemistry & Technology			√		
FDT 2008	Comprehensive Techniques in Food Analysis			√	√	
FDP 2014	Food Analysis Lab	√			√	
FDP 2015	Food Process Engineering Lab	√			√	
FDP 2016	Seminar & Critical Review of Research Paper	√	√			
FDP 2017	Research I	√	√			
FDP 2018	Research II	√	√			
FDP 2019	Industrial Training	√	√			
FDP 2020	Research, Thesis and Open Defense	√	√			
FDT 2021	Food Standards and Safety Regulations			√		√
FDT 2055	Biotechnology of Fermented Foods			√		√
FDT 2023	Food Packaging Science and Technology			√		√
FDT 2058	Bioprocess Engineering and Technology	√		√		
FDT 2025	Food Process and Equipment Design	√		√		
FDT 2026	Experimental Design and Optimization in Food Processing	√		√		
FDT 2027	Supply Chain Management in Food Industry	√		√		
FDT 2077	Enzymes in Food and Feed Industry			√	√	

Correlation between COs and POs

SEMESTER I

FDT 2001: Advances in Food Technology

Student will be able to ….

1. Analyse different design aspects of thermal processing applied to food (K4).
2. Demonstrate and apply the concepts of non-thermal food processing methods (K3).
3. Solve issues related to membrane, packaging and hurdle technology in food processing (K3).
4. Develop and analyse the efficacies of high-pressure processing to food applications (K4)
5. Infer about recent developments in advanced thermal and non-thermal techniques of food processing (K4)

FDT 2005: Carbohydrate Chemistry & Technology

Student will be able to ….

1. Classify different types of carbohydrate and highlight their chemistry in specific food (K4)
2. Demonstrate the different composition and functions of carbohydrates specific to food products (K3)
3. Highlight the function and mechanism of carbohydrate-based polymers for food stabilization (K4)
4. Interpret the chemistry & mechanism of different chemical changes within the food involving carbohydrate components (K4)
5. Apply and develop the carbohydrate-based formulations for different food applications (K3)

FDT 2008: Comprehensive Techniques in Food Analysis

Student will be able to ….

1. Demonstrate the basic principles of modern techniques used in food analysis for quality assurance (K3)
2. Infer about labels for food products based on food analysis (K5)
3. Develop analytical techniques for on-line monitoring of food quality during processing and storage (K3)
4. Ensure consumer safety through analysis of food contaminants and adulterants and apply them in the light of regulatory requirements (K5)
5. Discuss about the newer and relevant analytical techniques in food systems (K4)

FDP 2014: Food Analysis Lab

Student will be able to ….

1. Demonstrate the knowledge of redox chemical reactions to develop a protocol for analysing specific food attributes (K4)
2. Interpret different chemical and biochemical analysis specific to food (K4)
3. Compare protocols on different types of chemical and sensory analysis in foods (K5)
4. Apply and infer about the principles of different enzyme and vitamin assays (K4)

FDP 2016: Seminar and Critical Review of Research Paper

Student will be able to ….

1. Develop critical thinking regarding the research paper given (K5)
2. Analyse different literature sources about a certain topic (K4)
3. Comment on others' work in terms of the scientific content, novelty and correctness of published work (K5)
4. Evaluate the research methodologies, data analysis and interpretation (K5)
5. Develop skills for presentation and writing scientific documents (K6)

FDP 2017: Research I

Student will be able to ….

1. Develop critical thinking to identify the research gap for the project (K5)
2. Formulate a scientific question and approach to solve it (K6)
3. Plan the experimental methodology for the project (K5)
4. Develop skills to communicate the research plan effectively (K6)
5. Develop skills for writing scientific documents (K6)

SEMESTER II

FDT 2004: Advances in Food Engineering

Student will be able to ….

1. Perform and analyse simultaneous material and energy balances in food processes (K4)
2. Demonstrate the concept of heat and mass transfer in food processing and its integration to actual process design (K4)
3. Analyse the complexity of fluid flow problems associated with food operations (K4)
4. Design and estimate the performance of food processing equipment (K5)
5. Interpret the properties of materials used for food processing equipment and corrosion control (K5)

FDT 2002: Food Safety and Toxicology

Student will be able to ….

1. Analyze different types of hazards associated with foods and risk assessment for the hazards and safety evaluation systems (K4)
2. Explain the principles of toxicity testing in foods, role of additives in toxicity, and define sources of food allergens (K4)
3. Analyze the action of different toxic compounds of chemical and biological origin (K4)
4. Interpret the mechanisms of action of various microbial toxins in foods (K5)
5. Suggest appropriate detoxification strategies for microbial toxins (K5)

FDT 2003: Advances in Nutrition

Student will be able to ….

1. Highlight the emerging areas of biochemistry of food metabolism and nutrition (K4)
2. Interpret the nutritional needs as a lifecycle approach (K5)
3. Evaluate the impact of processing, storage, interactions and fortification on nutritional quality of food (K5)
4. Analyze the role of diet in disease management and special nutritional needs (K4)
5. Interpret the role of functional aspects of food components and nutrients affecting immune systems (K5)

FDP 2015: Food Process Engineering Lab

Student will be able to ….

1. Estimate the efficacy of different unit operations in developing a process specific to food (K5)
2. Analyse the effect of different process variables on the quality of food product (K4)
3. Analyse the effect of compositional variables on quality of food products (K4)
4. Design and develop the food process and products using the experimental design concept (K6)

FDP 2018: Research II

Student will be able to ….

1. Perform various experiments and troubleshoot the methods to generate reliable data (K5)

2. Apply different statistical tools for scientific data analysis (K4)
3. Evaluate critically the experimental data and draw meaningful inferences (K5)
4. Develop skills to communicate scientific results effectively (K6)
5. Develop skills for writing scientific documents (K6)

FDP 2019: Industrial Training

Student will be able to ….

1. Develop critical thinking regarding the various operations involved in food industry (K5)
2. Develop skills to address and solve certain industrial challenges in food processes (K6)
3. Develop skills for presentation and writing scientific documents (K6)

FDP 2020: Research III

Student will be able to ….

1. Perform experiments systematically to accomplish the set objectives (K3)
2. Evaluate critically the experimental data and draw meaningful inferences (K5)
3. Develop skills to defend own research effectively (K6)
4. Develop skills for writing scientific documents (K6)

Electives

FDT 2021: Food Standards and Safety Regulations

Student will be able to ….

1. Demonstrate the functional role and safety issues of food contaminants, adulteration, additives, packaging & labelling (K3).
2. Evaluate the hygiene and sanitation condition in food processing plant, equipment, storage and handling (K5)
3. Analyse the issues on microbial quality control of food and water in Food Processing Industry (K4)
4. Identify and analyse the critical quality control point for organic and GM food and thereby designing the HACCP system (K4)
5. Interpret the role, standard and law set by Indian and global regulatory authorities with respect to food quality control (K5)

FDT 2023: Food Packaging Science and Technology

Student will be able to ….

1. Highlight about food packaging as a method of food preservation (K4)
2. Interpret the role of different packaging materials and their physico-chemical properties (K5)
3. Establish the concepts of quality evaluation and testing of packaging materials (K4)
4. Asses the criteria for selecting a packaging material for a specific application (K5)
5. Develop the packaging materials suitable for newer processing techniques (K6)

FDT 2058: Bioprocess Engineering and Technology

Student will be able to ….

1) Demonstrate the concept of microbial kinetics in biochemical engineering (K3)
2) Apply the concept of stoichiometry in the modelling of microbial growth (K3)
3) Design and analyse different bioreactor systems and their components (K4)
4) Apply the principles of different upstream and downstream processes involved in bioprocesses (K3)
5) Apply the concept of microbial technologies in food processing and biorefineries as well as production of biologicals (K3)

FDT 2021: Enzymes in the Food Industry

Student will be able to ….

1. Highlight the action and mechanism of microbial enzymes and fermentative production of enzymes followed by isolation and purification (K4)

2. Analyze the role of specific enzymes in the processing of dairy, bakery, brewery, fruit and vegetable products, plantation crops (K4)
3. Analyze the role of specific enzymes in starch industry, confectionary, protein hydrolysis, extraction of oil (K4)
4. Analyze the role of specific enzymes in processing of meat, seafood and poultry products, waste management, animal feed industry (K4)
5. Analyze the role of specific enzymes as biosensors, additives, in packaging, and describe the concept of recombinant enzymes and safety of enzymes (K4)

FDT 2026: Experimental Design and Optimization in Food Processing

Student will be able to ….

1. Analyse different the statistical tests and hypothesis testing methods used in food processes (K4)
2. Apply the concept of experimental design in different food processes (K3)
3. Develop empirical equation using experimental data (K6)
4. Evaluate different types of optimization techniques in food processing (K5)
5. Apply multivariate analysis on a data set (K3)

FDT 2054: Biotechnology of Fermented Foods

Student will be able to ….

1. Highlight the concept of functional foods and different fermented foods (K4)
2. Interpret the role of microorganisms and enzymes involved in various food formulations (K5)
3. Analyse the principles and mechanism of immunological detection of pathogens in foods (K4)
4. Infer about the application of biotechnology in food processing and agricultural practices (K5)
5. Highlight the newer developments in processing technologies for fermented foods (K4)

SEMESTER I							
Subject			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
FDT 2001: Advances in Food Technology			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K3	2	2	2	2	3
	CO3	K3	2	2	2	2	3
	CO4	K4	3	2	3	3	3
	CO5	K4	3	2	3	3	3
	Course	**K4**	**3**	**2**	**3**	**3**	**3**
FDT 2005: Carbohydrate Chemistry & Technology			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K3	2	2	2	2	3
	CO3	K4	3	2	3	3	3
	CO4	K4	3	2	3	3	3
	CO5	K3	2	2	2	2	3
	Course	**K4**	**3**	**2**	**3**	**3**	**3**
FDT 2008: Comprehensive Techniques in Food Analysis			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K3	2	2	2	2	3
	CO2	K5	3	3	3	3	3

	CO3	K3	2	2	2	2	3
	CO4	K5	3	3	3	3	3
	CO5	K4	3	2	3	3	3
	Course	**K5**	**3**	**3**	**3**	**3**	**3**
FDP 2014: Food Analysis Lab			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K4	3	2	3	3	3
	CO3	K5	3	3	3	3	3
	CO4	K4	3	2	3	3	3
	Course	**K5**	**3**	**3**	**3**	**3**	**3**
FDP 2016: Seminar and Critical Review of Research Paper			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K5	3	3	3	3	3
	CO2	K4	3	2	3	3	3
	CO3	K5	3	3	3	3	3
	CO4	K5	3	3	3	3	3
	CO5	K6	3	3	3	3	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
FDP 2017: Research I			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K5	3	3	3	3	3
	CO2	K6	3	3	3	3	3
	CO3	K5	3	3	3	3	3
	CO4	K6	3	3	3	3	3
	CO4	K6	3	3	3	3	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
SEMESTER II							
FDT 2004: Advances in Food Engineering			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K4	3	2	3	3	3
	CO3	K4	3	2	3	3	3
	CO4	K5	3	3	3	3	3
	CO5	K5	3	3	3	3	3
	Course	**K5**	**3**	**3**	**3**	**3**	**3**
FDT 2002: Food Safety and Toxicology			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K4	3	2	3	3	3
	CO3	K4	3	2	3	3	3
	CO4	K5	3	3	3	3	3
	CO5	K5	3	3	3	3	3
	Course	**K5**	**3**	**3**	**3**	**3**	**3**

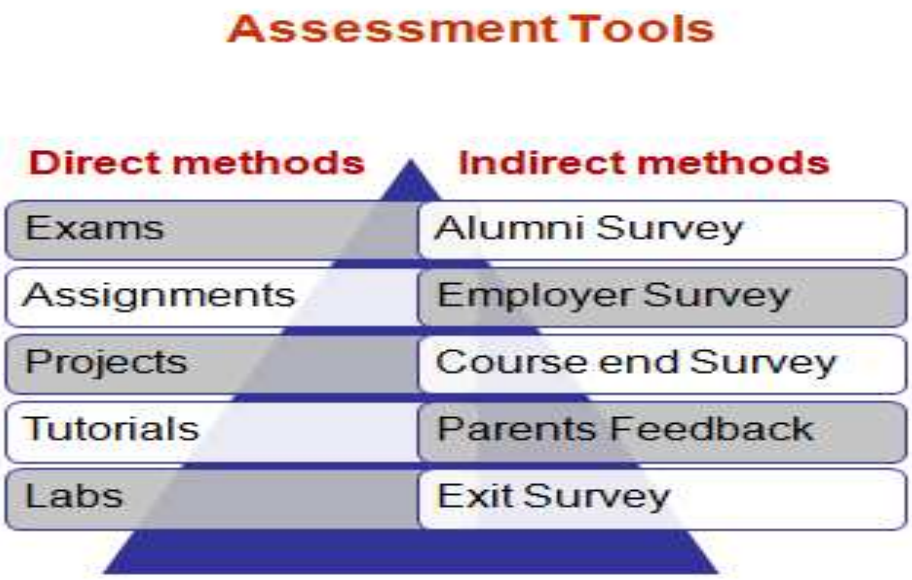
FDT 2003: Advances in Nutrition			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K5	3	3	3	3	3
	CO3	K5	3	3	3	3	3
	CO4	K4	3	2	3	3	3
	CO5	K5	3	3	3	3	3
	Course	**K5**	**3**	**3**	**3**	**3**	**3**
FDP 2015: Food Process Engineering Lab			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K5	3	3	3	3	3
	CO2	K4	3	2	3	3	3
	CO3	K4	3	2	3	3	3
	CO4	K6	3	3	3	3	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
FDP 2018: Research II			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K5	3	3	3	3	3
	CO2	K4	3	2	3	3	3
	CO3	K5	3	3	3	3	3
	CO4	K6	3	3	3	3	3
	CO5	K6	3	3	3	3	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
FDP 2019: Industrial Training			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K5	3	3	3	3	3
	CO2	K6	3	3	3	3	3
	CO3	K6	3	3	3	3	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
FDP 2020: Research III			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K3	2	2	2	2	3
	CO2	K5	3	3	3	3	3
	CO3	K6	3	3	3	3	3
	CO4	K6	3	3	3	3	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
Electives							
FDT 2021: Food Standards and Safety Regulations			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K3	2	2	2	2	3
	CO2	K5	3	3	3	3	3
	CO3	K4	3	2	3	3	3
	CO4	K4	3	2	3	3	3
	CO5	K5	3	3	3	3	3

	Course	**K5**	**3**	**3**	**3**	**3**	**3**
FDT 2023: Food Packaging Science and Technology			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K5	3	3	3	3	3
	CO3	K4	3	2	3	3	3
	CO4	K5	3	3	3	3	3
	CO5	K6	3	3	3	3	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
FDT 2058: Bioprocess Engineering and Technology			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K3	2	2	2	2	3
	CO2	K3	2	2	2	2	3
	CO3	K4	3	2	3	3	3
	CO4	K3	2	2	2	2	3
	CO5	K3	2	2	2	2	3
	Course	**K4**	**3**	**2**	**3**	**3**	**3**
FDT 2021: Enzymes in the Food Industry			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K4	3	2	3	3	3
	CO3	K4	3	2	3	3	3
	CO4	K4	3	2	3	3	3
	CO5	K4	3	2	3	3	3
	Course	**K4**	**3**	**2**	**3**	**3**	**3**
FDT 2026: Experimental Design and Optimization in Food Processing			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K3	2	2	2	2	3
	CO3	K6	3	3	3	3	3
	CO4	K5	3	3	3	3	3
	CO5	K3	2	2	2	2	3
	Course	**K6**	**3**	**3**	**3**	**3**	**3**
FDT 2054: Biotechnology of Fermented Foods			**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
			K5	K6	K5	K5	K4
	CO1	K4	3	2	3	3	3
	CO2	K5	3	3	3	3	3
	CO3	K4	3	2	3	3	3
	CO4	K5	3	3	3	3	3
	CO5	K4	3	2	3	3	3
	Course	**K5**	**3**	**3**	**3**	**3**	**3**

3, 2, 1 represent strong, moderate and weak correlation; '-' refers to no correlation.

2.2. Attainment of Program Outcomes (60)

2.2.1. Describe the assessment tools and process used to gather the data upon which the evaluation of Program Outcome is based (20)



Calculation of Course Outcome (CO)

Assessment tools used to measure the student learning and Course Outcomes:

End Semester exam: End Semester Score (25 M)

Continuous Evaluation: Score for Continuous (10 M) and Mid sem Examination (15 M)

The process adopted to map the assess the course outcomes

The assessment of the course outcomes (COs) have been performed by subject specialists. The corresponding steps have been discussed below.

Step I: Percentage weightage (W) has been given to each of the COs of a course corresponding to each question asked in end semester question paper.

Step II: Matrix showing Question wise marks for each student.

Step III: Calculation of CO wise score from Question wise marks. It is calculated as follows

$$S_{CO_{ij}} = \sum_{i=1}^{5}\sum_{j=1}^{10}\sum_{k=1}^{5} S_{Q_{kj}} \times W_{iQk}$$

$$= S_{Q_{1j}} \times W_{iQ1} + S_{Q_{2j}} \times W_{iQ2} + S_{Q_{3j}} \times W_{iQ3} + S_{Q_{4j}} \times W_{iQ4} + S_{Q_{5j}} \times W_{iQ5}$$

$$S_{CO_i} = \frac{1}{j}\left(\sum_{j=1}^{10} S_{CO_{ij}}\right)$$

Where, W_{iQk}=percent weightage given to i^{th} CO corresponding to k^{th} question (Q_k);

S_{Qkj} = Score obtained by j^{th} student corresponding to k^{th} question (Q_k)

S_{COij} = Score obtained by j^{th} student corresponding to i^{th} CO

s_{COi}=Average of S_{COij} obtained for the entire class corresponding to CO_i

Step IV: Counting % of students (m) scoring at least class average score of corresponding to CO_i.

If % of student scoring at least class average (m)	Attainment assigned to a_i
m ≥ 70%	3
60% ≤ m ≤ 69%	2
50% ≤ m ≤ 59%	1

Step V: Steps I to IV are followed for Continuous evaluation and Mid Semester marks.

Step VI: Calculation of Attainment of CO, as given below.

$$A_{CO_i} = a_{iES} \times w_{ES} + a_{iCA} \times w_{CA}$$

Where, a_{iES}=Attainment assigned to i^{th} CO from End Semester Marks;

w_{ES}=Weightage of Attainment from End Semester marks = 0.8;

a_{iCA}=Attainment assigned to i^{th} CO from Continuous + Mid Semester Marks;

w_{CA}=Weightage of Attainment from Continuous + Mid Semester Marks = 0.2;

Step VII: Calculation of Attainment of Course (A_{course}), as given below.

$$A_{course} = \frac{A_{CO1} + A_{CO2} + A_{CO3} + A_{CO4} + A_{CO5}}{5}$$

One sample calculation has been shown below

AY 2016-17: Semester II
Course: FDT 2004-Advances in Food Technology
Number of COs: **5**
Total number of students: **10**

Step I: Question pattern: Attempt any three out of Q2 to Q5 (five marks each).

End Semester: CO-Question Mapping

Question No.	Max Marks	CO1	CO2	CO3	CO4	CO5
Q.1	5	30%	30%		40%	
Q.2	5	20%	20%	20%	20%	20%
Q.3	5		30%	30%		40%
Q.4	10		30%	40%		30%

Continuous Evaluation and Mid Semester: CO-Question Mapping

Question No.	Marks	CO1	CO2	CO3	CO4	CO5
Continuous Evaluation	10	20%	20%	20%	20%	20%
Mid semester	15	20%	20%	20%	20%	20%

Step II: Students marks obtained

ROLL NO	End Semester Mark (25)				Continuous Evaluation (10)	Mid Semester (15)
	Q1	Q2	Q3	Q4		
16FET201	2	5	4.5	7.5	9.5	9
16FET202	4.5	4	4	8.5	9.5	9
16FET203	3	2.5	2.5	6	9	8
16FET204	4	3.5	4.5	7	8	11
16FET205	4	3.5	3.5	7	8	8
16FET206	5	2.5	4	4.5	9.5	11
16FET207	0.5	5	5	8	10	11
16FET208	1	5	4	7	8	9
16FET209	4	4.5	4.5	7	8	13
16FET210	2.5	5	3	8.5	9.5	12

Step III: Conversion from question wise mark to CO wise mark (End Semester)

ROLL NO	End Semester Mark (25)				
	CO1	CO2	CO3	CO4	CO5
16FET201	1.6	5.2	5.35	1.8	5.05
16FET202	2.15	5.9	5.4	2.6	4.95
16FET203	1.4	3.95	3.65	1.7	3.3
16FET204	1.9	5.35	4.85	2.3	4.6
16FET205	1.9	5.05	4.55	2.3	4.2
16FET206	2	4.55	3.5	2.5	3.45
16FET207	1.15	5.05	5.7	1.2	5.4
16FET208	1.3	4.6	5	1.4	4.7
16FET209	2.1	5.55	5.05	2.5	4.8
16FET210	1.75	5.2	5.3	2	4.75

The conversion formula is

$$S_{CO_{ij}} = S_{Q_{1j}} \times W_{Q1k} + S_{Q_{2j}} \times W_{Q2k} + S_{Q_{3j}} \times W_{Q3k} + S_{Q_{4j}} \times W_{Q4k} + S_{Q_{5j}} \times W_{Q5k}$$

In this sense, for Student 1 (16FET201) the score corresponding to CO2 is 5.2. This has been calculated as shown below.

$$S_{CO_{21}} = 0.3 \times 2 + 0.2 \times 5 + 0.3 \times 4.5 + 0.3 \times 7.5 \;\; = \;\; 5.2$$

For the same student 2 (17FET202) the score corresponding to CO2 is 5.9. This has been calculated as shown below.

$$S_{CO_{22}} = 0.3 \times 4.5 + 0.2 \times 4 + 0.3 \times 4 + 0.3 \times 8.5 \;\; = \;\; 5.9$$

Step IV : Calculation of Attainment of Course Outcome (a_i)

ROLL NO	End Semester Mark (25)				
	CO1	CO2	CO3	CO4	CO5
16FET201	1.6	5.2	5.35	1.8	5.05
16FET202	2.15	5.9	5.4	2.6	4.95
16FET203	1.4	3.95	3.65	1.7	3.3
16FET204	1.9	5.35	4.85	2.3	4.6
16FET205	1.9	5.05	4.55	2.3	4.2

16FET206	2	4.55	3.5	2.5	3.45
16FET207	1.15	5.05	5.7	1.2	5.4
16FET208	1.3	4.6	5	1.4	4.7
16FET209	2.1	5.55	5.05	2.5	4.8
16FET210	1.75	5.2	5.3	2	4.75
Class average (s_{COi})	1.725	5.04	4.835	2.03	4.52
No of students scoring at least class average	6	7	7	5	7
Total no of student	10	10	10	10	10
% of students (m) scoring at least class average	60	70	70	70	70

Step V - VI : Calculation of Attainment of Course (A_{course})

	CO1	CO2	CO3	CO4	CO5
CO Attainment from End Semester (a_{iES})	2	3	3	1	2
CO Attainment from Cont Evaluation + Mid Semester (a_{iCA})	3	3	3	3	3
Attainment of CO	2x0.8+3x0.2	2x0.8+3x0.2	2x0.8+3x0.2	2x0.8+3x0.2	2x0.8+3x0.2
Attainment of CO (A_{COi})	2.2	3	3	1.4	2.2
Attainment of Course (A_{course})	(2.2+3+3+1.4+2.2)/5 = **2.36**				

Calculation of Program Outcome (PO)

Step I: Assessment tools for Direct measurement: The attainment values for POs have been calculated with respect to attainment of Course (A_{course}) and their corresponding correlation with PO.

The working formula for calculating direct attainment has been presented below:

$$\text{Direct PO attainment } (\text{PO}_D) = \frac{\sum_{p=1}^{n}\left([A_{course}]_p \times C_p\right)}{\sum_{p=1}^{n} C_p}$$

Where, n= number of Courses correlated to corresponding PO

A_{course} = Obtained attainment for p^{th} course (0 to 3 scale)

C_p = Correlation of p^{th} course to corresponding PO in (0 to 3 scale), where, 3, 2, 1 stands for strong, medium, and weak correlation, respectively.

Step II: Assessment tools for Indirect measurement: The attainment values for POs have been calculated with respect to two surveys viz. (i) Student exit feedback (ii) Feedback from Examiner or Industry Mentor or Alumni. The sample feedback form has been attached in ***Annexure 2.2.1-Sample Feedback Form***.

For both the surveys, the working formula has been presented below:

$$\text{Feedback Score1 } (\text{S}_{FB1}) = \frac{\sum S_{SEF}}{N}$$

$$\text{Feedback Score2 } (\text{S}_{FB2}) = \frac{\sum S_{SEA}}{Q}$$

Where, N= number of students giving Student exit feedback

S_{SEF} = Score obtained from student exit feedback in the scale of 5

Q= number of Examiners and/or Alumni giving feedback

S_{SEA} = Score obtained from Examiners and/or Alumni feedback in the scale of 5

Step III: Counting % of people (q) scoring at least average feedback score of corresponding to PO.

% of people (q) scoring at least average feedback score (q)	Attainment assigned (a_{IPO1} or a_{IPO2})
q ≥ 70%	3
60% ≤ q ≤ 69%	2
50% ≤ q ≤ 59%	1

Average of two feedback scores is assigned to indirect PO attainment (PO_I).

$$\text{Indirect PO attainment } (PO_I) = \frac{a_{IPO1} + a_{IPO2}}{2}$$

Step IV: Calculation of Attainment of PO, as given below.

$$A_{PO} = PO_D \times w_D + PO_I \times w_I$$

Where, w_D=Weightage of Direct Attainment of PO = 0.8;
w_I=Weightage of Indirect Attainment of PO = 0.2;

One sample calculation for PO1 has been shown below

Direct Attainment of PO1

Code	Course	Level	Correlation	Attainment
FDT 2001	Advances in Food Technology	K4	3	2.52
FDT 2005	Carbohydrate Chemistry & Technology	K4	3	2.2
FDT 2008	Comprehensive Techniques in Food Analysis	K5	3	2.16
FDP 2014	Food Analysis Lab	K5	2	2
FDT 2004	Advances in Food Engineering	K5	3	2.36
FDT 2002	Food Safety and Toxicology	K5	3	2.2
FDT 2003	Advances in Nutrition	K5	3	2.2
FDP 2015	Food Process Engineering Lab	K6	2	2
FDP 2018	Research II	K6	3	2
FDP 2019	Industrial Training	K6	3	3
FDP 2020	Research III	K6	3	2
FDT 2021	Food Standards and Safety Regulations	K5	3	2
FDT 2023	Food Packaging Science and Technology	K6	3	2.8
FDT 2058	Bioprocess Engineering and Technology	K4	3	1.36
FDT 2054	Biotechnology of Fermented Foods	K5	3	2.52
			T = 43	
Direct PO1 Attainment = (3x2.52+3x2.2+3x2.16+…..+3x2.52)/ 43 =				**2.231**

Survey I: Student Exit Feedback

No. of Students	Feedback Scores (S_{SEF}) for PO1 in scale of 5				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
S1	4	4	4	4	4
S2	4	4	3	3	4
S3	4	3	4	3	3
S4	3	3	3	4	3
S5	4	3	4	4	3
S6	3	4	3	4	4
S7	4	3	4	4	3
S8	3	4	4	4	4
S9	4	4	3	4	4
S10	3	4	4	3	3
Average (S_{FB1})	3.6	3.6	3.6	3.7	3.5
Students giving ≥ S_{FB1}	6	6	6	7	5
No of Feedback	10	10	10	10	10
% Students giving ≥ S_{FB1}	60	60	60	70	50
Attainment assigned (a_{IPO1})	2	2	2	3	1

Survey II: Examiners and/or Alumni feedback

No. of Examiner/Alumni	Feedback Scores (S_{SEA}) for PO1 in scale of 5				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
P1	4	4	4	4	4
P2	4	4	3	4	3
P3	4	3	3	4	3
P4	4	4	4	4	3
P5	4	4	4	4	4
P6	3	4	4	4	4
P7	4	4	3	4	4
P8	3	3	3	3	3
P9	3	3	3	3	3
P10	4	4	4	4	4
Average (S_{FB2})	3.7	3.7	3.5	3.8	3.5
Students giving ≥ S_{FB2}	7	7	5	8	5
No of Feedback	10	10	10	10	10
% Students giving ≥ S_{FB2}	70	70	50	80	50
Attainment assigned (a_{IPO2})	3	3	1	3	1

Overall Attainment of PO1

Direct PO1 Attainment				2.193
Indirect PO1 Attainment	Survey I	Student Feedback	2	2.5
	Survey II	Examiner Feedback	3	
Overall Attainment of PO1 (A_{PO1})		= 2.193x0.8+2.5x0.2		2.25

2.2.2. POs attainment levels with observations (40)

Batch 15FET

Course	Level	PO1		PO2		PO3		PO4		PO5	
		Wt	A_{course}	W	Acourse	W	Acourse	W	Acourse	W	Acourse
FDT 2001	K4	3	2.2	2	2.2	3	2.2	3	2.2	3	2.2
FDT 2002	K5	3	1.72	2	1.72	3	1.72	3	1.72	3	1.72
FDT 2003	K5	3	2.2	3	2.2	3	2.2	3	2.2	3	2.2
FDP 2011	K6	2	2.2	3	2.2	2	2.2	2	2.2	2	2.2
FDP 2017	K6	2	3	3	3	2	3	2	3	2	3
FDT 2004	K5	3	1.68	3	1.68	3	1.68	3	1.68	3	1.68
FDT 2005	K4	3	2	3	2	3	2	3	2	3	2
FDT 2007	K5	3	2.04	3	2.04	3	2.04	3	2.04	3	2.04
FDP 2013	K6	3	2	3	2	3	2	3	2	3	2
FDP 2020	K6	3	3	3	3	3	3	3	3	3	3
FDT 2021	K5	3	1.32	3	1.32	3	1.32	3	1.32	3	1.32
FDT 2023	K6	3	1.68	3	1.68	3	1.68	3	1.68	3	1.68
FDT 2021	K4	3	2.36	2	2.36	3	2.36	3	2.36	3	2.36
FDT 2054	K5	3	2.36	3	2.36	3	2.36	3	2.36	3	2.36
Direct Attainment			1.877		1.897		1.877		1.877		1.877
Indirect-Survey I			2		2		2		2		2
Indirect-Survey II			2		3		3		2		2
Final Attainment		PO1	1.90	PO2	2.02	PO3	2.00	PO4	1.90	PO5	1.90
%Attainment		**PO1**	**63.3**	**PO2**	**67.3**	**PO3**	**66.7**	**PO4**	**63.3**	**PO5**	**63.3**

Wt, connection with PO; A_{course}, course attainment

Batch 16FET

Course	Level	PO1		PO2		PO3		PO4		PO5	
		Wt	A_{course}	W	Acourse	W	Acourse	W	Acourse	W	Acourse
FDT 2001	K4	3	2.36	2	2.36	3	2.36	3	2.36	3	2.36
FDT 2002	K5	3	1.8	2	1.8	3	1.8	3	1.8	3	1.8
FDT 2003	K5	3	1.52	3	1.52	3	1.52	3	1.52	3	1.52
FDP 2011	K6	2	3	3	3	2	3	2	3	2	3
FDP 2017	K6	2	3	3	3	2	3	2	3	2	3
FDT 2004	K5	3	2.04	3	2.04	3	2.04	3	2.04	3	2.04
FDT 2005	K4	3	2.04	3	2.04	3	2.04	3	2.04	3	2.04
FDT 2007	K5	3	2.04	3	2.04	3	2.04	3	2.04	3	2.04
FDP 2013	K6	3	3	3	3	3	3	3	3	3	3
FDP 2020	K6	3	3	3		3		3		3	
FDT 2021	K5	3	1.64	3	1.64	3	1.64	3	1.64	3	1.64
FDT 2023	K6	3	2.36	3	2.36	3	2.36	3	2.36	3	2.36
FDT 2021	K4	3	2.04	2	2.04	3	2.04	3	2.04	3	2.04
FDT 2054	K5	3	2.68	3	2.68	3	2.68	3	2.68	3	2.68
Direct Attainment			2.064		2.112		2.36		2.064		2.06
Indirect-Survey I			2		2		2		2		2
Indirect-Survey II			2		2		3		3		2
Final Attainment		PO1	2.05	PO2	2.09	PO3	2.15	PO4	2.15	PO5	2.05
%Attainment		**PO1**	**68.3**	**PO2**	**69.7**	**PO3**	**71.7**	**PO4**	**71.7**	**PO5**	**68.3**

Wt, connection with PO; A_{course}, course attainment

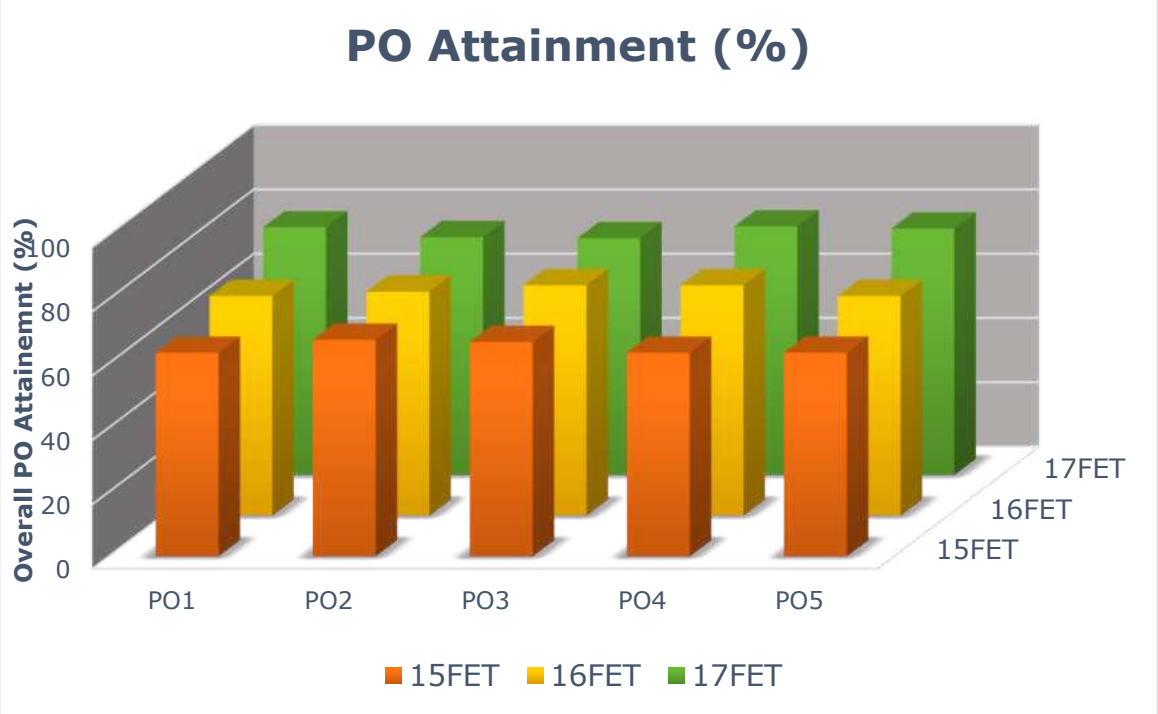
Batch 17FET

Course	Level	PO1		PO2		PO3		PO4		PO5	
		Wt	A_{course}	Wt	A_{course}	Wt	A_{course}	Wt	A_{course}	Wt	A_{course}
FDT 2001	K4	3	2.52	2	2.52	3	2.52	3	2.52	3	2.52
FDT 2005	K4	3	2.2	2	2.2	3	2.2	3	2.2	3	2.2
FDT 2008	K5	3	2.16	3	2.16	3	2.16	3	2.16	3	2.16
FDP 2014	K5	3	2	3	2	3	2	3	2	3	2
FDP 2016	K6	2	2	3	2	2	2	2	2	2	2
FDP 2017	K6	2	3	3	3	2	3	2	3	2	3
FDT 2004	K5	3	2.36	3	2.36	3	2.36	3	2.36	3	2.36
FDT 2002	K5	3	2.2	3	2.2	3	2.2	3	2.2	3	2.2
FDT 2003	K5	3	2.2	3	2.2	3	2.2	3	2.2	3	2.2
FDP 2015	K6	3	2.8	3	2.8	3	2.8	3	2.8	3	2.8
FDP 2018	K6	3	2	3	2	3	2	3	2	3	2
FDT 2021	K5	3	2	3	2	3	2	3	2	3	2
FDT 2023	K6	3	1.8	3	1.8	3	1.8	3	1.8	3	1.8
FDT 2058	K4	3	2.36	2	2.36	3	2.36	3	2.36	3	2.36
FDT 2054	K5	3	2.52	3	2.52	3	2.52	3	2.52	3	2.52
Direct Attainment			2.264		2.269		2.264		2.264		2.264
Indirect-Survey I			2		2		2		2		2
Indirect-Survey II			3		3		2		2		3
Final Attainment		PO1	2.31	PO2	2.22	PO3	2.21	PO4	2.31	PO5	2.31
%Attainment		**PO1**	**77.0**	**PO2**	**74.0**	**PO3**	**73.7**	**PO4**	**77.3**	**PO5**	**76.7**

Wt, connection with PO; A_{course}, course attainment

POs attainment levels with observations

Overall PO Attainment					
Batch	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
15FET	1.90	2.02	2.00	1.90	1.90
16FET	2.05	2.09	2.15	2.15	2.05
17FET	2.31	2.22	2.21	2.32	2.30
% Overall PO Attainment					
Batch	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
15FET	63.3	67.3	66.7	63.3	63.3
16FET	68.3	69.7	71.7	71.7	68.3
17FET	77.0	74.0	73.7	77.3	76.7



Target for PO attainment

Being one of the premier institutes in the country in Food Engineering and Technology, the skill level of the student is expected to be on a higher side. Therefore, starting the 70% attainment level in graduating batch 2016, the target for graduating batch 2018 is kept at least 75-80%.

Comment on Overall PO Attainment for Batch Graduating in 2018

PO	Target Value	Attainment	Observation
PO1: An ability to independently carry out research or investigation and development work to solve practical problems			
PO1	75-80	77	The research component of the curriculum has been revised from AY2017. It is expected that attainment of this PO1 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			
PO2: An ability to write and present a substantial technical report or document			
PO2	75-80	74	The submission of technical report has been increased in revised syllabus from AY2017. This is mainly associated with Research I, II, III and Industrial Training. Inclusion of lab is also done to emphasize this PO2. It is expected that attainment of this PO2 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			
PO3: An ability to demonstrate a degree of mastery over the area of food engineering and technology			
PO3	75-80	73	The engineering component of the curriculum has been increased in revised syllabus from AY2017. One laboratory course on Food Process Engineering has been included in revised syllabus. The inclusion of industrial Training will also help in solving practical problem related to Food Engineering and Technology. It is expected that attainment of this PO3 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			
PO4: An ability to use and evaluate modern techniques or tools applied in food processing, analysis and packaging			
PO4	75-80	77	The revised syllabus from AY2017, inclusion of Food Analysis lab will emphasize this PO4. Knowledge on experimental design as one of the Electives will help in attaining the PO4. It is

			expected that attainment of this PO2 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			
PO5: An ability to provide solution to the issues related to nutrition, food safety and regulatory affairs			
PO5	75-80	76	The attainment if Satisfactory. However, in the revised syllabus incorporation of Industrial Training will also help in solving practical problem related to nutrition, food safety and regulatory affairs.
Action: Trying to maintain the level and targeting for higher.			

CRITERION 3	Students' Performance	75

Table: 3.1

Item	AY 2018-19	AY 2017-18	AY 2016-17	AY 2015-16	AY 2014-15
Sanctioned intake of the program (N)	18	10	10	10	10
Total number of students admitted through GATE (N1)	18	10	10	10	10
Total number of students admitted through PG Entrance and others *(N2)*	-	-	-	-	-
Total number of students admitted in the Program (*N*1 + *N*2)	18	10	10	10	10

CAY – Current Academic Year
CAYm1- Current Academic Year minus1= Current Assessment Year
CAYm2 - Current Academic Year minus2=Current Assessment Year minus 1
LYG – Last Year Graduate
LYGm1 – Last Year Graduate minus 1
LYGm2 – Last Year Graduate minus 2

Table: 3.2

Year of entry	*N1 + N2* (As defined above)	Number of students who have successfully graduated	
		I Year	II Year
2018-19	18	18	
2017-18	10	10	In process
2016-17	10	10	10
2015-16	10	9	9
2014-15	10	10	10

3.1. Enrolment Ratio through GATE (20)

Table: 3.1.1

Year of entry	Enrolment Ratio= N1 /N;	Students enrolled through GATE
2018-19	1	100%
2017-18	1	100%
2016-17	1	100%
2015-16	1	100%
2014-15	1	100%

N is sanctioned intake; N1 is number of students admitted through GATE.

3.2. Success Rate in the stipulated period of the program (20)

Item	AY 2018-19	AY 2017-18	AY 2016-17	AY 2015-16	AY 2014-15
Sanctioned intake of the program (*N*)	18	10	10	10	10
Number of students completing program in stipulated duration		In process	10	9	10
Number of students admitted in first year of same batch	18	10	10	10	10
S.I.	-	1	1	0.9	1
Average S.I. of past 3 years	**-**	**0.967**			
Assessment Point		**0.967 x 20 = 19.33**			

S.I. = Number of students completing program in stipulated duration/ Number of students admitted in first year of same batch; Average S.I.= Mean of SI for past 3 Batches Assessment points = 20 X Average S.I.

3.3. Placement, Higher Studies and Entrepreneurship (20)

Item	Graduating in AY			
	2018-19	2017-18	2016-17	2015-16
The total no. of students admitted in first year (N)	18	10	10	10
No. of students placed in companies or Government Sector (x)	-	8	9	9
No. of students pursuing Ph.D. / JRF/ SRF(y)	-	2	0	0
No. of students turned entrepreneur in engineering/technology (z)	-	0	0	0
x + y + z =	-	10	0.9	0.9
Placement Index: (x + y + z) /N	-	P1=1	P2=1	P3=0.9
Average placement= (P1 + P2 + P3)/3	0.95			
Assessment Points = 20 × average placement	**0.95 x 20 = 19**			

Table: 3.3.1

3.3.1a. Provide the placement data in the below mentioned format with the name of the program and the assessment year:

S.no.	Name of the student placed	Enrollment no.	Name of the employer	Appointment letter reference no. with date
1	Abhisheka Pandian	16FET201	K P Manish Global Ingredients Pvt Ltd	16-Oct-18
2	Harshal	16FET202	ITC Limited	9-Jul-18
3	Kakoli Pegu	16FET203	JRF, ICT Mumbai	ICT/REG RRD/ 327 18th July,2018
4	Kapil Rai	16FET204	EVALUESERVE SEZ (GURGAON) PRIVATE LIMITED	16-Jul-18
5	Kishori Panmand	16FET205	Fine Organic Industries Limited	19-Nov-18
6	Krutika Bhangale	16FET206	Indchem International	1st August, 2018
7	Niveditha Giri	16FET207	DKSH India private limited	NV OL – 2018, 7th Aug, 2018
8	Rishab Dhar	16FET208	JRF, ICT Mumbai	ICT/REG/RRD/4495 15th Jan, 2018
9	Shubham Goyal	16FET209	Central Bank of India	12th March, 2018
10	Sneha Awasthi	16FET210	ITC Limited	9-Jul-18
11	Shah Vrushti	15FET2002	VKL Seasoning Pvt Ltd	9th February ,2017
12	Aroshi Sharma	15FET2004	VKL Seasoning Pvt Ltd	9th February ,2017
13	Bulbul	15FET2005	VKL Seasoning Pvt Ltd	9th February ,2017
14	Ashwani Kumar	15FET2006	Vinayak Ingredients Pvt Ltd	24th April,2017
15	Vardan Singh	15FET2007	ITC Limited	14th July,2017
16	Soni Niharika	15FET2008	Tasty Bite	2nd May,2017
17	Swarnali Das	15FET2009	Capital foods private limited	CFL/HR/AP/PL/08/543 30th June, 2017
18	Divya M	15FET2010	NutriPlanet Foods	NP0005
19	Cheryl Fernandes	15FET2011	VKL Seasoning Pvt Ltd	9th February ,2017
20	Rahel Das	14FET2001	Ruchi Soya Industries Limited	6th August, 2016
21	Siddhant Banura	14FET2002	Unibourne Food Ingredients	NA
22	Yuga Bhat	14FET2003	Alfa Laval	L/APPT/GET/2016-17/24 18th May,2016
23	Ashwini Mohurle	14FET2004	Ankush Enterprises	NA
24	Sunil Jondhale	14FET2005	Preparing for Civil Services	NA
25	Dhananjay Ghorpade	14FET2006	Keva Flavours Pvt Ltd	30th June,2016
26	Rahul Jain	14FET2007	Preparing for Civil Services	NA
27	Himanshu Chaudhary	14FET2009	Firmenich	12th August, 2016
28	Sonakshi Meshram	14FET2010	VKL	13th July, 2016
29	Krati Dargarh	14FET2011	AB Mauri India Pvt Ltd	1st February, 2017

3.4. Professional Activities (15)

3.4.1. Student's participation in Professional societies/chapters and organizing engineering events (5)

From the MTech batch 15FET, 16FET, 17FET

1. Abhisheka Pandian has presented poster on the topic "Quality Monitoring of Paneer during Cold Chain using Enzymatic TTI" at International conference on recent advances in Food Processing Technology organized by IIFPT, Thanjavur during 17th-19th August, 2018
2. Rishab Dhar has presented poster on the topic "Pulsed light treatment of mixed tropical fruit beverage: Product formulation, processing, kinetics and secondary modelling" at UAA ICT Innovative Idea Competition which was held on 9th May, 2019
3. Kakoli Pegu has presented poster on the topic "Optimization of process parameters drying time and temperature of Syzygium cumini L. leather using response surface methodology" at IFCON 2018 organized by CFTRI, Mysore
4. Oindrila Ghosh has presented poster on the topic "Extraction of bioactive compounds from agro-industrial waste using plant oil" at UGC-CAS One Day In-house Seminar organized by ICT Mumbai on 26th December 2018
5. A workshop on 'Analytical and preparative instrumentation for the food industry' was conducted by Anton Paar on 27th February, 2017 in the dept. food engineering and technology (FETD), ICT, Mumbai. The objective of this workshop was to help students to find the best solution for trace element analysis of food ingredients, quality checks on flavours and sophisticated analysis of mouth-feel, mixing and stirring behavior.
6. The FETD, ICT organized a hands-on training for analysis of food bioactives on 2-4 March, 2017 with the assistance of TEQIP. The workshop was coordinated by Dr. Shalini Arya and her team of post-graduate and Ph.D. Students. Industry professionals, academicians and scientists from reputed institutes attended this workshop
7. A 3 day "Bakery Technology Workshop" was held at FETD from 27th to 29th July, 2017. It was jointly organized by FETD and Assocom Instituite of Bakery Technology and Management (AIBTM). There was a session on introduction to bakery products, bakery equipments and short bread cookies. The participants learnt about the different ingredients and mixing methods involved in preparation of breads, cookies and cakes. They prepared chocolate chip cookies, buns, chiffon cake, chocolate truffle cake, French baguette and hard oils.
8. Workshop on food preservation techniques was jointly organized in association with biotechnology industry research assistance council (BIRAC) and Department of food engineering and technology, ICT Mumbai on and from 26thfebruary
9. DuPont Nutri Scholars Awards 2017

   Ms. Aratrika Ray, Mrs. Suman Kumari and Mrs. Anu Ahlwawat stood second and won One lakh cash prize in the category ULTIMATE HEALTH AND WELLNESS PRODUCT under the guidance of Dr. US Annapure

   Ms. Madhura Janve, Mr.Baburaj Regubalan, Ms. Shraddha Srinivasan and Ms. Sana Shaikh won Stood second and won cash prize of one lakh in the category MOST NUTRITIOUS FOOD IDEA under the guidance of Dr. Laxmi Ananthanarayan
10. On July 31, 2015, on behalf of Keva Flavours Pvt Ltd (formerly Kelkar Group), an interactive session was conducted for the first- and second-year M. tech students of FETD. This session that discussed the scope and prospects of food processing and allied industries in India was convened by Mr. Amit Choudhury and Mrs. Sangita Dasgupta (Senior Manager- Key accounts) along with Mrs. Anita Kulkarni from Keva flavours.
11. Every year students of FETD participate in National Nutrition Week which is organized by AFSTI at ICT, Mumbai

3.4.2. Student's publications (10)

Graduating year 2015-16

1. Banura, S., Thirumdas, R., Kaur, A., Deshmukh, R.R., Annapure, U.S. (2018) Modification of starch using low pressure radio frequency air plasma. *LWT - Food Science and Technology*. 89, pp. 719-724

Graduating year 2016-17

1. Bulbul, V. J., Bhushette, P. R., Zambare, R. S., Deshmukh, R. R., &Annapure, U. S. (2019). Effect of cold plasma treatment on Xanthan gum properties. *Polymer Testing*, *79*, 106056.
2. Shah, N. N., Soni, N., & Singhal, R. S. (2018). Modification of proteins and polysaccharides using dodecenyl succinic anhydride: Synthesis, properties and applications—A review. *International journal of biological macromolecules*, *107*, 2224-2233.
3. Soni, N., Shah, N. N., & Singhal, R. S. (2019). Dodecenylsuccinylated guar gum hydrolysate as a wall material for microencapsulation: Synthesis, characterization and evaluation. *Journal of food engineering*, *242*, 133-140.
4. Nagavekar, N., Kumar, A., Dubey, K., & Singhal, R. S. (2019). Supercritical carbon dioxide extraction of kokum fat from Garcinia indica kernels and its application as a gelator in oleogels with oils. *Industrial Crops and Products*, *138*, 111459.
5. Fernandes, C. G., Sonawane, S. K., & Arya, S. S. (2019). Optimization and modeling of novel multigrain beverage: Effect of food additives on physicochemical and functional properties. *Journal of Food Processing and Preservation*, e14151.
6. Fernandes, C. G., Sonawane, S. K., & Arya, S. S. (2018). Cereal based functional beverages: a review. *Journal of Microbiology, Biotechnology & Food Sciences*, *8*(3).

Graduating year 2017-18

1. Arya, S. S., Pegu, K., & Sadawarte, P. D. (2017). Bioactive Compounds and Health Benefits of Jamun (Syzygium cumini). *Bioactive Molecules in Food*, 1-20.
2. Dhar, R., & Chakraborty, S. (2019). Effect of Pulsed Light Treattemnt on Various Quality Attributes and Kinetic Modeling. Innovative Food Science and Emerging Technologies. (Communicated).
3. Pandian, A. & Chakraborty, S. (2019). The Enzymatic Time-Temperature Indicator (TTI) Device: A Review of its Applications in Quality Monitoring and Shelf-life Estimation of Food Products during Storage. Journal of Food Engineering Reviews (Communicated).

CRITERION 4	Faculty Contributions	75

Sl No.	Name	Highest Degree	Date of Receiving Highest Degree	Area of Specialization	Current Designation	Date (Designated as Prof/Assoc. Prof.).	Initial Date of Joining	Association Type	Currently Associated with (Yes/No)
1	Dr. Uday S. Annapure	PhD	29/09/2000	Food chemistry	Professor	16/04/2009	16/04/2003	Regular	Yes
2	Dr. Rekha S. Singhal	PhD	30/09/1989	Food Technology	Professor	30/04/2007	1/8/1989	Regular	Yes
3	Dr. Smita S. Lele	PhD	15/02/1990	Biochemical Engineering	Professor	30/01/1999	18/11/1986	Regular	Yes
4	Dr. Laxmi Ananthanarayan	PhD	9/9/2010	Biochemistry	Associate Professor	27/07/1998	16/10/1985	Regular	Yes
5	Dr. Shalini S. Arya	PhD	31/12/2008	Food Technology	Assistant Professor		25/07/2008	Regular	Yes
6	Dr. Jyoti S. Gokhale	PhD	27/09/2011	Bioprocess Technology	Assistant Professor		16/06/2014	Regular	Yes
7	Dr. Snehasis Chakraborty	PhD	8/8/2015	Food Engineering	Assistant Professor		29/10/2015	Regular	Yes
8	Dr. Gunjan Prakash	PhD	8/8/2007	Bioprocess Technology	Associate Professor	26/01/2017	9/2/2009	Regular	Yes
9	Dr. Reena Pandit	PhD	1/3/2007	Bioprocess Technology	Assistant Professor		2/5/2012	Regular	Yes
10	Dr. Anand Patwardhan	PhD	29/02/1988	Chemical Engineering	Professor	18/12/2007	18/12/2007	Regular	Yes
11	Dr. D. D. Sarode	PhD	15/02/2010	General Engineering	Associate Professor	12/6/1997	12/6/1997	Regular	Yes
12	Mr. M.A.K. Kerawala	M.Tech	29/09/1984	General Engineering	Associate Professor	16/02/1987	16/02/1987	Regular	Yes
13	Dr. Parag Gogate	PhD	20/06/2002	Chemical Engineering	Associate Professor	4/7/2016	3/7/2007	Regular	Yes
14	Dr. A.B. Pandit	PhD	31/07/1984	Chemical Engineering	Professor	1/1/1996	1/1/1991	Regular	Yes
15	Dr. P.R. Vavia	PhD	1/7/1991	Pharmaceutical Sci & Tech	Professor	8/4/2013	1/12/1993	Regular	Yes
16	Dr. P.D. Vaidya	PhD	4/1/2005	Chemical Engineering	Associate Professor	12/2/2015	1/8/2007	Regular	Yes
17	Dr. Prerana Goswami	PhD	28/05/2018	General Engineering	Assistant Professor		6/6/1998	Regular	Yes
18	Dr. S.S. Bhagwat	PhD	1/6/1989	Chemical Engineering	Professor	18/11/2003	18/11/1986	Regular	Yes
19	Dr. P.R. Nemade	PhD	30/08/2008	Chemical Engineering	Assistant Professor		1/1/2013	Regular	Yes
20	Dr. Shamlan Reshamwala	PhD	18/08/2012	Bioprocess Technology	Assistant Professor		20/08/2014	Regular	Yes

Name of The Faculty	Research Publications			PhD Guidance		
	2017-18	2016-17	2015-16	2017-18	2016-17	2015-16
Prof. Smita S. Lele	3	5	5	5	8	10
Prof. Uday S. Annapure	7	14	8	14	17	18
Prof. Rekha S. Singhal	9	15	10	17	17	18
Dr. Laxmi Ananthanarayan	4	8	6	13	16	16
Dr. Shalini S. Arya	8	10	19	5	6	6
Dr. Jyoti Sagar Gokhale	NA	NA	NA	NA	NA	NA
Dr. Snehasis Chakraborty	3	3	7	1	NA	NA
Dr. Gunjan Prakash	15	15	13	0	0	0
Dr. Reena Pandit	9	9	9	5	4	0
Dr. Anand Patwardhan	64	59	53	14	13	9
Dr. D. D. Sarode	12	11	10	1	1	0
Mr. M.A.K. Kerawala	3	3	1	0	0	0
Dr. Parag Gogate	274	263	183	11	8	5
Dr. A.B. Pandit	339	333	294	42	38	36
Dr. P.R. Vavia	148	144	122	43	41	31
Dr. P.D. Vaidya	73	59	41	18	9	4
Dr. Prerana Goswami	20	12	4	0	0	0
Dr. S.S. Bhagwat	70	64	63	35	32	31
Dr. P.R. Nemade	10	10	5	0	0	0
Dr. Shamlan Reshamwala	7	7	7	0	0	0

4.1. Student-Faculty Ratio (SFR) (10)

Bachelor of Technology in Food Engineering and Technology						
Year of Study	CAY (2018-19)		CAYm1 (2017-18)		CAYm2 (2016-17)	
	Sanction Intake	Actual admitted through lateral entry students	Sanction Intake	Actual admitted through lateral entry students	Sanction Intake	Actual admitted through lateral entry students
2nd Year	16	0	16	0	16	0
3rd Year	16	0	16	0	16	0
4th Year	16	0	16	0	16	0

Sub-Total	48	0	48	0	48	0
Total	48		48		48	

M.Tech Food Biotechnology			
Year of Study	(2018-19)	(2017-18)	(2016-17)
	Sanction Intake	Sanction Intake	Sanction Intake
1st Year	10	10	10
2nd Year	10	10	10
Total	**20**	**20**	**20**

M.Tech Food Engineering and Technology			
Year of Study	(2018-19)	(2017-18)	(2016-17)
	Sanction Intake	Sanction Intake	Sanction Intake
1st Year	18	10	10
2nd Year	10	10	10
Total	**28**	**20**	**20**

Total Data for All PG Program			
Year of Study	2018-19	2017-18	2016-17
	Sanction Intake	Sanction Intake	Sanction Intake
1st Year	28	20	20
2nd Year	20	20	20

SFR			
Description	**2018-19**	**2017-18**	**2016-17**
Total No. of Students in the Department(S)	96	88	88
	Sum total of all (UG+PG) students	**Sum total of all (UG+PG) students**	**Sum total of all (UG+PG) students**
No. of Faculty in the Department(F)	18	18	18
	F1	**F2**	**F3**
Student Faculty Ratio (SFR)	5.33	4.89	4.89
	SFR1=S1/F1	**SFR2=S1/F1**	**SFR3=S3/F3**
Average SFR	5.04		
	SFR=(SFR1+SFR2+SFR3)/3		
F=Total Number of Faculty Members in the Department (excluding first year faculty)			

4.1.1 Information about the regular and contractual faculty

	Total Number of regular Faculty in Department	Total Number of contractual Faculty in Department
2018-19	7	0
2017-18	7	0
2016-17	7	0

4.2.1 Faculty Competencies in the Area of program Specialization (30)

(Relevant Faculty Information, in the area of Program specialization.

Name of Faculty	Relevant area of Specialization	
	2018-19	**2017-18**
Prof. Smita S. Lele	Food Engineering, Fermentation Technology, Fundamentals of Food Process, Engineering, Advances in Food Engineering	Food Engineering, Fermentation Technology, Fundamentals of Food Process, Engineering, Advances in Food Engineering
Prof. Uday S. Annapure	Carbohydrate chemistry and technology (gelatinization, retrogradation and resistant starch) and Advances in food technology (extrusion, pulsed light, modified	Carbohydrate chemistry and technology (gelatinization, retrogradation and resistant starch) and Advances in food technology (extrusion, pulsed light, modified
Prof. Rekha S. Singhal	Food additives and ingredients, Current topics in food science and technology, Nutraceuticals and functional foods, Principles of food analysis, Modern techniques in food analysis, Food safety and toxicology	Food quality, Food chemistry, Biopolymers, Lipid chemistry and technology, Food product development, Food processing, Fermentative production and downstream processing of biomolecules, Traditional foods.
Dr. Laxmi Ananthanarayan	Human nutrition, Food packaging, Food product development, Food chemistry, Instant food formulation, Protein rich food formulation, Food preservation	Human nutrition, Food packaging, Food productdevelopment, Food chemistry, Instant food formulation, Protein rich food formulation, Food preservation
Dr. Shalini S. Arya	Hydrodynamic cavitation of liquid food, Cereal chemistry and processing – process and product development ; Indian Traditional foods – chemistry, technology and product development; Nutraceuticals – chemistry, technology and product development; Cereal legume health products - low glycemic index foods, gluten free formulations; utilization of food waste; Fermented indigenous foods; Downstream processing of biomolecules	Cereal chemistry and processing – process and product development; Indian Traditional foods – chemistry, technology and product development; Nutraceuticals – chemistry, technology and product development; Cereal legume health products - low glycemic index foods, gluten free formulations; utilization of food waste; Fermented indigenous foods; Downstream processing of biomolecules

Dr. Jyoti Sagar Gokhale	Principles of Food Analysis, Biotechnology of Fermented Foods, Waste Management in Food Processing, Nutraceuticals and Functional Foods, Biochemistry Lab, Technical Analysis Lab	Principles of Food Analysis, Biotechnology of Fermented Foods, Waste Management in Food Processing, Nutraceuticals and Functional Foods, Biochemistry Lab, Technical Analysis Lab
Dr. Snehasis Chakraborty	Advances in Food Technology, Advances in Food Engineering, Experimental Design and Optimization in Food Processing	Advances in Food Technology, Advances in Food Engineering

4.2.2. Faculty Research Publications (10)

Name of The Faculty	Academic Research								
	Part A: Number of quality publications in refereed/SCI Journals, citations, Books/book Chapters etc.								
	Publications in refereed/SCI Journals			Citations			Books/Book Chapters		
	2017-18	2016-17	2015-16	2017-18	2016-17	2015-16	2017-18	2016-17	2015-16
Prof. Smita S. Lele	3	5	5	347	381	386	1	NA	NA
Prof. Uday S. Annapure	7	14	8	267	184	125	NA	NA	NA
Prof. Rekha S. Singhal	9	15	10	1705	1638	1627	1	2	4
Dr. Laxmi Ananthanarayan	4	8	6	362	328	311	NA	NA	NA
Dr. Shalini S. Arya	8	10	19	135	82	64	1	NA	NA
Dr. Jyoti Sagar Gokhale	NA	NA	NA	2	11	9	1	1	NA
Dr. Snehasis Chakraborty	3	3	7	77	56	28	NA	3	NA

Name of The Faculty	Academic Research					
	Part B: Ph.D Guided/Ph.D awarded during the assessment period while working in the institute					
	2017-18		2016-17		2015-16	
	Guided	Awarded	Guided	Awarded	Guided	Awarded
Prof. Smita S. Lele	5	1	8	1	10	3
Prof. Uday S. Annapure	14	2	17	1	18	3
Prof. Rekha S. Singhal	17	2	17	1	18	4
Dr. Laxmi Ananthanarayan	13	3	16	NA	16	2
Dr. Shalini S. Arya	5	1	6	NA	6	NA
Dr. Jyoti Sagar Gokhale	NA	NA	NA	NA	NA	NA
Dr. Snehasis Chakraborty	1	NA	NA	NA	NA	NA

4.2.3. Faculty Development Work (10)

Sr.No	Topic	Description	Venue	Date
Prof. Smita S. Lele				
1	Career Selection and Personality Development	Invited talk and chief guest at Golden Jubilee Function Pachora	Coope Bank Pachora, Jalgaon	August 31, 2015
2	Fermented Fruits and Vegetables: Scenario and Potential in India	Invited talk at National Conference on Biotechnological Interventions for Upgradation of Food Products of India,	University of Kashmir	9-10 September, 2015.
3	Nutrition, Health and Beyond	Invited talk	Mumbai Commissioners Office	September 14, 2015.
4	Invited lecture on "Science and Technique of S & T propagation	Invited lecture at39th Indian Social Science Congressheld during	Manglore University,	1st -5th December 2015
5	Food Safety & Life Style	Invited speaker	shree pancham KhemrajMahavidyalaya, Sawantwadi.	December 5, 2015
6	National Seminar on Recent FSSAI on Recent FSSAI Notifications and Amendments	Invited speaker	Hotel Peninsula Grand, Mumbai	March 9, 2016
7	Career selection and positive thinking	Delivered a lecture	Singhgad College	September 20, 2016.
8	Holistic approach on health and nutrition	Chief Guest, for felicitation program under IQAC (Internal quality assurance committee) and delivered lecture	Modern college, Vashi	September 19, 2016.
	Appropriate career selection	Delivered a lecture	ST Xavier's college, Mumbai	August 20, 2016.
9	Mango, Jamun & Other Fruit Wine Making	Organized two successive one week workshop in collaboration with Sawarde Valley Food Foundation (SVFF) and supported by support from TEQIP III.	Sawarda, Chiplun,	June, 2018
Prof. Uday S. Annapure				
1	Food Science and Technology	Invited talk	CKT College, Panvel	January 10, 2015
2	Recent trends in Food Processing and Technology	Invited talk at state level seminar on 'Recent Trends in Dairy and Food Processing	Vivekanand Arts, Sardar Dalipsingh Commerce and Science College, Aurangabad	February 16, 2016
3	Non-thermal Processes : Emerging Technologies for Food Processing	Invited talk at Farmer Empowerment through Agro-processing & Sustainable Technologies duringXXIV Indian Convention of Food Scientists & Technologists	VNMKV, Parbhani	December 18-19, 2015
4	Non-Thermal Process - Emerging Technologies for Food and Nutrition	Innovative Thought Forum, Brainstorming on Food Processing, Food Security and Food	Maple Room, Indian Habitat Centre, Lodhi Road, New Delhi.	November 25, 2015

	Security	Nutrition		
5	National conference on Technologies in Sustainable food systems (TSFS - 2016)	Invited guest of honour	Dept. of food engg. and technology, SLIET Longowal University, Punjab	7-8 October 2016
6	Plasma processing of materials	Invited to talk at a workshop	Dept. of Physics, ICT	September 21, 2016
7	Soy Based Extruded Products	Invited talk delivered at USSEC conference on "Soy: Avenues and Opportunities"	American Soybean Association and US Soybean Export Council, at Ahmedabad, Gujarat	February 28, 2017.
8	Soy Based Extruded Products	Invited talk delivered at conference on "Soy Nutrition and Soy Opportunities – Creating Linkages	Organised by USSEC in collaboration with the Association of Food Scientists and Technologist, Soy Food Promotion and Welfare Association and Soy Processors Association of India at Hotel Taj Santacruz,	December 28, 2016.
9	Cold Plasma Processing	Invited talk at the World Food Day seminar	Department of Food Processing Technology, A.D. Patel Institute of Technology, New Vallabh Vidya Nagar, Anand, Gujarat.	
10	Non-Thermal Process - Emerging Technologies for Food Processing	Invited talk delivered under TEQIP	Department of Technology, Shivaji University, Kolhapur	September 14, 2016.
11	Recent Trends in Food & Agri Biotech	Invited to talk on DBT sponsored National Conference	Dept. of Biotechnology, Sinhgad College of Engineering, Pune	14-15 September 2017.
12	Nutrition week 2017	Invited Guest of Honour	ICT, Mumbai in Association with AFST Mumbai at ICT	September 7, 2017
Prof. Rekha S. Singhal				
1	Tips for writing research papers	A lecture delivered at National Workshop on 'Writing Scientific Research Articles of International Standards,	College of Home Science, Nirmala Nikatan, Mumbai	July 10, 2015
2	Challenges in Food Analysis,	A lecture delivered	Chandigarh	August 20, 2015
3	Nutraceuticals for joint health,	A lecture delivered at Savitibai Phule Pune University Sponsored two-day International Seminar on "pharmaceuticals to Nutraceuticals: A Pragmatic Approach'	Sinhgad College of Pharmacy, Pune	January 16, 2016.
4	Nutraceuticals for joint health,	A lecture delivered at seminar on 'Nanobiotechnology and Nutraceuticals in Health and Disease Management'	Pillai College of Arts, Commerce and Science, New Panvel	January 19, 2016
5	Trehalose - a newer	lecture delivered at	Tata Chemicals	January 22,

	food ingredient with nutritional and processing advantages	iNNCOTECH Series Symposium	Innovation Centre, Pune.	2016
6	Food safety from farmto- fork: some realities, challenges, constraints and regulatory framework,	Lecture delivered at 25th Indian Convention of Food Scientists and Technologists (ICFOST-XXV),	Guru Nanak Dev University, Amritsar, Punjab	November 10-12, 2016.
7	Making agriculture pronutrition	Lecture delivered at Prof. Jamuna Prakash Felicitation Function	University of Mysore	February 18, 2017.
8	Bioavailability of nutraceuticals: some insights	Lecture delivered at the TEQIP organized workshop on 'Hands on Training for Analysis of Food Bioactives',		March 3, 2017
9	Woman: A salute to the centre of gravity of our existence,	Lecture given on the occasion of International Women's Day,	Babasaheb Ambedkar Technological University, Lonere,	March 8, 2017.
10	Microbes and depression: a deep connect	Lecture delivered at 7th Interdisciplinary Research Conference	Krishna Institute of Medical Sciences Deemed University, Karad,	March 9, 2017.
11	Valorization of food processing wastes,	A plenary lecture delivered at UGC SAP National Seminar on Research Trends in Food Processing: Value Addition and Enterprise Development (RTiFP-2017),	Tezpur University,	March 27, 2017.
12	Health and Wellness through Affordable Food Technology, organized by	Seminar on 'Prosperity through Science & Technology,	Marathi Vidnyan Parishad, Nehru Science Centre,	February 16, 2018.
13	Supercritical fluid extraction of biomolecules	Lecture delivered at a workshop on Food Preservation Techniques	Organized by BIRAC, New Delhi at ICT, Mumbai	February 15-17, 2018.
14	Innovations in Chemistry - Laboratory to Society (ICLS-2018)",	Food as a complex matrix of chemicals and materials: some innovations, plenary lecture, National Conference ICLS-2018	North Maharashtra University, Jalgaon,	March 5-6, 2018.
15	a) Microencapsulation of sensitive food constituents b) Nutraceuticals for joint health	Lectures delivered at	Dept of Studies in Food science & Nutrition, University of Mysore,	March 23, 2018
Dr. Snehasis Chakraborty				
1	Safety aspects of Synthetic, Nature Identical and Natural flavoring Substances	Lecture delivered at India in Food Safety and Quality Management (FSQM) Course	IIT Kharagpur	January 17 to30, 2016
2	Advanced thermal and nonthermal processing	Delivered a guest lecture	KK wagh College, Nashik,	26 August 2017.

	of food			
3	Spray drying: operating principles and design criteria	Provided training	Sunpharma industries Ltd. Delhi	5-6 July, 2017.
4	Give training on Advanced Food Processing Techniques to Masters students at	Provided training	Centre of food technology, Allahabad	14-15 May 2017
5	Analysis of food bioactives,"statistical techniques applied in analysis of food bioactives	Provided hands on training	ICT Mumbai	2-4 March, 2017.

Seminars/lectures/workshops organised by Department

Sr.No	Date	Funding/Co-organizer/collaborator	Distinguished speaker/Affiliation	Title of lecture/workshop
1	March 6, 2019	UGC & TEQIP	Dr. Umesh Hebbar Prof. Utpal Raychaudhuri,	Carbohydrates in Food and Food Processing'
2	February 5-7, 2019	UGC & TEQIP		Hands on Training for Analysis of Food Bioactives
3	26 Dec, 2018	UGC & TEQIP		One-Day In House Seminar on 'Uprising Drift in the Path of Food Biotechnology and Fermentation Technology:
4	26-28 Feb, 2018	Food engineering and technology department, ICT and BIRAC	NA	Workshop on Food Preservation Techniques
5	May 4- 8, 2018 and June 14- 21, 2018.	In collaboration with Sahyadri Education Society at Chiplun and sponsored by TEQIP III.	NA	Two workshops were organized with hands on training on non-grape-fruit wine making
6	Friday, Dec 29, 2017		Dr. P. Neville R. J. Amunugoda, Industrial Technology Institute (ITI), Colombo, Sri Lanka	Initiatives of Non-thermal Food Processing in Sri Lanka: An overview
7	Tuesday Dec 12, 2017		Professor Keshavan Niranjan Professor of Food Bioprocessing Editor, Journal of Food Engineering Department of Food and Nutritional Sciences University of Reading	New ProductDevelopment (NPD) in food business
8	Friday, Jan 19, 2018		Dr. C. Anandharamkrishnan, Director, Indian Institute of Food Processing Technology, Thanjavur, India	Current and future prospects of nanotechnology in food processing

9	Tuseday 28th November, 2017	Marico Industries Visiting Fellowship	Dr. Shyam S. Sablani, Associate Department Chair Department of Biological Systems Engineering, WSU	Polymer Packaging for Advanced Food Processing Technologies
10	December 9, 2016	NA	NA	National seminar on opportunities & challenges of foreign direct investment (FDI) in food retail india
11	September 27, 2016	Food engineering and technology department jointly with AFST Mumbai chapter		Workshop to showcase ICT FETD success stories & bringout opportunities for fruit & veg processing in India for dreaming entrepreneurship & SME & farmers
12	August 12, 2016	Food Engineering and technology department under TEQIP-II in collaboration with AFST(I) Mumbai Chapter		A workshop on " E n t r e p r e n e u r s h i p Development: Dare to dream"
13	February 15, 2017	Food engineering and technology department jointly with AFST Mumbai chapter under TEQIP-II program supported by world bank		Prof. D.V.Rege Memorial seminar Nutraceuticals-Science to Business
14	2-4th March, 2017	Supported by TEQIP-II		workshop on Hands on training for analysis of food bioactives
15	September 27,2016	organized by Prof S.S. Lele jointly with Trilok Food, Satara and supported by TEQIP		One day workshop on "Fruits and Vegetable Processing Opportunities in Maharashtra
16	1st September , 2015	Golden Jubilee Visiting fellowship	Dr. Anil Gaokar Teacher's Colony, Post: Nandanagadda, Karwar, Karnataka	Food Rheology
17	12th January, 2016	Golden Jubilee Visiting fellowship	Prof. Dr. Jyoti Prakash Tamang Dean, School of life sciences, Prof. Dept. of Micriobiology, Sikkim University	Microbiology & Health benefits of Global Fermented Food & Beverages
18	4th July, 2015	Marico Industries visiting fellowship	Dr. Hormazdiar Patva, Director, Sensient India Pvt. Ltd., Mumbai.	Flavour and colour insights, current overview and research focused approach
19	15th February, 2016	NA	Dr. Prathap Shetty	Microflora from fermented foods as rich bio- resource for technological applications
20	30th March, 2016	Marico Industries visiting fellowship	Dr. Joseph Lewis	Food Law: Principle to Practice

4.3. Faculty as Participants in Faculty Development/Training activities/ STTPs (5)

Sr.No	Programm Title	Description	Duration
Prof. Smita S. Lele			
1	Training Programme on NBA Accreditation		5 & 6th February 2016
2	Prof. D. V. Rege Memorial Seminar Neutraceuticals-Science to Business		2/15/2017
3	Bioreactors and challenge in scale up of food bioprocessing	UGC refresher course,	3/1/2017
4	Mango, Jamun & other fruit wine making	Modules on fruit selection and characterization, fruit processing, upstream and downstream processing of wine, routine wine analysis, sensory evaluation techniques, and finance and market opportunities.	Jun-18
5	Ideas, Innovation & Industry enabling smart food factories organized		3/3/2018
6	Advanced pedagogy and management capacity building training for engineering faculty and senior administrators	Faculty development program	21st to 25th June 2018
7	How to stay fit, happy and be efficient at work	Capacity building programme	6/24/2018
8	Fruit processing		1/7/2018
9	Bioprocessing of fruit vegetable waste	Faculty development program	10/15/2017
10	19th World Congress of Food Science and Technology	IUFoST- 2018	23-27, October 2018
Prof. Uday S. Annapure			
1	Quality Initiatives in Technical & Higher Educational Institutions	Workshop	07/10/2015 - 09/10/2015
2	Cold Plasma Processing: An Emerging Technology for Food Processing		18/12/2015 - 19/12/2015
3	Recent Trends in Dairy &	Seminar	2/16/2016

	Food Processing		
4	Recent FSSAI Notifications & Amendments	Seminar	3/9/2016
5	Palm Oil Familiarization Programme		21/08/2016 - 27/08/2016
6	Tailoring Technologies for Rural Sector: Development & Dissemination		29/10/2018 - 02/11/2018
7	Techniques in Food Processing & Preservation	Seminar	3/23/2019
8	Scope of Research in Hotel Management & Catering Technology	Workshop	8/10/2019
9	8th International Food Convention		12/12/2018 - 15/12/2018
10	iCFRAFPT-2018		17/08/2018 - 19/08/2018
11	25th ICFoST-XXV		10/11/2016 - 12/11/2016
12	Post-Harvest Handling, Ambient Controlled Storage and Supply Chain Management		2/2/2018
13	Bakery Technology	Workshop	27/07/2017 - 29/07/2017
14	Prof. D. V. Rege Memorial Seminar Neutraceuticals-Science to Business	Tequip and supported by world bank	2/15/2017
15	19th World Congress of Food Science and Technology	IUFoST- 2018	23-27, October 2018
Prof. Rekha S. Singhal			
1	Regulatory Practices: Interpretation & Compliance, PFNDAI	Faculty development program	April 18, 2016.
2	Prosperity through Science & Technology, Marathi Vidnyan Parishad	Seminar	2/16/2018
3	Food Preservation Techniques, BIRAC, New Delhi		15 to 17-02-2018
4			
5			
6	Advanced pedagogy and management capacity building training for engineering faculty and senior administrators	Workshop, Faculty development program	21st to 25th June 2018

7	19th World Congress of Food Science and Technology	IUFoST- 2018	23-27, October 2018
Dr. Laxmi Ananthanarayan			
1	Advanced pedagogy and management capacity building training for engineering faculty and senior administrators	Faculty development program	21st to 25th June 2018
2	19th World Congress of Food Science and Technology	IUFoST- 2018	23-27, October 2018
3	Scope of research in Hotel Management & Catering Technology	Theory course in food analysis	10th August 2019
Dr. Shalini S. Arya			
1	Food Entrepreneurship Development	Workshop FETD, ICT & AFSTI (Mumbai Chapter),	12th August 2016
2	Fruits and Vegetable Processing Opportunities in Maharashtra	Workshop	27th September 2016
3	19th World Congress of Food Science and Technology	IUFoST- 2018	23-27, October 2018
4	Level 2 workshop on Research Based Pedagogical Tools		6-8, December, 2017
5	Science Leadership Workshop for New Global Young Academy Members	8th International Conference of Young Scientists & Annual General Meeting of the Global Young Academy, Pattaya, Thailand	7-11 May, 2018.
6	Research Based Pedagogical Tools	Training on Level 2 workshop National Science Academy (INSA), New Delhi, India Centre of Excellence in Science and Mathematics Education (CoESME), Indian Institute of Science Education and Research (IISER), Pune and Sheffield Hallam University, UK	6-8, December, 2017.
7	Research Based Pedagogical Tools,	Level 1 Teacher Training Workshop Pt. Ravishankar Shukla University, Raipur, Chhattisgarh and Sheffield Hallam University, UK	6-9, October, 2017.

Dr. Jyoti Sagar Gokhale			
1	Microwave Heating and Processing of Foods	AICTE Sponsored one-week QIP Short Term Course	13th August to 17th August 2019
2	Nutraceuticals: Recent Trends and Advances	National Seminar	30th November 2018
3	Uprising Drift in the Path of Food Biotechnology and Fermentation Technology	In-House Seminar for Research Scholars of Department of Food Engineering and Technology	26th December 2018
4	Faculty Induction Program	Faculty Induction Program	November 27 to December 2, 2017
5	Orientation Program	Orientation Program	February 6 to March 4, 2017
6	Teaching and Learning Biology: Problem Solving Approach	National Workshop	August 4- 11, 2014
Dr. Snehasis Chakraborty			
1	Microwave Heating and Processing of Foods	Concept of microwave technology, its effect on food materials, and research work done on it so far (at IIT Bombay)	5 Days [13/05/2019 - 17/05/2019]
2	Recent Advances in Chemical Science and Technology	Recent Advances in Chemical Science and Technology at Mumbai University, India	20 Days [12 Nov-1st Dec 2018]
3	Preparative Processing and Analysis of Bio/Pharmaceuticals	Preparative Processing and Analysis of Bio/Pharmaceuticals at ICT Mumbai, India	5 Days [14 - 18 March 2018]
4	Summer Workshop on Bioprocess Engineering	Summer Workshop on Bioprocess Engineering at IIT Madras, India	5 Days [27 June - 1 July 2016]
5	Training Programme on NBA Accreditation	Training Programme on NBA Accreditation at ICT Mumbai, India	2 Days [4 - 5 Dec 2015], 2 Days [5 - 6 Feb 2016]
6	19th World Congress of Food Science and Technology	IUFoST- 2018	23-27, October 2018

4.4. Research and Development (30)

4.4.1. Sponsored Research (15)

AY 2018-19

No.	Faculty	Project Name	Funding Body	Grant (₹)	Duration
1	Professor Smita S. Lele	Techno-commercial Viability Studies for Small Scale Fruit Winery	RGSTC, Govt. of India	31,76,000	2018-2020
2	Dr. Shalini S. Arya	Novel, non-thermal, energy efficient, industrially scalable hydrodynamic cavitation processing of indigenous fruit juices for enhanced nutritional bioactives and shelf life extension	MOFPI	49,30,560	2018-2020
3	Dr. Shalini S. Arya	Novel, non-thermal, energy efficient, industrially scalable hydrodynamic cavitation (HC) processing of milk for enhanced nutrients and shelf life extension	DST-SERB	43,06,000	2018-2021
4	Dr. Snehasis Chakraborty	Integrated processing of beverages from minor tropical fruits	MoFPI	36,46,800	Dec 2018 – Dec 2021

AY 2017-18

No.	Faculty	Project Name	Funding Body	Grant (₹)	Duration
1	Prof. Uday S. Annapure	Studies in surface sterilization of spices using non thermal processing	DST- (Indo srilankan joint project)	26,48,000	November 2017-November 2019

AY 2016-17

No.	Faculty	Project Name	Funding Body	Grant (₹)	Duration
1	Dr. Snehasis Chakraborty	Pulse light processing of beverage using under-utilized fruits	DST-SERB	₹ 48,00,000	April 2017 – Mar 2020

4.4.2. Consultancy (from Industry) (15)

AY 2016-17, 2017-18, 2018-19

No.	Faculty	Project Name	Funding Body	Grant (₹)	Duration
1	Prof. Uday S. Annapure/Dr. Snehasis Chakraborty	Parametric study and data analysis in the process of developing cooking aids	Godrej & Boyce Mfg Co Ltd, India	₹ 5,17,500	Mar – Sep 2017

2	Prof. Uday S. Annapure	Low GI wheat grits	Kargill India Pvt Ltd		June-July 2018
3	Dr. Shalini S. Arya	Assessment of tur dal quality	Bühler India Pvt Ltd, Banglore	₹ 2,50,750	2018-19
4	Dr. Shalini S. Arya	Shelf life and quality study of Kombucha	Zen Tiger Kombucha, Mumbai	₹ 1,75,000	2018
5	Dr. Shalini S. Arya	Expert opinion on fruit leathers	Maximus Buildcom	₹ 2,00,000	May-17
6	Prof. R. S. Singhal	Microbial fermentation of tea	Unilever Industries Pvt. Ltd, Bangalore	₹ 10,39,000	2014-2017
7	Prof. R. S. Singhal	Taste response study of amaranth-quinoa snacks by Indian population	Rutgers Centers for Global Advancement and International Affairs	₹ 4,72,000	February 2014 to December
8	Prof. R.S.Singhal	Anti-Hangover Formulation	THINQ Pharma CRO. LTD	₹ 4,51,000	17th June - 17th December 2017
9	Prof. Uday S. Annapure	Safety Evaluation of cereal food products	General Mills	₹ 2,80,900	May-15
10	Dr. Shalini S. Arya	Usage study of Fortified Wheat and Monitoring	Tata Trust and Government of Maharashtra, Mumbai, India	₹ 3,00,000	2016-17
11	Dr. Shalini S. Arya	Physical, chemical, nutritional characterization and product development of besan	Bühler India Pvt Ltd., Bangalore, India	₹ 4,33,125	2016-17

CRITERION 5	Laboratories and Research Facilities	75

5.1. Adequate & well-equipped laboratories in area of Program specialization (30)

List of support staff

Name	Designation
Mrs. S. S. Jadhav	Lab Technician
Mrs. C. B. Koli	Lab Assistant
Ms. S. R. Dhakne	Lab Assistant
Mrs. Pramila Pawar	Lab Attendant
Mr. Santosh Rajam	Lab Attendant
Mr. Ganesh Bhagat	Lab Attendant
Mr. Rupesh Alim	Lab Attendant

Laboratory Used for M. Tech. Food Engineering and Technology

S.No.	**Name of the Laboratory**	**Specialized Equipment Name**	**Equipment details**	**Related PO**	**Utilization %**
1.	Food Analysis Lab	Weighing balance (g)	Anand Instruments	PO1, 3, 4	70%
		Weighing balance (mg)	Sartorius	PO1, 3, 4	70%
		Spectrophotometer x 2units	Thermo Scientific	PO1, 3, 4	30%
		Bacteriological Incubator	Bacto	PO1, 3, 4	15%
		Hot Air Oven	Labline	PO1, 3, 4	30%
		Cyclo mixer	Remi	PO1, 3, 4	20%
		Hot plate x 3units	Labline	PO1, 3, 4	30%
		Water Purification System	Sartorius	PO1, 3, 4	100%
		Autoclave	Equiptronics	PO1, 3, 4	15%
		Water Bath	Equiptronics	PO1, 3, 4	50%
		Fumehood	Inhousedesign	PO1, 3, 4	40%
2.	Food Processing Lab (A 289)	Refrigerator	Samsung	PO1, 3, 4	30%
		Homogenizer	APV	PO1, 3, 4	20%
		Balance 1kg	Smart	PO1, 3, 4	50%
		Balance 3kg	Smart	PO1, 3, 4	20%
		Coating Pan	Hally instruments	PO1, 3, 4	10%
		Colloidal Mill	Hally instruments	PO1, 3, 4	20%
		Conventional Oven	Garbin	PO1, 3, 4	20%
		Deep Freezer	Bluestar	PO1, 3, 4	10%
		Dough mixer	Abrazo	PO1, 3, 4	20%
		Dryer 2 no	Adv system	PO1, 3, 4	20%
		Filter press	Dinshaw	PO1, 3, 4	20%
		Hammer mill x 2	Natraj	PO1, 3, 4	20%
		Heavy duty mixer	Bosch	PO1, 3, 4	30%

		Hot Air Oven	Labline	PO1, 3, 4	30%
		IR Dryer	Gel Engg	PO1, 3, 4	10%
		Juicer x 2	Prestige	PO1, 3, 4	10%
		Particle size shaker	CS Scientific	PO1, 3, 4	10%
		Planetary mixer	Abrazo	PO1, 3, 4	15%
		Pulper	Parson	PO1, 3, 4	20%
		Refractometer	ABBE	PO1, 3, 4	20%
		Retort	Laxmi Engg	PO1, 3, 4	10%
		Sealing Machine	Pakona	PO1, 3, 4	20%
		Sheeter	Ferneto	PO1, 3, 4	10%
		Stone Grinding mill	Smartken	PO1, 3, 4	10%
		Vacuum pump	Vijay	PO1, 3, 4	15%

Table 5.1.1

Utilization % = (No of experiment in which it is used/Total experiment) x 100%

FDP 2016 Food Analysis Lab

No.	Experiment	Equipment required	Stu/grp
FA1	Proximate composition in food	muffle furnace, kjeldahl, soxhelt, oven	2
FA2	Analysis of milk and dairy products & Detection of adulterants in milk (liquid)	lactometer, butyrometer	2
FA3	Analysis of wheat flour; Determination of damaged starch from whole wheat flour	Baking oven, dough knider and sheeter, texture analyzer	2
FA4	Analysis of tea and coffee	muffle furnace, kjeldahl, soxhelt, oven	2
FA5	Estimation of phenolics, antioxidant activity, chlorophyll and carotenoids	spectrophotometer	2
FA6	Analysis of Food adulteration with respect to specific foods dairy, cereal, muscles food etc.	spectrophotometer, colorimeter	2
FA7	Microbial and Enzyme assay	laminar air flow, spectrophotometer	2
FA8	Discriminative and Descriptive Sensory analysis of Foods		2
FA9	Demo of colorimeter, texture analyzer, DSC, HPLC, GC-MS etc.	colorimeter, texture analyzer, DSC, HPLC, GC-MS	2

FDP 2015 Food Process Engineering lab

No.	Experiment	Equipment	Stu/grp
FPE1	Milling, Particle size reduction and sieve analysis of cereal and wheat flour	Sieve, miller, dehusker	2
FPE 2	Homogenization, Rheological Study and mixing index in a food mixture	Homogenizer, Rheometer	2
FPE 3	Kinetics in thermal process design: Retort processing & pasteurization of liquid food	Autoclave, water bath, spectrophotometer	2

FPE 4	Effect of process and product parameters on baking of bread & biscuit	Baking oven, dough mixer, kneader and sheeter, texture analyzer, colorimeter	2
FPE 5	Effect of Process and product parameters on quality of fruit products	Cutter, shredder, spectrophotometer, texture analyzer, colorimeter, pH meter, refractometer, water activity meter, moisture analyzer	2
FPE 6	Effect of Process and product parameters on quality of dairy products	lactometer, butyrometer, pH meter, refractometer, water activity meter	2
FPE 7	Effect of material and air properties on tray & spray drying of food materials	tray drier, spray drier	2
FPE 8	Non-thermal processing of food	ultrasound, pulse light, Autoclave, water bath, spectrophotometer	2
FPE 9	Study of extraction of oleoresins from spices using liquid carbon dioxide	super critical fluid extraction, spectrophotometer	2

5.2. Research facilities / Center of excellence (30)

S.No.	**Name of the Facility**	**Specialized Equipment Name**	**Equipment details**	**Related PO & Used in Expt**
1.	Extruder room	Extruder	Brabender	PO1
2.	Instrumentation Room	Differential Scanning Calorimeter	Shimadzu	PO1
		HPTLC	LamagAhchlom	PO1
		Laminar Air Flow	Micro-Med India	PO1, FA7, FPE3, 8
		Microscope	Motic	PO1
		UV-vis spectrophotometer	Shimadzu	PO1, FA5-7, FPE3, 8
		UV-vis spectrophotometer	Hitachi	PO1, FA5-7, FPE3, 8
		Centrifuge (J2-MC)	Bechmann	PO1, FA2,5, FPE3, 8
3.	Lab A-211	Shaker incubator	Remi	PO1
		Water Purification	Borosil RO	PO1
		Autoclave	Local	PO1, FA7, FPE3, 8
		pH meter	Thermo fisher	PO1, FA7, FPE3, 8
		Rotary Evaporator	Ika	PO1
		Centrifuge	Remi	PO1, FA2,5, FPE3, 8
		Weighing balance	Wensar	PO1
4	Lab A-214	Nanodrop		PO1
		Gel doc	BioRad	PO1
		Heating block	Neolab	PO1
		Rocking platform	Neolab	PO1
		UV transilluminator	UVP	PO1
5.	Lab A-213	1. Centrifuge	Remi	PO1, FA2,5, FPE3,
		2. Shaker algae 25C	Orbiteck	PO1, FA5, FPE3
		3. Bath Sonicator		PO1, FPE8
6.	Lab A-218	1. Cooling centrifuge	Remi	PO1, FA2,5, FPE3, 8

		2. Incubator	Thermolab	PO1, FA7, FPE3, 8
		3. Ultraflitration unit	Millipore	PO1, FPE8
		4. Rotavap	Buchi	PO1
		5. Pulsed Light	Xenon	PO1, FPE8
7.	Lab A-237	1. Bath Sonicator	Plasto crafts	PO1, FPE8
		2. Centrifuge Superspin R-V/FA	Equiptronics	PO1, FA2,5, FPE3, 8
		3. pH meter with magnetic stirrer	Sunbim	PO1, FA5-7, FPE3, 8
		4. Reflux unit		PO1, FA4
		5. Microwave oven	Vacucell	PO1, FPE3
		6. Vacuum oven		PO1, FPE7
8.	Lab A-283	1. Hot Air Oven	Expe Hi-Tech	PO1, FPE7, FA1
		2. Kel Plus	Kjeldahl Unit	PO1, FA1
		3. Sox plus		PO1, FA1
		4. Fibra plus		PO1, FA1
		5. Weighing Balance	Contech	PO1
		6. pH meter		PO1
9.	Autoclave room	1. Environmental Test Chamber	Remi Instruments Ltd.	PO1
		2. Oil/Water Bath Shaker	Global Corp.	PO1, FPE3, FA7
		3. Water Bath Shaker		PO1, FPE3, FA7
10.	PTC	MAP-CAP	Reepack	PO1
11.	Fermentation Lab	UV-vis spectrophotometer	Shimadzu	PO1, FA5-7, FPE3, 8
		Milipore Lab Scale Ultra filtration System	Millipore	PO1
		Real Time PCR	AppliedBiosystems	PO1
		Fermentor	Sartorius	PO1
		GC-MS	Varian	PO1
12	SFE Lab	Spray dyer x 2	JISL, LS8-48, JISL, Spraymate	PO1, FPE7
		Supercritical Fluid Extraction x 2	Applied Separation and chemtron	PO1, FPE9
13	Prof. D V Rege Lab	96- Well Plate Spectrophotometer	Biotech	PO1, PO1, FA5-7, FPE3, 8
		HPLC	Dionex	PO1
		HPLC	Jasco	PO1
		HPLC	Jasco	PO1
		PCR	Techne	PO1
		PCR	Bio Rad	PO1
		PCR	Bio Rad	PO1
		Protein Purification Fraction Collector	Bio Rad	PO1
		Rheometer	(Brookefield)	PO1, FPE2
		Colorimeter	HunterLab	PO1, FA9, FPE3
		Sonicator (probe+tub)		PO1, FPE8
		Weighing Balance	Wensor	PO1
		Weighing Balance	Sartorius	PO1
		GC	Agilent Technologies	PO1
		GC	Chemito	PO1
		Viscometer	Haake	PO1, FPE2
		Gel Doc	BioRad	PO1
		Water activity meter	Rotronics	PO1, FPE7

Table 5.2.1

5.3. Access to laboratory facilities, training in the use of equipment (15)

All M.Tech students have access to all the sophisticated instruments and have been trained during their coursework and labwork.

List of FETD Laboratory and Utilization

Sr. No	Lab No	Name	Utilization
1	A-209	Extruder Room	UG, PG, Ph.D.
2	A-208	Instrumentation Lab	UG, PG, Ph.D.
3	A-211	FETD Lab	UG, PG, Ph.D.
4	A-212	Autoclave room	UG, PG, Ph.D.
5	A-213	Lab-A213	UG, PG, Ph.D.
6	A-214	Mol. Bio Lab	UG, PG, Ph.D.
7	A-215	Fermentation Lab	UG, PG, Ph.D.
8	A-216	Laminar Room	UG, PG, Ph.D.
9	A-217	Prof. DV Rege Lab	UG, PG, Ph.D.
10	A-218	FETD Lab	UG, PG, Ph.D.
11	A-237	PTC Lab	UG, PG, Ph.D.
12	A-238	FBT Lab	UG, PG, Ph.D.
13	A-283	Lab 283	UG, PG, Ph.D.
14	A-285	Super Critical Extraction Room	UG, PG, Ph.D.
15	A-289	Processing Lab	UG, PG, Ph.D.
16	A-241	Technical Analysis Lab	UG, PG, Ph.D.
17	-	Lalwani Center Food Biotechnology UG Lab	UG, PG, Ph.D.

Training Given to Students in last three AY

Sr no.	Date of Training	Name of the equipment/ facility	Training Given By
1	8/01/2017	Turbidity meter	Systronics meter
2	15/01/2017	HPLC UV	Jasco
3	25/05/2017	Vacuum oven	Best Engine
4	20/03/2018	Pulsed Light System	Xenon Corporation
5	05/04/2018	FTIR	Thermofisher
6	28/06/2018	Viscotip	Brookfield
7	25/07/2018	Texture Analyser	Stable Microsystems
8	17/08/2018	LAB Spectrophotometer	Jasco
9	03/01/2019	Colorimeter	Hunter Lab
10	12/02/2019	Cooling centrifuge	Remi
11	15/03/2019	Water Activity Meter	Potronics
12	27/08/2019	HPLC RID	Jasco
13	30/08/2019	Rheometer	Anton Paar

CRITERION 6	Continuous Improvement	75

6.1. Actions taken based on the results of evaluation of each of the POs (25)

Target for PO attainment

Being one of the premier institutes in the country in Food Engineering and Technology, the skill level of the student is expected to be on a higher side. Therefore, starting the 70% attainment level in graduating batch 2016, the target for graduating batch 2018 is kept at least 75-80%.

Comment on Overall PO Attainment for Batch Graduating in 2018

PO	Target Value	Attainment	Observation
PO1: An ability to independently carry out research or investigation and development work to solve practical problems			
PO1	75-80	77	The research component of the curriculum has been revised from AY2017. It is expected that attainment of this PO1 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			
PO2: An ability to write and present a substantial technical report or document			
PO2	75-80	76	The submission of technical report has been increased in revised syllabus from AY2017. This is mainly associated with Research I, II, III and Industrial Training. Inclusion of lab is also done to emphasize this PO2. It is expected that attainment of this PO2 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			
PO3: An ability to demonstrate a degree of mastery over the area of food engineering and technology			
PO3	75-80	76	The engineering component of the curriculum has been increased in revised syllabus from AY2017. One laboratory course on Food Process Engineering has been included in revised syllabus. The inclusion of industrial Training will also help in solving practical problem related to Food Engineering and Technology. It is expected that attainment of this PO3 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			
PO4: An ability to use and evaluate modern techniques or tools applied in food processing, analysis and packaging			
PO4	75-80	77	The revised syllabus from AY2017, inclusion of Food Analysis lab will emphasize this PO4. Knowledge on experimental design as one of the Electives will help in attaining the PO4. It is expected that attainment of this PO4 will be higher in graduating batch of 2019.
Action: Trying to maintain the level and targeting for higher.			

PO5: An ability to provide solution to the issues related to nutrition, food safety and regulatory affairs			
PO5	75-80	77	The attainment if Satisfactory. However, in the revised syllabus incorporation of Industrial Training will also help in solving practical problem related to nutrition, food safety and regulatory affairs.
Action: Trying to maintain the level and targeting for higher.			

Action Taken on Curriculum

Curriculum for M. Tech. in Food Engineering and Technology (FET) has been revised in 2017-18. The important points in revised curriculum was as follows.

Concern Raised from the AY 2016-17	Action Taken	Related PO
Engineering Component of the program	The component for Engineering Science in the entire curricula was increased.	PO1
Practical problem-Solving ability of students needs attention	The syllabus of all the technical courses has been revised	PO1
No hands-on practical component in curriculum except Research	In each of the first two semesters, one laboratory course has been accommodated. The laboratory courses are FDP 2014: Food Analysis Lab and FDP 2015: Food Process Engineering Lab	PO1-PO5
Students were lacking in overall training	Industrial Training for One semester (Semester III) has been introduced.	PO1, PO3
Quality of Project	The M.Tech. Project Component has been divided to Semester I, II and IV. Semester IV is entirely devoted to research.	PO1, PO2
Number of Electives offered are less from the department	The number of core electives for M.Tech. courses has been increased. For instance, the added core electives are: Separation Techniques in Food Industry, Food Process and Equipment Design, Experimental Design and Optimization in Food Processing, Supply Chain Management in Food Industry, and Advances in Commodity Technology	PO4, PO5

Examination reforms: Out of 100 marks, 20 marks are assigned to Continuous Evaluation (such as surprise test, quiz & assignment). Next 30 marks are given to Mid Semester Examination (periodic test) and End Semester Examination Consists of 50 marks.

6.2. Improvement in Quality of Projects (10)

MTech from Food Engg & Tech graduated 2015-16

Student	Thesis Title	Broad Category in Food Engg & Tech
Ms. Sonakshi M. Meshram	Studies on Development of Indian Traditional Foods	Processing & Analysis
Ms. Ashwini E. Mohurle	Study of Functional Properties of Protein Co-Precipitate	Analysis
Ms. Yuga N. Bhat	Product & Process Development for Utilization of Dill Herb (Anethum Graveolens) and Drumstick Pods (Moringa Oleifera)	Product & Process Development
Ms. Rahel S. Das	Studies on Protein Co-Precipitates	Processing
Mr. Siddhant Banura	Effect of Cold Plasma Treatment on Properties of Starches	Processing
Mr. Sunil Jondhale	Studies in Isolation and Characterization of Plant Gum Exudated	Processing & Analysis
Mr. Dhananjay Ghorpade	Studies on Peanut Meal Incorporated Bread	Product Development
Mr. Rahul Jain	Studies on Microwave Processing of Paneer & Wheat-Grass Dehydration	Processing
Ms. Krati Dargarh	Omega-3 Enriched Functional Semi Sweet Biscuit with Flaxseeds	Product Development
Himanshu G Kumar Chaudhary	Enzyme Active Grain Flours in Novel Food Applications	Product Development
	Average Score out of 500	**374**
	No of Students Scoring more than average out of 10 students	**4**
	Attainment assigned in scale of 3	**1**

MTech from Food Engg & Tech graduated 2016-17

Student	Thesis Title	Broad Category in Food Engg & Tech
Vrushti Jigneshkumar Shah	Effect of cereal flour ingredients on textural properties of selected traditional foods	Processing & Analysis
Aroshi Mohinder Kumar Sharma	Studies on isolation and physico-chemical characterization of plant gum exudates	Processing & Analysis
Bulbul Rajinder Vij	Studies on effect of Cold Plasma Treatment on Xanthan gum	Processing
Ashwani Jawahar Kumar	Studies on Oleogels: Formulation, Functionality and Applications	Processing & Analysis
Vardan Singh	Studies on roselle (Hibiscus sabdariffa L.) and its food applications	Processing & Analysis
Niharika Abhay Soni	Modification of guar gum hydrolysate using dodecenyl succinic anhydride	Processing & Analysis
Swarnali Tarunkumar Das	Studies on the development of healthful fruit beverages	Product Development
Divya Mahalingaiah M.	Flaxseed incorporated functional flat bread	Product Development
Cheryl Allen Fernandes	Multigrain Functional Beverage	Product Development
	Average Score out of 500	**425**
	No of Students Scoring more than average out of 9	**5**
	Attainment assigned in scale of 3	**2**

MTech from Food Engg & Tech graduated 2017-18

Student	Thesis Title	Broad Category in Food Engg & Tech
Abisheka Pandian	Quality Monitoring of Paneer during Cold Chain using Enzymatic TTI	Engineering
Harshal	Novel Products from Fruit Seeds	Product Development
Kakoli Pegu	Effect of processing on bioactive compounds of fruit and vegetable leathers	Processing & Optimization
Kapil Rai	Development of flavored sugar cubes using ginger oleoresin	Product & Process Development
Kishori Balu Panmand	Development of sugar-free and reduced-fat Indian traditional confection	Product & Process Development
Krutika Anil Bhangale	Effect of cold plasma treatment on Acacia catechu gum	Processing & Analysis
Niveditha N.V.	Effect of cold plasma processing on the physico-chemical properties of palm oil	Processing & Analysis
Rishab Dhar	Pulsed Light Treatment of Mixed Tropical Fruit Beverage	Process optimization & Modelling
Shubham Goyal	Encapsulation of Momordica Charantia Linn. (bitter gourd) juice by spray drying technique	Process optimization & Modelling
Sneha Awasthi	Ginger candies: Process optimization and product development	Process optimization & Product Development
	Average Score out of 500	**438**
	No of Students Scoring more than average out of 10	**6**
	Attainment assigned in scale of 3	**3**

Comment on Improvement of Research Project

-There is a steady improvement in quality of the project as can be seen from the average score of the students is gradually increasing

-The number of students scoring more than average is also increased for the batch graduating in 2017-18

-The application of sound experimental design and using modern state-of the art instrument are facilitating the improvement.

-The thesis is thoroughly checked by two examiners (internal & external) and it is being plagiarism checked prior to submission.

-The process optimization, modelling, design and engineering component is increasing in the project gradually

-Further, the research component has been increased in AY2017 including the revised rubrics of the project. The project component has been divided to Semester I, II and IV. Semester IV is entirely devoted to research. It is expected that the quality of project is going to improve in next year.

-The thesis is evaluated of 500 marks and the **Rubrics** for evaluation is given below.

Details	Max. Marks	Internal Examiner	External Examiner
Understanding of Research Area	70		
Problem formulation/Experimental design/Mathematical Modelling	70		
Quality of Work done	70		
Analysis and Interpretation of Results	70		
Quality of Thesis Submitted	70		
Quality of Presentation	70		
Answer to Question raised during Open Defence	80		
Total	**500**		

Recommendation

The MTech thesis submitted by candidate is:

- Acceptable, may be regarded as final in present form.
- Acceptable, but with minor revisions.

6.3. Improvement in Placement, Higher Studies & Entrepreneurship (10)

Item	Graduating in AY			
	2018-19	2017-18	2016-17	2015-16
The total no. of students admitted in first year (N)	18	10	10	10
Total No of students completed first year (N1)	18	10	9	10
No. of students placed in companies or Government Sector (x)	-	8	9	9
No. of students pursuing Ph.D. / JRF/ SRF(y)	-	2	0	0
No. of students turned entrepreneur in engineering/technology (z)	-	0	0	0
x + y + z =	-	10	0.9	0.9
Placement Index: (x + y + z) /N	-	P1=1	P2=0.9	P3=0.9
Actual Placement index: (x+y+z)/N1	-	P1=1	P2=1	P3=0.9
Average placement= (P1 + P2 + P3)/3	0.95			
Assessment Points = 20 × average placement	**0.95 x 20 = 19**			

Comment on Improvement in Placement

-The placement for last three graduating batches is more than 90% in either case. Rather for the last year graduates (i.e. graduate in AY 2017-18) the placement is 100%.

-One student from entry year 2014-15 (14FET) did not continue after admission, so all other 9 students got placed in graduating year 2016-17

- The number of students opting for higher studies or PhD has been increased to 2 (20% increase) in last graduating year (AY 2017-18)

-The average pay package of the students, graduating in AY 2017-18, got placed in industry was Rs. 5.5 lakh per annum; whereas, the average package from previous year was within Rs. 4.8-5 lakh per annum

-All the students placed in last graduating year (AY 2017-18) are in Core national or Multinational company in Food Sector

-The trend in becoming entrepreneur is increasing and we expect that in coming year, at least one or two students will become entrepreneur in Food Sector.

6.4. Improvement in the quality of students admitted to program (10)

Assessment is based on improvement in terms of ranks/score in GATE examination

GATE Score	2018-19	2017-18	2016-17
Highest Score	733	704	624
Minimum Score	230	306	195

Table 6.4.1

Comment on Improvement in quality of students admitted

-All the students in last five academic years of this program are GATE qualified and they receive fellowship and contingency sponsored by AICTE

-From the above Table 6.4.1, it is clear that the quality of students admitted increased in last year. The Highest marks in GATE score is increasing in last three years.

-As there is increased sanction in intake from 10 to 18 in AY 2018-19, the minimum GATE score has been decreased (including reservation)

6.5. Improvement in quality of paper publication (10)

Graduating year 2015-16

1. Banura, S., Thirumdas, R., Kaur, A., Deshmukh, R.R., Annapure, U.S. (2018) Modification of starch using low pressure radio frequency air plasma. *LWT - Food Science and Technology*. 89, pp. 719-724

Graduating year 2016-17

1. Bulbul, V. J., Bhushette, P. R., Zambare, R. S., Deshmukh, R. R., &Annapure, U. S. (2019). Effect of cold plasma treatment on Xanthan gum properties. *Polymer Testing*, *79*, 106056.
2. Shah, N. N., Soni, N., & Singhal, R. S. (2018). Modification of proteins and polysaccharides using dodecenyl succinic anhydride: Synthesis, properties and applications—A review. *International Journal of Biological Macromolecules*, *107*, 2224-2233.
3. Soni, N., Shah, N. N., & Singhal, R. S. (2019). Dodecenylsuccinylated guar gum hydrolysate as a wall material for microencapsulation: Synthesis, characterization and evaluation. *Journal of Food Engineering*, *242*, 133-140.
4. Nagavekar, N., Kumar, A., Dubey, K., & Singhal, R. S. (2019). Supercritical carbon dioxide extraction of kokum fat from Garcinia indica kernels and its application as a gelator in oleogels with oils. *Industrial Crops and Products*, *138*, 111459.

5. Fernandes, C. G., Sonawane, S. K., & Arya, S. S. (2019). Optimization and modeling of novel multigrain beverage: Effect of food additives on physicochemical and functional properties. *Journal of Food Processing and Preservation*, e14151.
6. Fernandes, C. G., Sonawane, S. K., & Arya, S. S. (2018). Cereal based functional beverages: a review. *Journal of Microbiology, Biotechnology & Food Sciences*, *8*(3).

Graduating year 2017-18

1. Arya, S. S., Pegu, K., & Sadawarte, P. D. (2017). Bioactive Compounds and Health Benefits of Jamun (Syzygium cumini). *Bioactive Molecules in Food*, 1-20.
2. Dhar, R., & Chakraborty, S. (2019). Effect of Pulsed Light Treattemnt on Various Quality Attributes and Kinetic Modeling. *Innovative Food Science and Emerging Technologies.* (under review).
3. Pandian, A. & Chakraborty, S. (2019). The Enzymatic Time-Temperature Indicator (TTI) Device: A Review of its Applications in Quality Monitoring and Shelf-life Estimation of Food Products during Storage. *Journal of Food Engineering Reviews* (under review).

International Publications with MTech students of program are co-authors

Cumulative Impact Factor

Graduating Year	**2015-16**	**2016-17**	**2017-18**
Number of graduates	**10**	**9**	**10**
Number of Publications	1	6	3
Cumulative impact factor of the journals	3.714	16.831	8.302

Comment Improvement in quality of paper publication (10)

-The cumulative impact factor of the journal publications has been increased from Graduating year 2015-16 to 2016-17.

-As discussed earlier, the quality of thesis work has been improved in last three years and it is reflecting through publications

-It is fact that the manuscript needs to undergo rigorous revision and journal protocols. Therefore, the number of publications from the master's thesis work from graduating batch 2017-18 is expected to be increased.

-All the journals are of high standard international journal and comes in top 20 journals in Food Science & Technology.

-The examples of journals include *LWT - Food Science and Technology, International Journal of Biological Macromolecules, Journal of Food Engineering, Industrial Crops and Products, Journal of Food Processing and Preservation, Innovative Food Science and Emerging Technologies, Journal of Food Engineering Reviews.*

6.6. Improvement in laboratories (10)

Industry supported laboratories in last two years

-Prof. DV Rege Laboratory is completely renovated to attain the state-of-the art facility in the area of Food Analysis. It is sponsored by HIMEDIA Lab., India. This centre helps all the MTech and PhD students to carry out their research smoothly.

-Food Analysis lab has been renovated and it is sponsored by Goodwill Industries Ltd., India. This lab is used by UGs, PGs & PhDs was renovated which led to increase in working space for the students resulting in increased output and efficiency.

-PTC Research Lab re-designed and renovated and it is sponsored by Goodwill Industries Ltd., India. It is equipped with high tech instruments pertaining to food analysis and processing. M.Tech in Food Engineering and Technology students work in this lab, it is convenient for analysis

-One Smart Classroom is being constructed with modern tools and conferencing facility. It is sponsored by Fine Organics Ltd., India. Through this the students can be connected to any online tutorial facility from Foreign University.

INSTITUTE OF CHEMICAL TECHNOLOGY रसायन तंत्रज्ञान संस्था

Deemed to be University under Section-3 of UGC Act 1956

Elite Status & Centre of Excellence - Government of Maharashtra

NAAC A++ CGPA 3.77

Professor G. D. Yadav

B Chem Eng, Ph D(Tech), DSc (Hon Causa; DYPU), FNA, FTWAS, FASc, FNASc, FNAE, FRSC(UK), FIChemE(UK), ChE(UK), FICS, FMASc, FISTE, FIIChE

Vice Chancellor and R. T. Mody Distinguished Professor

J. C. Bose National Fellow (DST-GOI)

Declaration

I undertake that, the institution is well aware about the provisions in the NBA's accreditation manual concerned for this application, rules, regulations, notifications and NBA expert visit guidelines in force as on date and the institute shall fully abide by them.

It is submitted that information provided in this Self-Assessment Report is factually correct.

I understand and agree that an appropriate disciplinary action against the Institute will be initiated by the NBA in case any false statement/information is observed during pre-visit, visit, post visit and subsequent to grant of accreditation.

Date: 10-10-2019

Place: MUMBAI

Prof. G. D. Yadav

Vice-Chancellor

VICE CHANCELLOR
INSTITUTE OF CHEMICAL TECHNOLOGY
(University under Section-3 of UGC ACT of 1956)
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Adjunct Professor, School of Applied Sciences, RMIT University, Australia
Adjunct Professor, Dept. of Chemical & Biological Engg., University of Saskatchewan, Canada

Annexure 1.2.1 - Continuous Evaluation (Sample)

FDT 2001: Advances in Food Technology

.AY 2018-19: Continuous Evaluation – Presentation & Group Discussion (15 min each)

Sl No.	Roll No.	Topic of Presentation	Related CO	Evaluation Division (10)				
				Presentation skill (2)	Technicality of PPT (2)	Discussion with Peers (2)	Time management (2)	Q&A (2)
1	1 & 18	Challenges in High-pressure Thawing of Foods	CO4					
2	2 & 17	Microbial Risk and Regulatory Aspects of RTE Frozen foods	CO5					
3	3 & 16	RF Flash Heating for Food Sterilization	CO5					
4	4 & 15	Design Aspects of Forward-Osmosis Equipment for Fluid Foods	CO3					
5	5 & 14	Consumer Perception and Regulatory Aspects for Irradiated Food	CO2					
6	6 & 13	Natural Antimicrobials in Food Packaging: A Biopreservation Method	CO3					
7	7 & 12	Challenges in Low-Temperature Smoking and Curing of Meat	CO1					
8	8 & 11	Microbial Safety of Pickled Vegetables	CO3					
9	9 & 10	Oscillating Magnetic Field in Food Preservation	CO5					

Course Outcomes

Student will be able to ….

1) Analyse different design aspects of thermal processing applied to food (K4).
2) Demonstrate and apply the concepts of non-thermal food processing methods (K3).
3) Solve issues related to membrane, packaging and hurdle technology in food processing (K3).
4) Develop and analyse the efficacies of high-pressure processing to food applications (K4)
5) Infer about recent developments in advanced thermal and non-thermal techniques of food processing (K4)

CO-PO Mapping

		PO1	**PO2**	**PO3**	**PO4**	**PO5**
		K5	K6	K5	K5	K4
CO1	K4	3	2	3	3	3
CO2	K3	2	2	2	2	3
CO3	K3	2	2	2	2	3
CO4	K4	3	2	3	3	3
CO5	K4	3	2	3	3	3
Course	**K4**	**3**	**2**	**3**	**3**	**3**

3, 2, 1 represent strong, moderate and weak correlation; '-' refers to no correlation

Annexure 1.2.2 – Synopsis of Master's Thesis (Sample)

Pulsed Light Treatment of Mixed Tropical Fruit Beverage

Synopsis submitted to

INSTITUTE OF CHEMICAL TECHNOLOGY, MUMBAI

for the award of the degree of

MASTER OF TECHNOLOGY

in

FOOD ENGINEERING AND TECHNOLOGY

by

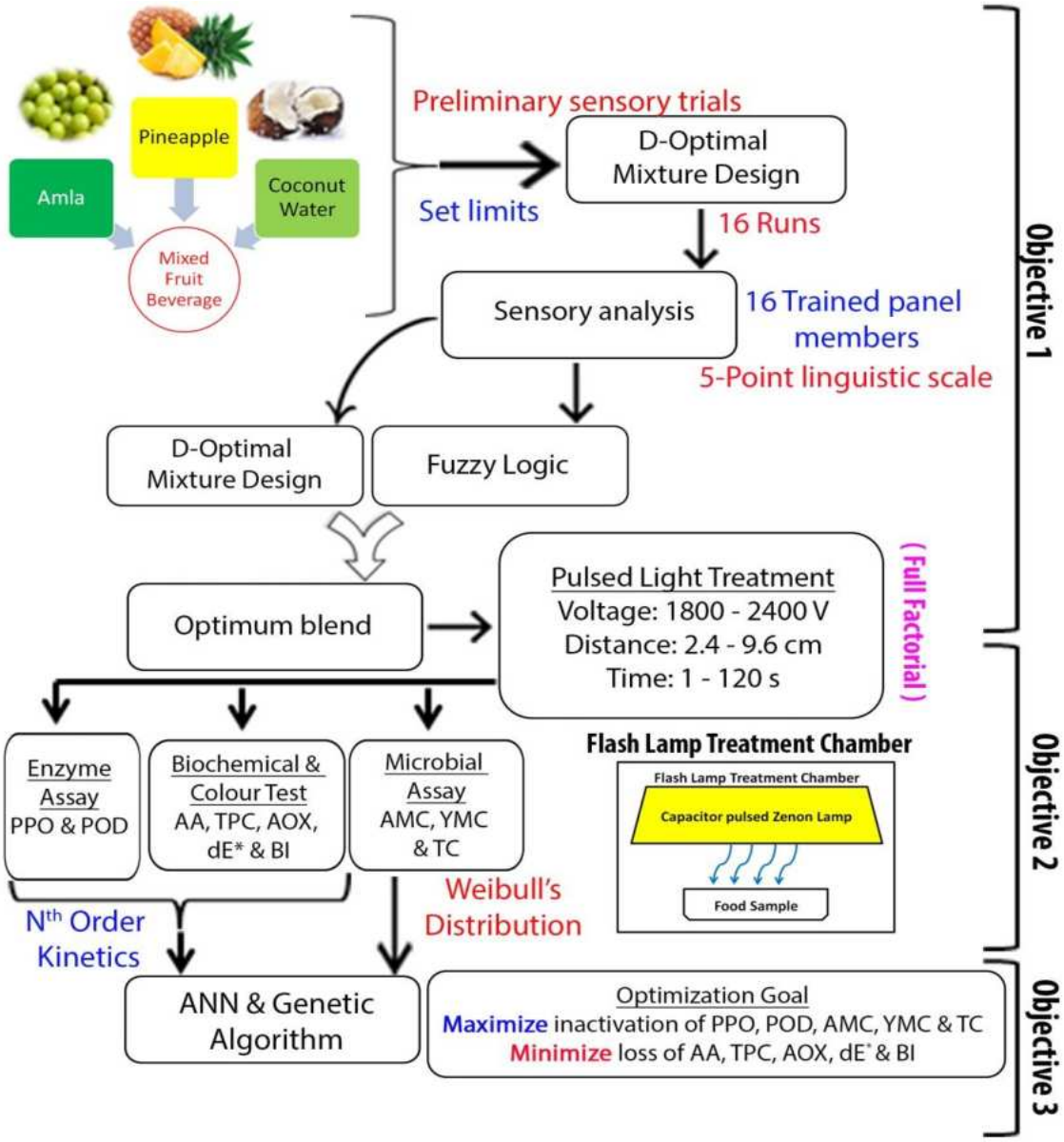
RISHAB DHAR

under the supervision of

Dr. SNEHASIS CHAKRABORTY

Department of Food Engineering and Technology
Institute of Chemical Technology, Mumbai
(University under Section 3 of UGC Act 1956;
Elite Status and Centre of Excellence, Government of Maharashtra)
Maharashtra, India
2016 – 2018

Graphical Overview



Synopsis Summary

Name of student	Rishab Dhar
Name of the degree	M.Tech
Department	Food Engineering and Technology
Name of Guide	Dr. Snehasis Chakraborty
Registration No.	M.Tech Food Engineering and Technology / 9
Date of registration	June 30, 2018
Title of the thesis	Pulsed light treatment of mixed tropical fruit beverage
Classification	Food preservation, food processing, Experimental design
Keywords	Pulsed light, beverage, fuzzy logic, kinetic study, ANN, optimization

1. Abstract

Consumers demand high-quality processed foods with minimal changes in nutritional and sensory properties. Pulsed light (PL) is one of the types of non-thermal processing and considered to keep food quality attributes better than traditional thermal processing. The present study was performed to get a benchmark in evaluating changes in quality parameters along with kinetic modeling with mixed fruit beverage samples after thermal and non-thermal (PL) treatments. PL treatments were carried out with four independent parameters i.e. voltage (1800, 1950 and 2100V), time (1, 30, 60, 90 and 120 sec), number of pulses (2, 47, 94, 140 and 187) and distance (2.4, 6 and 9.6 cm). PL treatments have significantly affected microbial load in beverages and showed 3.87, and 3.54 Log_{10} CFU/ml reduction in terms of aerobic mesophilic count (AMC) and yeast and mold count (YMC) respectively. Yeast and mold were able to resist for a longer duration (90°C, 7.5 min). PL has retained antioxidant capacity and vit-C as compared to thermal treatments. Colour was minimally influenced by PL. The study explores that PL has a potential as an excellent alternative or complement to the conventional thermal processing of beverages. Inactivation kinetic equation deducted from this study can be integrated to predict the microbial reduction level of specific liquid foods under PL treatment.

2. Introduction

India is the 2nd largest producer of tropical fruits in the world with a production of 82.631 MT in 2014-15. The tropical fruits have a unique chemical composition of sugars, vitamins, minerals, amino acids and are the finest source of phytohormones as well as phytonutrients. However, fruits are perishable in nature which leads to post-harvest losses; about 30-40% of the cultivated tropical fruits are lost due to inadequate processing and limited usage. It is well known that a variety of fruits are being produced in India and the diversity within the usage of fruits managed them to categorize as a major, minor and underutilized ones. The underutilized fruits are basically the fruits which are not being explored earlier with respect to its nutritional functionality. There are a group of underexplored tropical fruits having a huge content of phytochemicals within it. In this sense, fruit-based beverages which are rich in functional compounds are becoming more and more popular because of their refreshing tastes, unique colours, exciting flavours and high nutrient content. However, the limited shelf-life of these products is acting as the barrier before the commercialization of the beverages.

The conventional technique or method to pasteurize the fruit beverage is the thermal processing. However, it is already evident that high temperature during the treatment can adversely affect the quality of food products, by reducing their nutritional value or altering sensory attributes, such as color and flavor. Therefore, there is a search for non-thermal processing technique for the beverage to extend the shelf-life simultaneously retaining the nutritional profile. Pulsed light (PL) is a fast, environment-friendly and high potential novel technology for food decontamination and preservation. It is based on

the application of short intensity pulses (100-400 μs) majorly in the UV range. PL treatment of foods has been approved by the FDA (1996) under the code 21CFR179.41. Current literature on food applications is relatively scarce, mainly dealing with the PL decontamination of solid and semisolid products such as vegetables [1], fruit, food powers and seeds [2]. However, the study on PL treatment of real beverage system is scarce.

The proposed research has two different domains. First one is exploring the underutilized tropical fruit and coming up with a novel fruit beverage. This is very much important in the case of a country like India where the diversity in the product is the focus to fulfill the consumer demand. The second one is to explore the pulse light treatment for fruit beverage in view of pasteurization. Apart from high-pressure processing, the concept of non-thermal processing is still not commercialized in India. Therefore, exploring a non-thermal treatment and coming out with the optimized condition will be of great interest to the industry. On the other hand, using the underexplored fruit to come up with the high quality minimally processed beverage will add value to the entire chain and minimize the post-harvest loss.

Research Objectives

1) To optimize the formulation of the mixed fruit beverage through sensory analysis.
2) To develop the inactivation kinetics for different quality parameters (enzymatic, microbial, and nutritional) under the pulsed light domain.
3) To optimize the pulsed light treatment conditions for the beverage with a maximum nutritional retention and microbial destruction.

3. Materials and Methods

Formulation of the mixed fruit beverage through sensory analysis

Mature fruits pineapple (*Ananas comosus*), coconut (*Cocos nucifera*), and amla (*Phyllanthus emblica*) were used to prepare beverage in such way that, alma contributes to maximum nutrient content, pineapple for dominant taste; while the coconut water to provide mild taste and appearance as well as it replaces the amount of water in the beverage. D-optimal mixture design with 3-components was opted for deciding 16 different formulations where overall acceptability served as the single response. FSSAI specifications were followed for fixing the limits of each component. A group of 16 semi-trained sensory panel members from the department (FETD, ICT) was the assessors. Fruit beverages were rated on the basis of five-point linguistic scale in a completely randomized manner during evaluation. Score(s) obtained from discriminative sensory analysis were evaluated through two optimizing methods viz. numerical optimization and Fuzzy Logic. Finally, the most common formulation from both the optimizing tools was considered as an optimized formulation for the mixed fruit beverage.

Pulse Light (PL) Treatment

The present study was performed to get a benchmark in evaluating changes in quality parameters between mixed fruit beverage samples after thermal and non-thermal (PL) treatments. PL treatments were performed with a horizontal bench-top pulsed light system (Model X–1100, Xenon Corporation, USA) equipped with 16-inch linear xenon flash lamp. The equipment comprises the controller unit, treatment chamber and Xenon flash lamp that could deliver high-intensity white light in short pulses to treat mixed fruit beverage samples. For each treatment sample (15 mL) was carefully spread in 85 mm diameter petri plates facing the center-most position of the lamp at a specific distance. Each treatment was performed at a fixed pulse width of 640 ms.

PL study was carried out in 75 conditions according to full factorial design with three independent parameters i.e. voltage (1800, 1950, 2100, 2250 and 2400 V), time (1, 30, 60, 90 and 120 sec), and distance (2.4, 6 and 9.6 cm). While thermal Study was accompanied at 5 different temperature (50, 60, 70, 80 and 90 °C) and time (1sec, 2.5, 5, 7.5 and 10 min) combinations. An individual set of untreated samples were kept along with thermal as well as non-thermal study.

Kinetic Study and Process Optimization

The kinetic study was performed for different quality attributes of the mixed beverage under pulse light treatment. The process variables were light intensity, pulsation and distance between light and sample treated. The physical and biochemical responses include color, total phenols, antioxidant capacity and ascorbic acid content in the beverage. Besides, that inactivation kinetics of spoilage enzymes viz. polyphenol oxidase (PPO) and peroxidase (POD) was also measured. The destruction kinetics of the natural micro-flora (aerobic mesophiles, coliform, yeast and mold counts) in the beverage was also developed. The n^{th} order kinetic model was employed in this sense. Further, the treatment condition was optimized using the artificial neural network (ANN) and genetic algorithm (GA). The optimization was targeted to process the beverage with maximum inactivation of spoilage entities and minimum nutrient degradation.

4. Results and Discussions

The summary of the results and inferences obtained from the study of the effect of thermal, non-thermal (PL) along with individual untreated samples on quality parameters of beverages has been summarized below.

- Even though results for colour were not showing clear trend but approximately we observed that the colour of samples were not much affected by PL treatments whereas, in case of thermal treatment yellowness of beverages was significantly affected by the simultaneous increase in temperature and time which may be due to degradation of colored polymeric

compounds and enhancement in the browning of juice. ΔE^* represents the total color difference increased after PL treatment, which was in agreement with the trend reported by Bhat et al. [3] for UV treatment of starfruit juice.

- PL treatments showed a slight increase in total polyphenols at an extreme voltage of 2400 V with minimum distance at 2.4 cm (1.29 residual phenolic content) which might be due to increased activity of enzyme phenylalanine ammonia lyase due to exposure of UV-C [4] as PL includes the UV range as well. Other than that inactivation of PPO to some extent also leads to prevention of loss of polyphenols [5].
- The antioxidant capacity (AOX) decreased with simultaneous increase in temperature in case of thermal treatments. While a slight increase in AOX capacity was observed with the severity of PL intensity which was also reported in the case of UV-C treatment of starfruit juice [4].
- Degradation of vit-C increased with the severity of both treatments, 40 and 31% losses were observed in case of thermal (90°C, 10 min) and PL (2400V, 2.4cm and 120s) treated samples respectively which might be due to oxidation process [9] along with activities of ascorbate oxidase and POD [6].
- PL treatments have significantly affected microbial load in beverages and showed 3.87, and 3.54 Log_{10} CFU/ml reduction in terms of total plate count (AMC) and yeast and mold count (YMC) respectively. In case of thermal, minimum visible count for AMC (1.3 Log_{10} CFU/ml) was observed at 90°C, 5 min and thereafter inactivated completely. Whereas no YMC were there beyond 90°C, 7.5 min; this might be due to the difference in thickness of the cell wall and size of microorganism. This shows that yeast and mold were little more resistant towards both thermal and non-thermal conditions. Coliforms were least resistant in both treatments and were not observed throughout the study.
- It has been suggested that photo-degradation of proteins proceeds through photo-oxidation causing amino acid residues to give cross-links [8] and through reduction of disulphide (S-S) bonds [9] which may finally lead to reduced enzyme activity. Polyphenol oxidase (PPO) enzyme seems to be more resistant than peroxidase enzyme (POD). An insignificant increase in enzyme activity was observed for PPO in milder conditions with lower fluence obtained at 9.6, 6 and 2.4 cm distance with 1800 V, 1950 V and 2100 V. During more severe PL treatment conditions, PPO and POD activity was successfully diminished. Almost at all the treatment conditions, POD activity was reduced significantly. Similar results were

obtained by Bhat & Stamminger [6] and Manzocco et al., [7] who worked with UV and PL treatment respectively.

- In terms of resistivity similar trend was observed while thermal treatment [10]. But in this, clearer inactivation was visible. Compared to PL inactivation rate, thermal inactivation rate was slightly faster.

5. Conclusion

PL treatment caused slight increase in total phenolic content and antioxidant capacity compared to the untreated juice, whereas in case of thermal treatment no significant change appeared in total phenolic content and loss of antioxidant capacity was observed. The loss of vit-C was higher in case of thermal as compared to PL treatment. From the aspect of microbial reduction, PL showed a lower microbial reduction and enzyme inactivation rate than thermal, which might be due to an insufficient PL exposure as well as the blockage of radiation.

6. References

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Annexure 1.2.5 – Lab Instruction Sheet (Sample)

EXPT. Effect of product parameters on quality of baked product

A biscuit is a kind of small, flat-baked product that is usually made with a chemical leavener such as baking powder. The term 'Biscuit' is said to derive from French word "bisc", meaning double cooked. Biscuit is a wheat flour baked product with low moisture, less than 5% and high shelf life. Soft wheat flour is flour is used generally for making biscuit.

GLUCO BISCUIT:

RECIPE:

Flour	100gm
Pulverized Sugar	35gm
Salt	3.5gm
Shortening	20gm
GMS	0.6gm
Sodium bicarbonate	0.5gm
Ammonium bicarbonate	1gm
Powdered Vanilla	30gm
SMP	2gm
Liquid Glucose	3gm
Lecithin	6gm
Water	10-15ml
Essence	Vanilla+Nutmeg 1ml each

Part of the shortening is mixed with GMS and lecithin. Add sugar and cream the mixture. Add the balance fat and blend. Add liquid glucose. Dissolved soda, salt and ammonium bicarbonate in water. Cream and mix for about 20 minutes. Add flour and mix for about 10 minutes. Cover with wet muslin cloth and give a holding time of 30 minutes. Roll the dough in 3-4mm thickness. Cut into biscuit shape. Bake at 230^0 F for 6-7 minutes.

MARIE BISCUIT:

RECIPE:

Flour	100gm
Pulverized Sugar	22gm
Salt	0.7gm
Fat	18gm
GMS	0.6gm
Sodium bicarbonate	0.5gm
Ammonium bicarbonate	0.75gm
Corn flour	4gm
SMP	2.7gm
Liquid Glucose	2.5gm

Lecithin	0.6gm
Water	42ml
Essence	Vanilla+Butter
Colour	As required
Sodium bisulphate	0.02gm

Pulverized sugar, lecithin and fat are creamed together. To the flour add 3/4th of water and mix well. In the remaining water add salt, aerating agent, sodium bisulphite, SMP and add to the dough. Add the cream mix. Total mixing is about 25 minutes. Sheet the dough to 2-2.5mm thickness. Add 4-6 layers and final sheet 2.5mm thickness. Cut circular pieces biscuit. Apply a film of milk and bake at 160^0 C for 25 minutes.

CRACKERS PLAIN BISCUIT:

Take 1gm compressed yeast. To this add 60gm flour, 1.25gm powdered sugar, 5gm shortening and about 25-30ml water. Allow to ferment for 18 hours at 30^0 C at 75-80% RH. The balance of ingredients, flour40gm, 0.75gm baking powder, 0.5gm ammonium bicarbonate, 8ml glycerin are mixed with the sponge (to the required amount of water) and then allowed to ferment for 2 hours.

Plying and Rolling: Use 20% layering dust consisting of 100gm flour, 35gm fat and 4.5gm salt (20% layering dust based on weight of the flour). Dough is rolled to about 2mm thickness. Then 6-8 layers are laminated with layering dust in between and then rerolled to about 2mm thickness. Cut circular pieces of 4mm diameter and sprinkle salt on the top of the pieces by tapping with a finger. Bake at 200^0 C for 10 minutes. At the end, keep the dough open for 3 minutes. After removal dip the cracker in refined oil.

NANKATAI:

RECIPE:

Flour	175gm
Fine Rawa	25gm
Vanaspati	130gm
Powdered Sugar	125gm
Ammonium bicarbonate	0.25gm
Cardmom	2gm
Nutmeg	2gm

Cream the sugar with fat till it is dissolved. Add rawa and mix thoroughly, finally add flour and other ingredients mix to get dough. Make equal sized balls and place them in grassed tray. Bake at 160-170^0 C for suitable time (15-20 minutes).

KHARA BISCUIT:

Wheat flour	100g
Salt (X1)	5-15 g
Vanaspati	50g
Water (X2)	50-70 mL

Experimental design: Face centered composite design (FCCD)*

Run	x_1	x_2	X_1	X_2
1	+1	+1		
2	+1	-1		
3	-1	+1		
4	-1	-1		
5	$-\alpha$	0		
6	$+\alpha$	0		
7	0	$-\alpha$		
8	0	$+\alpha$		
9	0	0		
10	0	0		
11	0	0		
12	0	0		
13	0	0		

*In FCCD, $\alpha = 1$

Procedure: Weigh the ingredients. Wheat flour is put into the mixing pan and water in which salt is dissolved in added, continuously and slowly. About ¼-1/5 of fat is added and mixing is continued till highly elastic dough is obtained (20-25 minutes).

- Cover the dough with a wet muslin cloth and allow for equilibration of moisture (15 minutes). Divide the dough into pieces of uniform size.
- Sheet to 1 mm thickness. Plasticize the fat by working with hand and apply the fat to all the sheets.
- Cut the sheets into 3-4 pieces. About 4 strips are spooled one on the other and dough pieces is covered with wet muslin cloth for 15-20 minutes.
- Dough piece is sheeted with roller pin to 0.5-1cm thickness.
- Cut the sheet into suitable size (8 X 3cm^2), place on baking trays.
- Apply a film of water on surface with a wet muslin cloth and bake at 170^0 C for 6 min.
- Cool the biscuits to room temp.
- Perform the analysis of the corresponding responses in triplicate.

Responses (Y1-Y5): Hardness, Fracturability, total color change, browning index, specific volume

Data Analysis: RSM and ANOVA

Optimization: Numerical Optimization

Outcome: Optimized Composition of Salt and Water in Khara Biscuit

Texture Analysis

Here is our modified list of typical TPA parameters:

Parameter	How Expressed	How Measured (Plot #2)
Hardness	The maximum force of the 1st compression.	Same

The Hardness value is the peak force that occurs during the first compression. The hardness need not occur at the point of deepest compression, although it typically does for most products.

Fracturability	The force at the first peak	Peak Force at F1

Not all products fracture; but when they do fracture the Fracturability point occurs where the plot has its first significant peak (where the force falls off) during the probe's first compression of the product.

Cohesiveness	The area of work during the second compression divided by the area of work during the first compression.	Area 2/Area 1 *Optional (similar, not identical): Area 5/Area 4*

Cohesiveness is how well the product withstands a second deformation relative to its resistance under the first deformation.

Springiness	Springiness is now expressed as a ratio or percentage of a product's original height. Springiness is measured several ways, but most typically, by the distance of the detected height during the second compression divided by the original compression distance.	Distance 2 / Distance 1 *Optional (same value): Time 2/Time 1*

Springiness is how well a product physically springs back after it has been deformed during the first compression and has been allowed to wait for the target wait time between strokes. The springback is measured at the down-stroke of the second compression. In some cases an excessively long wait time will allow a product to springback more than it might under the conditions being researched (e.g. you would not wait 60 seconds between chews).

Gumminess (semi-solids)	Gumminess is mutually exclusive with Chewiness since a product would not be both a semi-solid and a solid at the same time.	Hardness * (Area 2/Area 1) Optional (similar value):Hardness * (Area 5/Area 4)	Hardness x Cohesiveness

Gumminess **applies only to semi-solid products** and is Hardness * Cohesiveness (which is Area 2/Area 1).

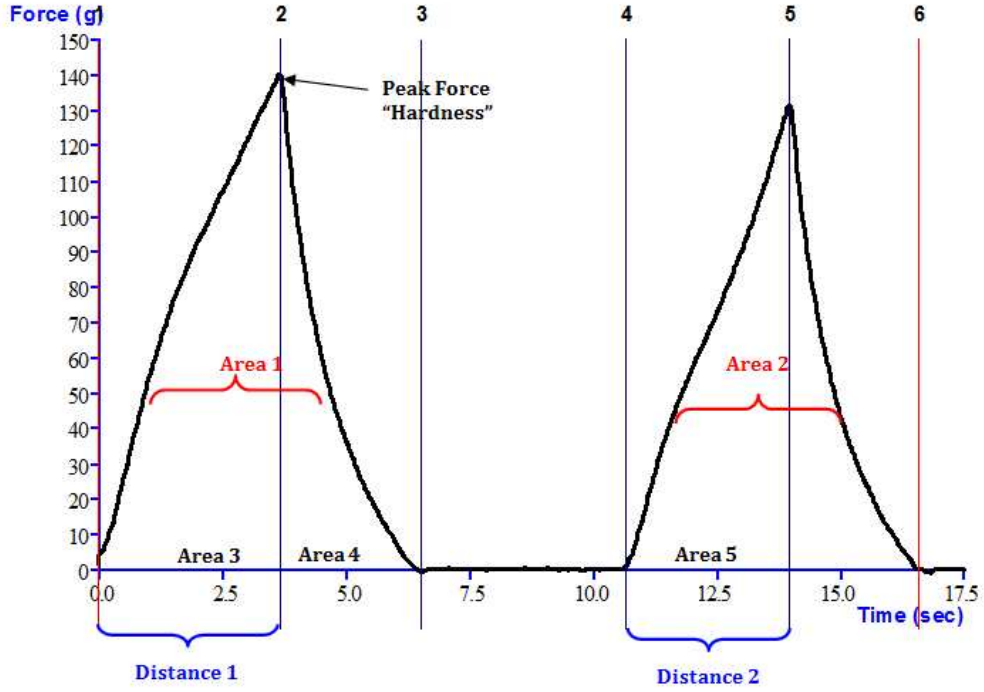
Chewiness (solids)	Gumminess * Distance 2 / Distance 1	Hardness x Cohesiveness x Springiness

Chewiness **applies only to solid products** and is calculated as Gumminess * Springiness (which is Distance2/Distance1).

Resilience	It is calculated by dividing the upstroke energy of the first compression by the downstroke energy of the first compression.	Area 4/Area 3

Resilience is how well a product "fights to regain its original height". Resilience is measured on the withdrawal of the first penetration, before the waiting period is started. Resilience can be measured with a single compression; however, the withdrawal speed must be the same as the compression speed.

Plot #2


Force (g)
2
3
4
5
6
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Peak Force
"Hardness"
Area 1
Area 2
Area 3
Area 4
Area 5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Time (sec)
Distance 1
Distance 2

Annexure 2.2.1_Sample Feedback Form

STUDENT EXIT FEEDBACK

Institute of Chemical Technology

Programme: MTech in Food Engineering & Technology

Name (Optional): _____ Entry Year: _____

This is for you to give us the honest and correct information about the services offered in this department. This would help us in improving our system effectively.

Kindly rate your ability using the scale:

5. Excellent	4. Good	3. Satisfactory	2. Needs Improvement	1. Poor

No.	Details of Ability	5. Excellent	4. Good	3. Satisfactory	2. Needs Improvement	1. Poor
1	To carry out research					
2	To solve practical problems					
3	To write technical document					
4	To present a technical topic					
5	To use modern analytical techniques					
6	To use sophisticated or statistical tools					
7	Mastery on food safety & regulation					
8	Mastery on food processing, packaging & analysis					
9	Mastery on food engineering & technology					
10	Career goal (4-5 years down the line)					

Any further comment for improvement :

Annexure 2.2.1_Sample Feedback Form

EXAMINER / ALUMNI FEEDBACK

Institute of Chemical Technology

Programme: MTech in Food Engineering & Technology

Student Name: _____ Date: _____

This is for you to give us the honest and correct information about the student ability from your perspective. This would help us in improving our system effectively.

Kindly give your ratings for the student using the scale:

5. Excellent	4. Good	3. Satisfactory	2. Needs Improvement	1. Poor

No.	Details of Ability of the student	5. Excellent	4. Good	3. Satisfactory	2. Needs Improvement	1. Poor
1	To carry out research					
2	To solve practical problems					
3	To write technical document					
4	To present a technical topic					
5	To use modern analytical techniques					
6	To use sophisticated or statistical tools					
7	Mastery on food safety & regulation					
8	Mastery on food processing, packaging & analysis					
9	Mastery on food engineering & technology					

Any further comment : _____

_____