SELF ASSESSMENT REPORT

submitted to

NATIONAL BOARD OF ACCREDITATION

for the accreditation of

BACHELOR OF TECHNOLOGY

in

FOOD ENGINEERING AND TECHNOLOGY

[2nd CYCLE ACCREDITATION (TIER I)]

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

November 2022

CONTENT

Criteria No.	Details	Page No.
Part A	Institutional Information	1-7
Part B	Program Level Criteria	8-142
Criteria 1	Course Outcomes and Program Outcomes	8-48
Criteria 2	Program Curriculum & Teaching-Learning Processes	49-78
Criteria 3	Students' Performance	79-90
Criteria 4	Faculty Information & Contributions	91-109
Criteria 5	Resources	110-132
Criteria 6	Continuous Improvement	133-142
	Declaration Form	143

CRITERIA SUMMARY

Program: Bachelor of Technology in Food Engineering and Technology

Criteria No.	Details	Mark	Institute Mark
1.	Course Outcomes and Program Outcomes	100	100
2.	Program Curriculum & Teaching-Learning Processes	75	75
3.	**Students' Performance**	75	69
4.	Faculty Information & Contributions	100	100
5.	Resources	75	75
6.	Continuous Improvement	75	75
	Total	500	494

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. Other Academic Institutions of the Trust/Society/Company etc., if any:

Name of the Institution(s)	Year of Establishment	Programs of Study	Location

Table A.6

7. 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	60	15	1995	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	27/12/2016 to 30/06/2022
2.	B.Tech - Dyestuff Technology	Dyestuff Technology	1944	16	2	1995	AICTE Approved (F.No. Western/1-9318340850/2021/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.	AICTE Approved (F.No. Western/1-9318340850/2021/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.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	27/12/2016 to 30/06/2022
5.	B.Tech - Oils, Oleochemicals and Sufactant Technology	Oils, Oleochemicals and Sufactant Technology	1943	16	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	27/12/2016 to 30/06/2022
6.	B.Tech - Pharmaceuticals Chemistry and Technology	Pharmaceutical Sciences and Technology	1943	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	14/01/2017 to 30/06/2020
7.	B.Tech - Polymer Engineering and Technology	Polymer and Surface Engineering	1946	08	08	1995	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	27/12/2016 to 30/06/2022
8.	B.Tech - Surface Engineering & Technology	Polymer and Surface Engineering	1946	08	16	1995	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	27/12/2016 to 30/06/2022
9.	B. Pharmacy	Pharmaceutical Sciences and Technology	1959	18	30	1995	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	22/09/2016 to 30/06/2021

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.	M. Chemical Engineering	Chemical Engineering	1958	30	NA	NA	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	28/09/2016 to 30/06/2021
2.	M.Tech - Dyestuff Technology	Dyestuff Technology	1961	4	14	2019	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	01/07/2015 to 30/06/2020
3.	M.Tech -Food Engineering &Technology	Food Engineering and Technology	1945	10	18	2018	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	03/03/2020 to 30/06/2026
4.	M.Tech - Fibres and Textile Processing Technology	Fibres and Textile Processing Technology	1961	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	01/07/2015 to 30/06/2020
5.	M.Tech - Oils, Oleochemicals and Surfactant Technology	Oils, Oleochemicals and Sufactant Technology	1966	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	03/03/2020 to 30/06/2023
6.	M.Tech - Pharmaceuticals Sciences and Technology	Pharmaceutical Sciences and Technology	1961	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	03/03/2020 to 30/06/2026
7.	M.Tech - Polymer Engineering and Technology	Polymer and Surface Engineering	1966	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	01/07/2015 to 30/06/2020
8.	M.Tech - Surface Engineering & Technology	Polymer and Surface Engineering	1966	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	01/07/2015 to 30/06/2020
9.	M.Tech - Food Biotechnology	Food Engineering and Technology	2008	2	8	2009	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	28/09/2016 to 30/06/2021
10.	M.Tech - Bioprocess Technology	DBT-ICT Center of Biosciences	1994	30	N.A	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	03/03/2020 to 30/06/2023
11.	M.Tech - Perfumery and Flavor Technology	Dyestuff Technology	1992	5	13	2017	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	01/07/2015 to 30/06/2020

12.	M.Tech - Green Technology	Green Technology	2010	30	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	28/09/2016 to 30/06/2021
13.	M. Tech - Pharmaceutical Biotechnology	Pharmaceutical Sciences and Technology	2017	15	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	N.A.
14.	M.E. (Plastic Engineering)	General Engineering	1972	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	03/03/2020 to 30/06/2023
15.	M.Sc. (Chemistry)	Chemistry	2010	20	N.A.	N.A.	N.A.	N.A.
16.	M.Sc. (Textile Chemistry)	Fibres and Textile Processing Technology	2010	20	N.A.	N.A.	N.A.	N.A.
17.	M.Sc. (Engineering Mathematics)	Mathematics	2012	20	N.A.	N.A.	N.A.	N.A.
18.	M.Sc. (Physics)	Physics	2014	20	N.A.	N.A.	N.A.	N.A.
19.	M. Pharmacy	Pharmaceutical Sciences and Technology	1965	18	N.A.	N.A.	AICTE Approved (F.No. Western/1-9318340850/2021/EOA)	01/07/2014 to 30/06/2017

Table: A.7.1

** Write the applicable one:*

- Applying for the 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.

8. Programs to be considered for Accreditation vide this application

S. No.	Program Name	Current Year Sanctioned Intake	Current Year Admission (in Nos.)
1.	Bachelor of Technology in Food Engineering and Technology	16	20

9. Total Number of Engineering Students

No.	Program Name	Category	2021-22	2020-21	2019-20
1	B. Chemical Engineering	Total no. of boys	68	66	66
		Total no. of girls	19	22	21
		Total no. of students	87	88	87
2.	B.Tech - Dyestuff Technology	Total no. of boys	11	14	15
		Total no. of girls	5	5	6
		Total no. of students	16	19	21
3.	B. Tech- Food Engineering and Technology	Total no. of boys	13	13	10
		Total no. of girls	7	7	10
		Total no. of students	20	20	20
4.	B. Tech- Fibres and Textile Processing Technology	Total no. of boys	19	23	17
		Total no. of girls	4	14	16
		Total no. of students	23	37	37
5.	B. Tech- Oils, Oleochemicals and Surfactant Technology	Total no. of boys	11	15	13
		Total no. of girls	6	3	6
		Total no. of students	17	18	19
6.	B. Tech- Pharmaceuticals Chemistry and Technology	Total no. of boys	13	16	11
		Total no. of girls	10	7	10
		Total no. of students	23	23	21
7.	B. Tech Polymer Engineering and Technology	Total no. of boys	16	17	14
		Total no. of girls	3	2	5
		Total no. of students	19	19	19
8.	B. Tech Surface Engineering & Technology	Total no. of boys	11	14	14
		Total no. of girls	3	5	5
		Total no. of students	14	19	19
9.	M. Chemical Engineering	Total no. of boys	21	24	23
		Total no. of girls	5	5	7
		Total no. of students	26	29	30
10.	M.Tech- Dyestuff Technology	Total no. of boys	4	1	7
		Total no. of girls	4	5	8
		Total no. of students	8	6	15
11.	M.Tech.-Food Engineering &Technology	Total no. of boys	8	10	12
		Total no. of girls	9	8	5
		Total no. of students	17	18	17
12.	M.Tech- Fibres and Textile Processing Technology	Total no. of boys	12	11	9
		Total no. of girls	3	5	6
		Total no. of students	15	16	15
13.	M.Tech- Oils, Oleochemicals and Surfactant Technology	Total no. of boys	12	12	8
		Total no. of girls	6	5	10
		Total no. of students	18	17	18

14.	M.Tech- Pharmaceuticals Sciences and Technology	Total no. of boys	9	11	5
		Total no. of girls	8	7	13
		Total no. of students	17	18	18
15.	M.Tech- Polymer Engineering and Technology	Total no. of boys	14	14	14
		Total no. of girls	2	4	4
		Total no. of students	16	18	18
16.	M.Tech- Surface Engineering & Technology	Total no. of boys	10	11	15
		Total no. of girls	7	7	3
		Total no. of students	17	18	18
17.	M.Tech- Food Biotechnology	Total no. of boys	3	1	5
		Total no. of girls	7	8	5
		Total no. of students	10	9	10
18.	M.Tech- Bioprocess Technology	Total no. of boys	18	12	14
		Total no. of girls	10	17	16
		Total no. of students	28	29	30
19.	M.Tech- Perfumery and Flavor Technology	Total no. of boys	8	6	9
		Total no. of girls	8	12	9
		Total no. of students	16	18	18
20.	M.Tech. Green Technology	Total no. of boys	10	8	16
		Total no. of girls	13	20	10
		Total no. of students	23	28	26
21.	M. Tech. Pharmaceutical Biotechnology	Total no. of boys	3	5	3
		Total no. of girls	4	5	7
		Total no. of students	7	10	10
22.	M.E. (Plastic Engineering)	Total no. of boys	8	5	9
		Total no. of girls	3	6	1
		Total no. of students	11	11	10

10. 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.

11. 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 endeavors, 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.

12. 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 co-coordinator
Name: Dr. Ashwin Mohan
Designation: Associate Dean, Internal Quality Assurance
Contact No. 022-33611019
Mobile No: 9869506632/9920084964
Email id: associatedean.iqa@ictmumbai.edu.in

PART B: Program Level Criteria

CRITERION 1	Course Outcomes and Program Outcomes	100

1.1. State the Vision and Mission of the Department and Institute and Program Educational Objectives (05) (Inst. Marks 05)

VISION OF INSTITUTE

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 INSTITUTE

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 regarding material and energy while protecting the environment and conserving natural resources. Our endeavors, 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.

DEPARTMENT OF FOOD ENGINEERING AND TECHNOLOGY

VISION OF DEPARTMENT

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

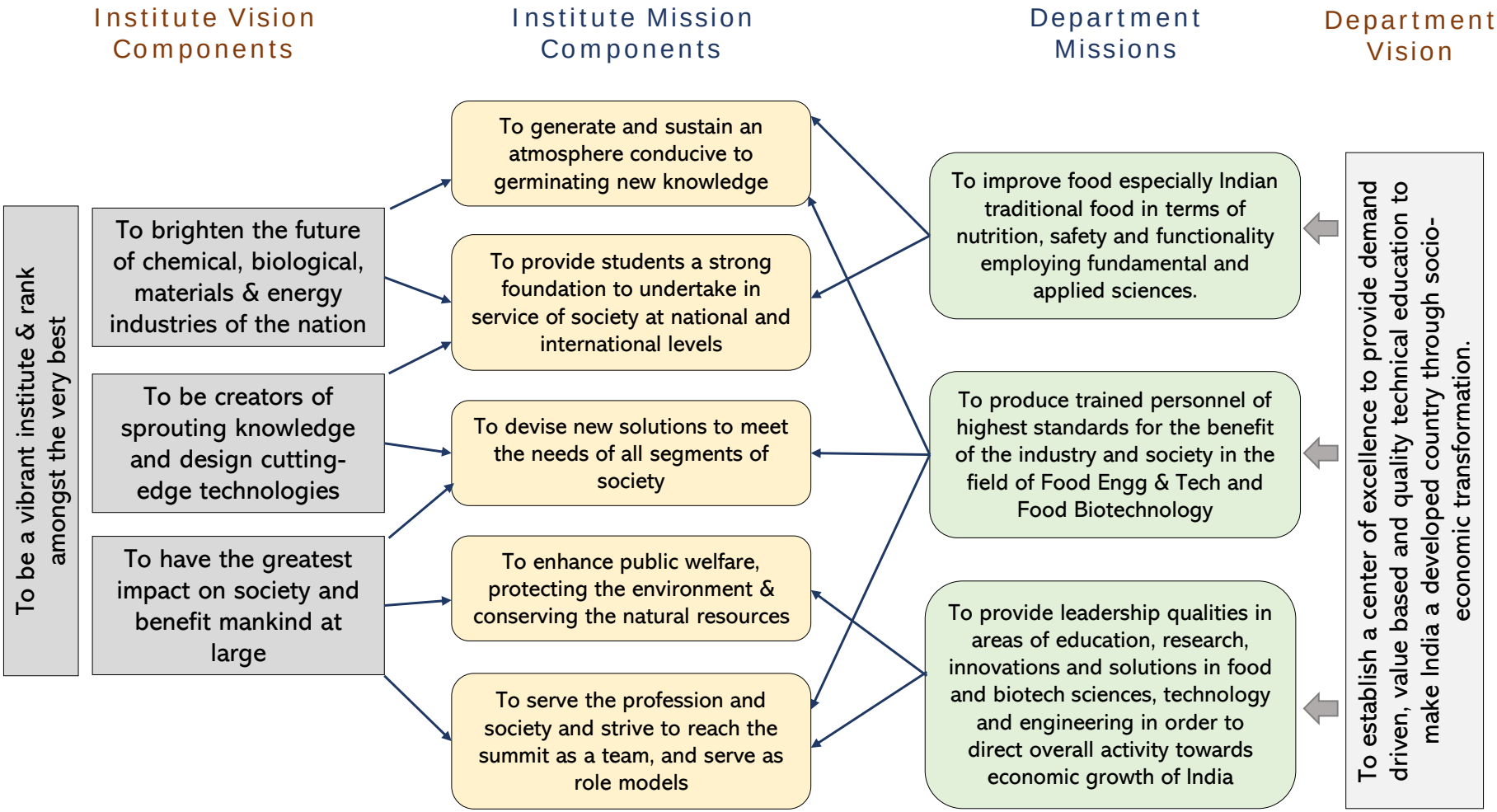
MISSION OF DEPARTMENT

- **M1:** Creating an atmosphere to deliver fundamental knowledge in Food Engineering and Technology for the students to fulfil the need of all segments of society and the environment.
- **M2:** Starting from the classroom teaching and simultaneously creating a multi-disciplinary platform capable of conducting research, technology development, and solving industrial challenges.
- **M3:** Providing leadership and training personnel for the benefit of the industry and society complying with overall activity towards the economic growth of the country.

Program Educational Objectives (PEOs)

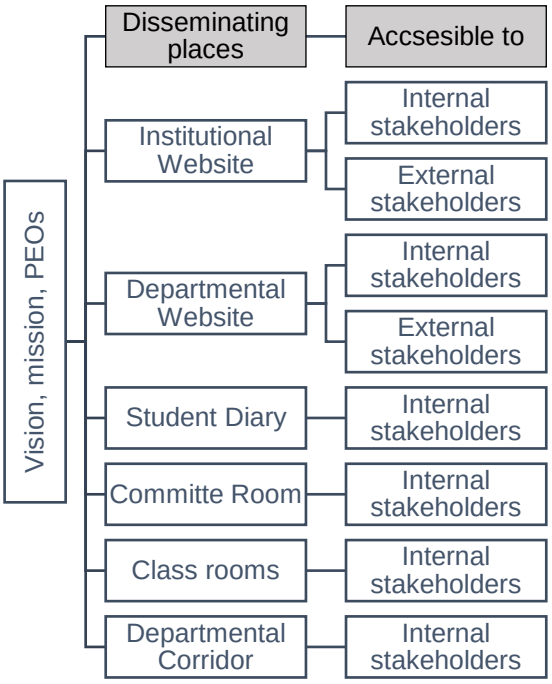
- **PEO1: Successful Career:** Graduates from the programme will have successful careers in food and allied industries at various levels of management
- **PEO2: Higher Study:** Graduates from the programme will pursue higher study related to food engineering and technology and allied disciplines in premier institutions across the world and make a career in academics or research
- **PEO3: Multi-disciplinary Skills:** Graduates from the programme will work in a multi-disciplinary environment in the domain of food technology.

The justification of the consistency between Department Vision and Mission with the Institute Vision and Mission has been presented below as a schematic.


Institute Vision Components
Institute Mission Components
Department Missions
Department Vision
To be a vibrant institute & rank amongst the very best
To brighten the future of chemical, biological, materials & energy industries of the nation
To be creators of sprouting knowledge and design cutting-edge technologies
To have the greatest impact on society and benefit mankind at large
To generate and sustain an atmosphere conducive to germinating new knowledge
To provide students a strong foundation to undertake in service of society at national and international levels
To devise new solutions to meet the needs of all segments of society
To enhance public welfare, protecting the environment & conserving the natural resources
To serve the profession and society and strive to reach the summit as a team, and serve as role models
To improve food especially Indian traditional food in terms of nutrition, safety and functionality employing fundamental and applied sciences.
To produce trained personnel of highest standards for the benefit of the industry and society in the field of Food Engg & Tech and Food Biotechnology
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
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.

1.2. **Indicate where the Vision, Mission, and PEOs are published and disseminated among stakeholders (05)** **(Inst. Marks 05)**

The role of the food technologist and implementation of program learning into practice have been displayed on Institutional Website as well as listed in Student Diary. Various technical and cultural events in the Institute take themes from the above-listed challenges and students become aware about these PEOs and contribute in this direction.

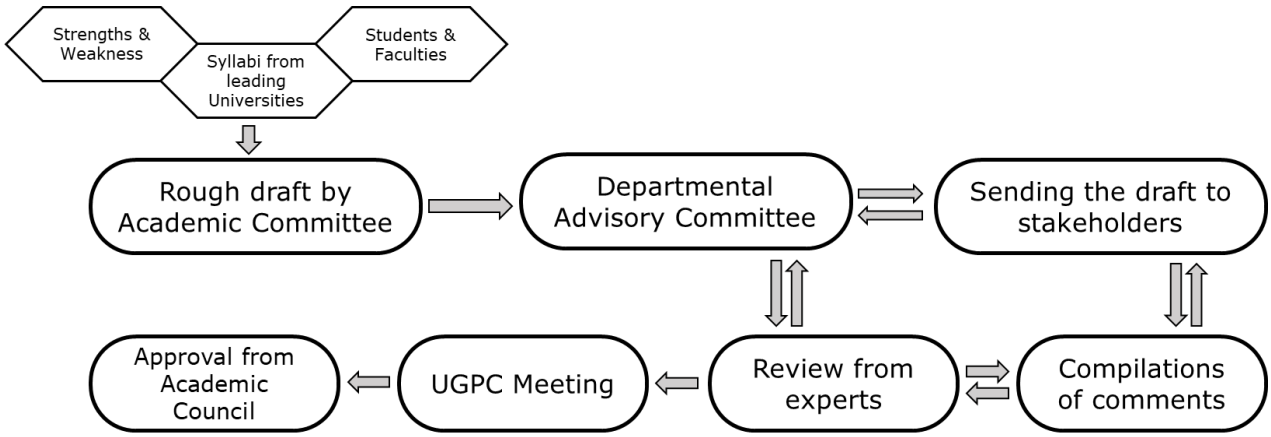


Internal stakeholders include Management, Governing Board Members, Faculty, Support staff, and students.

External stakeholders include Employers, Alumni, Funding agencies, Parents and Industry.

State the process for defining the Vision and Mission of the Department, and PEOs of the program

The process of reviewing and revising the Vision and Mission of the Department, and PEOs of the program has been discussed in the following points and with the schematic given below.



- The interactive sessions between HOD along with VC and other committee members of the **Advisory Committee** allow for setting the aims and objectives of the department while keeping the expectations of stakeholders.

- In the **Board of Studies** meeting, the Departmental mission and vision are revisited by brainstorming amongst the expert members. The strength, weakness, opportunity, and threat (SWOT) analysis is performed, keeping in mind the focus of the department and the needs of the society. The statements are prepared based on the outcome. The statements are framed to emphasize the role of food technologists as a scientist, practitioners, and responsible citizens.

- The revised statements for Vision, Mission, and Program Educational Objectives (PEOs) are sent to stakeholders for their feedback by the secretary of the **Board of Studies**.

- Once the statements are approved by the Board of Studies, it is passed to the **Dean (Academic Programs),** followed by approval in the **UG Program Committee of the Institute**.

- Finally, it is placed to the **Academic Council** of the Institute for approval.

- The Vision and Mission statements are revisited every five years, whereas program educational objectives (PEOs) and Program outcomes are revisited each year.

<table>
<tr><th>PEOs</th><th>Description of the assessment process</th><th>Frequency</th></tr>
<tr><td>PEO1: Successful Career: Graduates from the program will have successful careers in food and allied industries at various levels of management</td><td rowspan="3">-We gather the information about their next career step from the student exit feedback
-Further, we interact with them through email and social media
-After three years from the graduation we calculate the achievement in this PEO

Example:
The feedback taken in 2020 for the 13FET batch who passed out in 2017, shows the following:
5 Graduates are pursuing higher studies in food technology allied subjects
8 Graduates are working as professionals in the food industry
3 Graduates completed MBA followed by respective jobs in the industry

Therefore, the outcome of PEO for 13FET batch is as follows:

PEO1: (8/16)*100% = 50%
PEO2: (5/16)*100% = 31%
PEO3: (3/16)*100% = 19%

The target set for PEO1: PEO2: PEO3 was 50:40:10. The results show 50: 31: 19. It is quite clear that graduates are searching for multidisciplinary skills in their careers</td><td rowspan="3">-Feedback is collected yearly.

-Assessment is done after 3 years of graduation for every batch</td></tr>
<tr><td>PEO2: Higher Study: Graduates from the programme will pursue higher study related to food engineering and technology and allied disciplines in premier institutions across the world and make a career in academics or research</td></tr>
<tr><td>PEO3: Multi-disciplinary Skills: Graduates from the programme will work in a multi-disciplinary environment in the domain of food technology.</td></tr>
</table>

1.3. **Establish consistency of PEOs with the Mission of the Department (05)** **(Inst. Marks 05)**

Program under Consideration

Bachelor of Technology in Food Engineering and Technology

Program Educational Objectives (PEOs)

- **PEO1: Successful Career:** Graduates from the programme will have successful careers in food and allied industries at various levels of management
- **PEO2: Higher Study:** Graduates from the programme will pursue higher study related to food engineering and technology and allied disciplines in premier institutions across the world and make a career in academics or research
- **PEO3: Multi-disciplinary Skills:** Graduates from the programme will work in a multi-disciplinary environment in the domain of food technology.

Consistency with PEOs with Department Mission

Mission Statements	PEO1: Successful Career	PEO2: Higher Study	PEO3: Multi-disciplinary Skills
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 the 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 to direct overall activity towards the economic growth of India.	3	3	3

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

Table B.1.3

1.4. **Establish the correlation between the courses and the Program Outcomes (POs) & Program Specific Outcomes (10) (Inst. Marks 10)**

Course Articulation Matrix for Core Courses

Sr. No.	Course Code & Title	Course Outcomes (COs)		Graduate attributes/Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
				K3	K4	K6	K5	K6	K3	K3 +S	K3	K3 +A	K2 +A	K3	K6 +A +S	K3	K4
1	FDT1011: Spl 1: Chemistry of Food Constituents	CO1	Describe the various constituents present in foods and their roles therein and solve practical problems in food quality (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Describe the properties, method of preparation and applications of food constituents (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Describe the mechanisms and significance of physicochemical reactions involved in food processing and storage (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO4	Explain the significance of water in food quality, preservation and storage (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO5	Describe and demonstrate the role of food constituents on nutritional/anti-nutritional and aesthetic quality of raw and processed foods (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
2	FDT1015: Spl 2: Nutrition	CO1	Explain basic concepts of nutrition, compute energy value of foods and understand body's need for energy (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Explain the role of different constituents of carbohydrates and lipids in human nutrition (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Describe the role of proteins in human nutrition, explain concept of protein quality and methods of estimation and identify anti-nutritional factors in food sources (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO4	Describe the requirements and role of micronutrients (vitamins /minerals) in human health. (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO5	Explain formulation of diets, techniques of health surveys, nutritional assessment etc. (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3

3	FDT1030: Spl 3 Introduction to Food Systems	CO1	Describe the fundamental knowledge of physics and material science approach to food systems (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Describe surface tension and physical forms like emulsion & foam in food products (K2).	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Explain and apply the concept of rheology in food products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Apply the concept of water activity and thermal properties in food products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Explain and apply the sensory evaluation in assessing food quality and acceptance (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
4	FDP1014: Pr 1: Biochemistry	CO1	Analyze different analytical methods used for protein and sugar estimation (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO2	Analyse different enzyme assay, their purification and applications (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Demonstrate and analyse the analytical methods for vitamin estimation (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Develop analytical protocols of important nutrients in foods (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Apply the concept of biochemical analysis in quality assurance of food industry (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
5	FDP1013: Pr 2: Microbiology	CO1	Describe and analyze the principles of different staining techniques used for bacteria, yeast and chemical compounds within the cells (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO2	Describe and apply the procedure for enumerating the microorganisms in the food samples (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Analyse the effect of different media composition and physiochemical factors for microbes (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Isolate and characterize different microorganisms from food samples (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO5	Assess the microbial quality of various food samples (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
6	FDT1014: Spl 4: Food	CO1	Describe the different factors associated with microbial spoilage of food and the corresponding biochemical changes in it (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2

	Microbiology	CO2	Explain the spoilage and methods of controlling the microbial spoilage for specific food products and describing the fundamentals of food fermentation (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Describe different food borne infections and food poisoning, microbial toxins and functions of newer pathogens (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO4	Describe and apply different detection methods of critical microorganisms, rapid methods of microbial analysis, and applications of immunological techniques to food industry (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Identify the target organism in specific food and design the hazard analysis critical control points system ensuring microbiological safety and quality of foods (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
7	FDT1031: Spl 5: Principles of Food Preservation	CO1	Apply the principles and develop operations using thermal technologies for food preservation (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO2	Apply the principle, technology and operations of various non-thermal technologies for food preservation (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Analyse the concept of various advanced thermal food processing (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Apply the technique of low temperature in food preservation and analyse the process efficiency (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO5	Apply the principles of hurdle technology in food preservation (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
8	FDT1013: Spl 6: Food Chemistry	CO1	Describe the chemical composition of various food commodities and the interactions of different constituents within the food systems (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Describe the standards of identity-based on authentic chemical composition and analytical techniques (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Explain the various contaminants and toxicants present in the food systems (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO4	Describe the presence of different anti-nutritional factors in foods (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO5	Extrapolate the knowledge gained to judge the quality and authenticity of the food (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3

9	FDT1012: Spl 7: Food Additives and Ingredients	CO1	Describe the various additives and ingredients used in food industries (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Describe the mechanisms of food additives involved in foods and explain their significance in food quality, preservation, and storage (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Describe the safety of use of food additives and ingredients (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO4	Extrapolate the knowledge gained on food additives and ingredients in food industries (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Describe the process of preparation of food additives and ingredients (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
10	FDT1022: Spl 8: Food Engineering	CO1	Apply and analyse the fundamental knowledge of material and energy as a basic tool in food engineering analysis (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO2	Analyse the performance of heat exchangers applied in food processes (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Analyse the efficacy of different mass and momentum transfer operations in food processing (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Design the cold storage and refrigerated vans in food operations (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Analyse the performance of various mechanical operations applied in food industry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
11	FDP1011: Pr 3: Technical Analysis	CO1	Perform and demonstrate the analytical techniques associated with sugar & water samples (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Demonstrate the analytical techniques associated with mineral estimation in food samples (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Select the appropriate analytical technique when presented with a practical problem (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Demonstrate practical proficiency in a food analysis laboratory (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Categorize and recommend suitable analytical techniques to find out the properties of foods and food waste samples (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
12	FDP1015: Pr 4: Food	CO1	Understand the principles of different analytical techniques associated with food and	3	3	2	3	2	3	3	3	3	3	3	2	3	3

	Chemistry		demonstrate practical proficiency in a food analysis laboratory (K4)															
		CO2	Identify the appropriate analytical technique when presented with a practical problem (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Describe and use principal analytical methods used for quantifying the composition and reactions of food components (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Interpret and report data derived from chemical experiments/analysis in a meaningful way (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO5	Apply basic statistical methods to sampling/testing and the analysis of experimental data (e.g., relate this to QC or HACCP) (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
13	FDT1027: Spl 9: Food Process Engineering	CO1	Explain and develop basic flow sheet in food processing operations (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Analyse the design aspects of different thermal processes and equipment (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Design different non-thermal processes and bakery equipment (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Explain the cooling technology in food processing and design the cold storage and refrigerated vans (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Analyse the critical process control parameters and develop plant layout of a food industry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
14	FDT1017: Spl 10: Technology of Fruits, Vegetables, and Tubers	CO1	Explain and develop basics of Fruits and vegetable processing operations (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Analyse the process protocols of different fruit and vegetable-based products and quality (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Describe the maturity indices, methods, and their importance during harvesting and processing (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO4	Explain the tuber processing, and various products process protocols and design the novel food products out of them (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Analyse the quality characteristics of importance in fresh and processed fruit, vegetable, and tuber products in the food industry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3

15	FDT1026: Spl 9: Elective-I (Food Biotechnology)	CO1	Describe the fundamentals of molecular biology, chemistry, biology, and different mechanisms of DNA, RNA, and protein synthesis (K2).	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Explain the regulations in gene expression in prokaryotes and eukaryotes and recombinant DNA technology (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Describe different techniques and mechanisms involved in industrial fermentation processes (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO4	Describe and apply tissue culture and microalgae techniques as a tool of food biotechnology and describe the facts of genetically modified foods and nutritional genomics (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Describe various applications of enzymes in industrial processes (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
16	FDP1019: Pr 5: Food Processing and Product Development	CO1	Explain and develop basic flow sheet in food processing operations (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Analyse the major food processing steps applied during various food preparations (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Describe and design novel food products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Use different food processing equipment for product development (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Analyse the developed food products (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
17	FDP1018: Pr 6: Food Analysis-I (Chemical)	CO1	Apply the fundamental knowledge in the analysis of plantation crops/animal-based products/dairy based products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Analyse the unit operations involved in the processing of different plantation crops/animal products/milk and dairy products (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Select and demonstrate a suitable extraction/isolation technique for high-value compounds from plantation crops/milk/animal products (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Develop new products and processes for value-addition of plantation crop/dairy/animal products (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3

		CO5	Develop strategies related to the processing of dairy/plantation animal-based products and do troubleshooting (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
18	FDP1021: Pr 7: Food Analysis-II (Instrumentation)	CO1	Select the appropriate instrumental method when presented with a practical problem (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO2	Demonstrate practical proficiency in a food analysis laboratory using advanced instruments (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Evaluate the basic methods of instrumental and subjective sensory evaluation, including when certain methods might be used, the type of data derived, and how that data might be used in decision-making (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO4	Demonstrate practical proficiency in chromatographic techniques applied in food analysis (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Choose appropriate techniques for foods and when/how to use them in a food processing environment/situation such as QA&/QC (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
19	FDT1025: Spl 11: Technology of Dairy, Animal, and Plantation Products	CO1	Explain fundamental knowledge on dairy-based and animal-based products (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Explain the facts and unit operations/flow sheet of manufacture and technologies involved in the processing/food plant sanitation of different animal products/milk and dairy products (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Apply techniques suitable for the extraction/isolation of high-value compounds from milk/animal products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Develop/design/modify new products/processes for value-addition of dairy/animal products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Explain the causes related to any aspect of quality/spoilage and processing of dairy/animal based products and do troubleshooting (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
20	FDT1023: Spl 12: Technology of Cereals, Legumes, and Oilseeds	CO1	Explain the uniqueness of cereal grain, legume, and oilseed and the inter-relationships of the key constituents (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Infer about the quality of finished baked products, ingredient function, product formulation and processing, and molecular mechanisms (K4).	3	3	2	3	2	3	3	3	3	3	3	2	3	3

		CO3	Apply different processing operations applied to legume and oilseed-based products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Describe the processing methods applied for wheat, malt, and their products (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO5	Apply the technology involved in baked, extruded, puffed and fermented cereal, legumes and oilseeds products and Indian traditional products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
21	FDT1051: Spl 12: Elective – II (Nutraceuticals and Functional Foods)	CO1	Describe the fundamental knowledge on various nutraceuticals and functional foods and their mechanism of action and manufacturing aspects (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Explain the basics of nutrigenomics and its relation with nutraceuticals (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Explain the safety/ toxicity aspects of nutraceuticals and interactions with prescribed drugs (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Describe the basic terminologies and regulatory issues in the field of their applications (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO5	Explain the roles of various nutraceuticals in different physiological/disease conditions (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
22	FDP1022: Seminar	CO1	Develop a protocol for literature survey about a certain topic (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO2	Evaluate the literature and interpret the scientific content (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO3	Apply the concept of food technology one a selected topic (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Develop skills for presenting a scientific topic in food science (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO5	Develop skills for writing a scientific document (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
23	FDP1024: Project I	CO1	Develop critical thinking to identify the research gap for the project (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO2	Formulate a scientific question and approach to solve it (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO3	Plan the experimental methodology for the project (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3

		CO4	Develop skills to communicate the research plan effectively (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO5	Develop skills for writing a scientific document on the research work (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
24	FDP1023: In-plant Training	CO1	Apply the concept of project & production management in further planning (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Develop critical thinking regarding the various operations involved in food industry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Solve certain industrial challenges in food processes (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO4	Present and communicate an industrial problem effectively (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO5	Write a scientific report on the training (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
25	FDT1028: Spl 13: Food Safety, Quality, and Regulations	CO1	Describe the functional role and safety issues of food contaminants, food adulteration, food additives, food packaging & labeling (K2).	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Design the hygiene and sanitation in food processing plant, equipment, storage, and handling (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Analyse the various quality attributes of food and especially on microbial quality control of food and water in Food Processing Industry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Identify and analyze the critical quality control point in different stages of production of food and thereby designing the HACCP system. (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO5	Explain the role, standard and law set by Indian and global regulatory authorities concerning food quality control (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
26	FDT1019: Spl 14: Food Packaging	CO1	Discuss and analyze the role of food packaging in food preservation (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO2	Describe different food packaging materials, properties, and interactions (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO3	Apply the concept of packaging concerning various food commodities (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Explain and interpret various tests used in evaluating quality and safety of food	3	2	1	2	1	3	3	3	3	3	3	1	3	2

			packaging materials (K2)															
		CO5	Describe newer food packaging technologies (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
27	FDT1052: Spl 15: Principles of Food Analysis	CO1	Describe the basic principles of physical, chemical, biological and instrumental techniques used in food analysis for quality assurance (K2)	3	2	1	2	1	3	3	3	3	3	3	1	3	2
		CO2	Explain newer and relevant analytical techniques in food systems and design labels for food products based on food analysis (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO3	Develop analytical techniques for online monitoring of food quality during processing and storage (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO4	Ensure consumer safety through analysis of food contaminants and adulterants and apply them in the light of regulatory requirements (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO5	Assess the environmental impact of products life from farm to fork (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
28	FDT1053: Spl 16: Elective III (Waste Management in Food Processing)	CO1	Describe and interpret different terminologies in wastewater treatment (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
		CO2	Explain and analyse different treatment methods used in wastewater treatment (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Develop waste management strategies for food processing industries (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO4	Explain and recommend the strategies for the recovery of biological from various food wastes (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO5	Design and develop a waste treatment protocol for different food wastes (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
29	FDP1025: Project II	CO1	Perform experiments & troubleshoot to generate reliable data (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO2	Apply different statistical tools for scientific data analysis (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Evaluate critically the experimental data and draw meaningful inferences (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO4	Develop skills to communicate the research outcome effectively (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3

		CO5	Develop skills for writing a complete document on the project work (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
30	FDP1023: Pr 8: Food Processing and Engineering	CO1	Analyse the different unit operations in developing a process specific to food products (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO2	Analyse different thermal processes for food preservations (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
		CO3	Analyse and evaluate the effect of different process variables on the quality of food products (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO4	Analyse and evaluate the effect of compositional variables on quality of food products (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO5	Develop and optimize the food process and products using the experimental design concept (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Table B.1.4a

PSO1: Able to have knowledge for higher studies
PSO2: Able to involve in consumer awareness program and food regulations
Program Outcomes (POs 1-12) have been set as indicated in Annexure I.

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution
K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

Program Articulation Matrix

Sr. No.	Course Code & Title	Graduate attributes/Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
		K3	K4	K6	K5	K6	K3	K3 +S	K3	K3 +A	K2 +A	K3	K6 +A +S	K3	K4
1	CHT1341: Physical Chemistry-I (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
2	CHT1401: Analytical Chemistry (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
3	MAT1101: Applied Mathematics-I (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
4	PYT1101: Applied Physics-I (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
5	CHP1343: Physical and Analytical Chemistry Lab (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
6	GEP1101: Engineering Graphics(K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
7	HUP1101: Communication Skills (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
8	CHT1342: Physical Chemistry-II (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
9	CHT1132: Organic Chemistry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
10	CET1507: Process Calculations (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
11	MAT1102: Applied Mathematics-II (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
12	PYT1103: Applied Physics-II (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
13	PYP1101: Physics Laboratory (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
14	CHP1132: Organic Chemistry Laboratory (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
15	FDT1011: Spl 1: Chemistry of Food Constituents (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
16	FDT1015: Spl 2: Nutrition (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
17	FDT1030: Spl 3 Introduction to Food Systems (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
18	BST1102: Biochemistry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3

19	BST1101: Microbiology (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
20	FDP1014: Pr 1: Biochemistry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
21	FDP1013: Pr 2: Microbiology (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
22	GET1116: Engineering Mechanics & Strength of Materials (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
23	FDT1014: Spl 4: Food Microbiology (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
24	CET1105: Transport Phenomena (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
25	GET1105: Basic Electrical Engineering and Electronics (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
26	FDT1031: Spl 5: Principles of Food Preservation (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
27	GEP1106: Electrical Engineering and Electronics Lab (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
28	MAP1201: Computer Applications Lab (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
29	CET1401: Chemical Engineering Operations (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
30	CET1201: Chemical Reaction Engineering (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
31	FDT1013: Spl 6: Food Chemistry (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
32	FDT1012: Spl 7: Food Additives and Ingredients (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3
33	FDT1022: Spl 8: Food Engineering (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
34	FDP1011: Pr 3: Technical Analysis (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
35	FDP1015: Pr 4: Food Chemistry (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
36	FDT1027: Spl 9: Food Process Engineering (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
37	FDT1017: Spl 10: Technology of Fruits, Vegetables, and Tubers (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
38	HUT 1103: Industrial Psychology and Human Resource Management I (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
39	HUT1104: Industrial Management I (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
40	FDP1019: Pr 5: Food Processing and Product Development (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3
41	FDP1018: Pr 6: Food Analysis-I (Chemical) (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3

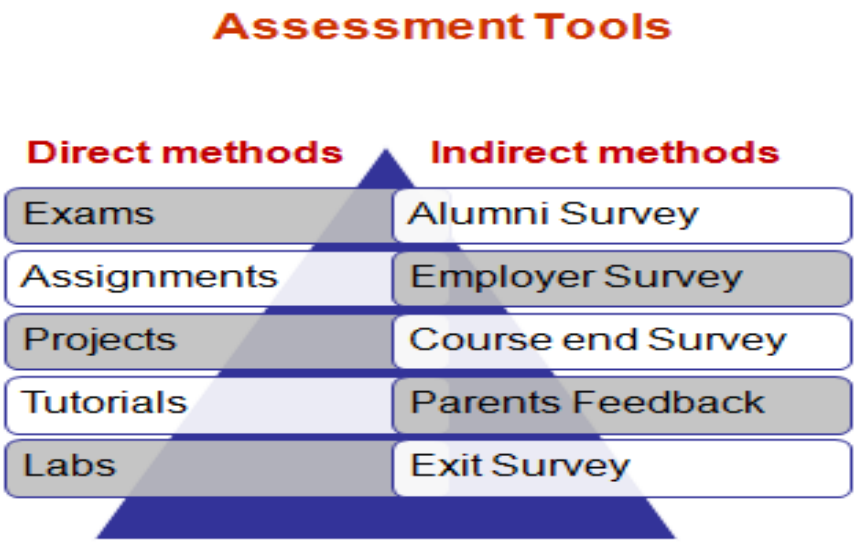
42	FDP1021: Pr 7: Food Analysis-II (Instrumentation) (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
43	CET1703: Chemical Process Control (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
44	FDT1025: Spl 11: Technology of Dairy, Animal, and Plantation Products (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3	
45	FDT1023: Spl 12: Technology of Cereals, Legumes, and Oilseeds (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3	
46	HUT1105: Industrial Management II (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3	
47	CEP1714: Chemical Engineering Laboratory (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3	
48	FDP1022: Seminar (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
49	FDP1024: Project I (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
50	FDP1023: In-plant Training (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
51	CET1504: Chemical Project Engineering and Economics (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3	
52	FDT1028: Spl 13: Food Safety, Quality, and Regulations (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3	
53	FDT1019: Spl 14: Food Packaging (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3	
54	FDT1052: Spl 15: Principles of Food Analysis (K4)	3	3	2	3	2	3	3	3	3	3	3	2	3	3	
55	FDP1025: Project II (K6)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
56	FDP1023: Pr 8: Food Processing and Engineering (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
57	FDT1026: Spl 9: Elective-I (Food Biotechnology) (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3	
58	FDT1051: Spl 12: Elective – II (Nutraceuticals and Functional Foods) (K3)	3	3	2	2	2	3	3	3	3	3	3	2	3	3	
59	FDT1053: Spl 16: Elective III (Waste Management in Food Processing) (K5)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

Table B.1.4b

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; – No Contribution
K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

1.5. **Attainment of Course outcomes (25)** **(Inst. Marks 25)**

1.5.1. **Describe the assessment tools and processes used to gather the data upon which the evaluation of Course Outcome is based (05)** **(Inst. Marks 05)**



Calculation of Course Outcome (CO)

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

End Semester exam: End Semester Score (50%)

Continuous Evaluation: Score for Continuous (20%) and Mid Sem Examination (30%)

The process adopted to map the assess the course outcomes

The assessment of the course outcomes (COs) has 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 ai
m ≥ 60%	3
60% < m ≤ 50%	2
m < 50%	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

Batch 17FET, Semester IV

Course: FDT 1031-Spl 5: Principle of Food Preservation
Number of COs: 5
Total number of students: 18

Step I: Question pattern: All Questions are compulsory

End Semester: CO-Question Mapping

Question No.	Max Marks	CO1	CO2	CO3	CO4	CO5
Q.1	12	50%	50%	00%	00%	00%
Q.2	8	00%	50%	00%	50%	00%
Q.3	12	00%	25%	25%	25%	25%
Q.4	6	33.3%	00%	33.3%	33.3%	00%
Q.5	12	20%	00%	30%	00%	50%

Continuous Evaluation and Mid Semester: CO-Question Mapping

Question No.	Marks	CO1	CO2	CO3	CO4	CO5
Continuous Evaluation	20	20%	20%	20%	20%	20%
Mid semester	30	20%	20%	20%	20%	20%

Step II: Students marks obtained

ROLL NO	End Semester Mark (50)					Continuous Evaluation (20)	Mid Semester (30)
	Q1	Q2	Q3	Q4	Q5		
17FET101	7.5	4.5	4.5	4.5	9	15	16
17FET102	11	7	7.5	5	11.5	17	23
17FET104	5.5	4.5	5	4	8	15	13
17FET105	11	7.5	11.5	5.5	11.5	19	26
17FET106	5.5	6.5	6	0	11.5	18	18
17FET107	9.5	8	7	3	8.5	14	19
17FET108	10	7	7	5.5	10	18	23
17FET109	11	7	10.5	4.5	8	16	23
17FET110	10.5	6.5	10.5	5.5	10	18	24
17FET112	12	7	11	6	10.5	19	29
17FET113	10	2	4	4	10	15	21
17FET115	11.5	5.5	9	4	10	14	17
17FET117	11.5	6.5	11	5.5	11.5	17	26
17FET118	10.5	7.5	10	5.5	11	17	23
17FET119	12	7	10.5	6	10.5	16	24
17FET120	11	7	7.5	4.5	10	14	21
17FET121	12	5	10.5	5.5	11.5	18	20
17FET122	10.5	6.5	10	6	7	18	22

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

ROLL NO	End Semester Mark (50)				
	CO1	CO2	CO3	CO4	CO5
17FET101	7.04	7.13	5.31	4.86	5.63
17FET102	9.45	10.88	6.98	7.03	7.63
17FET104	5.67	6.25	4.97	4.82	5.25
17FET105	9.62	12.13	8.14	8.44	8.63
17FET106	5.05	7.50	4.95	4.75	7.25
17FET107	7.44	10.50	5.29	6.74	6.00
17FET108	8.82	10.25	6.57	7.07	6.75
17FET109	8.59	11.63	6.51	7.61	6.63
17FET110	9.07	11.13	7.44	7.69	7.63
17FET112	10.08	12.25	7.88	8.23	8.00
17FET113	8.32	7.00	5.32	3.32	6.00
17FET115	9.07	10.75	6.57	6.32	7.25
17FET117	9.87	11.75	8.02	7.82	8.50
17FET118	9.27	11.50	7.62	8.07	8.00
17FET119	10.08	12.13	7.76	8.11	7.88
17FET120	8.99	10.88	6.36	6.86	6.88
17FET121	10.12	11.13	7.89	6.94	8.38
17FET122	8.63	11.00	6.58	7.73	6.00

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 a student (17FET101) the score corresponding to CO2 is 7.13. This has been calculated as shown below.

$$S_{CO_{21}} = (7.5 \times 0.5) + (4.5 \times 0.5) + (4.5 \times 0.25) + (4.5 \times 0.0) + (9 \times 0.0) = 7.13$$

For another student (17FET108) the score corresponding to CO2 is 10.25. This has been calculated as shown below.

$$S_{CO_{22}} = (10 \times 0.5) + (7 \times 0.5) + (7 \times 0.25) + (5.5 \times 0.0) + (10 \times 0.0) = 10.25$$

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

ROLL NO	End Semester Mark (25)				
	CO1	CO2	CO3	CO4	CO5
17FET101	7.04	7.13	5.31	4.86	5.63
17FET102	9.45	10.88	6.98	7.03	7.63
17FET104	5.67	6.25	4.97	4.82	5.25
17FET105	9.62	12.13	8.14	8.44	8.63
17FET106	5.05	7.50	4.95	4.75	7.25
17FET107	7.44	10.50	5.29	6.74	6.00
17FET108	8.82	10.25	6.57	7.07	6.75
17FET109	8.59	11.63	6.51	7.61	6.63
17FET110	9.07	11.13	7.44	7.69	7.63
17FET112	10.08	12.25	7.88	8.23	8.00
17FET113	8.32	7.00	5.32	3.32	6.00
17FET115	9.07	10.75	6.57	6.32	7.25
17FET117	9.87	11.75	8.02	7.82	8.50
17FET118	9.27	11.50	7.62	8.07	8.00
17FET119	10.08	12.13	7.76	8.11	7.88
17FET120	8.99	10.88	6.36	6.86	6.88
17FET121	10.12	11.13	7.89	6.94	8.38
17FET122	8.63	11.00	6.58	7.73	6.00
Class average (s_{COi})	8.62	10.32	6.67	6.80	7.13
% of students (m) scoring at least class average	66.7	72.2	44.4	66.7	55.6

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

	CO1	CO2	CO3	CO4	CO5
CO Attainment from End Semester (a_{iES})	2	3	1	3	2
CO Attainment from Cont Evaluation + Mid Semester (a_{iCA})	2	2	2	2	2
Attainment of CO Calculation	(2x0.8) +(2x0.2)	(3x0.8) +(2x0.2)	(1x0.8) +(2x0.2)	(3x0.8) +(2x0.2)	(2x0.8) +(2x0.2)
Final Attainment of CO (A_{COi})	2.8	2.8	1.2	2.8	2
Attainment of Course (A_{course})	(2.8+2.8+1.2+2.8+2)/5 = 2.32 [77.3%]				

1.5.2. **Record the attainment of Course Outcomes of all courses with respect to set attainment levels (20)** **(Inst. Marks 20)**

Measuring CO attainment through Semester End Examinations (SEE): The process is as discussed above in point 1.5.1

The final attainment list has been tabulated below (for 18FET, 17FET and 16FET batches)

Course Title	Code	Level	Target	2018-22	2017-21	2016-20
Physical Chemistry-I	CHT1341	K3	70.0%	66.7%	66.7%	66.7%
Analytical Chemistry	CHT1401	K3	70.0%	75.0%	66.7%	66.7%
Applied Mathematics-I	MAT1101	K3	70.0%	66.7%	66.7%	66.7%
Applied Physics-I	PYT1101	K3	70.0%	86.7%	80.0%	66.7%
Physical and Analytical Chemistry Lab	CHP1343	K4	70.0%	66.7%	83.3%	66.7%
Engineering Graphic	GEP1101	K3	70.0%	83.3%	66.7%	66.7%
Communication Skills	HUP1101	K3	70.0%	60.0%	60.0%	60.0%
Physical Chemistry-II	CHT1342	K4	70.0%	66.7%	66.7%	66.7%
Organic Chemistry	CHT1132	K4	70.0%	66.7%	75.0%	66.7%
Process Calculations	CET1507	K3	70.0%	66.7%	66.7%	66.7%
Applied Mathematics-II	MAT1102	K3	70.0%	66.7%	77.8%	66.7%
Applied Physics-II	PYT1103	K3	70.0%	66.7%	66.7%	66.7%
Physics Laboratory	PYP1101	K4	70.0%	66.7%	66.7%	66.7%
Organic Chemistry Laboratory	CHP1132	K4	70.0%	66.7%	66.7%	55.6%
Spl 1: Chemistry of Food Constituents	FDT1101	K3	70.0%	82.7%	70.7%	73.3%
Spl 2: Nutrition	FDT1015	K3	70.0%	73.3%	60.0%	66.7%
Spl 3 Introduction to Food Systems	FDT1030	K3	70.0%	60.0%	60.0%	77.3%
Biochemistry	BST1102	K4	70.0%	72.0%	66.7%	73.3%
Microbiology	BST1101	K3	70.0%	77.3%	61.3%	100.0%
Pr 1: Biochemistry	FDP1014	K4	70.0%	66.7%	100.0%	100.0%
Pr 2: Microbiology	FDP1013	K4	70.0%	73.3%	100.0%	100.0%
Engineering Mechanics & Strength of Materials	GET1116	K3	70.0%	73.3%	66.7%	73.3%
Spl 4: Food Microbiology	FDT1014	K3	70.0%	66.7%	86.7%	68.0%
Transport Phenomena	CET1105	K3	70.0%	66.7%	83.3%	58.3%
Basic Electrical Engineering and Electronics	GET1105	K3	70.0%	83.3%	58.3%	58.3%
Spl 5: Principles of Food Preservation	FDT1031	K4	70.0%	80.0%	77.3%	70.7%
Electrical Engineering and Electronics Lab	GEP1106	K3	70.0%	66.7%	75.0%	58.3%
Computer Applications Lab	MAP1201	K4	70.0%	53.3%	60.0%	66.7%
Chemical Engineering Operations	CET1401	K4	70.0%	66.7%	60.0%	73.3%
Chemical Reaction Engineering	CET1201	K4	70.0%	66.7%	66.7%	66.7%
Spl 6: Food Chemistry	FDT1013	K3	70.0%	60.0%	60.0%	60.0%
Spl 7: Food Additives and Ingredients	FDT1012	K3	70.0%	93.3%	61.3%	60.0%

Spl 8: Food Engineering	FDT1022	K4	70.0%	66.7%	56.0%	66.7%
Pr 3: Technical Analysis	FDP1011	K4	70.0%	73.3%	66.7%	66.7%
Pr 4: Food Chemistry	FDP1015	K4	70.0%	66.7%	60.0%	66.7%
Spl 9: Food Process Engineering	FDT1027	K4	70.0%	93.3%	66.7%	73.3%
Spl 10: Technology of Fruits, Vegetables, and Tubers	FDT1017	K4	70.0%	61.3%	80.0%	61.3%
Industrial Psychology and Human Resource Management I	HUT1103	K4	70.0%	66.7%	66.7%	66.7%
Industrial Management I	HUT1104	K4	70.0%	66.7%	75.0%	66.7%
Pr 5: Food Processing and Product Development	FDP1019	K4	70.0%	66.7%	66.7%	66.7%
Pr 6: Food Analysis-I (Chemical)	FDP1018	K4	70.0%	66.7%	66.7%	66.7%
Pr 7: Food Analysis-II (Instrumentation)	FDP1021	K5	70.0%	66.7%	66.7%	66.7%
Chemical Process Control	CET1703	K6	70.0%	66.7%	73.3%	66.7%
Spl 11: Technology of Dairy, Animal, and Plantation Products	FDT1025	K3	70.0%	66.7%	62.7%	60.0%
Spl 12: Technology of Cereals, Legumes, and Oilseeds	FDT1023	K4	70.0%	60.0%	80.0%	66.7%
Industrial Management II	HUT1105	K4	70.0%	75.0%	75.0%	75.0%
Chemical Engineering Laboratory	CEP1714	K4	70.0%	66.7%	66.7%	66.7%
Seminar	FDP1022	K6	70.0%	66.7%	66.7%	66.7%
Project I	FDP1024	K6	70.0%	66.7%	66.7%	66.7%
In-plant Training	FDP1023	K6	70.0%	66.7%	66.7%	66.7%
Chemical Project Engineering and Economics	CET1504	K4	70.0%	72.0%	86.7%	53.3%
Spl 13: Food Safety, Quality, and Regulations	FDT1028	K4	70.0%	73.3%	73.3%	60.0%
Spl 14: Food Packaging	FDT1019	K4	70.0%	66.7%	61.3%	66.7%
Spl 15: Principles of Food Analysis	FDT1052	K4	70.0%	56.0%	73.3%	53.3%
Project II	FDP1025	K6	70.0%	73.3%	66.7%	66.7%
Pr 8: Food Processing and Engineering	FDP1023	K5	70.0%	66.7%	66.7%	66.7%
Spl 9: Elective-I (Food Biotechnology)	FDT1026	K3	70.0%	93.3%	66.7%	66.7%
Spl 12: Elective – II (Nutraceuticals and Functional Foods)	FDT1051	K3	70.0%	73.3%	66.7%	72.0%
Spl 16: Elective III (Waste Management in Food Processing)	FDT1053	K5	70.0%	66.7%	66.7%	73.3%

1.6. **Attainment of Program Outcomes and Program Specific Outcomes (25)** **(Inst. Marks 25)**

1.6.1. **Describe assessment tools and processes used for measuring the attainment of each Program Outcome and Program Specific Outcomes (05)** **(Inst. Marks 05)**

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:

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

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.

Direct Attainment of PO1 (17FET Batch)

Sr No	Course Code & Title	Level	Correlation	Attainment
1	CHT1341: Physical Chemistry-I	K3	3	2.00
2	CHT1401: Analytical Chemistry	K3	3	2.00
3	MAT1101: Applied Mathematics-I	K3	3	2.00
4	PYT1101: Applied Physics-I	K3	3	2.40
5	CHP1343: Physical and Analytical Chemistry Lab	K4	3	2.50
6	GEP1101: Engineering Graphic	K3	0	2.00
7	HUP1101: Communication Skills	K3	3	1.80
8	CHT1342: Physical Chemistry-II	K4	3	2.00
9	CHT1132: Organic Chemistry	K4	3	2.25
10	CET1507: Process Calculations	K3	3	2.00
11	MAT1102: Applied Mathematics-II	K3	3	2.33
12	PYT1103: Applied Physics-II	K3	3	2.00
13	PYP1101: Physics Laboratory	K4	3	2.00
14	CHP1132: Organic Chemistry Laboratory	K4	3	2.00
15	FDT1011: Spl 1: Chemistry of Food Constituents	K3	3	2.12
16	FDT1015: Spl 2: Nutrition	K3	3	1.80

17	FDT1030: Spl 3 Introduction to Food Systems	K3	3	1.80
18	BST1102: Biochemistry	K4	3	2.00
19	BST1101: Microbiology	K3	3	1.84
20	FDP1014: Pr 1: Biochemistry	K4	3	3.00
21	FDP1013: Pr 2: Microbiology	K4	3	3.00
22	GET1116: Engineering Mechanics & Strength of Materials	K3	3	2.00
23	FDT1014: Spl 4: Food Microbiology	K3	3	2.60
24	CET1105: Transport Phenomena	K3	3	2.50
25	GET1105: Basic Electrical Engineering and Electronics	K3	3	1.75
26	FDT1031: Spl 5: Principles of Food Preservation	K4	3	2.32
27	GEP1106: Electrical Engineering and Electronics Lab	K3	3	2.25
28	MAP1201: Computer Applications Lab	K4	3	1.80
29	CET1401: Chemical Engineering Operations	K4	3	1.80
30	CET1201: Chemical Reaction Engineering	K4	3	2.00
31	FDT1013: Spl 6: Food Chemistry	K3	3	1.80
32	FDT1012: Spl 7: Food Additives and Ingredients	K3	3	1.84
33	FDT1022: Spl 8: Food Engineering	K4	3	1.68
34	FDP1011: Pr 3: Technical Analysis	K4	3	2.00
35	FDP1015: Pr 4: Food Chemistry	K4	3	1.80
36	FDT1027: Spl 9: Food Process Engineering	K4	3	2.00
37	FDT1017: Spl 10: Technology of Fruits, Vegetables, and Tubers	K4	3	2.40
38	HUT 1103: Industrial Psychology and Human Resource Management I	K4	3	2.00
39	HUT1104: Industrial Management I	K4	3	2.25
40	FDP1019: Pr 5: Food Processing and Product Development	K4	3	2.00
41	FDP1018: Pr 6: Food Analysis-I (Chemical)	K4	3	2.00
42	FDP1021: Pr 7: Food Analysis-II (Instrumentation)	K5	3	2.00
43	CET1703: Chemical Process Control	K6	3	2.20
44	FDT1025: Spl 11: Technology of Dairy, Animal, and Plantation Products	K3	3	1.88
45	FDT1023: Spl 12: Technology of Cereals, Legumes, and Oilseeds	K4	3	2.40
46	HUT1105: Industrial Management II	K4	3	2.25
47	CEP1714: Chemical Engineering Laboratory	K4	3	2.00

48	FDP1022: Seminar	K6	3	2.00
49	FDP1024: Project I	K6	3	2.00
50	FDP1023: In-plant Training	K6	3	2.00
51	CET1504: Chemical Project Engineering and Economics	K4	3	2.60
52	FDT1028: Spl 13: Food Safety, Quality, and Regulations	K4	3	2.20
53	FDT1019: Spl 14: Food Packaging	K4	3	1.84
54	FDT1052: Spl 15: Principles of Food Analysis	K4	3	2.20
55	FDP1025: Project II	K6	3	2.00
56	FDP1023: Pr 8: Food Processing and Engineering	K5	3	2.00
57	FDT1026: Spl 9: Elective-I (Food Biotechnology)	K3	3	2.00
58	FDT1051: Spl 12: Elective – II (Nutraceuticals and Functional Foods)	K3	3	2.00
59	FDT1053: Spl 16: Elective III (Waste Management in Food Processing)	K5	3	2.00
			Sum = 174	
Direct PO1 Attainment = [{…+(3x2.12) +(3x2.32) +…+(3x1.68) +…+(3x1.88) +(3x2.00) +…} /174] =				2.09

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.

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

$$a_{IPO_i} = \frac{3}{5N}\sum_{j=1}^{N}\sum_{k=1}^{9} S_{QF_{kj}} \times W_{iQF_k}$$

$$= \frac{3}{5N}\left[S_{QF_{1j}} \times W_{iQF1} + S_{QF_{2j}} \times W_{iQF2} + \ldots + S_{QF_{9j}} \times W_{iQF9} \right]$$

Where, N= number of students giving Student exit feedback

a_{IPO1}= Indirect PO attainment of i^{th} PO from Feedback 1

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

Q= number of questionaries in feedback

W_{iQF} = weightage of k^{th} feedback question for i^{th} PO

Survey 1: Student Exit Feedback (for 17FET)

Que	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Wt.	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	5	4	5	4	5	4	5	5	5	5	5	5	5	5
2	4	5	5	4	5	5	5	4	5	5	5	4	4	4
3	1	1	1	1	1	3	3	3	5	5	2	3	1	4
4	5	5	5	5	3	5	3	4	5	5	3	5	5	5
5	5	5	5	4	5	4	4	5	4	5	4	4	5	4

6	4	4	4	4	4	4	4	4	4	4	4	4	4	4
7	4	4	5	4	5	4	5	5	4	5	4	4	5	4
8	4	4	3	3	3	4	4	4	4	4	3	4	4	4
Avg	4.00	4.00	4.13	3.63	3.88	4.13	4.13	4.25	4.50	4.75	3.75	4.13	4.13	4.25

Survey II: Program End Feedback (for 17FET)

Que	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Wt.	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	4	5	5	5	4	5	5	4	4	4	5	4	5	5
2	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	4	4	4	4	4	4	4	4	4	4	4	4	4	4
4	5	5	5	4	4	4	4	4	4	4	4	4	4	4
5	2	2	3	3	3	3	4	3	3	2	4	4	4	4
6	5	4	4	4	4	5	4	4	4	5	4	4	4	5
7	5	5	5	5	4	5	4	4	5	5	5	5	5	5
8	4	3	4	4	3	4	3	3	4	4	4	4	3	4
9	5	5	5	5	5	5	5	5	5	5	5	5	5	5
10	4	4	4	5	4	5	4	5	5	5	4	5	4	5
11	3	2	3	3	3	4	4	4	3	3	3	4	4	4
12	4	4	4	4	5	4	4	5	5	4	4	4	5	5
13	4	4	4	4	5	4	5	4	5	4	4	4	5	5
14	4	4	4	4	4	4	4	4	5	5	4	4	4	4
15	4	4	4	4	3	3	3	3	4	4	4	4	4	4
Avg	4.13	4.00	4.20	4.20	4.00	4.27	4.13	4.07	4.33	4.20	4.20	4.27	4.33	4.53

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

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

The term a_{IPOi} is converted from a 5-point scale to 3-point scale.

POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
a_{IPO1}	2.40	2.40	2.48	2.18	2.33	2.48	2.48	2.55	2.70	2.85	2.25	2.48	2.48	2.55
a_{IPO2}	2.48	2.40	2.52	2.52	2.40	2.56	2.48	2.44	2.60	2.52	2.52	2.56	2.60	2.72
PO_I	2.44	2.40	2.50	2.35	2.37	2.52	2.48	2.50	2.65	2.69	2.39	2.52	2.54	2.64

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;

Direct PO1 Attainment				2.09
Indirect PO Attainment	Survey I	Student Feedback	2.40	2.44
	Survey II	Industry Feedback	2.48	
Overall Attainment of PO1 (A_{PO1})		= (2.09x0.8) +(2.44x0.2)		2.16
% Attainment of PO1 (A_{PO1})		(2.16/3) x 100 =		72.0 %

Survey 1: Student Exit Feedback (for 16FET)

Que	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Wt.	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	5	5	4	5	4	5	4	4	4	5	4	5	5	4
2	2	2	3	2	2	2	3	4	4	4	3	4	3	4
3	5	5	5	5	3	5	3	4	5	5	3	5	5	5
4	5	4	5	4	4	5	4	4	5	4	5	4	4	4
5	4	4	4	5	3	4	4	4	4	4	4	4	3	4
6	4	4	5	5	4	4	5	4	5	5	4	5	5	5
7	4	4	4	4	2	4	4	4	4	4	4	4	4	3
Avg	4.14	4.00	4.29	4.29	3.14	4.14	3.86	4.00	4.43	4.43	3.86	4.43	4.14	4.14

Survey II: Program End Feedback (for 16FET)

Que	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Wt.	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	5	5	4	5	4	5	5	5	4	4	5	4	4	5
2	1	1	2	2	2	2	3	3	3	3	3	3	3	3
3	4	4	5	4	4	5	4	5	4	5	4	5	5	4
4	5	5	5	5	4	5	4	4	5	5	4	5	5	5
5	4	3	3	4	3	4	4	3	4	4	4	4	4	4
6	5	5	4	5	5	4	4	4	4	4	4	5	5	5
7	4	5	4	5	5	5	4	5	5	4	5	4	5	4
8	4	5	5	4	4	4	5	4	5	5	4	5	5	5
9	4	5	5	4	4	5	4	5	4	5	5	4	4	5
10	4	5	4	4	4	5	4	4	5	4	4	5	5	5
11	4	4	3	4	4	4	4	4	4	4	4	4	4	4
12	4	4	3	4	3	4	4	4	4	4	3	3	4	4
Avg	4.00	4.25	3.92	4.17	3.83	4.33	4.08	4.17	4.25	4.25	4.08	4.25	4.42	4.42

Average of two feedback scores on a 3-point scale (for 16FET)

POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
a_{IPO1}	2.48	2.40	2.57	2.57	1.88	2.48	2.32	2.40	2.66	2.66	2.32	2.66	2.48	2.48
a_{IPO2}	2.40	2.55	2.35	2.50	2.30	2.60	2.45	2.50	2.55	2.55	2.45	2.55	2.65	2.65
PO_I	2.44	2.48	2.46	2.54	2.09	2.54	2.39	2.45	2.61	2.61	2.39	2.61	2.57	2.57

Survey 1: Student Exit Feedback (for 18FET)

Que	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Wt.	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	5	5	5	4	4	5	5	4	5	5	4	5	4	5
2	4	5	5	4	4	5	5	4	5	5	5	4	5	5
3	1	2	2	3	3	2	4	5	5	5	3	4	4	5
4	5	5	5	5	4	5	4	5	5	5	3	5	5	5
5	4	4	4	5	5	5	4	4	4	5	5	4	5	5
6	4	4	4	4	4	4	4	4	4	4	4	4	4	4
7	4	4	5	5	5	4	5	4	5	5	4	4	4	5
8	4	4	3	3	2	3	4	4	4	5	3	4	4	4
Avg	3.88	4.13	4.13	4.13	3.88	4.13	4.38	4.25	4.63	4.88	3.88	4.25	4.38	4.75

Survey II: Program End Feedback (for 18FET)

Que	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Wt.	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	5	4	5	5	5	4	5	5	5	5	5	4	4	5
2	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	4	5	4	5	4	5	4	5	5	5	5	5	5	5
4	5	5	5	4	4	4	5	4	5	5	4	5	4	5
5	5	4	5	4	5	4	5	5	5	5	5	5	5	5
6	2	2	3	3	4	3	3	5	5	5	5	5	5	5
7	5	5	5	5	4	5	4	4	5	5	4	5	5	5
8	4	3	4	4	4	4	4	3	4	4	3	4	4	4
9	4	4	4	4	4	4	3	3	4	4	3	4	4	4
10	4	5	4	5	4	5	4	5	4	5	5	5	4	4
11	3	3	3	3	3	3	3	3	2	2	2	3	2	2
12	5	5	5	5	5	4	5	4	5	5	5	5	5	5
13	3	4	4	4	4	5	5	4	4	4	4	5	5	5
14	4	4	4	3	4	3	4	3	5	3	3	4	4	4
15	5	4	4	5	5	5	4	5	5	5	4	4	5	5
16	4	4	5	4	4	4	5	5	5	5	4	4	4	4
17	3	3	4	4	3	4	4	4	4	4	4	4	4	3
18	4	4	4	4	3	4	4	4	4	5	4	4	4	4
Avg	4.11	4.06	4.28	4.22	4.11	4.17	4.22	4.22	4.50	4.50	4.11	4.44	4.33	4.39

Average of two feedback scores on a 3-point scale (for 18FET)

POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
a_{IPO1}	2.33	2.48	2.48	2.48	2.33	2.48	2.63	2.49	2.80	2.93	2.33	2.55	2.63	2.85
a_{IPO2}	2.47	2.44	2.57	2.53	2.47	2.50	2.53	2.53	2.70	2.70	2.47	2.66	2.60	2.63
PO_I	2.40	2.46	2.52	2.51	2.40	2.49	2.58	2.51	2.75	2.81	2.40	2.61	2.61	2.74

1.6.2. **Provide result of evaluation of each PO and PSO (20)** **(Inst. Marks 20)**

For the academic year 2019-20 (16FET)

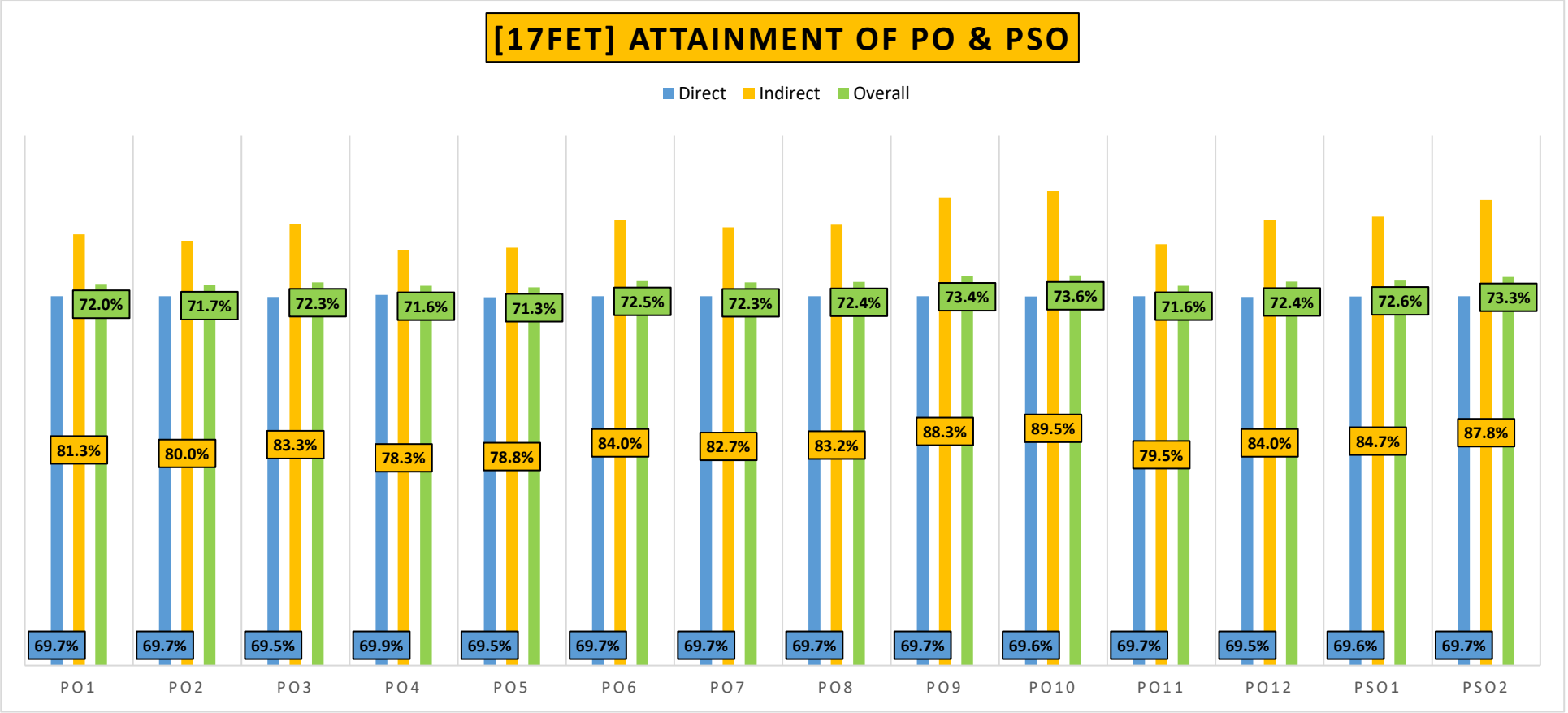
		Graduate attributes/Program Outcomes (POs)												PSOs	
Attainment		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Direct	Out of 3	2.04	2.04	2.03	2.04	2.03	2.04	2.04	2.04	2.04	2.03	2.04	2.03	2.03	2.04
	Percentage	67.8%	67.8%	67.8%	67.9%	67.8%	67.8%	67.8%	67.8%	67.8%	67.8%	67.8%	67.8%	67.8%	67.8%
Indirect	Survey I	2.48	2.40	2.57	2.57	1.88	2.48	2.32	2.40	2.66	2.66	2.32	2.66	2.48	2.48
	Survey II	2.40	2.55	2.35	2.50	2.30	2.60	2.45	2.50	2.55	2.55	2.45	2.55	2.65	2.65
	Out of 3	2.44	2.48	2.46	2.54	2.09	2.54	2.39	2.45	2.61	2.61	2.39	2.61	2.57	2.57
	Percentage	81.3%	82.5%	82.0%	84.5%	69.7%	84.7%	79.5%	81.7%	86.8%	86.8%	79.5%	86.8%	85.5%	85.5%
Overall	Out of 3	2.12	2.12	2.12	2.14	2.05	2.14	2.11	2.12	2.15	2.15	2.11	2.15	2.14	2.14
	Percentage	70.5%	70.8%	70.7%	71.2%	68.2%	71.2%	70.2%	70.6%	71.6%	71.6%	70.2%	71.6%	71.4%	71.4%

Table B.1.6.2a

For the academic year 2020-21 (17FET)

		Graduate attributes/Program Outcomes (POs)												PSOs	
Attainment		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Direct	Out of 3	2.09	2.09	2.09	2.10	2.08	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09
	Percentage	69.7%	69.7%	69.5%	69.9%	69.5%	69.7%	69.7%	69.7%	69.7%	69.6%	69.7%	69.5%	69.6%	69.7%
Indirect	Survey I	2.40	2.40	2.48	2.18	2.33	2.48	2.48	2.55	2.70	2.85	2.25	2.48	2.48	2.55
	Survey II	2.48	2.40	2.52	2.52	2.40	2.56	2.48	2.44	2.60	2.52	2.52	2.56	2.60	2.72
	Out of 3	2.44	2.40	2.50	2.35	2.37	2.52	2.48	2.50	2.65	2.69	2.39	2.52	2.54	2.64
	Percentage	81.3%	80.0%	83.3%	78.3%	78.8%	84.0%	82.7%	83.2%	88.3%	89.5%	79.5%	84.0%	84.7%	87.8%
Overall	Out of 3	2.16	2.15	2.17	2.15	2.14	2.18	2.17	2.17	2.20	2.21	2.15	2.17	2.18	2.20
	Percentage	72.0%	71.7%	72.3%	71.6%	71.3%	72.5%	72.3%	72.4%	73.4%	73.6%	71.6%	72.4%	72.6%	73.3%

Table B.1.6.2b

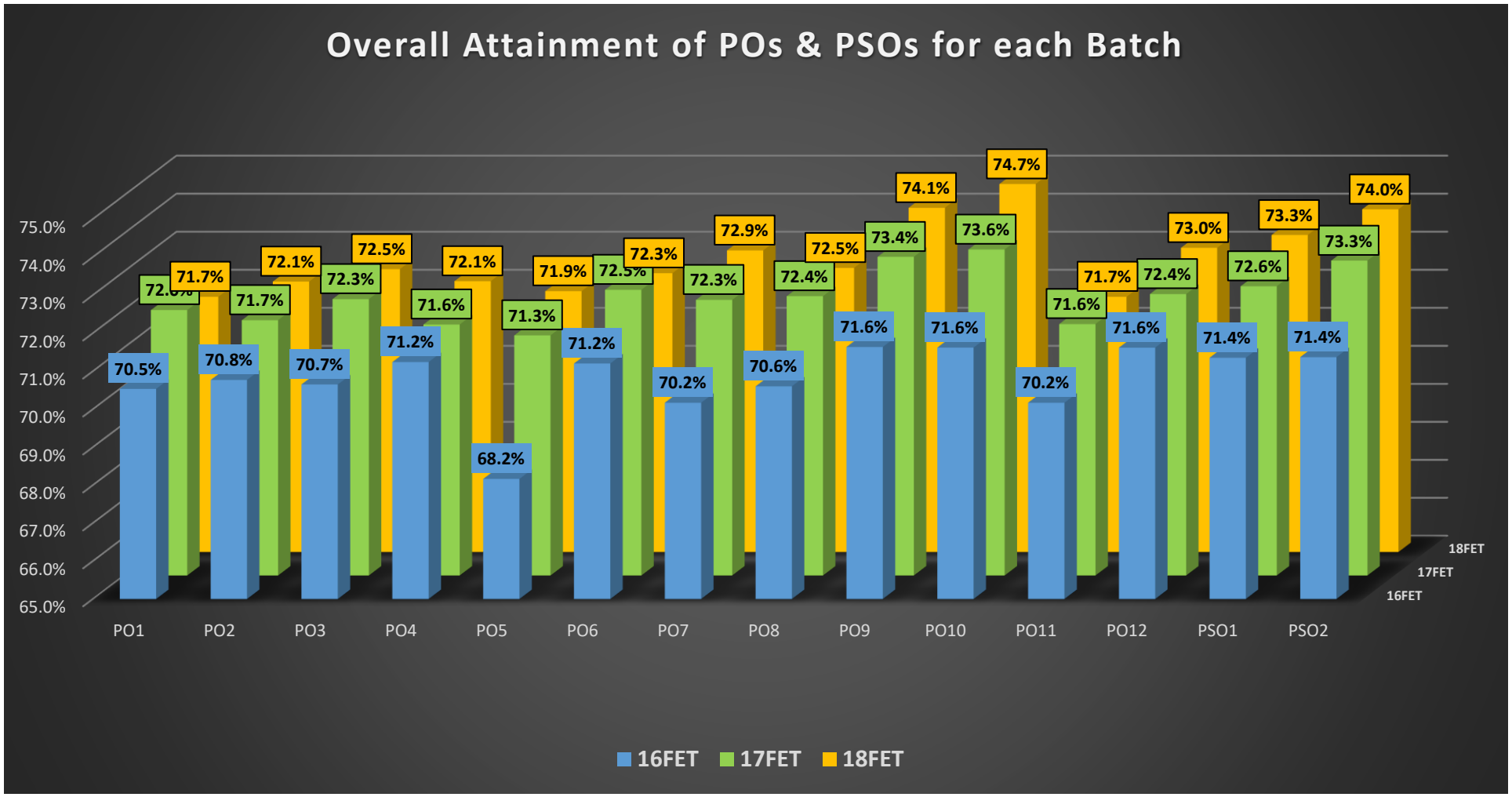

[17FET] ATTAINMENT OF PO & PSO
Direct
Indirect
Overall
72.0%
71.7%
72.3%
71.6%
71.3%
72.5%
72.3%
72.4%
73.4%
73.6%
71.6%
72.4%
72.6%
73.3%
81.3%
80.0%
83.3%
78.3%
78.8%
84.0%
82.7%
83.2%
88.3%
89.5%
79.5%
84.0%
84.7%
87.8%
69.7%
69.7%
69.5%
69.9%
69.5%
69.7%
69.7%
69.7%
69.7%
69.6%
69.7%
69.5%
69.6%
69.7%
PO1
PO2
PO3
PO4
PO5
PO6
PO7
PO8
PO9
PO10
PO11
PO12
PSO1
PSO2

For the academic year 2021-22 (18FET)

		Graduate attributes/Program Outcomes (POs)												PSOs	
Attainment		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Direct	Out of 3	2.09	2.09	2.09	2.08	2.10	2.09	2.09	2.09	2.09	2.10	2.09	2.09	2.10	2.09
	Percentage	69.7%	69.7%	69.5%	69.3%	69.9%	69.7%	69.7%	69.7%	69.7%	69.9%	69.7%	69.5%	69.9%	69.7%
Indirect	Survey I	2.33	2.48	2.48	2.48	2.33	2.48	2.63	2.49	2.80	2.93	2.33	2.55	2.63	2.85
	Survey II	2.47	2.44	2.57	2.53	2.47	2.50	2.53	2.53	2.70	2.70	2.47	2.66	2.60	2.63
	Out of 3	2.40	2.46	2.52	2.51	2.40	2.49	2.58	2.51	2.75	2.81	2.40	2.61	2.61	2.74
	Percentage	79.9%	81.9%	84.1%	83.5%	79.9%	83.0%	86.0%	83.7%	91.6%	93.8%	79.9%	86.9%	87.1%	91.4%
Overall	Out of 3	2.15	2.16	2.17	2.16	2.16	2.17	2.19	2.17	2.22	2.24	2.15	2.19	2.20	2.22
	Percentage	71.7%	72.1%	72.5%	72.1%	71.9%	72.3%	72.9%	72.5%	74.1%	74.7%	71.7%	73.0%	73.3%	74.0%

Table B.1.6.2c

Overall attainment of PO and PSO



1.7. **Evidence of solving complex engineering Problems (25)** **(Inst. Marks 25)**

The question paper of both mid and end semesters contains a significant amount of of problem-solving terms of numerical. One example of Mid Sem Question Paper is given below.

INSTITUTE OF CHEMICAL TECHNOLOGY
Matunga (E), Mumbai 400019 India
Third Year B. Tech. (Food Engineering and Technology) SEM VI
FDT 1027 Food Process Engineering

Mid Sem Exam Feb 7, 2020
Duration: 2 hours Max. Marks: 30

Make suitable (realistic) assumptions where necessary.

Q1. Give short answers (Any FIVE) **[2x5]**

a) Show the constant dryness fraction, volume and pressure lines on *T-s* and *h-s* diagrams for water-steam. In both diagrams, show the heating of water at 1 atm from 0 °C to superheated steam at 200 °C.
b) With the help of heat penetration profile within a can, state Ball's formula method for process time calculation in retort processing. What are the limitations of this method? What are the modifications suggested by Stumbo and Pham regarding the same?
c) With the help of a schematic, discuss the working principle of a bucket type steam trap used in boiler.
d) Schematically show how does the balanced draught help a fire-tube boiler to be operational.
e) One double walled horizontal cylindrical vat contains 10 kL fruit juice. Showing the most probable failure point, comment on the criteria for selecting the material thickness for construction.
f) With a schematic of cross-sectional view, show the overall heat penetration in triple tube heating system for thermosensitive sensitive food material. How the length of the assembly varies with Reynolds number?

Q2. Answer any FOUR from the following. **[5x4]**

a) Steam from an initial pressure of 7 bar and 200 °C is expanded isentropically to 1 bar. Show the process on *T-s* and *h-s* diagram. Calculate the final condition of steam, change in internal energy and work done during process. If the expansion follows law of compression (pV^n = constant), find the value of *n*.

b) An economizer has to be designed for a flue gas entry (20 m^3/s) at 550 °C with the feed water entry at 30 °C. The boiler needs 15 kg of air for every kg of coal and it operates at 14000 kg/h steam production with overall heat transfer coefficient of 90 $W \cdot m^{-2} \cdot K^{-1}$. Calculate the total area of heat exchange. Specific heat capacity of water is 4.273 $kJ \cdot kg^{-1} \cdot K^{-1}$. Specific heat capacity values of flue gas are 1.051, 1.063 and 1.075 $kJ \cdot kg^{-1} \cdot K^{-1}$ at 600, 650 and 700 °K, respectively.

c) A continuous sterilizer with 20 parallel holding sections (internal Φ 5 cm × 50 m) is used to sterilize 50000 kg milk (avg density = 1030 $kg \cdot m^{-3}$ and viscosity = 1.2 cP) initially at 40 ºC within 40 min. Steam serves as the heating medium. The initial count of index organism (D_0=2.7 min, E_a=287.65 kJ/mol, z=12 ºC) is 10^5 cfu/mL and final probability is 10^{-3}. Calculate the temperature of the holding section. Also calculate the temperature of holding tube when there will be 250 holding tubes.

d) In an assembly of heat pump assisted drying of amla, the air stream (3.156 kg dry $air \cdot min^{-1}$, humidity 0.015 kg water vap/ kg dry air) flows through a finned condenser (50 x 40 x 20 cm) at 25 °C and leaves at 50 °C. A refrigerant (R134a; evaporating heat 220 $kJ \cdot kg^{-1}$ & condensing heat 275 $kJ \cdot kg^{-1}$) is flowing inside the aluminum tube (k_{Al} = 200 $W \cdot m^{-1} \cdot K^{-1}$; ID 6 mm; thickness 0.5 mm) across the 1 mm thick fins and R134a is changing the phase within 50 to 60 °C. Typically 10% heat is being lost to surrounding; h_{air} and h_{ref} across the tube are 25.36 and 798.6 $W \cdot m^{-2} \cdot K^{-1}$, respectively. Take LMTD correction factor (F) = (100-R/2P)%. With a schematic, find out the length of the tube within the fin and number of tubes on the largest fin surface.

e) A doubled walled cylindrical horizontal bulk milk cooler (10 kL capacity) is insulated by 10 cm thick polyurethane foam (conductivity 0.02 $W \cdot m^{-1} \cdot K^{-1}$) surrounding it. The dimension of inside cylinder are: ID 1.672 m and 5.016 m long; 2 mm thick SS-304 sheet (conductivity 15 $W \cdot m^{-1} \cdot K^{-1}$) has been used for this. It cools the milk from 35 to 4 °C in 3 hours. Refrigerant is flowing at -10 °C through the pipe inside the milk and the metal tube is covered up by ice layer. Calculate the refrigeration load including the heat infiltrated through insulation. Assume natural convention both outside air and inside milk within the cooler. β for milk is 4×10^{-7} $m^3 \cdot m^{-3} \cdot K^{-1}$.

++++++++++++++++

Properties of Saturated Steam

Pressure (bar)	Temp (°C)	Sp vol (m^3/kg)		Sp enthalpy (kJ/kg)		Sp entropy (kJ/kgK)		Pressure (bar)	Temp (°C)	Sp vol (m^3/kg)		Sp enthalpy (kJ/kg)		Sp entropy (kJ/kgK)	
		v_f	v_g	h_f	h_g	s_f	s_g			v_f	v_g	h_f	h_g	s_f	s_g
1.00	99.6	0.001043	1.6938	417.5	2675.4	1.303	7.360	0.1992	60	0.001017	7.6785	251.1	2609.7	0.831	7.911
2.00	120.2	0.001061	0.8854	504.7	2706.3	1.530	7.127	0.3116	70	0.001023	5.0463	293.0	2626.9	0.955	7.757
6.00	158.8	0.001101	0.3154	670.4	2755.5	1.931	6.758	0.4736	80	0.001029	3.4091	334.9	2643.8	1.075	7.613
7.00	165.0	0.001108	0.27268	697.1	2762.0	1.992	6.705	0.7010	90	0.001036	2.3613	376.9	2660.1	1.193	7.480
15.0	198.3	0.001154	0.13167	844.6	2789.9	2.314	6.441	1.0133	100	0.001044	1.6730	419.1	2676.0	1.307	7.355
20.0	212.4	0.001177	0.09955	908.5	2797.2	2.447	6.337								

	Air at 20 °C	Air at 35 °C	Milk at 5 °C	Milk at 30 °C
Density ($kg \cdot m^{-3}$)	1.21	1.16	1032.5	1024.56
Heat capacity ($kJ \cdot kg^{-1} \cdot K^{-1}$)	1.0056	1.04	3.872	3.915
Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)	0.02565	0.0265	0.5465	0.5798
Viscosity ($\times 10^{-5}$ $kg \cdot m^{-1} \cdot s^{-1}$)	1.9135	1.99	92.4	81.35

$Nu = 0.13 Gr^{0.33} Pr^{0.33}$ for horizontal cylinder & air

$= 0.53 Gr^{0.25} Pr^{0.25}$ for horizontal cylinder & milk

$Gr = \frac{D_0^3 \rho^2 g \beta \Delta T}{\mu^2}$ for cylindrical container

+ + + + + + +

	Q1	Q2a	Q2b	Q2c	Q2d	Q2e
Course outcomes (CO)	1,2,3,4,5	1,2	1,2,5	2,5	3,4,5	3,4

Course outcomes (CO)

The students will be able to:
CO1: Develop basic flow sheet, material, and energy balance in food processing operations (K3)
CO2: Analyse the design aspects of different thermal processes and equipment (K4)
CO3: Analyse the design aspects of different mechanical processes in food operations (K4)
CO4: Explain the cooling technology in food processing and design the cold storage equipment (K3)
CO5: Analyse the critical parameters for transport phenomenon in food industry operations (K4)

+ + + + + + +

The projects given to final year BTech students are comprised of:

- New Product Development (NPD)
- Project Management
- Economics
- New Process Development
- Process Optimization
- Mathematical Modelling

One example of a Problem Statement given to the BTech Final Year Project is given below:

Project Title: Utilization of raw banana flour in cereal-based products

Student: Harshal Sunil Bote (18FET108)

Guide: Prof. Rekha S. Singhal

Problem Statement

1) Highlight the nutritional and nutraceutical benefits of using raw banana flour as a food ingredient. Explain the processing and process parameters to obtain raw banana flour of good quality. Survey the processed and marketed products based on raw bananas and raw banana flour in the Indian and global market.

2) Explore the use of raw banana flour in cereal flour products and develop at least two products that can be commercialized. Optimize their formulation and processing conditions. Identify quality parameters and packaging requirements for at least one product.

3) Design a plant that can produce 1 ton of banana flour per day and along with a line for using it in the identified processed product (anyone from the two above). What are the other products that can be manufactured on the same plant? How would the waste management be done in such a plant?

4) Identify a suitable location for setting up such a plant and work out the cost of the product chosen. Compare it with the ones commercially available.

5) Design a label as per FSSAI specifications. Suggest suitable marketing strategies for the same.

A sample laboratory instruction where the use of RSM and other statistical tools are used has been given below.

EXPT: Effect of product parameters on quality of baked product

Aim: To optimize the formulation of a *Khara* biscuit for a high-quality product

Composition of *Khara* biscuit is given below. The independent variables will be salt and vanaspati.

Ingredients	**Amount**
Wheat flour	100g
Water	60 mL
Salt (X1)	5-15 g
Vanaspati (X2)	40-60 g

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	-α	0		
6	+α	0		
7	0	-α		
8	0	+α		
9	0	0		
10	0	0		
11	0	0		
12	0	0		
13	0	0		

*In FCCD, α = 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 °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

CRITERION 2	Program Curriculum and Teaching-Learning Processes	75

2.1. **Program Curriculum (15)** **(Inst. Marks 15)**

2.1.1. **State the Structure and Component of the Curriculum (5)** **(Inst. Marks 05)**

Syllabus Structure B. Tech. First Year

SEMESTER I										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
CHT1137	Organic Chemistry-I	2	1	0	3	3	10	15	25	50
CHT1341	Physical Chemistry-I	2	1	0	3	3	10	15	25	50
CHT1139	Industrial Inorganic Chemistry	2	1	0	3	3	10	15	25	50
MAT1101	Applied Mathematics-I	3	1	0	4	4	20	30	50	100
PYT1101	Applied Physics-I	3	1		4	4	20	30	50	100
GEP1113	Engineering Graphics and Elementary AutoCAD	2	0	4	10	4	50	0	50	100
CHP1343	Physical and Analytical Chemistry Laboratory	0	0	4	8	2	25	0	25	50
Total		14	5	8	35	23	145	105	250	500

Table B.2.1.1a(I)

SEMESTER II										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
CHT1401	Analytical Chemistry	2	1	0	3	3	10	15	25	50
CHT1342	Physical Chemistry-II	2	1	0	3	3	10	15	25	50
CHT1138	Organic Chemistry-II	2	1	0	3	3	10	15	25	50
PYT1103	Applied Physics-II	2	1	0	3	3	10	15	25	50
MAT1102	Applied Mathematics-II	3	1	0	4	4	20	30	50	100
CET1507	Process Calculations	3	1	0	4	4	20	30	50	100
PYP1101	Physics Laboratory	0	0	4	8	2	25	0	25	50
CHP1132	Organic Chemistry Laboratory	0	0	4	8	2	25	0	25	50
HUP1101	Communication Skills	0	0	4	8	2	50	0	0	50
Total		14	6	12	44	26	180	120	250	550

Table B.2.1.1a(II)

Syllabus Structure B. Tech. Second Year

SEMESTER III										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
BST1110	Basics of Biology and Application to Technology	2	1	0	3	3	10	15	25	50
GET1110	Basic Mechanical Engineering	2	1	0	3	3	10	15	25	50
FDT1011	Spl 1: Chemistry of Food Constituents	3	1	0	4	4	20	30	50	100
CET1302	Material Technology	2	1	0	3	3	10	15	25	50
BST1102	Biochemistry	3	1	0	4	4	20	30	50	100
BST1109	Microbiology	2	1		3	3	10	15	25	50
FDP1014	Pr 1: Biochemistry	0	0	4	8	2	25	0	25	50
FDP1013	Pr 2: Food Microbiology	0	0	4	8	2	25	0	25	50
Total		14	6	8	36	24	130	120	250	500

Table B.2.1.1a(III)

SEMESTER IV										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
GET1117	Engineering Mechanics and Strength of Materials	2	1	0	3	3	10	15	25	50
CET1105	Transport Phenomena	3	1	0	4	4	20	30	50	100
GET1105	Electrical Engineering and Electronics	2	1	0	3	3	10	15	25	50
FDT1031	Spl 2: Principles of Food Preservation	3	1	0	4	4	20	30	50	100
FDT1014	Spl 3: Food Microbiology	2	1	0	3	3	10	15	25	50
FDT1015	Spl 4: Nutrition	2	1	0	3	3	10	15	25	50
GEP1106	Electrical Engineering and Electronics Laboratory	0	0	4	8	2	25	0	25	50
MAP1201	Computer Applications Laboratory	0	0	4	8	2	25	0	25	50
Total		14	6	8	36	24	130	120	250	500

Table B.2.1.1a(IV)

Syllabus Structure B. Tech. Third Year

SEMESTER V										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
CET1401	Chemical Engineering Operations	2	1	0	3	3	10	15	25	50
CET1212	Chemical Reaction Engineering	2	1	0	3	3	10	15	25	50
FDT1022	Spl 5: Food Engineering	3	1	0	4	4	20	30	50	100
FDT1032	Spl 6: Food Chemistry	2	1	0	3	3	10	15	25	50
FDT1052	Spl 7: Principles of Food Analysis	2	1	0	3	3	10	15	25	50
MAT1106	Design and Analysis of Experiments	2	2	0	4	4	20	30	50	100
FDP1011	Pr 3: Technical Analysis	0	0	8	16	4	50	0	50	100
FDP1015	Pr 4: Food Chemistry	0	0	4	8	2	25	0	25	50
Total		13	7	12	44	26	155	120	275	550

Table B.2.1.1a(V)

SEMESTER VI										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
FDT1027	Spl 8: Food Process Engineering	3	1	0	4	4	20	30	50	100
FDT1012	Spl 9: Food Additives and Ingredients	3	1	0	4	4	20	30	50	100
FDT1017	Spl 10: Technology of Fruits, Vegetables, and Tubers	2	1	0	3	3	10	15	25	50
HUT1103	Industrial Psychology and Human Resource Management I	2	1	0	3	3	10	15	25	50
HUT1106	Environmental Science and Technology	2	1	0	3	3	10	15	25	50
	Institute Electives-I	2	1	0	3	3	10	15	25	50
FDP1033	Seminar	0	0	6	12	3	0	0	0	50
FDP1034	Pr 5: Food Processing and Product Development	0	0	4	8	2	25	0	25	50
FDP1018	Pr 6: Food Analysis-I (Chemical)	0	0	4	8	2	25	0	25	50
Total		14	6	14	48	27	130	120	250	550
In-plant Training of 10 to 12 weeks after Semester VI										

Table B.2.1.1a(VI)

Syllabus Structure B. Tech. Fourth/Final Year

SEMESTER VII										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
CET1703	Chemical Process Control	2	1	0	3	3	10	15	25	50
FDT1024	Spl 11: Technology of Plantation Products	2	1	0	3	3	10	15	25	50
FDT1023	Spl 12: Technology of Cereals, Legumes, and Oilseeds	2	1	0	3	3	10	15	25	50
	Institute Elective-II	2	1	0	3	3	10	15	25	50
FDP1023	In-plant Training	0	0	0	0	6	10	15	25	50
HUT1203	Industrial Management	3	1	0	4	4	20	30	50	100
CEP1714	Chemical Engineering Laboratory	0	0	4	8	2	25	0	25	50
FDP1021	Pr 7: Food Analysis-II (Instrumental)	0	0	4	8	2	25	0	25	50
FDP1027	Project I	0	0	4	8	2	25	0	25	50
Total		11	5	12	40	28	145	105	250	500

Table B.2.1.1a(VII)

SEMESTER VIII										
Course Code	Course Title	Total Number of Contact Hours				Credits	Marks for Various Exams			
		L	T	P #	Hours		CA	Mid	End	Total
CET1504	Chemical Project Engineering and Economics	2	1	0	3	3	10	15	25	50
FDT1033	Spl 13: Technology of Dairy and Animal Products	3	1	0	4	4	20	30	50	100
FDT1028	Spl 14: Food Safety, Quality, and Regulations	2	1	0	3	3	10	15	25	50
FDT1019	Spl 15: Food Packaging	2	1	0	3	3	10	15	25	50
	Program Elective	2	1	0	3	3	10	15	25	50
	Pre-approved Open MOOCs/NPTEL	2	1	0	3	3	10	15	25	50
FDP1025	Project II	0	0	8	16	4	50	0	50	100
FDP1026	Pr 8: Food Processing and Engineering	0	0	8	16	4	50	0	50	100
Total		13	6	16	51	27	170	105	275	550

Table B.2.1.1a(VIII)

#Seminars and project works may be considered practical

Program curriculum grouping based on course components

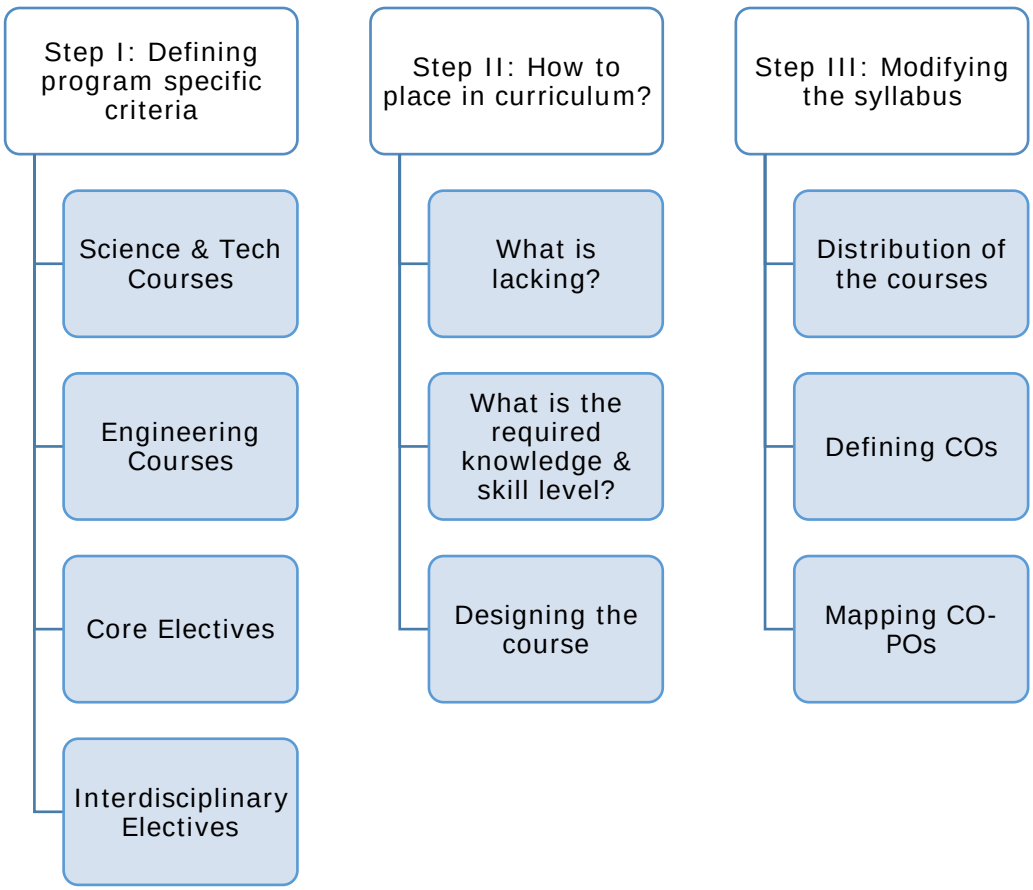
Course Component	Curriculum Content (% of the total number of credits of the program)	Total number of contact hours	Total number of credits
Basic Sciences	23.9%	67	49
Engineering Sciences	22.4%	70	46
Humanities and Social Sciences	3.4%	7	7
Program Core	34.6%	131	71
Program Electives	1.5%	3	3
Open Electives	2.9%	6	6
Project(s)	2.9%	24	6
Internships/Seminars	4.4%	12	9
Employment Enhancement Courses/Skill Based Courses	2.4%	11	5
Any other (MOOC Electives)	1.5%	3	3
TOTAL	100%	334	205

Table B.2.1.1b

2.1.2. **State the process used to identify the extent of compliance of the curriculum for attaining the Program Outcomes and Program Specific Outcomes (10)**

(Inst. Marks 10)

The steps followed in developing the curriculum are given below:



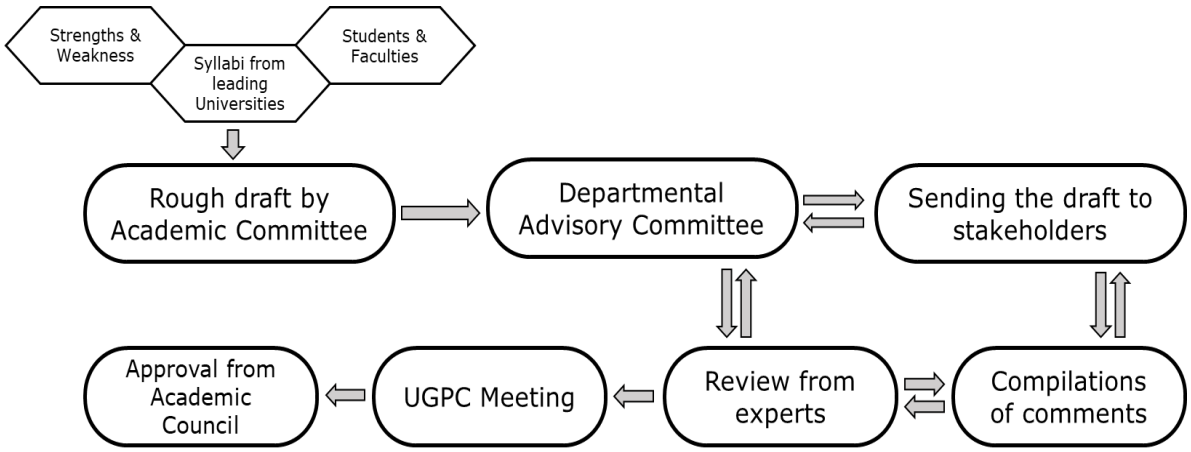
The Program Outcomes (POs) and Program Specific Outcomes (PSO) for BTech in Food Engineering and Technology are as follows:

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Food Analysis: Able to apply analytical techniques for food safety & quality assurance
PSO2	Innovations in Food Products and Process Development: Able to translate emerging science in various commodity products and newer technologies.

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

1. It should comply with the AICTE and institute guidelines
2. It should meet the requirements of Program Educational Objectives
3. It should satisfy the expected PO and PSOs from Food Engineering &Technology domain
4. It should be comparable with the benchmark taken
5. It should satisfy the feedback and queries from the stakeholders and experts

Following is the decision-making loop followed for syllabus revision. Course improvements are made every five years. Based on lacunae in the previous course the course structure is revised. At the beginning, the Departmental Syllabus Committee invites feedback from the stakeholders such as Alumni, Students, Industrialists and Academicians on the syllabus. The SWOC analysis are reviewed in the faculty common room meetings. The syllabus of the top US, European as well as Indian Institutes like NIT and IITs is also analyzed to check the distribution of the different courses. Based on the inputs and feedbacks, the revised curriculum is frames by Departmental Syllabus Committee. The revised curriculum is discussed in detail in the Board of Studies Meeting for approval. It is thereafter put in UG Program Committee. Academic Council provides the final approval for the revised syllabus.

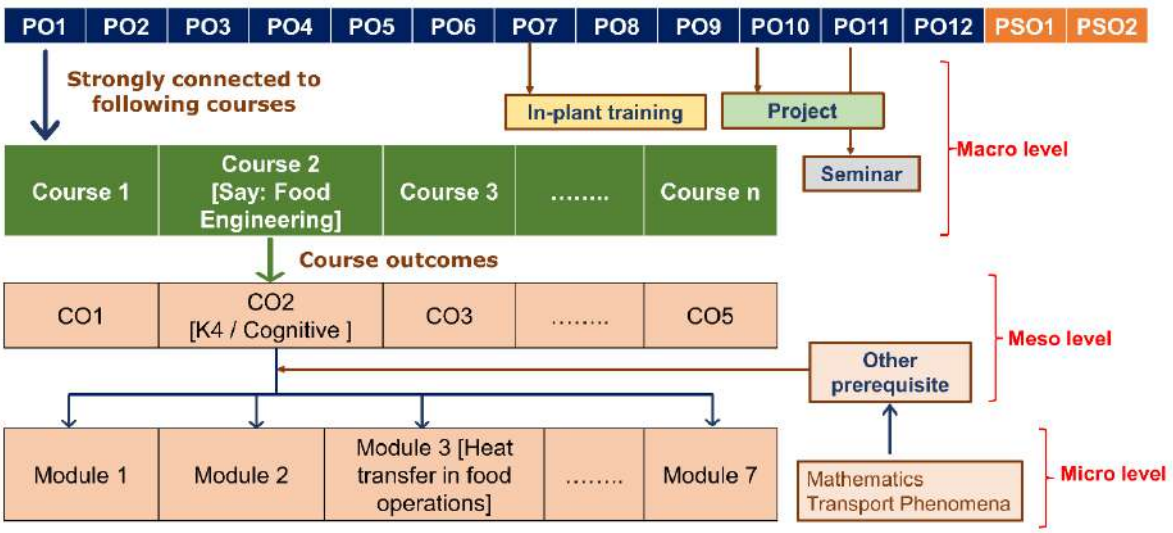


Benchmarking

Institute	Degree	Four Year Program Name	Total Credits
ICT Mumbai	B.Tech	Food Engineering and Technology	205
NIT Rourkela	B.Tech	Food Process Engineering	216
Washington State University	B.Sc	Food Science (Hons) – IFT Approved	122
Universiti Sains Malaysia	B.Tech	Food Science (Hons) – IFT Approved	150

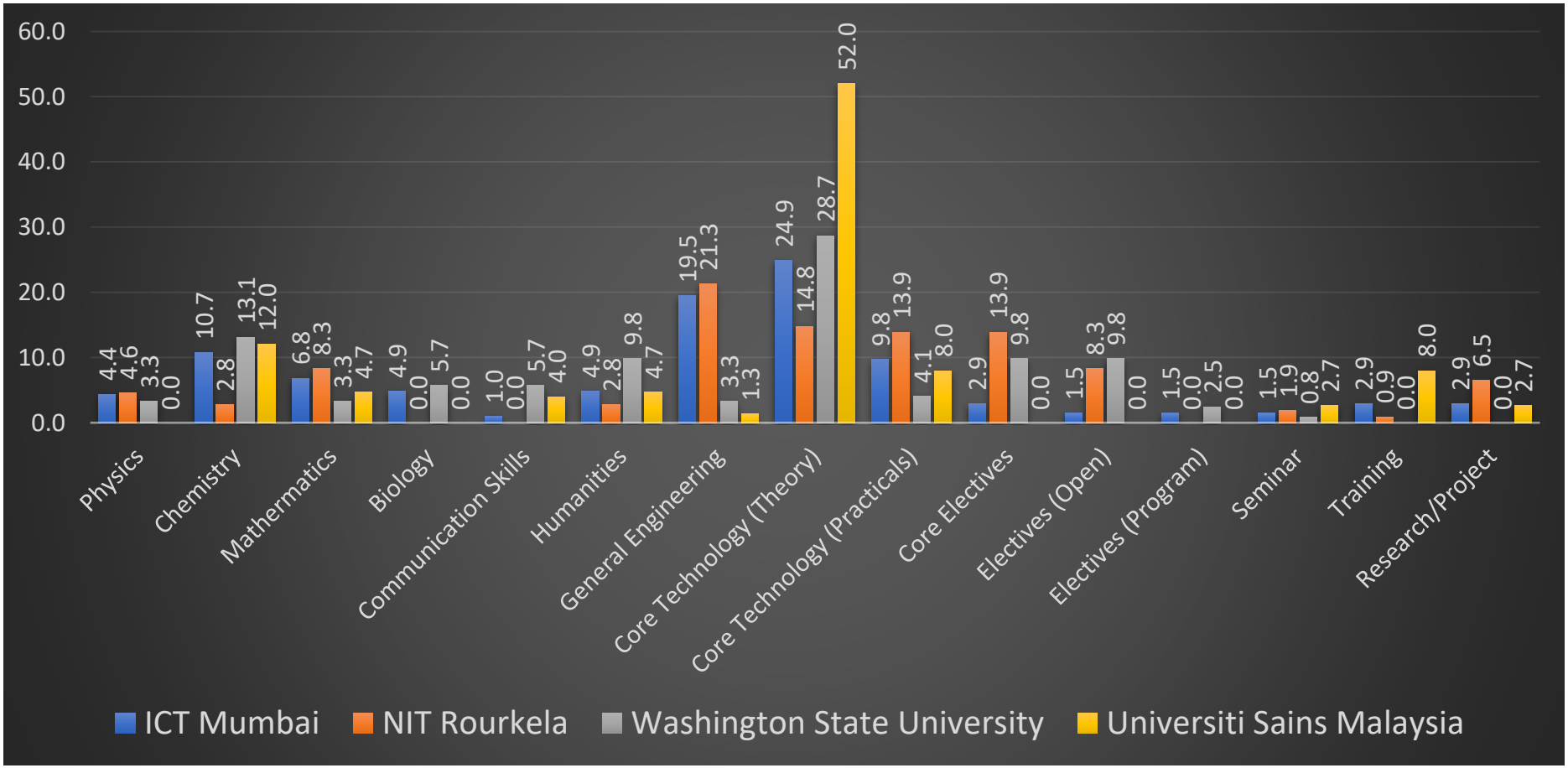
Course Domain	ICT Mumbai	NIT Rourkela	Washington State University	Universiti Sains Malaysia
Physics	4.4%	4.6%	3.3%	0.0%
Chemistry	10.7%	2.8%	13.1%	12.0%
Mathematics	6.8%	8.3%	3.3%	4.7%
Biology	4.9%	0.0%	5.7%	0.0%
Communication Skills	1.0%	0.0%	5.7%	4.0%
Humanities	4.9%	2.8%	9.8%	4.7%
General Engineering	19.5%	21.3%	3.3%	1.3%
Core Technology (Theory)	24.9%	14.8%	28.7%	52.0%
Core Technology (Practical)	9.8%	13.9%	4.1%	8.0%
Electives (Core)	2.9%	13.9%	9.8%	0.0%
Electives (Open)	1.5%	8.3%	9.8%	0.0%
Electives (Program)	1.5%	0.0%	2.5%	0.0%
Seminar	1.5%	1.9%	0.8%	2.7%
Training	2.9%	0.9%	0.0%	8.0%
Research/Project	2.9%	6.5%	0.0%	2.7%
TOTAL CREDITS	205	216	122	150

Curriculum Analysis



Course Curriculum Components Comparison

Among the above mentioned four universities (Home Institute, One Indian Institute, One Asian Institute and One Institute from either Europe or North America)



The curriculum of each course has been set from course outcome levels to the subject matter comprising of topics, sub-topics, practical activity, project work, and other activities, as indicated in the following figure. The content has been developed in such as a way that the desired abilities (PO and PSO) should be achieved within the stipulated time of the program curriculum. Program Outcomes (POs) and Program Specific outcomes (PSOs) are the macro level outcomes and modules are micro level outcomes.

The sequential steps used to develop the curriculum content are as follows:

- Course outcomes has been arranged as per higher taxonomic levels in the cognitive, psychomotor, and affective domains.
- The factual, conceptual, procedural, and Metacognitive knowledge that is required for the course outcomes have been identified through Micro, meso and macro level analysis. These have been presented as the 'Prerequisite courses' in the syllabus.
- The course outcomes have been mapped with the Program Outcomes (POs) and Program specific outcomes (PSOs), as given in the following table.

Course Name: FDT 1022 – Food Engineering (Sem V)

Course Outcomes (Students will be able to.....)	
CO1	Apply and analyze the fundamental knowledge of material and energy as a basic tool in food engineering analysis (K4)
CO2	Analyze the performance of heat exchangers applied in food processes (K4)
CO3	Analyze the efficacy of different mass and momentum transfer operations in food processing (K4)
CO4	Design the cold storage and refrigerated vans in food operations (K3)
CO5	Analyze the performance of various mechanical operations applied in the food industry (K4)

Mapping of Course Outcomes (COs) with Program Outcomes (POs)															
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
		K3	K4	K6	K5	K6	K3	K3+S	K3	K3+A	K2+A	K3	K6+A+S	K3	K4
CO1	K4	3	3	2	3	2	3	3	3	3	3	3	2	3	3
CO2	K4	3	3	2	3	2	3	3	3	3	3	3	2	3	3
CO3	K4	3	3	2	3	2	3	3	3	3	3	3	2	3	3
CO4	K3	3	3	2	2	2	3	3	3	3	3	3	2	3	3
CO5	K4	3	3	2	3	2	3	3	3	3	3	3	2	3	3
Course	K4	3	3	2	3	2	3	3	3	3	3	3	2	3	3

3, Strong Contribution; 2, Moderate Contribution; 1, Low Contribution; − No Contribution
K, knowledge level from cognitive domain; A, Affective domain; S, Psychomotor domain

2.2. Teaching-Learning Processes (60) (Inst. Marks 60)

2.2.1. Describe Processes followed to improve the quality of Teaching & Learning (15) (Inst. Marks 15)

The pandemic created a situation in which all the teachers had no option but to use ICT-enabled tools and online resources for effective teaching and learning. All the teachers used it effectively for

	Teachers Role	Instructional method	Activity happening	Instruction techniques used in					
				2019-20		2020-21		2021-22	
				Theory	Lab	Theory	Lab	Theory	Lab
Teacher centric	Informing	Classroom Lecture	Monologue	✓				✓	
		Demonstration	Dialogue		✓				✓
	Facilitating	Tutorial	Interaction	✓		✓		✓	
		Seminar		✓		✓	✓	✓	
		Case study		✓		✓	✓	✓	✓
		Group discussion				✓		✓	
	Guiding	Assignment	Action	✓		✓		✓	
		Practical			✓		✓		✓
		Project			✓		✓		✓
		Industry visit / training		✓			✓		✓
Student centric	Mentoring	ICT based Lecture	Reflection	✓		✓	✓	✓	✓
		Virtual Lab					✓		✓

Shift towards Blended learning

conducting all the courses in the programs run by the Department. Now, the faculties have trained themselves in blended learning. In the last two years, our faculties have redefined the traditional roles of a teacher. Now they have become a 'mentor' to the students and the learners are more involved in active learning. This trend is clear from the figure given below.

Students are assessed periodically through class assignments, quizzes, classroom interactions, video presentations, and lectures. A mandatory 12-week in-plant training at the end of Semester VI gives good experiential learning, whereas a problem-solving approach is developed during the practical lab-oriented (and not theoretical) project that each student undertakes in the final year.

Additional tools and platforms used for Blended Learning

- Google classroom or MS Teams
- Virtual labs
- Virtual industry visit
- Interactive video tutorials
- Open Educational Resources (OERs) like NPTEL, and SWAYAM courses
- Accessible through desktop/laptop, smartphones, and tablets

Feedback Received for Blended Learning

a) Students had more flexibility to relook into the content
b) Collaborative learning with an enriched learning experience.
c) Collaboration between students has been improved for online group activities

The Outcome of Student Performance

The average CGPA in the last two years (graduated in 2021 and 2022) has been increased compared to the graduating batch in 2020.

Catering to Student Diversity

Students are assessed periodically through class assignments, quizzes, classroom interactions, video presentations, and lectures. Due attention is paid to both advanced and slow learners as the need arises. For instance, for advanced learners, there are research and review papers published in Scopus-indexed journals based on the seminar and project work at the UG level. For slow learners, one-to-one interaction as the case may be is done in the courses where it is required.

Feedback for teaching

Institute level

Institute conducts feedback from all the students at the end of every semester before they fill out the end semester examination forms. The online feedback forms are filled out by every student for all the theory courses of the Institute for both UG and PG students. Every student must give their feedback without which they are not allowed to appear for the end semester examination. In this system, students are rating the teachers on a scale of 1 to 5 with a higher rating for best performances. The faculties who are getting less than 2 average grades are informed by Dean AP, Dean HRD, and respective heads of the departments to take necessary corrective actions. Institute has a biometric system that encompasses every lecture feedback system. Students are using this system to clear their doubts and professors are required to go through feedback given by students before the next lecture.

Department level

For every course, there is an online feedback mechanism corresponding to each course outcome. It is assessed on a 1-5 scale. They are also requested to write any comment corresponding to that course. The respective faculty collects those feedback and take the necessary steps to improve. The departmental Head conducts periodic meetings with the students and they are open to providing any feedback on teaching.

Best teacher award

The students of the Food Engineering and Technology Department are involved in selecting the best teachers under Prof. D.V. Rege Best Teacher Award.

2.2.2. Quality of end semester examination, internal semester question papers, assignments, and evaluation (15) **(Inst. Marks 15)**

Credit system

There are mainly two types of courses in the Institute - lecture courses and laboratory courses. Lecture courses consist of lecture (L) and tutorial (T) hours. Laboratory courses consist of practical (P) hours. The credit (C) for a course is dependent on the number of hours of instruction per week in that course, as given below:

- 1h/week of lecture (L) or tutorial (T) = 1 credit
- 2h/week of Practical (P) = 1 credit
- Credit (C) for a theory course = No. of hours of lectures per week +No. of hours of tutorials per week = L + T
- Credits (C) for a Laboratory course = ½ x No. of hours of laboratory course per week

Evaluation Pattern:

The weight ages of different modes of assessments shall be as under.

	In-Semester evaluation		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

Grades:

The total marks (in-semester + end-semester) of a candidate in a subject head are converted into a letter grade, based on the relative (and sometimes the absolute) performance of the student. For granting class a grade point of 6.0 and above will be considered equivalent to First class.

Letter Grade	AA	AB	BB	BC	CC	CD	DD	EE
Grade Point	10	9	8	7	6.5	6	5.5	5

Repeat End-Semester Examination

For those candidates who fail in a subject head or are eligible for appearing at the repeat examination, Repeat End-Semester Examination is conducted within one month from the declaration of the results of the regular end-semester examination. The marks obtained by candidates in the in-semester examinations (continuous assessment and periodic test) will be carried forward in such cases.

Improvement of performance

A candidate will be allowed to appear at the entire examination after the regular end-semester examination as per the respective rules to improve the performance.

Sample Mid Semester Question Paper

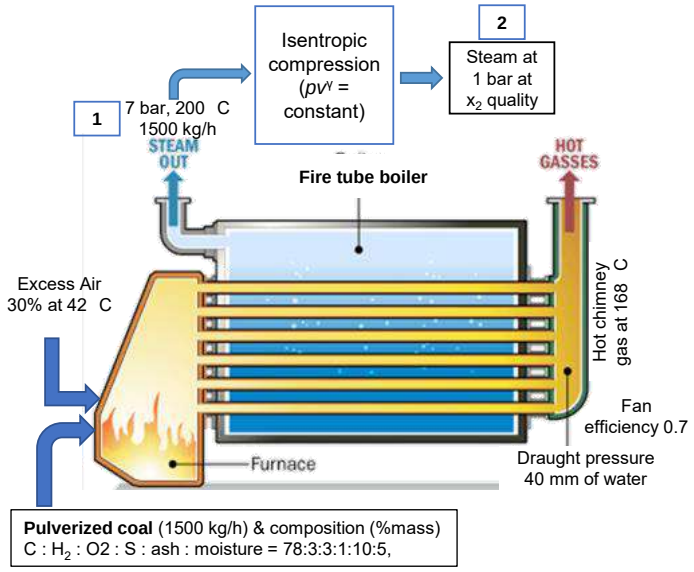
INSTITUTE OF CHEMICAL TECHNOLOGY
Matunga (E), Mumbai 400019 India

Third Year B. Tech. (Food Engineering and Technology) SEM VI
FDT 1027 Food Process Engineering

Mid Sem Exam — Feb 15, 2022
Duration: 11:00 AM – 1:15 PM — Max. Marks: 30

All questions are compulsory. Assumptions can be made where necessary.
***'XY'** stands for the last two digits of your Roll Number.*

Q1. Answer the following. **[10]**



Calculate

a) Mass of air to be supplied and mass of gaseous product formed per kg of coal burnt;

b) Power required to drive fan;

c) Dryness fraction (x_2) and γ of resulted steam; change in internal energy from steam 1 to 2

If the boiler is equipped with forced draught fan, what will be power required to drive it?

Q2. Answer the following **[5]**

A doubled walled cylindrical horizontal bulk milk cooler (10 kL capacity) is insulated by **XY** cm thick polyurethane foam (conductivity 0.02 $W \cdot m^{-1} \cdot K^{-1}$) surrounding it. The dimension of the inside cylinder is: ID 1.672 m and 5.016 m long; a 2 mm thick SS-304 sheet (conductivity 15 $W \cdot m^{-1} \cdot K^{-1}$) has been used for this. It cools the milk from 35 to 4 °C in 3 hours. The refrigerant flows at -10 °C through the pipe inside the milk, and an ice layer covers up the metal tube. Draw the schematic of the cooler. Calculate the refrigeration load, including the heat infiltrated through insulation. Assume natural convention both outside air and inside milk within the cooler. β for milk is 4×10^{-7} $m^3 \cdot m^{-3} \cdot K^{-1}$.

Q3. Answer the following. **[5]**

A fruit pulp having 80% (wet basis) moisture content and 1030 $kg.m^{-3}$ density is to be concentrated to 80% solids in a single drum dryer of 0.6 m diameter and 0.75 m width. The food is preheated to 90 °C, and the operating temperature is 150 °C. The material is scrapped after ¾ th revolutions, and the layer of food is observed to be 0.5 mm thick.

a) Draw the box diagram showing the material and enthalpy flow.
b) Calculate the mass of water evaporated.

Q4. Answer the following. **[3+2]**

a) A silo15.24 m high and 1.83 m diameter is filled with grain having a bulk density of 635 $kg.m^{-3}$. The pressure ratio, k, and coefficient of friction between grain and wall of the bin are 0.333 and 0.5, respectively. Calculate the lateral and vertical pressures developed in the silo.

b) Which among the two dries faster? a) freshly cut pineapple slices or b) blanched pineapple slices. Give supporting reason for the selected choice.

Q5. Answer the following. **[5]**

In a tray dryer, shredded cabbage is dried using air at a temperature of 65 °C and RH 20%. Air is flowing over the tray at 5 $m.s^{-1}$. The temperature and RH of the air remain constant throughout the drying. The size of each tray is 1 x 1m and 25 cm deep. The initial mass of cabbage is 15 kg. Consider that drying takes place from the upper surface of the tray (parallel flow) with negligible shrinkage of the material.

a) Draw the box diagram showing the material and enthalpy flow.
b) Calculate the drying rate and time at a constant rate period from an initial moisture content of 80% (wb) to a critical moisture content of 75% (wb).

++++++++

	Q1	Q2	Q3	Q4	Q5
Course outcomes (CO)	1,2,5	3,4,5	1,2	3,5	1,2,5

Course outcomes (CO)

The students will be able to…

CO1 Explain and develop basic flow sheet, material, and energy balance in food processing operations (K3)
CO2 Analyze the design aspects of different thermal processes and equipment (K4)
CO3 Analyze the design aspects of different mechanical processes in food operations (K4)
CO4 Explain the cooling technology in food processing and design the cold storage and refrigerated vans (K3)
CO5 Analyze the critical parameters for transport phenomenon in food industry operations (K4)

+++++++

Sample Continuous Evaluation

Second Year B. Tech. (Food Engineering and Technology) SEM IV
FDT 1031 Principles of Food Preservations

AY 2020-21: Continuous Evaluation
Presentation & Group Discussion (15 min each)
Mar 26 and Apr 2, 2021

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	Food Preservation using Chemical Preservatives	CO5					
2	2 & 17	Food Preservation using Bio-Preservatives	CO5					
3	3 & 16	Food Preservation using Fermentation	CO5					
4	4 & 15	Food Preservation taking pH as one of the hurdle	CO5					
5	5 & 14	Ionizing Radiations in Food Preservation	CO2					
6	6 & 13	Corrosion, Lacquering, Spoilage in Canned foods	CO1					
7	7 & 12	Cryogenic freezing and IQF	CO4					
8	8 & 11	Intermediate Moisture Foods	CO5					
9	9 & 10	Osmotic dehydration	CO5					

Course Outcomes
The students will be able to…
CO1: Apply the principles and develop operations using thermal technologies for food preservation (K4)
CO2: Apply the principle and operations of various non-thermal technologies for food preservation (K3)
CO3: Analyze the concept of various advanced thermal food processing (K4)
CO4: Apply the technique of low temperature in food preservation & analyze the process efficiency (K4)
CO5: Apply the principles of hurdle technology and membrane techniques in food preservation (K3)

+++++++

Sample End Semester Question Paper

INSTITUTE OF CHEMICAL TECHNOLOGY

N.M.Parekh Marg, Matunga, Mumbai 400019 India. Ph: +91-22-33611111/2222, Fax: +91-22-33611020, www.ictmumbai.edu.in

End Sem Exam: April 2021

FDT 1027: Food Process Engineering

DATE: 17 April, 2021 **TIME: 11:00 AM - 2:15 PM**

DAY: Saturday **MARKS: 50**

Make suitable (realistic) assumptions and use Steam Table where necessary.

Q	Question	M
1	*Answer the following in short.* a) Draw a schematic showing the velocity profile of biscuit dough between two rollers during sheeting? How the protein network inside the dough is influenced by sheeting? b) With a schematic of a psychrometric chart, highlight the conditions of air inside a spray dryer starting from heating of air to blowing out in the atmosphere. c) What are the different types of plant layout employed in food industry? Draw a suitable layout for a fruit juice processing plant providing the list of the necessary sanitary operations. d) When do we use SS310 and SS316 for food applications? Showing the probable failure point, comment on the criteria for selecting the material thickness while constructing a monobloc thin-walled horizontal vessel. **e)** What is cut-off diameter of fat in milk while passing through a disc type centrifugal separator? With a schematic, show the movement of fat globule and skim milk through a single disc passage inside the separator.	**10**
2	**a)** Within a high-pressure domain (100-600 MPa/30-70 °C/1 s-30 min), the isobaric-isothermal inactivation rate constant of pineapple bromelain follows *n*th order reaction (n = 1.2). It also follows the combined Arrhenius-Eyring relationship where $E_a = E_{a_0} + a_1(P - P_{ref}) + a_2(P - P_{ref})^2$ $V_a = V_0 + a_3(T - T_{ref})$ Considering the midpoints of P-T domain as reference values, the calculated activation energy (E_a) values at 200, 300, 500 and 600 MPa are 44.7, 31.4, 21.0 and 18.2 kJ·mol^{-1}, respectively; The activation volume (V_a) values at 50 and 70 °C are -9.1 and -6.3 mL·mol^{-1}, respectively. Pulse effect (PE) values are 0.06, 0.125 and 0.39 at 350 MPa/50 °C, 400 MPa/60 °C and 600 MPa/70 °C, respectively. If inactivation rate of bromelain is 0.016 U^{n-1}·min^{-1} at 350 MPa/50 °C, find out the time required for 90% reduction in its initial activity at 400 MPa/60 °C. Compare the same with first order kinetics. **b)** Draw a schematic of screw and barrel within a single screw extruder and show the net flow profile along the screw axis.	**7+3**
3	**a)** Steam from an initial pressure of 7 bar and 200 °C is expanded isentropically to 1 bar. Show the process on *T-s* and *h-s* diagram. Calculate the final condition of steam, change in internal energy and work done during process. If the expansion follows law of compression (pV^n = constant), find the value of *n*.	**5+5**

	b) Fruit juice is being concentrated in a single effect evaporator from 10% to 30% solid content (w/w). Feed enters at 1000 $kg \cdot h^{-1}$ and 75 ºC. The evaporator is coupled with mechanical vapor compression system with suction and delivery (steam chest) pressures of 1 bar and 2 bar, respectively. The soluble solid may be assumed to be hexose sugar. With the help of p-h diagram, calculate the amount of primary steam required and COP of the system.	
4	**a)** In an assembly of heat pump assisted drying of amla, the air stream (3.156 kg dry $air \cdot min^{-1}$, humidity 0.015 kg water vap/ kg dry air) flows through a finned condenser (50 x 40 x 20 cm) at 25 °C and leaves at 50 °C. A refrigerant (R134a; evaporating heat 220 $kJ \cdot kg^{-1}$ & condensing heat 275 $kJ \cdot kg^{-1}$) is flowing inside the aluminum tube (k_{Al} = 200 $W \cdot m^{-1} \cdot K^{-1}$; ID 6 mm; thickness 0.5 mm) across the 1 mm thick fins and R134a is changing the phase within 50 to 60 °C. Typically 10% heat is being lost to surrounding; h_{air} and h_{ref} across the tube are 25.36 and 798.6 $W \cdot m^{-2} \cdot K^{-1}$, respectively. Take LMTD correction factor (F) = (100-R/2P)%. i. Draw a schematic of the condenser showing the air and refrigerant flow. ii. Find out the length of the tube within the fin and number of tubes on the largest fin surface. **b)** With the help of a schematic and pressure balance, describe the breakdown of fat globule in milk flowing through a two-stage homogenizing valve. .	**6+4**
5	Total solids in milk are to be increased from 10% to 45% in a triple effect evaporator. 45% evaporation takes places in first effect and rest two effects will contribute equally. Thermo-compressor is applied between the first two effects. Feed rate is 1000 kg/h. Standard evaporation temperature in the three effects are 80, 70 and 60 ºC, respectively. Jacket vapor condenses at 88, 78 and 68 ºC, respectively. Area of evaporators are 10.5, 10.5 and 14 m^2, respectively. The efficiencies are: e_1 (nozzle) = 0.96; e_3 (momentum tr) = 0.95; e_2 (mixing) = 0.8. i. Draw a schematic of the evaporator assembly with thermo-compressor. ii. Obtain the boiler pressure when thermo-compression is in operation. iii. Obtain the overall heat transfer coefficients in the three effects.	**10**

+++++++++

Properties of Saturated Steam

Pressure (bar)	Temp (°C)	Sp vol (m^3/kg)		Sp enthalpy (kJ/kg)		Sp entropy (kJ/kgK)		Pressure (bar)	Temp (°C)	Sp vol (m^3/kg)		Sp enthalpy (kJ/kg)		Sp entropy (kJ/kgK)	
		v_f	v_g	h_f	h_g	s_f	s_g			v_f	v_g	h_f	h_g	s_f	s_g
1.00	99.6	0.001043	1.6938	417.5	2675.4	1.303	7.360	0.1992	60	0.001017	7.6785	251.1	2609.7	0.831	7.911
2.00	120.2	0.001061	0.8854	504.7	2706.3	1.530	7.127	0.3116	70	0.001023	5.0463	293.0	2626.9	0.955	7.757
6.00	158.8	0.001101	0.3154	670.4	2755.5	1.931	6.758	0.4736	80	0.001029	3.4091	334.9	2643.8	1.075	7.613
7.00	165.0	0.001108	0.27268	697.1	2762.0	1.992	6.705	0.7010	90	0.001036	2.3613	376.9	2660.1	1.193	7.480
15.0	198.3	0.001154	0.13167	844.6	2789.9	2.314	6.441	1.0133	100	0.001044	1.6730	419.1	2676.0	1.307	7.355
20.0	212.4	0.001177	0.09955	908.5	2797.2	2.447	6.337								

	Air at 20 °C	Air at 35 °C	Milk at 5 °C	Milk at 30 °C
Density ($kg \cdot m^{-3}$)	1.21	1.16	1032.5	1024.56
Heat capacity ($kJ \cdot kg^{-1} \cdot K^{-1}$)	1.0056	1.04	3.872	3.915
Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)	0.02565	0.0265	0.5465	0.5798
Viscosity ($\times 10^{-5}$ $kg \cdot m^{-1} \cdot s^{-1}$)	1.9135	1.99	92.4	81.35

$Nu = 0.13 Gr^{0.33} Pr^{0.33}$ for horizontal cylinder & air

$=0.53 Gr^{0.25} Pr^{0.25}$ for horizontal cylinder & milk

$$Gr = \frac{D_0^3 \rho^2 g \beta \Delta T}{\mu^2}$$ for cylindrical container

+++++++

	Q1	Q2	Q3	Q4	Q5
Course outcomes (CO)	1,2,3,4,5	3,5	1,2,5	3,4,5	1,2

Course outcomes (CO)

The students will be able to…

CO1 Explain and develop basic flow sheet, material, and energy balance in food processing operations (K3)

CO2 Analyse the design aspects of different thermal processes and equipment (K4)

CO3 Analyse the design aspects of different mechanical processes in food operations (K4)

CO4 Explain the cooling technology in food processing and design the cold storage equipments (K3)

CO5 Analyse the critical parameters for transport phenomenon in food industry operations (K4)

Sample Rubrics for the Evaluation of Laboratory Course

Performance Assessment

FDP1023: Pr 8: Food Processing and Engineering

Semester VIII

Faculty In-Charge of the Lab: Dr. Snehasis Chakraborty

Practical Title: Thermal Pasteurization of food products

Aim of the Experiment: To study the influence of temperature and time of treatment on the enzyme activity of pineapple juice

Criteria	Very good (4)	Good (3)	Satisfied (2)	Need to improve (1)
Experimental plan	Independently identified and clearly defined experimental plan, number of experiments, ranges, independent and dependent variables.	Independently identified experimental plan, number of experiments, independent and dependent variables. However, for defining ranges, assistance was required.	When variables and ranges were provided, able to define the experimental plan, a number of experiments, independent and dependent variables.	Significant assistance was required to identify the experimental plan & ranges and to define the number of independent and dependent variables.
Methodology	The methodology for sample preparation and enzyme assay was clear during instruction. No assistance was required further.	Performed enzyme assay independently, but for sample preparation, a repeat instruction was required.	Performed both enzyme assay and sample preparation after repeat instruction.	Performed enzyme assay and sample preparation after repeat instruction as well as assistance from a technician.
Data Collection	The tabular form of experimental design, absorbance, and activity data.	The tabular form of only experimental design and absorbance data.	The tabular form of only experimental design.	No table was prepared.
Calculations	Calculations of activity, rate constant, and z-value are shown appropriately.	Calculations of activity and rate constants are shown. For z-value, assistance was required.	Calculations of activity are shown. For rate constant and z-value, assistance was required.	For the calculations of activity, rate constant, and z-value, significant assistance was required.
Diagrams	Plots for rate constant and z-value were presented with no assistance.	Plot for rate constant was presented, but for the z-value plot,	Both the plots for rate constant and z-value were presented with	Both the plots for rate constant and z-value were presented with

		minimal assistance was required.	minimal assistance.	significant human assistance.
Conclusion	Clearly spelled out the most resistant enzyme and z-values. Also, limitations were pointed out.	Clearly spelled out the most resistant enzyme and z-values. But no limitations were mentioned.	Spelled out the z-values. But no comments on most resistant enzymes and limitations.	Significant assistance was required to conclude on z-values, most resistant enzyme, and limitations.

Evaluation of One student:

Experiment: To study the influence of temperature and time of treatment on the enzyme activity of pineapple juice

Name: Nirav Vargantwar (18FET101)

Evaluation: 19 out of 24

Criteria	Very good (4)	Good (3)	Satisfied (2)	Need to improve (1)
Experimental plan		x		
Methodology		x		
Data Collection		x		
Calculations			x	
Diagrams	x			
Conclusion	x			
Total	**8**	**9**	**2**	**0**

2.2.3. Quality of student projects (15) (Inst. Marks 15)

All the student projects are relevant to the needs of food engineering and technology. The BTech project is of two semesters (Sem VII and Sem VIII).

Evaluation Sheet (Semester VII)

No.	Assessment criteria	Guide	External Examiner	Avg. Marks
1	Literature survey on the topic			/10
2	Trials taken and Interpretation			/10
3	PPT, Soft skills & Time management			/10
4	Report – Language, Formatting, Technicality, Frequency of consulting with Guide		NA	/20
				/50

Evaluation Sheet (Semester VIII)

The evaluation criteria for Semester VIII are given below.

No.	Criteria for Evaluation	Industry expert I	Industry expert II	Marks
1	Justification of the problem & Literature survey			/20
2	Objectives, Work Plan, Trials, Outcome			/20
3	Flowsheet, Material Balance, Operations			/20
4	Costing & Plant Design, layout			/20
5	Regulatory aspects, CCP, Packaging & Labelling			/20
6	Report (Formatting, Technicality, References) & attendance	Only Guide will evaluate		/50

The projects given to final year BTech students are comprised of

- New Product Development (NPD)
- Project Management
- Economics
- New Process Development
- Process Optimization
- Mathematical Modelling

One example of a Problem Statement given to the BTech Final Year Project is given below:

Project Title: Mass transfer studies in osmotically dehydrated food products

Student: Nirav Vargantwar (18FET101)

Problem Statement

The majority of table grapes are used for making raisins. These are made primarily by sun drying several different types of grapes. However, these raisins from grapes are small, dark, and wrinkled because of uncontrolled drying parameters. The raisin can be produced by osmotic dehydration, which can reduce the cost of production. In addition, the quality parameters of osmotically dehydrated products are superior to that of sun-dried products. This project aims to explore a raisin developed using osmotic dehydration. The osmotic agent will be molasses, a by-product of the sugarcane industry. In this sense, perform the following activities and prepare a report accordingly.

1. Perform a market and literature survey on osmotically dehydrated or pretreated fruit products and justify the selection of the process and raw materials.
2. Develop an osmotically dehydrated grape raisin using molasses that has high sensory acceptability.
3. Optimize the formulation using a suitable experimental design to obtain a final product.
4. Explore the osmotic dehydration and mass transfer aspect in the products
5. Characterize the developed product and compare it with the standard benchmark.
6. Explore the assembly design required for the continuous operation of this product manufacturing.
7. Prepare a flowsheet showing the raw material balance for the product's manufacturing and calculate the manufacturing cost, depreciation cost, and breakeven capacity.
8. Design a plant having a production capacity of 1 ton per day, identify a suitable site location, propose a layout, and discuss the equipment design, planning ofoperations, and quality control protocols.
9. Design a label for the developed product and discuss the packaging material and marketing strategies.
10. Discuss quality assurance and waste management for the developed product.

The list of project topics and category have been given below.

Batch 18FET

Enrolment No	Name of the Student	Guide Name	Name of the Topic	Project Category
18FET101	Nirav Vargantwar	SC	Mass transfer studies in osmotically dehydrated food product.	-Process development & designing
18FET102	Amay Jitendra Dagade	RSS	Kulfis using jaggery as a sweetener	-Product development & optimization
18FET103	Ankur Upadhyay	SSA	Plant-based meat	-Product development & optimization
18FET104	Anooshka Avasare	LA	Multigrain pasta	-Product development & optimization
18FET105	Anupama Lokhande	LA	Instant traditional breakfast premix	-Process optimization
18FET106	Aviraj Patole	RSS	Chickpea flour-based traditional sweets using jaggery as a sweetener	-Product development & optimization
18FET108	Harshal Bote	RSS	Utilization of raw banana flour in cereal-based products	-Product development & optimization
18FET109	Hritik Sonawane	RSS	Biscuit bhakris from millets	-Product development & optimization
18FET110	Lipakshi Safaya	JSG	Plant protein shakes	-Product development & optimization
18FET111	Nimai Agarwal	SSA	Protein-rich bread	-Product development & optimization
18FET112	Rucha Rajesh Rane	SC	Synbiotic formulations using legumes	-Product development & optimization
18FET113	Sameera Faruk Kazi	LA	Ready to fry snack	-Product development & optimization
18FET114	Sarvesh N Toshniwal	SC	Detecting maturity of fruit based on image processing technique	-Process development through AI
18FET115	Soumya Mohan	SSA	Plant based egg	-Product development & optimization
18FET116	Tanvi Bapat	JSG	Millet based cake mix	-Product development & optimization
18FET117	Vaibhav Vishwanath	SSA	Banana probiotic	-Product development & optimization
18FET118	Viplave Waghmare	JSG	Millet based dhokla premix	-Product development & optimization
16FET109	Saniya Kamil Tadvi	LA	Yoghurt analogue	-Product development & optimization

RSS: Prof Rekha S Singhal
LA: Prof Laxmi Ananthanarayan
SSA: Dr Shalini S Arya
JSG: Dr Jyoti S Gokhale
SC: Dr Snehasis Chakraborty

Batch 17FET

Enrolment No	Name of the Student	Guide Name	Name of the Topic	Project Category
17FET101	Ghananil Sarode	JSG	Shelf-stable ready to cook curry premixes	-Product development & optimization -Shelf-life study
17FET102	Omkar Bal	SSA	Gluten free novel functional foods	-Product development & optimization
17FET105	Aashita Pillai	SSA	Novel bread from non-wheat cereals	-Product development & optimization
17FET106	Apurva Khartad	SC	Formulation of synbiotic beverage using legumes	-Process optimization
17FET107	Pritam Patil	SC	Pulsed light irradiation of dehydrated onion products	-Process optimization
17FET108	Yash Vijaykar	LA	Ready to fry savoury snacks	-Product development & optimization
17FET109	Sudhanwa Lele	LA	Development of healthy snacks	-Product development & optimization
17FET110	Rajeev Ramesh	RSS	Cakes using jaggery as sweetener	-Product development & optimization
17FET112	Vedant Mundada	SC	Combined nonthermal treatment of mosambi juice	-Process optimization
17FET113	Sagar Badnakhe	JSG	Ready-to-eat premix	-Product development & optimization
17FET115	Vikas Pandey	USA	Lemon ginger powder	-Product development & optimization
17FET117	Hrithik Shetty	JSG	Development of millet-based pizza base	-Product development & optimization
17FET118	Atharva Mate	USA	Plant based chicken nuggets	-Product development & optimization
17FET119	Rahul Kamath	JSG	Development of plant-based milk alternative beverage	-Product development & optimization
17FET120	Anmol Dhar	USA	High fibre/protein extruded product	-Product development & optimization
17FET121	S. Arjun	SSA	Probiotics from cereal	-Product development & optimization
17FET122	Nidhi Baoney	SSA	Innovative products from pseudo cereals (millets)	-Product development & optimization

RSS: Prof Rekha S Singhal
LA: Prof Laxmi Ananthanarayan
USA: Prof. Uday S. Annapure
SSA: Dr Shalini S Arya
JSG: Dr Jyoti S Gokhale
SC: Dr Snehasis Chakraborty

Batch 16FET

Enrolment No	Name of the Student	Guide Name	Name of the Topic	Project Category
16FET101	Akshay Koradiya	RSS	Formulation of prebiotic snacks	-Product development & optimization
16FET102	Anuj Jaju	USA	Fiber rich food product: Gulab Jamun	-Product development & optimization
16FET103	Jaishree Kumbhare	JSG	Development of Functional Food using Jackfruit Seed Powder	-Product development & optimization
16FET104	Nikita Bhatkar	SC	Microwave Pasteurization of Beverage	-Product development & optimization
16FET105	Rahul Choudhary	JSG	Carrot Fermented Probiotic Drink	-Product development & optimization
16FET106	Rahul Venkatram	SC	CFD modeling and Process Optimization of legume based functional bread	-Process optimization & modeling
16FET107	Rakshita Prasad	RSS	Functional chocolates	-Product development & optimization
16FET110	Sanket Vanare	LA	Product development of edible vegetable slices	-Product development & optimization
16FET111	Shreya Nuguri	JSG	Microwave Assisted Extraction of Pectin from Food waste (Pomegranate peel)	-Product development & optimization
16FET112	Shrikesh Narule	LA	Use of natural pigments in high temperature applications for foods	-Product development & optimization
16FET114	Sourabh Joshi	USA	High protein vegan frozen dessert	-Product development & optimization
16FET115	Sudarshan Patil	RSS	Flour from cauliflower	-Product development & optimization
16FET116	Vimi Kuwlekar	USA	Coconut cream – coffee creamer	-Product development & optimization
16FET117	Yash Shah	SC	Enzyme inactivation by Pulsed Light and Ultrasound Treatment	-Process optimization

RSS: Prof Rekha S Singhal
LA: Prof Laxmi Ananthanarayan
USA: Prof. Uday S. Annapure
SSA: Dr Shalini S Arya
JSG: Dr Jyoti S Gokhale
SC: Dr Snehasis Chakraborty

2.2.4. Initiatives related to industry interaction, industry internship (10) (Inst. Marks 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 BTech program curriculum has been designed considering the feedback from industry personnel such as:

- Dr. Ummeayman Rangwala (Keva Flavours)
- Dr. Rohit Upadhyay (Nestle India)
- Dr. Akshay Bhat (The Good Food Institute India)
- Dr. Hormaz Patwa (Sensient India)

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

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

Sr No	Visiting faculty from Industry	Subject	Hour/wk
1	Dr. Subha Nishtala	FDT1028, Food Safety, Quality and Regulations (Sem VIII)	1
2	Dr. Rohini Sharma	FDT1028, Food Safety, Quality and Regulations (Sem VIII)	2
3	Dr Hormatz Patwa	FDT 1012: Food Additives and Ingredients (Sem V)	2
4	Dr Swati D. Singh	FDP 1022: Food Processing and Product Development (Sem VI)	4
5	Dr. Shantanu Sawant	FDT 1013: Food Chemistry (Sem V)	1

D. In-Plant Training

Training during May-Aug 2022 for 19FET batch

Sr. No.	Name	Company For In Plant Training	Mode
1	Abhaykumar Bafna	Mapro Foods Pvt. Ltd., Satara, Maharashtra	On site
2	Drushti Daryani	General Mills, Mumbai	On site
3	Pratik Kalantri	Mapro Foods Pvt. Ltd., Satara, Maharashtra	On site
4	Gunjan Kulkarni	Omniactive Health Technologies, Pune	On site
5	Komal Kaur Sasan	Haldirams Pvt. Ltd., Mumbai	On site
6	Vedant Sawant	Vista Osi Group, Navi Mumbai	On site
7	Vishal Bhore	General Mills, Mumbai	On site
8	Vedika Rathi	Omniactive Health Technologies, Pune	On site
9	Sarang More	Mapro Foods Pvt. Ltd., Satara, Maharashtra	On site
10	Junaid Inamdar	Keva Flavours Pvt. Ltd., Mumbai	On site
11	Chinmay Deshpande	Mapro Foods Pvt. Ltd., Satara, Maharashtra	On site
12	Atiksha Jagadale	Sensient India Pvt. Ltd., Navi Mumbai	On site
13	Devraj Rajput	Keva Flavours Pvt. Ltd., Mumbai	On site
14	Riddhi Pisal	Vista Osi Group, Navi Mumbai	On site
15	Shivani Jadhav	ITC Life Sciences, Mumbai	On site
16	Bhumika Pawara	Sensient India Pvt. Ltd., Navi Mumbai	On site
17	Shivani Dhembare	Keva Flavours Pvt. Ltd., Mumbai	On site
18	Isha Patil	Omniactive Health Technologies, Pune	On site
19	Kaustubh Pedhambkar	Omniactive Health Technologies, Pune	On site

Training during May-Aug 2021 for 18FET batch

Sr. No.	Name	Company For In Plant Training	Mode
1	Nirav Vargantwar	Haldirams Pvt. Ltd., Mumbai	Offline
2	Anupama Lokhande	Guilt free Industries Ltd, Thane	Offline
3	Sameera Kazi	Godrej Tyson Foods Ltd., Mumbai	Offline
4	Hritik Sonawane	Arhaa Food Mfg, Pvt. Ltd., Mumbai	Offline
5	Amay Dagade	Empire Spices and Foods Ltd., Ghatkopar, Mumbai	Offline
6	Aviraj Patole	Empire Spices and Foods Ltd., Ghatkopar, Mumbai	Offline
7	Vaibhav Vishwanath	Sensient India Pvt. Ltd., Navi Mumbai	Online
8	Lipakshi Safaya	ITC Life Sciences, Mumbai	Online
9	Purvaja Dodke	Poshtique, Malad, Mumbai	Online
10	Viplave Waghmare	Poshtique, Malad, Mumbai	Online
11	Rucha Rane	General Mills, Mumbai	Online
12	Sarvesh Toshniwal	General Mills, Mumbai	Online
13	Anooshka Avasare	Vista Osi Group, Navi Mumbai	Online
14	Saniya Tadvi	Vista Osi Group, Navi Mumbai	Online
15	Nimai Agarwal	Vista Osi Group, Navi Mumbai	Online
16	Tanvi Bapat	Omniactive Health Technologies, Pune	Hybrid
17	Soumya Mohan	Omniactive Health Technologies, Pune	Hybrid
18	Harshal Bote	Omniactive Health Technologies, Pune	Hybrid
19	Ankur Upadhyay	Omniactive Health Technologies, Pune	Hybrid

D. Industry Feedback on in-plant training

The in-plant training is being evaluated for 6 credits (50 Marks) in Semester VII of BTech in Food Engineering and Technology. Feedback by Industry mentor has weightage of 30% in their evaluation. The rubrics for Industry feedback is given below.

Evaluation of In-Plant Training
Semester VII

Student name:
Duration of training:
Industry:
Mentor:
Contact details of Mentor:

No	Parameter	Marks out of 10
1	General Behaviour: Ethics and Attendance	
2	Oral and Written Communication Skills	
3	Interpersonal Skills	
4	Technical Knowledge	
5	Professional Skills (Initiative and Motivation)	
6	Managerial Skills (Time and Resource)	
Any Other Comment:		

2.2.5. Initiatives towards the New Education Policy (5) (Inst. Marks 05)

The Institute and Food Engineering and Technology Department has already taken a step forward in 2021 towards implementing the National Educational Policy (NEP) in our program. The highlights of those plans are appended below.

1. Towards a More Holistic and Multidisciplinary Education

The Proposed Program Educational Objectives (PEOs) of the BTech program has been revised in 2021 and the revised statements are as follows. This is in line with implementing the National Educational Policy (NEP).

PEO1: Successful Career: Graduates from the program will have successful careers in food and allied industries at various levels of management.

PEO2: Higher Study: Graduates from the program will pursue higher study related to food engineering and technology and allied disciplines in premier institutions across the world and make a career in academics or research.

PEO3: Multi-disciplinary Skills: Graduates from the program will work in a multidisciplinary environment in the domain of food technology.

The PEO3 is to attain multi-disciplinary skills in our graduates. In that sense, the revised four-year BTech in Food Engineering and Technology program comprised of Basic Sciences, Engineering Sciences, Humanities, and Social Sciences, Core and Electives on Food Engineering and Technology, Open Electives, Project, In-plant training, Seminar, and other Skill Based Courses.

2. Optimal Learning Environments

a) Since last year, the faculties of the department have been shifted more towards blended learning. The intention is to provide the students with more flexibility and involvement in active learning. The students will be more involved in collaborative learning with an enriched experience. The tools used for this blended learning are Google classroom or MS Teams, Virtual labs, Virtual industry visits, Interactive video tutorials, Open Educational Resources (OERs) like NPTEL, and SWAYAM courses. These are in line with the National Educational Policy for higher education.

b) The credit hours for theory courses are reduced and more focus on practical and hands on training-based courses were given in the recently revised syllabus. Choice-based credit systems with open electives and MOOCs have been introduced in the recently revised syllabus in August 2021.

3. Teacher Education

In Sep 2021, Institute has implemented a new Career Advancement Scheme (CAS) which is in line with the NEP policy – 'Promoting Teacher Education'. Under the scheme, every incumbent faculty has to undergo a set of Faculty Development Programme (FDP) in the relevant area and advanced pedagogy. They also have to attend FDP through a MOOCS course with E-Certification by NPTEL-AICTE. Besides, Industrial Training or Professional Training has been mandated for any promotion. Additionally, the incumbent faculty needs to complete 8 modules of teachers training by the National Institute of Technical Teachers Training and Research (NITTTR) on different aspects of teaching such as Orientation Towards Technical Education and Curriculum Aspects, Professional Ethics & Sustainability, Communication Skills Modes & Knowledge Dissemination, Instructional Planning and Delivery, Technology Enabled Learning & Life-Long Self Learning, Student Assessment and Evaluation, Creative Problem-Solving Innovation and Meaningful R&D, Institutional Management & Administrative procedures.

4. Equity and Inclusion

In our BTech program, all the students are given equal importance. Due attention is paid to both advanced and slow learners as the need arises. For instance, for advanced learners, there are research and review papers published in Scopus-indexed journals based on the seminar and project work at the UG level. For slow learners, one-to-one interaction as the case may be is done in the courses where it is required.

5. Regulation on Teaching and Evaluation

At the institute level, a separate Internal Quality Assurance (IQA) cell was established to assess the quality of the teaching method and question papers. It comes under the purview of the Dean of Internal Quality Assurance.

However, in line with one of the policies of NEP – 'Regulatory System on Teaching and Evaluation', the Board of Studies (BoS) members of the Department of Food Engineering and Technology has proposed an Academic and Examination Audit Committee with the following members.

- Prof. Prathap Kumar Shetty, Pondicherry University (Chairperson)
- Prof. Dharmesh Chandra Saxena, SLIET, Longowal, Punjab
- Prof. Paramita Bhattacharjee, Jadavpur University, Kolkata

The committee will frame the corresponding measures to audit both academic and examination matters.

CRITERION 3	**Students'** Performance	75

Item (Information to be provided cumulatively for all the shifts withexplicit headings, wherever applicable)	CAY 2021-22	CAYm1 2020-21	CAYm2 2019-20
Sanctioned intake of the program (*N*)	16	16	16
Total number of students admitted in first year *minus* number of students migrated to other programs/institutions, plus no. of studentsmigrated to this program (*N*1)	16	16	16
Number of students admitted in 2nd year in the same batch via lateralentry (*N*2)	0	0	0
Separate division students, if applicable (N3)	4	4	4
Total number of students admitted in the Program (*N*1 + *N*2 + *N3*)	20	20	20

Table B.3a

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

Year of entry	N1+N2+N3 (As defined above)	Number of students who have successfully graduated without backlogs in any semester/year of study (Without Backlog means no compartment or failures in any semester/year of study)			
		I Year	II Year	III Year	IV Year
(2021-22) CAY	20				
(2020-21) CAYm1	20	16	16		
(2019-20) CAYm2	20	13	13	13	
(2018-19) CAYm3	18	13	11	11	11
(2017-18) CAYm4 (LYG)	18	15	15	12	12
(2016-17) CAYm5 (LYGm1)	17	14	14	13	13
(2015-16) CAYm6 (LYGm2)	16	13	13	13	13

Table B.3b

Year of entry	N1+N2+N3 (As defined above)	Number of students who have successfully graduated in a stipulated period of study) [Total of with Backlog + without Backlog]			
		I Year	II Year	III Year	IV Year
(2021-22) CAY	20				
(2020-21) CAYm1	20	18	18		
(2019-20) CAYm2	20	18	18	18	
(2018-19) CAYm3	18	17	17	17	17
(2017-18) CAYm4 (LYG)	18	16	16	16	16
(2016-17) CAYm5 (LYGm1)	17	15	14	14	14
(2015-16) CAYm6 (LYGm2)	16	14	14	14	14

Table B.3c

3.1. Enrolment Ratio (15) (Inst Marks 15)

Item (Information to be provided cumulatively for all the shifts withexplicit headings, wherever applicable)	CAY 2021-22	CAYm1 2020-21	CAYm2 2019-20
Sanctioned intake of the program (*N*)	16	16	16
Total number of students admitted in first year *minus* number of students migrated to other programs/institutions, plus no. of studentsmigrated to this program (*N*1)	16	16	16
Enrollment Ratio (N1/N)x100%	100%	100%	100%
Marks for Enrollment Ratio	15	15	15
Average marks for Enrollment Ratio	15		

Item (Students enrolled at the First Year Level on average basis during the previousthree academic years starting from current academic year)	Marks
>=90% students enrolled	15
>=80% students enrolled	12
>=70% students enrolled	10
>=60% students enrolled	8
Otherwise	0

Table B.3.1

3.2. Success Rate in the stipulated period of the program (15) (Inst Marks 13)

3.2.1. Success rate without backlogs in any semester/year of study (10) (Inst Marks 8.5)

SI= (Number of students who have graduated from the program without backlog)/ (Number of students admitted in the first year of that batch and actually admitted in 2nd year via lateral entry and separate division, if applicable)
Average SI = Mean of Success Index (SI) for the past three batches
Success rate without backlogs in any semester/year of study = 10 × Average SI

Item	Last Year of Graduate,	Last Year of Graduate minus 1	Last Year of Graduate minus 2
	LYG (17FET)	LYGm1 (16FET)	LYGm2 (15FET)
No of the students admitted in the corresponding First Year + admitted in 2nd year via lateral entry and separate division, if applicable	18	17	16
No of students who have graduated without backlogs in the stipulated period	16	13	14
Success Index (SI)	0.889	0.765	0.875
Average Success Index	0.843		
Success Rate without backlogs	0.843 × 10 **= 8.43 ≈ 8.5**		

Table B.3.2.1

3.2.2. Success rate in stipulated period of study [Total of with backlog + without backlog] (5) (Inst Marks 4.5)

SI= (Number of students who graduated from the program in the stipulated period of the course duration)/ (Number of students admitted in the first year of that batch and actually admitted in 2nd year via lateral entry and separate division, if applicable)
Average SI = mean of Success Index (SI) for past three batchesSuccess rate = 5 × Average SI

Item	Last Year of Graduate	Last Year of Graduate minus1	Last Year of Graduate minus2
	LYG [CAYm4] (17FET)	LYGm1 [CAYm5] (16FET)	LYG*m*2 [CAYm6] (15FET)
Number of students admitted in the corresponding First Year + admitted in 2nd year via lateral entry and separate division, if applicable	18	17	16
Number of students who have graduated in the stipulated period	17	16	14
Success Index (SI)	0.944	0.941	0.875
Average Success Index	0.92		
Success Rate with backlogs	0.92 × 5 = 4.6		

Table B.3.2.2

Note: If 100% of students clear without any backlog then also total marks scored will be 15 as both 3.2.1 & 3.2.2will be applied simultaneously.

3.3. Academic Performance in Second Year (5) (Inst Marks 3.5)

Academic Performance = 0.5 * Average API (Academic Performance Index), where
API = ((Mean of 2nd Year Grade Point Average of all successful Students on a 10-point scale) or (Mean of the percentage of marks of all successful students in Second Year/10)) x (number of successful students/number of students appeared in the examination)

Successful students are those who are permitted to proceed to the Third year.

Academic Performance	CAYm1 (2019-20)	CAY*m2* (2018-19)	CAY*m3* (2017-18)
Mean of CGPA or Mean Percentage of all successful students(X)	8.32	8.27	7.86
Total no. of successful students (Y)	17	15	17
Total no. of students appeared in the examination (Z)	19	17	18
API = X* (Y/Z)	7.444	7.297	7.423
Average API = (AP1 + AP2 + AP3)/3	7.388		
Academic Performance = 0.5 * Average API	**7.388 × 0.5 = 3.69 ≈ 3.5**		

Table B.3.3

3.4. Academic Performance in Third Year (5) (Inst Marks 04)

Academic Performance = 0.5 * Average API (Academic Performance Index)
API = ((Mean of 3rd Year Grade Point Average of all successful Students on a 10-point scale) or (Mean of the percentage of marks of all successful students in Third Year/10)) x (number of successful students/number of students appeared in the examination)

Successful students are those who are permitted to proceed to the final year.

Academic Performance	CAYm1 (18FET)	CAYm2 (17FET)	CAYm3 (16FET)
Mean of CGPA or Mean Percentage of all successful students(X)	8.292	8.126	8.145
Total no. of successful students (Y)	17	15	14
Total no. of students appeared in the examination (Z)	17	17	14
API = X* (Y/Z)	8.292	7.17	8.145
Average API = (AP1+AP2 + AP3)/3	7.869		
Academic Performance = 0.5 * Average API	**7.869 × 0.5 = 3.93 ≈ 4**		

Table B.3.4

3.5. Placement, Higher Studies and Entrepreneurship (15) (Inst Marks 13.5)

Assessment Points = 15 × average placement

Item	CAYm1 (18FET)	CAYm2 (17FET)	CAYm3 (16FET)
Total No. of Final Year Students (N)	18	17	14
No. of students placed in companies or Govt. Sector (x)	7	9	6
No. of students admitted to higher studies with valid qualifying scores (GATE or equivalent State or National Level Tests, GRE, GMAT, etc.) (y)	8	8	5
No. of students turned entrepreneur in engineering/technology (z)	1	0	1
x + y + z =	16	17	12
Placement Index: (x + y + z)/N	0.889	1.000	0.857
Average placement= (P1 + P2 + P3)/3	0.915		
Assessment Points = 15 × average placement	13.725 ≈ **1**3.5		

Table B.3.5

3.5a. Provide the placement data in the below-mentioned format with the name of the program and the assessment year:

Batch: 18FET (Graduated in June 2022)				
No	Name of the Student Placed	Enrolment No.	Name of the Employer	Appointment Letter Reference No. with Date
1.	Nirav Vargantwar	18FET101	Case Western Reserve University	10-03-2022
2.	Amay J. Dagade	18FET102	Self Employed (Amey Food Products)	UDYAM-MH-23-0096654
3.	Ankur Upadhyay	18FET103	Ohio State University	500694012
4.	Anooshka Avasare	18FET104	Keva Flavours, Mumbai	Mulund Corp/Email dt 7th Jun 2022
5.	Anupama Lokhande	18FET105	Ajana Plastic	Joining 12 July 2022
6.	Aviraj Patole	18FET106	IIM, Ahmedabad (not yet joined)	CET roll no: 22261065437
7.	Harshal Bote	18FET108		
8.	Hritik Sonawane	18FET109	ICT, Mumbai	Masters: ICT/ACAD/1430
9.	Lipakshi Safaya	18FET110	SABMiller India Ltd, Bangalore	Supply Management Trainee (1-08-2022)
10.	Nimai Agarwal	18FET111	IIM, Ahmedabad	PGP-FABM-2022-24/160
11.	Rucha R. Rane	18FET112	Lund University, Sweden	Masters: 20001103-T341
12.	Sameera F. Kazi	18FET113	Anthem Biosciences Pvt. Ltd.	HRD/OFF/Letter/10
13.	Sarvesh Toshniwal	18FET114		
14.	Soumya Mohan	18FET115	Lund University, Sweden	Masters: 20001222-T222
15.	Tanvi Bapat	18FET116	Perfetti Van Melle India Pvt. Ltd.	Graduate Engineer Trainee (18-05-2022)
16.	Vaibhav Vishwanath	18FET117	Wageningen University, Netherlands	Masters: 1238701
17.	Viplave Waghmare	18FET118	Anthem Biosciences Pvt. Ltd.	HRD/OFF/Letter/10
18.	Saniya K. Tadvi	16FET109	Vista Processed Foods Pvt Ltd.	

Batch: 17FET (Graduated in June 2021)				
No	Name of the student placed	Enrolment No.	Name of the Employer	Appointment letter reference No. with date
1	Ghananil Sarode	17FET101	Mapro Foods Pvt. Ltd	Production Trainee (17-11-2020)
2	Omkar Vidyadhar Bal	17FET102	IIT Guwahati	M.Tech Roll No. 214162008 (28-08-2021)
3	Aashita M Pillai	17FET105	WINSPARK INNOVATIONS LEARNING PVT LTD	BD Counselor Code - PS03971 (07-07-2021)
4	Apurva Sumed Khartad	17FET106	Mapro Foods Pvt. Ltd.	Production Trainee (16-06-2021)
5	Pritam Tanaji Patil	17FET107	Future Market Insights	Consultant Level-1 CIN-U74900PN2014PTC153166 (23-12-2021)
6	Yash Sahebrao Vijaykar	17FET108	LEVEL FIT TECH PRIVATE LIMITED	Project Manager (10-05-2021)
7	Sudhanwa Anand Lele	17FET109	WUR Nederland	Master Food Technology Student No.: 1116258 (01-09-2021)
8	Rajeev Ramesh	17FET110	Adani Wilmar	AWL/ICT M/ Campus Hiring (18-02-2021)
9	Vedant Kishor Mundada	17FET112	University of Illinois	UIN 676070167
10	Sagar Ganesh Badnakhe	17FET113	Mapro Foods Pvt. Ltd.	Production Trainee (17-11-2020)
11	Hrithik Shetty	17FET117	Ohio State University	ID: 500594084 (6009086735941271)
12	Atharva Suhas Mate	17FET118	INDO BAKELS PVT. LTD.	NPD Executive (23-06-2021)
13	Rahul Damodar Kamath	17FET119	Ohio State University	ID: 500599396 [6009086735864982] (08-02-2021)
14	Anmol Dhar	17FET120	University of Hyderabad	Enrl. No: 40AIML064-21/2 (August -2021)
15	S Arjun	17FET121	PSG College of Technology, Coimbatore	MBA-Govt Aided. No. TN/MBA/GCT/ALLOT/2021 /2006SS/MBA(SS)/10024 (14-10-2021)
16	Nidhi Vijay Baoney	17FET122	IIM, Ahmedabad	Ref: PGP-FABM Admissions Office (09-06-2021)
17	Sagar Jagdish Sompura	16FET108	EuroSchool	Middle School Teacher-Math (11-10-2021)

Batch: 16FET (Graduated in August 2020)				
No	Name of the student placed	Enrollment No.	Name of the Employer	Appointment letter reference No. with date
1	AkshayKumar Korkodiya	16FET101	Alfa Laval	Graduate trainee Engineer L/APPT/BOAT/2020-21 (11-01-2021)
2	Anuj Jaju	16FET102	Self-Employed	
3	Jaishree Kumbhare	16FET103	BYJU's -The Learning App	
4	Nikita Bhatkar	16FET104	Research Assistant ICT Bhubaneswar	ICT IOCB/Project/2020-21 (15-07-2020)
5	Rahul Choudhary	16FET105		
6	Rahul Venkatram	16FET106	Ohio State University	ID: 500500499 (6009086519200802)
7	Rakshita Prasad	16FET107	Wrapped up Love	Co-Founder GST #27BPPPP6982R1ZF
8	Shreya Nuguri	16FET111	Ohio State University	ID: 500504021 (6009086391211587)
9	Sanket Vanare	16FET110	Alfa Laval	Graduate Trainee Engineer (Jan 2021)
10	Shrikesh Narule	16FET112	IIM Indore	Post Graduate Programme in Management (PGP) 2020-22
11	Sourabh Sanjeev Joshi	16FET114	Vanita Agrochem (India)PVT. LTD.	Executive -Technical Services and R&D CIN-U24119PN2003PTC018212 (16-01-2021)
12	Sudarshan Patil	16FET115	Weikfield Ltd.	
13	Vimi Kuwlekar	16FET116	Hurix System Private Limited	Content Writer Member code: TBD32 (15-03-2022)
14	Yash Dharmesh	16FET117	Department of Food Sci & Human Nutrition University of Illinois	MS Program UIN:662936238 (27-05-2020)

3.6. Professional Activities (20) (Inst Marks 20)

3.6.1. Professional societies/chapters and organizing engineering events (5) (Inst Marks 05)

Events Organized:

2021-2022

- ACS on Campus hosted a virtual event in collaboration with ICT, Mumbai on 24th February 2022. Which was an interactive session featuring ACS Editors' best tips for science writing and managing data, networking with local professionals and peers, and making lasting connections.
- Online student interaction session organized by ICT Mumbai on 1st Feb 2022. Mr. Subhendu Acharjee talked on Campus to Corporate Series.
- Llecture series by Keva Flavours (21st Feb to 17th Mar 2022) on Flavour Regulatory, Beverages, GCMS & Interview Skills.
- Savishkar India in collaboration with ICT NICE, IIC, and ICT hosted a session on "Entrepreneur" on 1st May 2022. Presented opportunity to interact with a shark (Dr. Deepa Bhajekar, a serial entrepreneur in science and Technology who plans to invest in ideas full of potential).
- ICT Mumbai and Think India ICT presented a talk on "CRUNCH TIME Narendra Modi's National Security Crises" by Dr. Sreeram Chaulia, Dean, Jindal School of International Affairs, Sonipat, Haryana on the 11th of May, 2022.

2020-2021

- A webinar on "A step into the World of Leadership" was organized by FETD, ICT, Mumbai and hosted by Dr. Shalini Arya on 1st May 2021. Speaker: Dr. Geetal Mahajan, Johnson & Johnson, Consumer Health R&D under the Leadership Development Program.
- A webinar on "How to prepare for GATE (XE/XL)? Top Tips and Strategies for Food Technologist!" was organized by FETD, ICT, Mumbai, and hosted by Associate Professor Shalini Arya on 1st May 2021. In this Mr. Amar and Mr. Nilesh who have qualified GATE exam in the first attempt shares and explains their top tips, strategies, time management, important book, and much more.
- FETD, ICT, and the Indian National Young Academy of Science (INYAS), INSA has organized a series of Sixteen Saturday Webinars for the students addressing various career opportunities in the STEM field. Eminent speakers contributed to this noble cause of sharing and spreading knowledge for the benefit of students.
- Online session on Career guidance session for Masters aspirants by ICT Mumbai on 21 May 2021.
- Online session on Career guidance session for MBA aspirants and Job Seekers by ICT Mumbai on 19 May 2021.
- A virtual webinar on "Striving for Academic and Professional Excellence" by Prof. Laxmi Ananthanarayan, organized by FETD, ICT, Mumbai on 31st March 2022.
- Online session on Industry readiness program by ICT Mumbai on 19 Mar 2021.
- Golden Jubilee Visiting Fellowship Lecture on "Using Delivery by Design approach for encapsulation and delivery of nutraceuticals: A case study of curcumin" by Mahesh Kharat on 15th Feb 2021.
- A webinar on "Cracking FSSAI Exam -FSSAI Exam strategy" was organized by FETD, ICT on 31st January 2021. Speaker: Sukanya Pondugala, Assistant Director Technical FSSAI.
- The very first Saturday webinar in this series was "Career Opportunities in Food Science and Technology" by Sanjeev Kumar Sharma on 30th January 2021
- Hands-On Training on HPTLC by Mr. Vishwajit Kale, Anchrom Enterprises (I) Pvt. Ltd. In association with FETD, ICT Mumbai on 27th January 2021

2019-20

- National Nutrition Week celebration with AFSTI Mumbai Chapter on 23-24th Sep 2019.
- Prof. J V Bhat and Prof. A Sreenivasan Memorial lecture was hosted by ICT Mumbai on 24th Sept 2019
- World Food Safety Day 7th June 2019
- Keva Flavours Food product competition April 12, 2019
- Hands-on Training on Food bioactive on 5-7 February 2019
- In house food product development Competition conducted by FETD for all the students in Feb-2019

3.6.2. Publication of technical magazines, newsletters, etc. (5) (Inst Marks 05)

Department Newsletter

- FETD newsletter (food for thought) vol-3
- FETD newsletter (food for thought) vol-2
- FETD newsletter (food for thought) vol-1

Institute Magazine

- Bombay Technologist,
- Annual Technical Journal of Technological Association
- The Chemical Web, Online Newsletter cum Journal

Student's Publications

- Basak, S., Venkatram, R., & Singhal, R. S. (2022). "Recent advances in the application of molecularly imprinted polymers (MIPs) in food analysis". Food Control (May-2022), 109074.
- Kennedy, L. E., Abraham, A., Kulkarni, G., Shettigar, N., Dave, T., & Kulkarni, M. (2021). Capsanthin, a Plant-Derived Xanthophyll: a Review of Pharmacology and Delivery Strategies. AAPS PharmSciTech, 22(5), 1-12.
- Bhatkar, N. S., Dhar, R., & Chakraborty, S. (2021). Multi-objective optimization of enzyme-assisted juice extraction from custard apple: An integrated approach using RSM and ANN coupled with sensory acceptance. Journal of Food Processing and Preservation, 45(3), e15256.
- Arya, S. S., Venkatram, R., More, P. R., & Vijayan, P. (2021). The wastes of coffee bean processing for utilization in food: a review. Journal of Food Science and Technology, 1-16.
- Kamath, R., Basak, S., & Gokhale, J. (2021). Recent trends in the development of healthy and functional cheese analogues-a review. LWT, 112991.
- Chaturvedi, S., Khartad, A., & Chakraborty, S. (2021). The potential of non-dairy synbiotic instant beverage powder: Review on a new generation of healthy ready-to-reconstitute drinks. Food Bioscience, 42, 101195.
- Shaikh, A. E. Y., & Chakraborty, S. (2021). Optimizing the formulation for reduced-calorie and antioxidant-rich sapodilla-based spread using hybrid computational techniques and fuzzy analysis of sensory data. Journal of Food Process Engineering, 44(5), e13676.
- Ghodki, B. M., Dadlani, G., Ghodki, D. M., & Chakraborty, S. (2019). Functional whole wheat breads: Compelling internal architecture. LWT, 108, 301-309.
- Chakraborty, S., & Shrivastava, C. (2019). Comparison between multiresponse-robust process design and numerical optimization: A case study on baking of fermented chickpea flour-based wheat bread. Journal of Food Process Engineering, 42(3), e13008.
- Chakraborty, S., & Shrivastava, C. (2019). Dry Fractionation of Legumes. In Technologies for Value Addition in Food Products and Processes (pp. 337-374). CRC Press.

3.6.3. Participation in inter-institute events by students of the program of study (5) (Inst Marks 05)

From the B.Tech Batch 19FET, 18FET, 17FET

Sr. No.	Name of Student	Class	Event	Activity	Prize
1	Tanvi Bapat*	B.Tech IV	National Nutrition week	Recipe competition	2nd
2	Hritik Sonowane	B.Tech IV	Alchemy, the National Level Chemical Engineering Symposium, NIT Tiruchirappalli, 2021	Paper presentation	1st
3	Vaibhav Vishwanath	B.Tech IV	E-Summit 2021	Hawk Arena	2nd
4	Nirav Vargantwar	B.Tech IV	Food & Beverage Management	Certificate course from Universita Commerciale Luigi Bocconi	
5	Ankur Upadhyay	B.Tech IV	Papyrus event, Vortex 2021	Paper presentation	
6	Ankur Upadhyay	B.Tech IV	CHEM-TRIATHLON		3rd
7	Shivani Dhembare*	B.Tech III	Master Food Technologist, Nutrition Fiesta 2021	Food Technies	2nd
8	Nirav Vargantwar, Amay Dagade, Harshal Bote, Aviraj Patole, Hritik Sonawane, Akanksha Warade* & Shivani Dhembare*	B.Tech IV B.Tech III	NutriScholars AWARDS 2020 Nutrischolars AWARDS 2020 (Season 3)	4 pm Healthy Savoury Snacks 4 pm Healthy Savoury Snacks	
9	Sudhanwa Lele, Vedika Rathi*, Drushti Daryani* and Abhaykumar Bafna	B.Tech III	Nutrischolars AWARDS 2020 (Season 3)	ProChips 4 pm Healthy Savoury Snacks	
10	Shivani Dhembare*	B.Tech III	CHEM-E-QUIZ, Organized by Chemical Engineering Students Sports Cultural & Academic Association(CESSCAA).	Fundamentals of Chemical Engineering	65%

3.6.4. Participation in inter-institute events by students (5) (Inst Marks 5)

Inter-Institutional Competitions/Activities		Inter-Departmental Competitions/Activities	
Name of the Activity	Number of students	Name of the Activity	Number of students
Prodigy	All	Annual Day	All
Chemfusion	All	Funtech	All
Manzar	All	Manthan	All
Vortex	All		
Exergy (2012)	All		
IDP (Industry Defined Problems)	All		
Sports-Saga	All		

Achievements from the BTech batch 19FET, 18FET, 17FET, 16FET

Pratik Pankaj Kalantri
- Event Head of Pitchers in E-Summit'22, ICT, Mumbai
- Certified for completing training in Manufacturing (Level 2) & COVID-Food Safety Supervisor

Drushti Daryani
- Completed Phase 1 of The India Smart Protein Innovation Challenge (ISPIC)2021 and scored 87.20%
- Awarded as Teacher of the Month (March 2021) for her exemplary work as a teacher at the Centre Vatsalya Trust

Atiksha Jagadale Completed Phase 1 of The India Smart Protein Innovation Challenge (ISPIC)2021 and scored 65.50%.

Junaid Shahid Inamdar Certified for completing training in Manufacturing (Level 2) & COVID-Food Safety Supervisor

Abhaykumar Bafna
- Virtual Factory Visit (January 2022)– Ojman Foodbio, Pune, Conducted by FoodTechPathshala
- Virtual Factory Visit (January 2022)– Chitale Bandhu, Pune Conducted by FoodTechPathshala
- Manufacturing (Level 2) & COVID- Food Safety Supervisor Certificate, held at FRCC Training Hall 122 Pocket E South West Delhi Conducted by Food Regulation and Compliance Centre

Vedant Sawant
- Virtual Factory Visit (January 2022)– Ojman Foodbio, Pune, Conducted by FoodTechPathshala
- Virtual Factory Visit (January 2022)– Chitale Bandhu, Pune Conducted by FoodTechPathshala
- Successfully completed Internship held in June-July, organized by IIM Bangalore's 2021
- Co-ordinator as a part of VORTEX 8.0, 2021 and has volunteered in E-summit'22

Vishal Bhore
- Successfully completed Student Excellence & Learning Program (SELP) 2019 held under TEQIP-III, ICT, Mumbai
- Volunteered in the Public Relation during VORTEX 2019, TA, ICT, Mumbai
- Completed internship program of 1 month at ITC Foods factory, Ranjangaon
- Virtual Factory Visit (January 2022)– Chitale Bandhu, Pune Conducted by FoodTechPathshala

Sarang Nitin More
- Manufacturing (Level 2) & COVID- Food Safety Supervisor Certificate, held at FRCC Training Hall 122 Pocket E South West Delhi Conducted by Food Regulation and Compliance Centre
- Event Head of Hawk Arena, E-Summit'22

Chinmay Deshpande
- Completed the ICT 5 km MARATHON with mission "ZERO HUNGER" with a finish time 00:38:08
- Event Head of E-Quiz in E-Summit'22
- Manufacturing (Level 2) & COVID- Food Safety Supervisor Certificate, held at FRCC Training Hall 122 Pocket E South West Delhi Conducted by Food Regulation and Compliance Centre

Sameera Kazi Public Relations Head of 'Vortex 8.0 - The Chemfest' 2021, ICT, Mumbai

Rucha Rane Overall Event Head of 'Vortex 8.0 - The Chemfest' 2021, ICT, Mumbai

Nirav Vargantvar Swimming Contingent for the year 2018-19, ICT, Mumbai

Lipakshi Safaye Content Head for E-cell 2020-21, ICT, Mumbai

Ankur Vijay Upadhyay

- Research trainee at OmniActive Health Technologies (Nutraceutical Company) in the Extraction and R&D department (May-August, 2021)
- BTUGRP research Internship Program at IIT Bombay Chemical Engineering Department (January - March 2021)


Criterion 4	Faculty Information and Contributions	100

Name	PAN no.	Qualification	Specialization	Designation	Date of Joining	Date on which designated as professor/ associate professor	Nature of association (Regular/ Contract/ Adjunct)	If contractual, mention Full-time or Part- time	Date of leaving (In case, currently associated is No)
Prof. R. S. Singhal	ABEPS5434M	PhD	Food Technology	Professor	14.03.1990	30.04.2007	Regular	NA	NA
Prof. Laxmi Ananthanarayan	AAGPA3226L	PhD	Biochemistry	Professor	16.10.1985	01.10.2013	Regular	NA	30.09.22
Prof. Uday S. Annapure	AGDPA0605L	PhD	Food Chemistry	Professor	15.04.2003	16.04.2009	Regular	NA	NA
Dr. Shalini S. Arya	APQPG4745P	PhD	Food Technology	Associate Professor	25.7.2008	NA	Regular	NA	NA
Dr. Jyoti Gokhale	BGMPS3371P	PhD	Bioprocess Technology	Assistant Professor	16.6.2014	NA	Regular	NA	NA
Dr. Snehasis Chakraborty	ALNPC0296J	PhD	Food Engineering	Assistant Professor	29.10.2015	NA	Regular	NA	NA
Dr. Aniruddha B. Pandit	AADPP3869K	PhD	Sonochemical Process, Reactor design and Process Intensification	Professor	01.01.1991	01.01.1996	Regular	NA	NA
Dr. Dilip D. Sarode	AALPS9158E	PhD	Engineering Mechanics and strength of materials	Professor	12.06.1997	01.03.2014	Regular	NA	NA
Dr. Gunjan Prakash	AQRPP0679Z	PhD	Industrial Fermentation	Associate Professor	09.09.2009	26.01.2017	Regular	NA	NA
Dr. Parag R. Gogate	AHNPG3328H	PhD	Separation Process, Process intensification	Professor	03.07.2007	04.07.2016	Regular	NA	NA
Dr. Sachin Jadhav	BFMPJ9477E	PhD	Instrumentation and process control, Separation, Nanotechnology, Process intensification	Assistant Professor	May, 2018	NA	Regular	NA	NA

Dr. Reena Pandit	BEHPP2916L	PhD	Algal Biotechnology	Associate Professor	02.05.2012	27.01.2017	Regular	NA	NA
Dr. Shamlan M S Reshmwala	NA	PhD	Overexpression and Secretion of Recombinant Proteins, Enzyme Engineering for Improved Catalysis	Assistant Professor	15.10.2011	NA	Regular	NA	NA
Dr. Prerna Goswami	AEAPG6881M	PhD	Sustainable Energy and Environment	Associate Professor	06.06.1998	08.02.2017	Regular	NA	NA
Mr. M A K Kerawalla	AACPK9005D	ME	Electrical Engineering and Electronics	Associate Professor	16.02.1987	16.02.1998	Regular	NA	NA
Dr. Manishkumar D. Jadhav	ADCPY0618F	PhD	Nanotechnology	Assistant Professor	24.09.2019	NA	Regular	NA	NA
Dr. Prashant S. Kharkar	AMFPK8202K	PhD	Pharmaceutical Chemistry	Professor	19.10.2019	19.10.2019	Regular	NA	NA
Dr. Manju Sharma	CBPPS9841B	PhD	Biofuel and Bioenergy	Assistant Professor	25.06.2011	25.06.2011	Regular	NA	NA

Table B.4

4.1. Student-Faculty Ratio (SFR) (15) (Inst. Marks 15)

No of UG programs in the Department (n): 1

No of PG programs in the Department (m): 2

Description	2021-22	2020-21	2019-20
Total No. of Students in the Department(S)	104	104	104
	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)*	8.225	9.4	9.77
	F1	F2	F3
Student Faculty Ratio (SFR)	12.644	11.06	10.64
	SFR1=S1/F1	SFR2=S2/F2	SFR3=S3/F3
Average SFR	SFR= (SFR1+SFR2+SFR3)/3		
	11.44		
*F=Total Number of Faculty Members (considering the fractional load) involved in 2nd to final year UG and PG programs of the department			

Provide the information about the regular and contractual faculty as per the format mentioned below

Academic Year	Total Number of regular Faculty in Department	Total Number of Contractual Faculty in Department
2021-22	17 (5 core faculties)	0
2020-21	21 (7 core faculties)	0
2019-20	20 (7 core faculties)	0

4.2. Faculty Cadre Proportion (10) (Inst. Marks 10)

Academic Year	Professors		Associate Professors		Assistant Professors	
	Required F1	Available	Required F2	Available	Required F3	Available
2021-22	0.58	3	1.15	1	3.46	2
2020-21	0.58	3	1.15	1	3.46	2
2019-20	0.58	4	1.15	1	3.46	2
Avg numbers	RF1=0.58	AF1=3.33	RF2=1.15	AF2=1	RF3=3.46	AF3=2
Cadre Ratio	[(AF1/RF1) + ((AF2/RF2)x0.6)+((AF3/RF3)x0.4)] = 6.49					
Marks	6.49 × 5 = 32.45					
Marks claimed	10					

The reference Faculty cadre proportion is 1(F1):2(F2):6(F3)

4.3. Faculty Qualification (10) (Inst. Marks 10)

FQ = [(10X +4Y)/F)]
where X is no. of regular faculty with Ph.D.,
Y is no. of regular faculty with M. Tech,
F is no. of regular faculty required to comply 1:20 Faculty-Student ratio

CAY	X	Y	F	FQ=[(10X+4Y)/F)]
2021-22	6	0	5.2	10
2020-21	6	0	5.2	10
2019-20	7	0	5.2	10
Average assessment				10

4.4. Faculty Retention (5) (Inst. Marks 05)

No. of regular faculty members	2021-22	2020-21	2019-20	%Faculty retained	Marks
	17*	21*	20	100%	5

*One faculty member superannuated in 2020

4.5 Faculty competencies in correlation to curriculum (Inst. Marks 05)

Name of Core Faculty	Components of Curriculum	Area of Specialization	Number of Publication
Prof. Rekha S. Singhal	Principles of Food Analysis Food Additives and Ingredients Technology of Dairy and Animal products	Food Technology	408
Prof. Smita S. Lele	Introduction to Food Systems Food Engineering Food Process Engineering	Biochemical Engineering	108
Prof. Uday S. Annapure	Principles of Food Preservation Food Chemistry Technology of Fruits, Vegetables and Tubers Microbiology Lab	Food Chemistry	139
Prof. Laxmi Ananthanarayan	Chemistry of Food Constituents Nutrition Food Packaging Food Biotechnology Technology of Plantation Products	Biochemistry	72
Dr. Shalini S. Arya	Technology of Fruits, Vegetables and Tubers Technology of Plantation Products Technology of Cereals, Legumes Food Chemistry Lab Food Analysis I Food Processing and Product Development Lab	Food Technology	86
Dr. Jyoti S. Gokhale	Nutrition Nutraceuticals and Functional Foods Waste Management in Food Processing Biochemistry Lab Technical Analysis Lab Food Analysis II	Bioprocess Technology	09
Dr. Snehasis Chakraborty	Introduction to Food Systems Principles of Food Preservation Food Engineering Food Process Engineering Food Processing and Engineering Lab	Food Process Engineering	53

4.6. Innovations by the Faculty in Teaching and Learning (5) (Inst. Marks 05)

Mode of instruction delivery:

Online platforms used are MS Office, zoom, Google classroom, etc.

Continuous evaluation methods: Quiz, presentation, group discussion, case study, class test

I. Study material: in the form of presentation, handouts
II. Knowledge update: Students are encouraged to go through research papers on novel aspects frequently and they are asked to present that work either individually or in a group.
III. Tutorial classes along with tutorial sheets.
IV. Scope for self-learning
- Industry visits
- Saturday Lecture Series (Spring, 2021) are arranged where Industry people and outside faculty members and scientists deliver lectures and guide students
- Students are encouraged to carry out summer research based on their ideas
- In YICC (Vortex) event, students solve problems posed by industry using basic engineering concepts and library.
- A reading room facility is provided

V. Generation of self-learning facilities, and availability of materials for learning beyond syllabus
1. Regular visits to Industry
2. Help in organizing YICC and getting problems from Industry
3. Library facility
4. Reading room with mini-library
5. Encouraging students to participate in different competitions and providing financial assistance.

	Teachers Role	Instructional method	Activity happening	Instruction techniques used in					
				2019-20		2020-21		2021-22	
				Theory	Lab	Theory	Lab	Theory	Lab
Teacher centric	Informing	Classroom Lecture	Monologue	✓				✓	
		Demonstration	Dialogue		✓				✓
	Facilitating	Tutorial	Interaction	✓		✓		✓	
		Seminar		✓		✓	✓	✓	
		Case study		✓		✓	✓	✓	✓
		Group discussion				✓		✓	
	Guiding	Assignment	Action	✓		✓		✓	
		Practical			✓		✓		✓
		Project			✓		✓		✓
		Industry visit / training		✓			✓		✓
Student centric	Mentoring	ICT based Lecture	Reflection	✓		✓	✓	✓	✓
		Virtual Lab					✓		✓

Shift towards Blended learning

4.7. Faculty as participants in development/training activities (10) (Inst. Marks 10)

Name of Faculty	Participant or Resource person	Max 5 per Faculty		
		2021-22 (CAY)	2020-21 (CAYm1)	2019-20 (CAYm2)
Prof. Rekha S. Singhal	Resource person	3	4	5
Prof. S. S. Lele	Resource person	3	0	0
Prof. U. S. Annapure	Participant	0	0	3
Prof. L. Ananthanarayan	Participant	0	0	3
Dr. Shalini S. Arya	Participant	5	5	0
Dr. Jyoti S. Gokhale	Participant	5	3	3
Dr. Snehasis Chakraborty	Participant	5	5	5
Sum		21	15	19
RF = No of Faculty required to comply 20:1 SFR		5.2	5.2	5.2
Assessment [2*(Sum / 0.5RF)]		16.1	11.5	14.6
Marks Claimed		10		

- A Faculty scores maximum five points for participation
- Participation in 2 to 5 days Faculty development program: 3 Points
- Participation >5 days Faculty development program: 5 points

Training Programs / Courses attended by faculty

Name of teacher who attended	Title of the program	Duration (from – to) (DD-MM-YYYY)
Dr. Shalini S. Arya	e-Shodhyatra: Emerging Trends and Technologies in Scholarly communication	23-11-2020 to 04-12-2020
Dr. Shalini S. Arya	Recent Developments in Food Processing	25-10-2021 to 29-10-2021
Dr. Shalini S. Arya	Recent trends in non-thermal processing: Prospects and Challenges	4-10-2021 to 08-10-2021
Dr. Shalini S. Arya	Authentic Leadership and Excellence	22-11-2021 to 26-11-2021
Dr. Shalini S. Arya	Recent Trends in Food Processing and Preservation Technologies	01-02-2022 to 05-02-2022
Dr. Snehasis Chakraborty	Computers and automation in life science-based research	30-08-2021 to 03-09-2021
Dr. Snehasis Chakraborty	Advanced Pedagogical Techniques	13-09-2021 to 19-09-2021
Dr. Snehasis Chakraborty	Training on Technical Committee members of BIS	24-5-2021 to 25-5-2021
Dr. Snehasis Chakraborty	Industrial Training in Bakery	18-5-2020 to 30-5-2020
Dr. Snehasis Chakraborty	QIP on Microwave Heating and Processing of Foods	13-6-2019 to 18-6-2019
Dr. Jyoti S. Gokhale	Inculcating Universal Human Values in Technical Education	14-03-2022 to 18-03-2022

Dr. Jyoti S. Gokhale	Functional Foods and Nutraceuticals (SWAYAM)	July to December 2021
Dr. Jyoti S. Gokhale	Advanced Pedagogical Techniques	13-09-2021 to 19-09-2021
Dr. Jyoti S. Gokhale	Skills Of Achieving A Successful Academic Research Career	23-02-2022 to 27-03-2022
Dr. Jyoti S. Gokhale	One Week Online Faculty Development Programme on Innovation to Entrepreneurship A Roadmap'	22-02-2021 to 26-02-2021
Dr. Jyoti S. Gokhale	Roadmap for Nutraceutical Development, Safety and Regulatory Requirements	25-09-2020 to 25-09-2020
Dr. Jyoti S. Gokhale	Fermented Foods and Beverages	18-08-2020 to 22-08-2020

Faculty Recognition and memberships

Faculty Name	Faculty Recognition and Memberships
Prof. Rekha S. Singhal	INSA Fellow 2022 ICT-UAA Distinguished Fellow Ranked as the top 2% most-cited scientists (List published by Stanford University 2021) Fellow of Association of Food Scientist and Technologists, India Fellow (FIBA) of the International Bioprocessing Association-An International Forum on Industrial Bioprocesses Award May 2019 Fellow of Biotech Research Society of India (BRSI) CG Memorial award, FRI Malviya Memorial award, BRSI Editor, Carbohydrate Polymers, Elsevier, UK Scientific panel member of FSSAI, New Delhi Member, Selection committee for promotions, BARC, Mumbai Member, Expert group in the area of secondary agriculture, Department of Biotechnology, Government of India Member, Subject Expert Committee (SEC) on Engineering & Technology (ET), WOS-A Scheme Department of Science and Technology, New Delhi Member, Subject Expert Committee (SEC) on Health, Food and Nutrition (HFN), WOS-B Scheme Department of Science and Technology, New Delhi Member, Scientific panel of FSSAI, New Delhi, on (i) Food Additives, Flavouring, processing Aids and Materials in Contact with Food, and (ii) Water (including flavoured water) and beverages (alcoholic and non-alcoholic) Life Member, Association of Food Scientists and Technologists (India) Life Member, Association of Carbohydrate Chemists and Technologists, India Member, Advisory Board, Trends in Carbohydrate Research, published by ACCT (I) Member, BIPP, BIG, SBIRI, SPARSH, BIRAP, and Secondary Agriculture/ Food Processing Entrepreneurial Network (SAEN) in Punjab, Department of Biotechnology, Government of India Member, Monitoring Committee on CSIR Mission on Nutritionals and Nutraceuticals Member, Technical Expert Committee (TEC) on Medicinal Aromatic Plants, Bioresource and Secondary Agriculture and Silk Biotechnology for NER, DBT, Government of India Special invitee, Expert Committee meeting of Engineering Sciences – NPDF, DST, Government of India

	Member, working group, Preparation of Teachers' Manual for Jeevan Kaushal (Life Skills) Curriculum, UGC, New Delhi
Prof. Smita S Lele	Woman Achiever Award given by Akhil Bharatiya Chitpawan Mahasangha, 2017 VASVIK Award 2017 Industrial research Award for Women Scientists 2017 Fellow of Indian Chemical Society 2020 AFST Fellow 2018) ICT-UAA Distinguished Fellow Member CSIR- Food and Safety Solution (Focus)2018-2020 Member, FIST program for science colleges, DST, 2017- 2020 ICT Coordinator, Unnat Bharat and Maharashtra Abhiyaan programme Life member of AFST, AMI, BRSI, IIChE, UAA
Prof. U. S. Annapure	President of Association of Food Scientist and Technologists, India 2021 Fellow of Maharashtra Academy of Sciences BOYSCAST Fellow Member, Board of Studies (BoS) for M.Sc. Food Technology at Defence Institute of Advanced Technology (Deemed University), Pune Member, Research and Recognition Committee in subject of food science and technology at Shivaji university Kolhapur, 2017- 18 Member, selection committee for promotion under CAS, Dr. Babasaheb Ambedkar Marathwada university Member, selection committee for promotion under CAS at North Maharashtra university, Jalgaon Member, RRC in the subject of chemical technology (food) at Dr. Babasaheb Ambedkar Marathwada university member, Research advisory committee, Indian Institute of food processing Technology (IIFPT, Tanjavur) Referee, for various national and international journal in the area of food science and technology Examiner for Ph.D. thesis of various universities in India Member, food additives sectional committee (FAD 8) at BUREAU of Indian Standard New Delhi Member, National Core group for broad subject matter area (BSMA), Indian council for education research (ICAR), New Delhi Member, committee for scrutinizing minor research proposal at Mumbai university Member, Selection committee for appointments of Assistant Professor at Shivaji University Kolhapur, Life Member, Association of Food Scientists and Technologists, India [(AFST (I)] Life Member, Association of Carbohydrate Chemists and Technologists of India (ACCTI)Life Member, Biotech Research Society of India (BRSI) Member, International Society of Food Engineering (ISFE), USA Life Member, UDCT Alumni Association
Prof. L. Ananathanarayan	Life Member, Association of Food Scientists and Technologists (India)Life Member, UDCT Alumni Association Member of Board of studies of Biotechnology Department of SIES College, Mumbai University Nominee on The Board of studies at Modern College, Vashi Member of Board of studies of Biochemistry Department of Sophia College for Women, Mumbai
Dr. S. S. Arya	TWAS Fellow Member, Global Young Academy, Halle, Germany, 2018 Member, Indian National Young Academy, INSA, Government of India New Delhi Member, National Science and Technology Innovation Policy, PSA, Government of India Local Executive Committee Member, Association of Food Scientists and Technologists (I), Mumbai Chapter Life Member, Biotechnology Research Society of India (BRSI), India Life Member, Association of Carbohydrate Chemists and Technologists of India

	Member, Society of Chemical Industry (SCI), London Member, International Society of Food Engineering (ISFE), Pullman, USA Member, OWSD, TWAS, Italy Member, CFT-PBN Alumni Association (CPAA), Mumbai
Dr. J. S. Gokhale	Joint Secretary, Association of Food Scientists and Technologists (India) (AFST(I)), Mumbai Chapter Life Member, Biotechnology Research Society of India (BRSI) Life Member, UDCT Alumni Association (UAA) Life Member Association of Food Scientists and Technologists (India) (AFST(I))
Dr. S. Chakraborty	Life Member for Association of Food Scientists & Technologists, India (AFST(I)) Member of Editorial Board for Journal of Food Engg & Tech, Tech Reviews, UK Panel member for Food Additives & Ingredients; Bureau of Indian Standards Recipient of Best PhD Thesis award across the country given by ICAR in June 2017. Recipient of DAAD Fellowship under Re-invitation program in MAY 2018. Recipient of Prof D.V. Rege–AFST Mumbai Chapter–2011 Endowment for Best Teacher Award 2018, 2020.

4.8 Research and Development (30) (Inst. Marks 30)

4.8.1 Academic Research (10) (Inst. Marks 10)

Faculty	Publications			Patents		Citations		Guidance	
	Publications in last 3 years (Scopus)	Research Article (from Scopus)	Book and Book Chapters	Granted	Applied	Total Citations (from Scopus)	h-index (Scopus)	Ph.D. Awarded	Ph.D. ongoing
Prof. Rekha Singhal	37	408	44	-	02	14662	56	42	12
Prof. Smita Lele	00	108	06	-	-	3460	29	38	00
Prof. Uday Annapure	59	139	07	01	01	3088	31	16	20
Dr. Laxmi Ananthanarayan	14	72	04	-	-	2892	21	16	11
Dr. Shalini Arya	31	86	04	-	-	1410	24	06	04
Dr. Snehasis Chakraborty	28	53	10	-	02	817	15	00	08
Dr. Jyoti Gokhale	09	09	05	-	-	62	05	00	02
TOTAL	190	857				24931	169		

Research Area of the Faculties

Faculty Name	Research Expertise
Prof. Rekha S. Singhal (Head, FETD & Professor of Food Technology)	• Carbohydrate chemistry • Food Chemistry • Traditional Foods • Supercritical fluid extraction of biomolecules • Fermentative production & Downstream Processing of Biomolecules
Prof. S. S. Lele (Emeritus Professor)	• Fruits and vegetable processing • Biological effluent treatments • Nutraceuticals
Prof. Uday S. Annapure (Director, ICT Marathwada Campus, Jalna and Professor of Food Chemistry)	• Carbohydrate Chemistry & Technology • Cold Plasma Processing • Traditional Foods • Fermentative production & Downstream Processing of Biomolecules
Prof. Laxmi Ananthanarayan (Coordinator, Food Biotechnology and Professor of Biochemistry)	• Human nutrition • Food packaging • Enzymes in the Food Industry
Dr. Shalini Arya (Assistant Professor)	• Traditional foods • Product development and processing of Cereals and legumes
Dr. Jyoti Sontakke-Gokhale (UGC Assistant Professor)	• Nutraceuticals and functional foods • Bio-catalysis • Waste management • Fermentative production & Downstream Processing of Biomolecules
Dr. Snehasis Chakraborty (Assistant Professor)	• Food Process Engineering • Kinetics modeling • Sensory analysis • Process optimization and Product development

4.8.2 Sponsored Research (10) (Inst. Marks 10)

Department Level

No.	Faculty	Project Name	Funding Body	Grant (in lakh)	Duration
1	Coordinator: Prof. R. S. Singhal	UGC-CAS II	UGC	₹ 206	2018-23
2	Coordinator: Prof. U. S. Annapure	FIST Grant	DST	₹ 98	2018-23
3	Coordinator: Prof. L. Ananthanarayan	MTech Food Biotechnology	DBT	₹ 33.8 ₹ 73.70	2020-21 2021-22
			Total =	₹411.5 lakhs	

Research Grant Received in 2021-22

Faculty	Project Title	Duration	Funding Agency	Amount (lakhs ₹)
Prof. U. S. Annapure (PI) & Dr. J. S. Gokhale (CO-PI)	Integrated approach for Utilization of Mango Processing waste	2021-2024	RGSTC	67.54
Prof. R. S. Singhal (PI) & Dr. J. S. Gokhale (CO-PI)	Resolving gaps in Scaling up Millet Value chain	2021-2023	MOFPI	8.15
Prof. U. S. Annapure (PI)	UGC-BSR Mid-Career Award Grant	2021-2022	UGC	10.0
	Total			85.69

Research Grant Received in 2020-21

Faculty	Project Title	Duration	Funding Agency	Amount (lakhs ₹)
Prof. U. S. Annapure	On-site Multi-ion monitoring system for on-line nutrient-laden water control in vertical hydroponic systems	2021-2023	Indo-German Science & Technology Centre	192.027
Dr. S. Chakraborty	Optimizing the fermentative production of dextran	2021-2024	CSIR	16.14
Prof. U. S. Annapure (Coordinator) Dr. S. Chakraborty (Co-coordinator)	PURSE Program	2021-25	DST	2400
	Total			2608.167

Research Grant Received in 2019-20

Faculty	Project Title	Duration	Funding Agency	Amount (lakhs ₹)
Prof. U. S. Annapure	Studies on frying performance of palm olein vis-a vis sunflower oil as frying medium under household frying conditions	2019-2021	Malaysian Palm Oil Board, Malaysia	20.3
	Total			20.3

4.8.3 Development activities (5) (Inst. Marks 05)

Renovation of Laboratory

- Prof. DV Rege Centre for Advanced Food Technology is sponsored by HIMEDIA Lab, India (58 lakhs)
- The food Analysis lab and PTC Research lab have been renovated by Goodwill Industries Ltd., India (13 lakhs)
- The fermentation lab and Conference room are sponsored by Fine Organics Ltd., India (53 lakhs)
- The food Processing lab is sponsored by Dr. Shrikhande (10000 USD)
- Research lab 283 is sponsored by Morde Foods (48 lakhs)

Infrastructural Facility

- All the faculties have their individual cabins.
- All classrooms are equipped with white/blackboard, computer, internet, projectors, and a biometric attendance system
- All the computers in the department are equipped with relevant software and internet facility
- During a pandemic, Internet speed increased from 50 Mbps to 100 Mbps
- G suit and zoom licenses for all departments
- Off-campus online access to library

Product Development

- Some of the products like instant Vegetable Soup are being developed in the department and marketed under the brand name 'Just Sip'.
- Further development of 'Fruit Wine' is presently underway.
- As per the course curriculum, B. Tech. final year students need to develop new products such as health supplements, Nutraceuticals and their standardization & development of protocols for some of the Indian Traditional Food products

Development of Facility

Instruments Available in the Department

- Extruders
- Tray and IR dryer
- Fluidized bed dryer
- Fermenter
- High pressure homogenizer
- Ultrasonic processor
- Pulsed Light System
- Spray dryer
- HPLC, HPTLC, SCFE
- GC, GCMS
- Texture Analyzer
- Electrophoresis unit
- Protein purification
- Ultrafiltration
- Microwave extractor
- RT-PCR
- Viscometers
- Colorimeter
- CAP/MAP
- Retort Processing
- Differential Scanning calorimetry
- Plasma Processing

Manpower Generated in last 3 Years	
Graduated Students	Research Outcome
• Bachelor Degree : 48 • Masters Degree : 78 • Doctorates : 8	• Research Publications : 190 • Technology Transfer : 1 • Patents Granted : 1 • Patents Applied : 4

Connection across the Globe	
Collaboration within India	International Collaboration
• BARC • TIFR • IIT Bombay • NCL, Pune • ACTREC, Mumbai • IIT Kharagpur • ICRISAT Hyderabad • CDRI Lucknow	• Penn State University, USA • Washington State University, USA • Rutgers University, USA • Queens University, Belfast • University of Saskatchewan, Canada • University of Reading, UK • Aalto University, Finland • Paul-Elrich Institute, Germany • Hohenheim University

MoU with Industry and Universities

- Washington State University
- Tata Chemicals
- Hindustan Unilever
- Trilok Food India
- Praj Industries Pune

4.8.4 Industry Sponsored Research/Consultancy (5) (Inst. Marks 5)

Industry Sponsored Research / Consultancy in 2021-22

No.	Faculty	Project Title	Duration	Funding Agency	Amount (lakhs ₹)
1	Dr. J. S. Gokhale	Value added products from seaweed & its applications	2021-2024	Pragati Biotech	16.08
2	Prof. U. S. Annapure	Extraction of Pectin from Citron	9 months (2021-22)	Global Mercantile Pvt. Ltd., Mumbai	9.25
3	Prof. U. S. Annapure	Development of bioactive-enriched millet-based functional beverages	Feb – Aug 2022	Eterno Foods Pvt. Ltd., Nagpur	3.98
		Total			29.31

Industry Sponsored Research / Consultancy in 2020-21

No	Faculty	Project Title	Duration	Funding Agency	Amount (lakhs ₹)
1	Dr. J. S. Gokhale (PI) & Dr. S. Chakraborty (CO-PI)	Development of plant based milk product	2020-2021	Vegannovative Solution Pvt. Ltd. Bengaluru	6.43
2	Dr. J. S. Gokhale	Characterization and application of extracted proteins	2020-2021	Praj Industries Pvt. Ltd.	5.31
3	Prof. U. S. Annapure	Plant and Mushroom based products	2020-2021	Zuari Foods & Farms Ltd.	4.00
4	Prof. U. S. Annapure	Identifying and Evaluating various natural non-nutritive sweeteners in food industry	2021-2024	Orcharnd Brands	28.00
		Total			43.74

Industry Sponsored Research / Consultancy in 2019-20

S. No	Faculty	Project Title	Duration	Funding Agency	Amount **(lakhs ₹)**
1	Prof. U. S. Annapure	Development of ready to eat custard	2019-2020 (6 months)	Vita Nutrics Foods and Feeds Pvt Ltd.	6.05
2	Prof. U. S. Annapure	Prebiotic Study on K-Ber100 Dietary Fiber using Selected Probiotic Strains	2019-2020 (6 months)	Aditya Birla Science & Technology Company Pvt Ltd, Mumbai	8.55
3	Prof. U. S. Annapure	Utilization of Mango Waste for Byproducts Development	2019-2020 (6 months)	Exotic Fruits Pvt. Ltd., Mumbai	6.93
4	Prof. U. S. Annapure	Development of Non-dairy Cheese	2019-2020 (6 months)	Mad Parsee LLP, Mumbai	4.65
5	Prof. U. S. Annapure	Plant and Mushroom based Product	2019-2020 (6 months)	Kurade Kraft Foods Pvt. Ltd./Tropical Mushrooms (Goa) Pvt. Ltd., Goa	4.00
6	Dr. S. Chakraborty	Development of plant-based egg alternative	2019-2020	Shivanika Foods Pvt. Ltd.	3.87
		Total			34.05

4.9. Faculty Performance Appraisal and Development System (FPADS) (5)

(Inst. Marks 05)

- The Food Engineering and Technology Department has a culture of doing industrial research and provides solutions to real-life problems. The outputs of the research are being effectively implemented in the curricula where students are benefited directly from the first-hand knowledge from these research activities.

-Our faculty members were already shouldering the administrative activities in the capacity of Registrar of the institute, Dean (Research, Consultancy, and Resource Mobilization), Director of the Jalna Campus, Wardens for the girls' hostels on campus, Course coordinators, Nodal officer and many more.

-A well-defined self-appraisal system is implemented effectively. A screenshot of the Performance-Based Appraisal Form is given below. The Head of the department evaluates every faculty member based on their performance each year.

वे.का.मु.-५,००,०००-२-२००६-एएलए३*-(एच)३४८
शा.नि.,सा.प्र.वि.,क्र. सीएफआर-१२९५/प्र. क्र. ३६/९५/१३, दि. १-२-९६;
शा.नि.,सा.प्र.वि.,क्र. सीएफआर-१२९८/प्र. क्र. २/तेरा, दि. १९-३-९९;
शा.पत्र,सा.प्र.वि.,क्र. सीएफआर-१२९८/प्र. क्र. २/तेरा, दि. २६-३-९९;
क्र. सीएफआर-१२०१/३८२/तेरा, दि. ७-५-२००२ अन्वये सुधारित.]

परिशिष्ट-ब (भाग-२)

गट ''अ'' ते गट ''क'' चे शासकीय अधिकारी / कर्मचारी यांच्यासाठी गोपनीय अहवालाचे स्वयंमूल्यनिर्धारण अहवाल प्रपत्र

स्वयंमूल्यनिर्धारण अहवाल लिहिणाऱ्या अधिकाऱ्यांना / कर्मचाऱ्यांना सूचना

१. जर उद्दिष्टे ठरवून देण्यात आली असतील तर ती उद्दिष्टे सर्वसाधारण सूचनांनुसार अथवा विशेष सूचनांनुसार ठरवून देण्यात आली होती का आपापसातील चर्चेनुसार ठरविण्यात आली होती.

२. सर्व दैनंदिन कामाची यादी येथे देऊ नये. फक्त ठळक, वैशिष्ट्यपूर्ण व उल्लेखनीय कामगिरीचा उल्लेख करावा. (उद्दिष्टे ठरवून देण्यात आली असल्यास उद्दिष्टांचा संदर्भ देऊन) संदिग्ध विधाने टाळावीत व नेमके विधान करावे.

३. तुमच्या कामगिरीबाबतचे तुमचे अभिप्राय दिलेल्या जागेएवढेच मर्यादित ठेवावेत. काहीही सहपत्रे त्यास जोडू नयेत. ती गोपनीय अहवालाच्या नस्तीत ठेवली जाणार नाहीत व कर्मचाऱ्यास परत करण्यात येतील.

४. ''मी माझ्या वरिष्ठांचे समाधान / पूर्ण समाधान होईपर्यंत काम केले'' किंवा ''वरिष्ठांना माझे काम नावाजले'' अशी किंवा अशा सारखी विधाने करू नयेत. अशी विधाने केल्यास ती दुर्लक्षित करण्यात येतील.

५. स्वयंमूल्यनिर्धारण अहवाल अर्ध्या पानातच लिहावा.

६. स्वयंमूल्यनिर्धारण अहवाल अधिकारी / कर्मचारी यांनी त्यांना प्राप्त झाल्यापासून १५ दिवसांच्या आत प्रतिवेदन अधिकाऱ्याकडे द्यावा.

प्रतिवेदन अधिकाऱ्यांना सूचना

१. गोपनीय अहवाल लिहिताना कर्मचाऱ्यांनी भाग-३ मध्ये लिहिलेल्या स्वयंमूल्यनिर्धारण अहवाल विचारात घ्यावा व तसा तो घेतला गेला असल्याचा विशिष्ट उल्लेख गोपनीय अहवालात करण्यात यावा.

२. वरील सूचना क्रमांक ६ अनुसार स्वयंमूल्यनिर्धारण अहवाल प्राप्त न झाल्यास प्रतिवेदन अधिकारी स्वत: गोपनीय अहवाल लिहू शकेल.

३. प्रतिवेदन अधिकाऱ्यांनी गोपनीय अहवालाच्या प्रपत्रात दिलेल्या पर्यायांपैकी एक पर्याय निवडून त्याभोवती वर्तुळ करावे. उदा. अ.क्र.४ उद्योगप्रियता व कार्यतत्परता या समोर उत्कृष्ट असे शेरे द्यावयाचे असल्यास ते खालीलप्रमाणे देण्यात यावेत.

अत्युत्कृष्ट (उत्कृष्ट) चांगले साधारण साधारणपेक्षा कमी

४. मागासवर्गीय अधिकारी / कर्मचारी यांना येणाऱ्या अडचणी समजून घेऊन त्या दूर करण्याच्या दृष्टीने अधिकारी / कर्मचारी यांनी केलेले प्रयत्न व त्यांच्याबाबतचा दृष्टिकोन याबाबतची नोंद परिशिष्ट ''ब'' (भाग-४) मधील बाब क्रमांक १० येथे नमूद करावी.

५. (अ) गोपनीय अहवालाच्या प्रपत्रातील बाब क्र. ३, ९, १०, ११ व १८ या समोरील शेरे, तसेच प्रतवारी स्वत:च्या हस्ताक्षरात लिहावी.

(ब) प्रतवारी नमूद करताना ती अहवालातील रकान्यासमोरील अभिप्रायाशी मिळती जुळती राहील याची दक्षता घ्यावी.

(क) अत्युत्कृष्ट शेरे नोंदविताना गोपनीय अहवाल काळातील कर्मचाऱ्याच्या कामकाजाच्या मूल्यांकनासाठी ठेवलेल्या कच्च्या टिपणावरून (Ephemeral Roll) अत्युत्कृष्ट शेऱ्याच्या पृष्ठ्यर्थ वस्तुस्थितीदर्शक समर्थन गोपनीय अहवालात देणे आवश्यक आहे.

(ड) साधारण, सर्वसाधारण, बरा, ठीक, सुमार या शेऱ्यांची वर्गवारी प्रतिकूल स्वरुपाची असल्याचे प्रतिवेदन अधिकाऱ्यांनी लक्षात घ्यावे.

पुनर्विलोकन अधिकाऱ्यांना सूचना

१. अधिकारी / कर्मचारी यांच्या कामाबाबतची प्रतवारी लिहावी.

२. प्रतवारी नमूद करताना ती अहवालातील रकान्यासमोरील अभिप्रायाशी मिळती जुळती राहील याची दक्षता घ्यावी.

३. अत्युत्कृष्ट शेरे नोंदविताना त्यांच्या पृष्ठ्यर्थ वस्तुस्थितीदर्शक समर्थन नोंदवावे.

-Since Sep 2021, a revised career advancement scheme (CAS) has been implemented by the institute which includes the 360-degree feedback as given below. Every activity has been assigned specific marks. In this way, these activities are recognized and rewarded during the promotion.

ANNEXURE - B

Institute Notification No. CAS Policy/7th pay commission/95/2021, **dated 1st September, 2021**

CALCULATION OF 360⁰ FEEDBACK SCORE

Name	
Present Position	
Period of Assessment	

a. Teaching Process (maximum points 25)

SN	Semester	Course Code/ Name	No. of scheduled classes	No. of actually held classes	Points earned (x/25)	Enclosure
1						
2						
		Total				

***Refer Annexure – 1**

b. Students feedback (maximum points 25)

SN	Semester	Course Code/ Name	Average student feedback on the scale of 25	Enclosure No.
1				
2				
		Total average		

***Refer Annexure – 2**

c. Departmental activities (maximum points 20)

Sr. No.	Semester	Activity	Credits	Criteria	Enclosure No.
1					
2					

***Refer Annexure – 3**

d. Institutional activity (maximum points 20)

Sr. No.	Semester	Activity	Credits	Criteria	Enclosure No.
1.					
2.					

***Refer Annexure – 4**

e. Annual Confidential Report (maximum points 10)

Sr. No.	Year	Activity	Credits	Criteria	Enclosure No.
1.					
2.					

***Refer Annexure –5**

Page **11** of **23**

RRD

4.10. Visiting Faculty/Adjunct/Emeritus Faculty etc. (10) (Inst. Marks 10)

Visiting Faculty

Sr. No	Faculty	Subjects	2021-22 (CAY)	2020-21 (CAYm1)	2019-20 (CAYm2)
1	Dr. Vilas Shirhatti	Nutraceuticals and Functional Foods	30	30	30
2	Dr. Hormaz Patva	Food Chemistry	30	-	45
3	Dr. Swati Singh	Food chemistry	30	15	-
4	Dr. Nirali Shah	Food Additives and Ingredients	30	30	15
5	Dr. N Ramasubramaniam	Introduction to Food Science and Technology	15	15	15
6	Dr. Jyoti Baliga	Technology of Dairy, Animal and Plantation Products Comprehensive Technique in Food Analysis Elective I: Food Packaging Science and Technology	60	45	45
7	Shubha Nishtala	Food Standards and Safety Regulations	30	30	45
8	Prof. K. Niranjan	Advances in Food Engineering	15	15	15
9	Dr. Laxmi Jayachandra	Principle of Food Preservation Food Process engineering	60	-	-
10	Dr. Vivek Shukla	Technology of Dairy, Animal and Plantation Products	15	-	-
11	Dr. Veena Yardi	Advances in Nutrition Elective-I: Basic Human Nutrition	30	30	-
12	Dr. Ninad Pandit	Bioprocess engineering and Technology Elective I: Bioprocess Engineering and Technology	15	15	15
13	Dr. Sagar Gokhale	Fundamentals of Food Engineering	15	15	15
14	Dr. Shantanu Samant	Biotechnology of Fermented Foods	30	-	-
15	Dr. Rachana Giara	Industrial Management 2	45	45	45
17	Dr. A V Joshi	Environmental Science and Technology	45	30	30
18	Dr. Rohini Sharma	Food Safety Quality and Regulations	15	15	-
19	Dr. JR Bandekar	Food Safety and Toxicology	15	15	15
		Cumulative classes/ year	525	390	330
Marks obtained (1+3+3+3+3=10)					

Adjunct Faculty

Prof. Mukund Karwe
Dean of International Programs,
Dept of Food Science
Rutgers University, USA
Editor, Journal of Food Engineering

Prof. R.C. Anantheswaran
Professor of Food Engineering &
Director for Education by Non-Traditional Delivery
Penn State University, USA
Editor, International Food Research Journal

Prof. K. Niranjan
Professor of Food Bioprocessing
University of Reading, UK
Editor, Journal of Food Engineering

Prof. Shyam S. Sablani
Associate Department Chair
Biological Systems Engineering
Washington State University, USA
Editor, Journal of Food Science

Prof. Kalidas Shetty
Associate Vice President for International Partnerships
Plant Metabolism and Food Security
North Dakota State University, USA
Editor Journal Food Science and Technology

Emeritus Faculty

Prof. Smita S. Lele
Emeritus Professor
M.Chem.Engg., Ph.D.Tech. FMASc, FBRS, FAFST, FICS
(Former Director, ICT Marathwada Campus, Jalna)
Institute of Chemical Technology
Nathalal Parekh Marg, Matunga
Mumbai 400019 India

CRITERION 5	Resources	75

5.1. **Adequate and well-equipped laboratories, and technical manpower (25)** **(Inst. Marks 25)**

Sr. No.	Name of the Laboratory	No. of students per setup (Batch Size)	Name of the important equipment	Weekly utilization status (All the courses for which the lab is utilized)	Technical Manpower support		
					Name of the technical staff	Designation	Qualification
1.	Food Technology Lab (Biochemistry Lab I & II; Microbiology Lab I & II)	16 (1 student / group)	1. Spectrophotometer 2. Oven 3. Autoclave 4. Cyclomixer 5. Microscopes 6. Balance 7. Hot plates	2 × 4 hours	Ms.S. R. Dhakne	Lab Assistant	B.Sc. (Chemistry)
					Mrs.S. S. Jadhav	Lab Technician	B.Sc. (Chemistry)
2	Food Analysis Lab (Technical Analysis Lab I & II; Food Analysis Chemical Lab)	16 (1 student / group)	1. Oven 2. Distillation unit 3. Gerber centrifuge 4. Fuming hood 5. Balance	3 × 4 hours	Mrs.C.B. Koli	Lab Assistant	B.Sc. (Physics)
					Mrs.S. S. Jadhav	Lab Technician	B.Sc. (Chemistry)
3	Food Processing Lab (Food Processing Lab I, II & III)	16 (2 students / group)	1. Coating pan 2. Planetary mixer 3. Sheeter 4. Pulper 5. Refractometer 6. Grinding mill	2 × 4 hours	Ms.S. R. Dhakne	Lab Assistant	B.Sc. (Chemistry)

			7. Cryostat 8. Juicer 9. Lab oven 10.Refridgerator 11.Conventional oven 12.Lab oven 13.APV Homogenizer 14.Colloidal mill		Mrs.S. S. Jadhav	Lab Technician	B.Sc. (Chemistry)
4	Chemical Engineering Lab	16 (2 students / group)	1.Unit Operations 2.Heat Transfer 3.Fluid Flow 4.Reaction Engineering 5.Mass Transfer Process Control	3 × 4 hours	Mr. P.P.Bhole	Lab Assistant	S.S.C.
					Mr. V. Bhambid	Lab Assistant	B.Sc. (Chemistry)
					Mrs. S. Kurande	Lab Assistant	M.Sc. (Chemistry)
5	Physical Testing Lab	40* (2 students / group)	1. BOD -BOD Track-B050C003849, 2. COD tester- Reactor and photometer-DR 900-DRB 200, 3. Moisture Balance 4. Ma-150, Fabric Conductivity 5. 8099 Resistivity Test Fixture, Static Charge Model 156a Charged Plate Monitor System, 6. Crease recovery testing 7. Spectrophotometer 8. Stiffness tester 9. Drape tester, 10.Sublimation fastness tester, 11. Water spray for water repellency tester.	3 × 4 hours	Mr. S. Gaikwad	Lab Assistant	H.S.C.

6	Inorganic Chemistry Lab	40* (2 students / group)	1. UV- Spectrophotometer 2.pH Meter 3.Ice making machine 4.Potentio meter	3 × 4 hours	Mr. A. P. Patil	Lab Assistant	H.S.C.
7	Organic Chemistry Lab	40* (2 students / group)	1. Buchner filter assembly 2. Fuming Hood 3. Ion Exchange Chromatography 4. Hot Air Oven	3× 4 hours	Mr. P.S. Gaikwad	Lab Assistant	Graduate
8	Physics Lab	40* (2 students / group)	1. Pieso Meter 2. Manometer 3. Hall Effect 4. Newton Ring 5. Lees Disk 6. Ultrasonic Interferomer	2× 4 hours	Mr. P. Nikam	Lab Assistant	Graduate
9	Electrical and Electronics Engineering Lab	40* (2 students / group)	1. Starters 2. Transformer 3. Ammeter 4. Voltameter 5. Watts Meter	3× 4 hours	Mr. P. Jadhav	Technician and Instrument mechanic	S.S.C.
10	Engineering Applications of Computers	40* (1 students / group)	1. Computers	3× 4 hours	Information processing center (IPC) team led by systems engineer Ms. Madhuri Shete	Systems Engineer	Graduate
					Mr. Yogesh Raut	Lab Assistant	Graduate
					Mr. Abhishek Ghadi	Lab Assistant	Graduate

Table B.5.1

*Combined batch with other B.Tech branches

5.2. **Laboratories maintenance and overall ambiance (5)** **(Inst. Marks 05)**

1. Laboratories are spacious, well-ventilated and the overall atmosphere is conducive towards learning. The well-furnished and well-equipped laboratory set-ups are the state-of-the-art facilities, specially designed to culminate a sense of research and professional attitude in students.
2. Lighting system is very effective, along with the natural light in every laboratory.
3. Whiteboards are provided in all laboratories to demonstrate the experimental methodologies to the students.
4. The machines are arranged so that the students can be accommodated comfortably. The area of each laboratory is sufficiently high as per the requirement of machine size.
5. Each student is provided with the individual sets of apparatus and a working desk. Some practical are performed in groups. However, not more than two students are grouped together, so that each and every student have a complete hands-on experience and a clear understanding of the experiment being carried out. Also, it is made sure that the analytical tests involved in the practical are carried out by every student and the results are well documented separately. Timely checking of journals ensures well updated lab records.

6. At least one lab assistant and one lab attendant are always present during the practical sessions. They ensure that all the requirements of the experiments such as chemicals, apparatus, equipment's, samples etc. are made available to all students at the ease. Well trained and qualified lab technicians are available for maintenance of equipment on regular basis in all the laboratories. It is ensured that the deputed technical staff has sufficient skills for handling the equipment and software pertaining to that particular laboratory.
7. Service, cleaning and maintenance of equipment is carried out regularly. Periodic lubrication of machines is must to avoid tare of machine. Calibration of laboratory equipment's is done by the lab technicians regularly. Minor repairs are carried out by the technical staff of the department based on available resources and expertise. Major repairs are outsourced by following the procedure of the Institute.
8. All laboratories are open for students and faculties for research
9. The Department has a couple of funded research laboratories. Students and faculty members are always encouraged to carryout research in these exclusive research laboratories. However, the research work is not constrained only to these laboratories.

10. The records of the consumables and chemicals are updated timely. Procurement and maintenance of lab facilities is very well taken care by the support staff. In case of any equipment or instrument breakdown, prompt actions are taken by the support staff for the repair activities.
11. All laboratories have integrated safety measure according to the type of experiments being carried out. The support staff and the teachers ensure that all the safety protocols are followed by all the students while working in the lab.
12. The waste generated in the labs is well segregated and disposed off properly. Organic solvent waste is also collected separately and sent for disposal. Activities, emitting any toxic fumes are carried out strictly in fume hood ensuring proper safety. Empty bottles of chemicals are thrown out in every month.

5.3. **Safety measures in laboratories (5)** **(Inst. Marks 05)**

Students are instructed to follow

- **Personal protection**
  - Always wear safety glasses when in the lab.
  - Always wear closed shoes and lab coats.
  - Use Nitrile gloves (Blue coloured) when handling most organic chemicals.
  - Use long acid resistant rubber gloves and a facemask when handling acids
  - Fire extinguisher near all the labs.
- **Broken Glass handling**
  - Sweep up the broken glass right away
  - Don't walk around with broken glass on the floor until the end of the class
  - Dispose of the broken glassware in the cardboard carton kept for that purpose. If one is not available, ask the person in charge
- **Usage of fume hood for concentrated chemicals**
- **Maintaining proper hygiene**
- **Separate disposal of toxic and hazardous chemicals**

Sr. No.	Name of the Laboratory	Safety measures
1	Food Technology Lab	1. Compulsory lab apron 2. Shoes, masks, gloves wherever necessary 3. Fire Extinguishers (A, B, C) 4. Well insulated electric wires and switches
2	Food Analysis Lab	1. Compulsory lab apron 2. Shoes, masks, gloves wherever necessary 3. Use of fume hood in experiments involving volatile chemicals 4. Fire Extinguishers (A, B, C) 5. Well insulated electric wires and switches 6. No un-attended flames and heating ops
3	Food Processing Lab	1. Proper care of electrical switches and wires 2. Shoes, masks, gloves wherever necessary 3. Fire Extinguishers (A, B, C) 4. Well insulated electric wires and switches
4	Computer Laboratory (IPC)	1. Proper care of electrical switches and wires 2. Fire Extinguishers (A, B, C)
5.	Physical testing lab	1. Compulsory lab apron 2. Shoes, masks, gloves wherever necessary 3. Use of fume hood in experiments involving volatile chemicals 4. Fire Extinguishers (A, B, C)

		5. Well insulated electric wires and switches 6. No un-attended flames and heating ops
6	Engineering Graphics	1. Proper handling of drawing boards 2. Fire Extinguishers (A, B, C)
7	Physics Laboratory	1. Avoid spillage 2. Compulsory lab apron 3. Shoes, masks, gloves wherever necessary 4. Fire Extinguishers (A, B, C)
8	Inorganic Chemistry Lab	1. Avoid spillage 2. Compulsory lab apron 3. Shoes, masks, gloves wherever necessary 4. Fire Extinguishers (A, B, C) 5. Careful handling of chemicals and glassware 6. No unattended flames and heating ops
9	Organic Chemistry Lab	1. Avoid spillage 2. Compulsory lab apron 3. Shoes, masks, gloves wherever necessary 4. Fire Extinguishers (A, B, C) 5. Careful handling of chemicals and glassware 6. No unattended flames and heating ops
10	Electrical Engineering and Electronics Lab	1. Careful handling of machines 2. Shoes, masks, gloves wherever necessary 3. Proper wire connections and permission from supervisor before using any electrical connections 4. Fire Extinguishers (A, B, C)

Table B.5.3

5.4. **Project laboratory (15)** **(Inst. Marks 15)**

List of Food Department Instruments

Sr. No	Name of Instrument	Make	Lab Name
1	Autoclave (Big)	Local make	Instrument Room
2	Oil/ Water Bath Shaker (Big)	Global Corp.	Instrument Room
3	Water Bath Shaker	Local make	Instrument Room
4	Autoclave (Small)	Local Assemble	Instrument Room
5	Environmental Test Chamber	Remi Instruments Ltd.	Instrument Room
6	-20 Freezer	Blue Star	Fermentation lab
7	96- Well Plate Spectrophotometer	Biotech	DVR Lab
8	Cyclo Mixer (Vortex)	Remi	DVR Lab
9	HPLC	Dionex	DVR Lab
10	HPLC	Jasco	DVR Lab
11	Microwave Oven (Power Solo 20)	Onida	DVR Lab
12	PCR	Techne	DVR Lab
13	PCR	Bio Rad	DVR Lab
14	PCR	Bio Rad	DVR Lab

15	Protein Purification Fraction Collector	Bio Rad	DVR Lab
16	Rheometer	(Brookfield)	DVR Lab
17	Sonicator	Local	DVR Lab
18	Weighing Balance	Sartorius	DVR Lab
19	Weighing Balance	Sartorius	DVR Lab
20	GC	Agilent Technologies	DVR Lab
21	Weighing Balance	Sartorius	DVR Lab
22	Gel Doc	Bio-Rad	DVR Lab
23	Hunter lab Colorimeter	Hunter lab	DVR Lab
24	Extruder	Brabender	Extruder Room
25	Biomedical Freezer	Sanyo	Fermentation Lab
26	Laminar	Microfield	Fermentation Lab
27	Millipore Lab Scale Tff System	Millipore	Fermentation Lab
28	Orbital Shaking Incubator	Remi	Fermentation Lab
29	Real Time PCR	Applied Bio systems	Fermentation Lab
30	Water Purification System	Sartorius	Fermentation Lab
31	Water Purification System	Borosil RO	
32	Fermenter- (Bio stat B Plus)	Sartorius	Fermentation Lab
33	Cryostat Bath	Fourtech	Fermentation Lab
34	Differential Scanning Calorimeter	Shimadzu	Instrumentation Room
35	Freeze (-20 °C)	Pooja Lab Equipment	Instrumentation Room
36	Freeze (-20 °C) –	Blue Star	Instrumentation Room
37	HPTLC	CAMAG - Anchrom	Instrumentation Room
38	Laminar Air Flow	Micro-Med India	Instrumentation Room
39	Microscope	Motic	DVR
40	Differential Scanning Calorimeter	Shimadzu	Instrumentation Room
41	Projection Microscope	Mvtex	Instrumentation Room
42	Rotary Shaker	Remi	Instrumentation Room
43	Texture Analyzer	Stable Microsystems	Instrumentation Room
44	UV-Vis Spectrophotometer	Shimadzu	Instrumentation Room
45	UV-Vis Spectrophotometer	Hitachi	Instrumentation Room

46	Centrifuge (J2-MC)	Beckmann	Instrumentation Room
47	IR Spectrophotometer	Buch Scientific	Instrumentation Room
48	UV Spectrophotometer	Thermo	Instrumentation Room
49	Autoclave	Local	Lab-A211
50	Distillation Unit	Local	Lab-A211
51	Dryer	Roche	Lab-A211
52	Magnetic Stirrers	Remi	Lab-A211
53	Orbital Shaker	Orbi-tek	Lab-A211
54	Oven	Expo Hitech	Lab-A211
55	Oven	Expo Hi Tech	Lab-A211
56	pH Meter	Thermo Fisher	Lab-A211
57	Refrigerator	Godrej	Lab-A211
58	Refrigerator	Sanyo	Lab-A211
59	Rocker Shaker	Neolab	Lab-A211
60	Rotary Evaporator	Ika	Lab-A211
61	Vacuum Pump	Today's	Lab-A211
62	Centrifuge	Remi	Lab-A211
63	Cyclo Mixer	Remi	Lab-A211
64	ISE Benchtop Meter	Thermo Fisher	Lab-A211
65	Shaker Incubator	Remi	Lab-A211
66	Centrifuge	Remi	Lab-A213
67	Map Cap	Reepack	Lab-A213
68	Refrigerator	LG	Lab-A213
69	Refrigerator	Godrej	Lab-A213
70	Shaker Algae Bacteria	Orbitech	Lab-A213
71	Vortex	Remi	Lab-A213
72	Water bath	Expo	Lab-A213
73	Shaker RT	Remi	Lab-A213
74	Gel Doc	Bio-Rad	Mol. Bio Lab
75	Heating Block	Neolab	Mol. Bio Lab
76	Magnetic Stirrer	Remi	Mol. Bio Lab
77	Rocking Platform	Neolab	Mol. Bio Lab
78	UV Transilluminator	UVP	Mol. Bio Lab
79	Vortex	Remi	Mol. Bio Lab
80	Nanodrop	Thermo	Mol. Bio Lab
81	Gel Doc	Bio-Rad	Mol. Bio Lab
82	Heating Block	Neolab	Mol. Bio Lab
83	Magnetic Stirrer	Remi	Mol. Bio Lab
84	Rocking Platform	Neolab	Mol. Bio Lab
85	UV Transilluminator	UVP	Mol. Bio Lab
86	Vortex	Remi	Mol. Bio Lab
87	Nanodrop	Thermo	Mol. Bio Lab

88	Cooling Centrifuge	Remi	Lab–A218
89	Hot Air Oven	Tempo	Lab–A218
90	Hot Plate	Biotechnique India	Lab–A218
91	Hot Plate	Schott India	Lab–A218
92	Incubator	Thermolab	Lab–A218
93	Refrigerators – 2	Godrej	Lab–A218
94	Ultrafiltration Unit	Millipore	Lab–A218
95	Vacuum Pump	Local	Lab–A218
96	Vortex Mixers -2	Remi	Lab–A218
97	Water bath	Lab Enterprises	Lab–A218
98	Fume Hood	Lab Guard	Lab-A218
99	Rotavap	Buchi	Lab-A218
100	Centrifuge Superfin R-V/FA	Plasto Crafts	PTC Lab
101	Fridge	Godrej	PTC Lab
102	Fridge (- 80 Freezer)	Sanyo	PTC Lab
103	Fridge (-20)	Kelvinometer	PTC Lab
104	Hot Plate	Bio Techniques India	PTC Lab
105	Low Temperature Water Bath	Imovotive	PTC Lab
106	Magnetic Stirrers with Hot Plate	Remi Equipments	PTC Lab
107	pH Meter with Magnetic Stirrer	Equiptronics	PTC Lab
108	Plant Growth Chamber	Wadegoti Industries	PTC Lab
109	Reflux Unit	Sunbim	PTC Lab
110	Vacuum Oven	Vacucell	PTC Lab
111	Vortex Meters	Remi	PTC Lab
112	Weighing Balance (250 G)	Wensar	PTC Lab
113	Weighing Balance (7 G)	Citizen	PTC Lab
114	Vacuum Drier	Sakova Scientific	PTC Lab
115	Ultrafiltration Unit	Millipore	PTC Lab
116	Freeze (-80 °C)	Pooja Lab Equipment	PTC Lab
117	Incubator Shaker	Orbitech	PTC Lab
118	Room Temperature Shaker	Biosystem Scientific	PTC Lab
119	Vacuum Drier	Sakova Scientific	PTC Lab
120	Hot Air Oven	Aditi Associates	PTC Lab
121	Weighing Balance	Atco	PTC Lab
122	pH Meter with Stirrer	Equpitronics	PTC Lab
123	DI Water Unit	Siemens	PTC Lab
124	Weighing Balance	Atco	PTC Lab
125	DI Water Unit	Siemens	PTC Lab

126	Ultrasonic Homogenizer (Probe Sonicator)	Athena Technology	PTC Lab
127	Microwave Ultrasonic Synthesis Extraction Reactor	Nuwav-Pro	PTC Lab
128	Ph Meter with Stirrer	Equpitronics	Lab-A283
129	Hot Air Oven	Expe Hi-Tech	Lab-A283
130	Kel Plus	Kjeldahl Unit	Lab-A283
131	Moisture Balance	Advance H-3a	Lab-A283
132	Muffle Furnace	Classic Scientific	Lab-A283
133	Shear Homogenizer	Dimmerstat	Lab-A283
134	Socs Plus	Pelican Equipments	Lab-A283
135	Water Bath	Sakova Scientific Co.	Lab-A283
136	Weighing Balance	Contech	Lab-A283
137	Ph Meter with Stirrer	Equpitronics	Lab-A283
138	Fibra Plus	Pelican Equipments	Lab-A283
139	Coating Pan	Hally Instruments	Processing Lab
140	Colloidal Mill	Hally Instruments	Processing Lab
141	Conventional Oven	Garbin	Processing Lab
142	Cryostat Bath	Modern Industries Corporation	Processing Lab
143	Falling Film Evaporator	Arrowhead Separation Engg.	Processing Lab
144	Grinding Mill	Local	Processing Lab
145	Homogenizer	EMTEK Instruments	Processing Lab
146	Homogenizer (APV)	Gaulin	Processing Lab
147	IR Dryer	GEL Engg.	Processing Lab
148	Juicer	Local	Processing Lab
149	Mini Boiler	Elite Engg.	Processing Lab
150	Oven	Hally Instruments	Processing Lab
151	Planetary Mixer	Local	Processing Lab
152	Pulper	Local	Processing Lab
153	Refrigerator	Samsung	Processing Lab
154	Retort	Laxmi Engg.	Processing Lab
155	Sealing Machine	Pakona Engg.	Processing Lab
156	Sheeter	Amba Roll Matic	Processing Lab
157	Tray Dryer	Local	Processing Lab
158	Weighing Balance	Survivor	Processing Lab
159	Oil Extraction Machine	Local	Processing Lab
160	Khao Making Machine	Local	Processing Lab
161	Laminar	Fabricated	Laminar Room
162	Distillation Unit	Borosil	Technical Analysis Lab

163	Fuming Hood	Labguard	Technical Analysis Lab
164	Gerber Centrifuge	Narang Scientific Industries	Technical Analysis Lab
165	Oven	TEMPO Industrial Corp.	Technical Analysis Lab
166	Weighing Balance	Sartorius	Technical Analysis Lab

Table B.5.4.1

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	Research laboratory	UG, PG, Ph.D.
4	A-212	Autoclave room	UG, PG, Ph.D.
5	A-213	Research laboratory	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	DVR Lab	UG, PG, Ph.D.
10	A-218	Research laboratory	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	Research laboratory	UG, PG, Ph.D.
14	A-285	Research laboratory	UG, PG, Ph.D.
15	A-289	Processing Lab	UG, PG, Ph.D.
16	A-241	Technical Analysis Lab	UG, PG, Ph.D.

Table B.5.4.2

5.5. **Feedback analysis and corrective measures taken for resources (5)**

(Inst. Marks 05)

-Institute conducts feedback from all the students at the end of every semester before they fill the end semester examination forms. The online feedback forms are filled by every student for all the theory and laboratory courses of the Institute for both UG and PG students.

-It is compulsory for every student to give their feedback prior to the end semester examination. In this form itself there is a separate section of practical courses and laboratory facilities provided to the students.

-The students can comment on the quality of the practical sessions and the understanding from the sessions as a part of the academic programs.

-The availability of lab resources can be also scrutinized by the students in this section. The faculties conducting the practical sessions are also given rating on the scale of 1 to 5 with higher rating for best performances. The faculties who are getting less than 2 average grades are informed by Dean AP, Dean HRD and respective head of the departments to take necessary corrective actions.

-If any difficulties are faced by the students during the actual practical commencement like unavailability of resources or breakdown of any instrument or equipment, they inform to the technical support staff present at that very moment. The technical staff tries to address the issues promptly, however if found out of scope, the issue can be reported to the faculty in-charge of the practical session.

-In case, of any, major maintenance it is completed through the Head of the department and respective Dean ICD. However, the issue is addressed within 15 working days.

5.6. Program Specific Budget Allocation, Utilization (10) (Inst. Marks 10)

5.6.1. Adequacy of budget allocation (5) (Inst. Marks 05)

The yearly budget is prepared according to the needs & requirements of the institute taking into consideration annual intake of students, laboratory & infrastructure requirements. Based on the income expenditure statements of the institute, the Vice Chancellor takes the decision about allocation of additional funds required by the specific department and while preparation of next annual budget allocations certain adequate provisions is made in the annual budget of the Institute. This takes care of the additional requirement of the funds by the various departments.

Total Budget at program level: FY 2019-20 to 2022-23

For CFY 2022-2023

Total Budget (in lakh)		Actual expenditure (in lakh		Total number of students: 64
Non-recurring	Recurring	Non-recurring	Recurring	Expenditure per student
68.1	305.02	-	-	-

Table B.5.6.a.1

For CFYm1 2021-2022

Total Budget (in lakh)		Actual expenditure (in lakh		Total number of students: 64
Non-recurring	Recurring	Non-recurring	Recurring	Expenditure per student
58.91	263.6	64.87	290.48	5.55

Table B.5.6.a.2

For CFYm2: 2020-2021

Total Budget (in lakh)		Actual expenditure (in lakh)		Total number of students: 64
Non-recurring	Recurring	Non-recurring	Recurring	Expenditure per student
212.63	264.23	56.1	250.94	4.79

Table B.5.6.a.3

For CFYm3: 2019-2020

Total Budget (in lakh)		Actual expenditure (in lakh)		Total number of students : 64
Non-recurring	Recurring	Non-recurring	Recurring	Expenditure per student
192.14	228.03	154.07	201.44	5.55

Table B.5.6.a.4

5.6.2. Utilization of allocated funds (5) **(Inst. Marks 05)**

Department budget summary for last four fiscal years

	Budget 19-20	Actual Exp. 19-20	Budget 20-21	Actual Exp. 20-21	Budget 21-22	Actual Exp. 21-22	Budget 22-23
Infrastructure Built-up	75.42	85.11	117.46	28.87	30.32	36.12	37.92
Library	8.16	9.99	13.79	2.64	2.77	3.06	3.21
Laboratory Equipment	108.56	58.97	81.38	24.59	25.82	25.69	26.97
Laboratory Consumables	12.22	14.73	20.33	9.21	9.68	12.8	13.44
Teaching & Non-teaching staff salary	98.31	111.2	153.47	157.23	165.09	162.84	170.98
Maintenance & spares	4.52	3.91	5.40	5.29	5.55	3.7	3.89
R & D	19.47	3.03	4.19	7.75	8.13	11.89	12.49
Training and Travel	14.15	6.35	8.77	5.37	5.64	8.14	8.55
Miscellaneous expenses	2.91	5.61	7.74	5.14	5.4	6.32	6.64
Other (Such as Consultancy, Building, etc.).	76.45	56.61	78.12	63.59	66.88	84.79	89.03
TOTAL	420.1	355.5	490.65	307.04	325.28	355.35	373.12

Table B.5.6 b

The utilization of allocated fund is satisfactory as can be seen from above Table.

The allocated funds have been well utilized in a planned manner for:

1. Development of institute laboratories.
2. Setup of new labs for research purposes.
3. Purchase of new equipment.
4. Improvement of available Library and Internet facilities.
5. Maintenance of workshop and lab equipment.
6. Organizing seminars, workshops and conferences.
7. Training programs for faculty members and non-teaching staffs.
8. Cultural and extracurricular activities of students

The expenditures during and after 2020-21 on certain non- recurring components such as infrastructure built-up decreased on account of COVID-19 scenario and lockdowns. Certain infrastructure development activities such as construction activities and student's activities were also affected during this period.

5.7. **Library and Internet (10)** **(Inst. Marks 10)**

5.7.1. Quality of learning resources (hard/soft) (6) **(Inst. Marks 06)**

The institute is having central library providing textbooks, reference books, national and international journals, Bound volumes of old journals, and the thesis of Ph. D and Master's degree students and few specialized databases. Also, we are very particular about the kind and the quality of the book volumes added to the collection in the library. We have relevant and quality book volumes added to our library collection every year from various reputed international publishers such as Wiley, Springer, American chemical society, Royal society of chemistry, Elsevier and such. Students can use these facilities every day and collect the required information for their learning needs in the Institute.

Prof. M. M. Sharma Library

Established in the year 1934, Prof. M. M. Sharma Library functions as the central library of the institute and can be called one of the best special libraries in the country. It performs a dual role of an Academic Library as well as a Research Library, catering to the information needs of the in-house students and faculty, in particular, and, the academic and research community, in general. It is housed in a separate Ground Plus two-storied building and follows a completely open-access system. The library follows Universal Decimal Classification scheme. The library can boast of rich heritage collection of old classic books and bound volumes dating back to 1930s. But along with the traditional collection it has a significant digital collection as well. Currently has access to more than 500 electronic journals. Has access to databases such as Reaxys, Sci-Finder, Scopus, Web of science, etc. The library is fully computerized using the library management software called KOHA. It can be termed as a hybrid library with best collection of printed and digital documents. The library is also a member of E-Shodh Sindhu Consortium. Library is under CCTV surveillance

a. **Library Timings:**

On Working days	8:30 a.m. – 8:30 p.m.
On 2nd and 4th Saturdays, Sundays and holidays	11.00 a.m.– 6.00 p.m.

Library remains open throughout the year except on four days, viz. Independence Day, Republic day, Ganesh Chaturthi, and Dasara.

b. **Specialty Area:**

Chemistry, Applied Chemistry, Chemical Technology, Chemical Engineering, Pharmacy, Energy & Environmental Engineering, Biotechnology, Food Technology & Fermentation, Polymer Science & Technology, Plastics, Textile Science & Technology, Oils & Surfactants, Dyestuff Technology, etc.

c. **Library Staff:**

Professional staff: 3 (All 3 with Library Science Degree)
Semi-professional staff: 2 (1 with Library Science Degree)
Attendants (two shifts): 12
Trainee: 1
Total Staff with Library Science Degree: 4

d. **Library Layout:**

The library is a ground-plus two-storied building.	*Carpet Area of the library (in m^2):* 1391
Reading space (in m^2): 1391	*Total seats in reading space:* 200

The layout is as follows:

Floors	Sections	Number of reading seats available
First Floor (Entrance to the Library)	Book Collection & Circulation counter	72
Second Floor	Current Journals (latest issues), Reference Book Section, Theses Section, Book Bank Section	48
Ground Floor	Bound volumes (Back Issues) of Journals, Photocopying Section	49
Second Floor	E-Library	31

e. **Membership:** Bonafide students and faculty of the institute are the members of the library and can avail book lending facility. Book borrowing facility is against ID card.

f. **Library Portal:** Library portal is hosted on the intranet of the institute http://ictlibrary.firstray.in/ OR http://intranet.ict/Library.aspx/

g. **Library Catalogue**: Library catalogue can be accessed through the WEBOPAC http://ictlibrary.firstray.in/

h. **Library at a Glance**

Total printed resources (Books, BV, standards, Reports, etc.)	77,988
Theses (Doctoral & Masters)	5835
Printed Journals	31 (International 12+National 19)
E-Databases	▪ Scopus ▪ Reaxys ▪ Sci-Finder ▪ Web of Science (eSS) ▪ Derwent Innovation ▪ InCites
E-Journals (4579)	▪ ACS (eSS) (49) ▪ Begell Digital Lib. (51) ▪ Bentham Science (132) ▪ Elservier SD (394) ▪ Emerald (62) ▪ IOP (68) ▪ Jove Video Journals (13) ▪ RSC (46) ▪ Sage (2) ▪ Springer (eSS) (1729) + 10 Top up ▪ Taylor & Francis (eSS) (1079) +27 Topup ▪ Thieme (2) ▪ Wiley (915)
E-Journals Archives (339)	▪ Elsevier (190) ▪ RSC (59) ▪ Sage (5) ▪ T&F (43) ▪ Thieme (2) ▪ Wiley (40)
E-Books (790)	▪ ACS (115) ▪ Begell (139) ▪ Elsevier (193) ▪ Pearson (68) ▪ RSC (155) ▪ T&F (120)
E-Research Tools	▪ iThenticate ▪ Urkund (eSS) ▪ Grammarly ▪ Remote XS
Digitization by ICT	• Digitized Theses (1000 completed) • BIOS, CIOS, FIAT report

Justification of counterpoints for deficiency

1. Library is expected to have 159750 volumes as against the reported 73400 volumes available. The available volumes are the Total available book volumes. If the entire volumes in the library collection including bound journals, Theses and so on is included then the total volumes would be about 100000 or so. Still if there appears a difference it is due to the fact that our institute caters to very special and limited subject areas where in the number of publications is limited. Also, we are very particular about the kind and the quality of the book volumes added to the collection in the library. We have relevant and quality book volumes added to our library collection every year from various reputed international publishers.
2. The same reasoning applies to the deficiency in the number of titles required and available.
3. As regards the deficiency in the number of national journals, it is due to the fact that we subscribe about 105 international journals in print and over 2000 journals are made available electronically to the library users across the campus.

LIBRARY COLLECTION:

PRINTED RESOURCES

i. **Books**

The library has a very rich collection of books. The spectrum of the book collection ranges from as old as dating back to 1930s to the latest. The collection has few rare and classic books which is regularly updated with the latest updated books in the area of Chemistry, Applied Chemistry, Chemical Technology, Chemical Engineering, Pharmacy, Energy & Environmental Engineering, Biotechnology, Food Technology & Fermentation, Polymer Science & Technology, Textile Science & Technology, Oils & Surfactants, Dyestuff Technology.

Book Bank collection is a special collection of Text Books which are issued to students for a longer period.

Access: Books can be searched through a computerized catalogue from the member's desk. Also, terminals on every floor are available to search the catalogue.

ii. **Printed Journals:**

The library subscribes to a number of scholarly journals in different specialized areas from various renowned publishers.

Access: Journals can be searched through a computerized catalogue from the member's desk. Also terminals on every floor are available to search the catalogue.

iii. **Theses:**

A collection of all the Theses submitted by PhD and Master's students are stored in the library and are available for reference to members.

Access: Theses can be searched through a computerized catalogue from the member's desk. Also terminals on every floor are available to search the catalogue.

iv. **Reports:**

This collection comprises of Bios, Cios & Fiat reports and various other research reports.

Access: Reports can be searched through a computerized catalogue from the member's desk. Also terminals on every floor are available to search the catalogue.

v. **Bound Volumes:**

The older issues of journals are bound into volumes and are available for reference.

Access: Printed catalogue of all the bound volumes is available at the ground floor in the Bound Volume section.

DIGITAL RESOURCES

The library subscribes to a number of indexing and abstracting and informative databases

i. **Scopus:** https://www.scopus.com/

Scopus is the largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings. Delivering a comprehensive overview of the world's research output in the fields of science, technology, medicine, social sciences, and arts and humanities, Scopus features smart tools to track, analyze and visualize research.

Access: IP based access is available throughout ICT campus.

ii. **Reaxys:** https://www.reaxys.com/

Reaxys is a web-based tool for the retrieval of chemistry information and data from published literature, including journals and patents. The information includes chemical compounds, chemical reactions, chemical properties, related bibliographic data, substance data with synthesis planning information, as well as experimental procedures from selected journals and patents. It is licensed by Elsevier.

Access: IP based access is available throughout ICT campus.

iii. **Sci-Finder**: https://sso.cas.org/

SciFinder is a research discovery application that provides unlimited access to the world's most comprehensive and authoritative source of references, substances and reactions in chemistry and related sciences. SciFinder offers a one-stop shop experience with flexible search and discover options based on user input and workflow.

Access: IP based access is available throughout ICT campus.

iv. **Web of Science**: https://www.webofscience.com/

Web of Science is an online subscription-based scientific citation indexing service now maintained by Clarivate Analytics that provides a comprehensive citation search. It gives access to multiple databases that reference cross-disciplinary research, which allows for in-depth exploration of specialized sub-fields within an academic or scientific discipline.

Access: IP based access is available throughout ICT campus.

v. **Derwent Innovation:** https://www.derwentinnovation.com/login/

Derwent Innovation is a proprietary patent research application that provides trusted patent data and tools to monitor technology trends and competitive landscapes, inform FTO opinions, prosecute patents, monetize and license assets and support litigation activities. It provides access to Derwent World Patents Index (DWPI), a curated patent database with editorially curated titles and abstracts, special subject matter classification coding and indexing, and proprietary patent invention-centric family building. Also includes the Derwent Patent Citation Index (DPCI) which indexes backwards and forwards patent and literature citations.

Access: Access is login based. User needs to visit the library, use library terminal to access it. Please enquire at Library Circulation counter for further details.

vi. **InCites Benchmarking & Analytics:** https://access.clarivate.com/

InCites Benchmarking & Analytics is a customized, web-based research evaluation tool that can help you develop your research strategy. InCites B&A allows you to analyze institutional productivity, monitor collaboration activity, identify influential researchers, showcase strengths, and discover areas of opportunity.

Access: IP based access is available throughout ICT campus.

vii. **e-Journals**

The library subscribes to a number of electronic journals from renowned publishers like Elsevier, Wiley, Thieme, Springer, Taylor & Francis, RSC, ACS, Begell, IOP, etc. Also has access to a huge number of ejournals through Inflibnet eShodhsindhu consortium.

Access: IP based access to all the ejournals is available throughout ICT campus.

https://pubs.acs.org/ https://www.begellhouse.com/
https://www.eurekaselect.net/index.php
https://www.sciencedirect.com/

https://www.emerald.com/insight/browse/publications

https://iopscience.iop.org/ https://www.rsc.org/
https://in.sagepub.com/ https://link.springer.com/
https://taylorandfrancis.com/
https://www.thieme.in/
https://onlinelibrary.wiley.com/

E-REFERENCE SOURCES:

i. **Begell Heat Exchanger Design Handbook (HEDH) – Multimedia edition: https://hedhme.com/**

Reference source for heat exchanger design and associated technologies. The print edition has been converted to a fully searchable interactive web-based multimedia product. The content is presented in an exciting interactive HTML format with in-text unit conversion and references, widgets for key heat transfer calculations, wizards to guide heat exchanger selection and 3D interactive visualization of equipment.

Access: IP based access to multimedia handbook is available throughout ICT campus.

ii. **Jove Video Journals: https://www.jove.com/**

Scientific video journal. Peer reviewed. Multi-disciplinary. Indexed in PubMed and Web of Science JoVE publishes peer-reviewed scientific video protocols to accelerate biological, medical, chemical and physical research. Watch our scientific video articles. The Journal of Visualized Experiments is a set of scientific video journals dedicated to advancing science by increasing reproducibility and efficient knowledge transfer. Articles combine high-quality video demonstrations of experiments with detailed text protocols. All content is peer-reviewed and indexed in Medline, PubMed, Web of Science, and other relevant databases. Video Journals include, Behavior, Biochemistry, Bioengineering, Biology, Cancer Research, Chemistry, Developmental Biology, Engineering, Environment, Genetics, Immunology and Infection, Medicine, Neuroscience.

iii. **E-Books**

Access to a collection of electronic Books published by RSC, ACS, Elsevier, Begell, T&F and Pearson eTextbooks is available.
https://pubs.acs.org/
https://www.begellhouse.com/
https://www.sciencedirect.com/
https://www.rsc.org/
https://taylorandfrancis.com/
https://ebookcentral.proquest.com/

Access: IP based access to all ebooks is available throughout ICT campus.

iv. **E-Theses**

The e-theses of ICT as well as other universities are available on inflibnet consortia e-Shodhganga.

Access: Link is accessible through the library portal. http://shodhganga.inflibnet.ac.in/

v. **eResearch Tools**

The library supports the research students with tools like

- *Reference Manager* (Mendeley, endnote, Zotero)
  https://www.mendeley.com/
  https://endnote.com/
  https://www.zotero.org/
- *Grammar Skills* (Grammarly)
  www.grammarly.com/edu
- *Plagiarism Check* (Urkund, iThenticate)
  https://www.ouriginal.com/login/
  https://app.ithenticate.com/en_us/login

vi. **Services:**

- Circulation
- Bibliographic Service
- User Orientation
- Reference Service
- Training programs, Workshops & Events
- Book Bank Service
- Reading Hall
- Internet (ports & wi-fi)
- eLibrary Terminals
- Photocopying Service

Events/Training Programs:

Training programs for the usage of e-resources is organized by the library regularly. Such programs & events are announced through emails. Also Author workshops & Literature Survey workshops are regularly organized by the library for PG & PhD Scholars. Some Event Details organized so far

- Prof. M M Sharma Library and ACS had organized a virtual event "ACS on Campus" on 24th February 2022, 11am to 01pm, for PG Students, covering topics "Effective Science Writing" - Ramesh L. Gardas, AE, The Journal of Chemical & Engineering Data, IIT Madras, "Managing Your Data" Dipankar Das (D.D.) Sarma, Senior Editor, *ACS Energy Letters*, Indian Institute of Science.

  ● Prof. M M Sharma Library had organized an online training program for Grammarly titled, Improving Research Writing Using Grammarly on 11th January 2022, 3.00pm

  ● Prof. M M Sharma Library with VES College of Science, Arts and Commerce Library had jointly organized one-day webinar on 'Emerging Technologies for Academic Libraries and Future Librarianship' on the occasion of Librarian's Day celebration and to commemorate the 129th Birth Anniversary of Dr. S R Ranganathan on 13th August 2021, 1.45pm

  ● Prof. M M Sharma Library had organized a webinar on Know your Library: Resources and Access on 15th July 2021 & 3rd Oct 2021, for ICT Community.

- Prof. M M Sharma Library with VES College of Science, Arts and Commerce Library had jointly organized 7-day National Level Capacity Building Programme'(Virtual) under TEQIP-III Twining programme titled "eShodhyatra: Emerging Trends & Technologies in Scholarly Communication" from 23rd November - 4th December 2020, Prof. Gagandeep Kang, FRS The Wellcome Trust Research Laboratory Division of Gastrointestinal Sciences Christian Medical College, Vellore, & Padma Vibhushan Prof. M.M. Sharma, FRS Emeritus Professor & Former Director, Institute of Chemical Technology, Mumbai were the Keynote Speaker and Guest of Honour respectively.

- Technological Association's Bombay Technologists had invited Senior Librarian for a talk titled "Beyond the walls of the library: reach the relevant e-information & services" on 20th November 2020

- On the occasion of Vachaan Prerana Din & World Food Day, Prof. M M Sharma Library had organized a Virtual Book Talk on "The Science and Technology of Chapatti and Other Indian Flatbreads, 15th October 2020, 4.00pm, Prof. S.S. Lele Director, Institute of Chemical Technology, Marathwada campus, Jalna, Prof. Laxmi Ananthanarayan Professor, Department of Food Engineering and Technology, Institute of Chemical Technology, Mumbai, Dr. Anamika Banerji Technical consultant, Baking Technology Platform, General Mills Indian Pvt. Ltd.

- Prof. M M Sharma Library had arranged for an online introductory session to Patenting in Academia and using Derwent Innovation on Saturday, August 1, 2020, 11.30am

- Prof. M M Sharma Library with VES College of Science, Arts and Commerce Library had jointly organized a National Webinar on Rethinking and Recreating the Academic Library: Lessons from the Pandemic E-Library 22nd –25th July 2020, for Academic Librarians, Prof. Ramesh Gaur Dean & Director (Lib & Inf.)/ Head - Kala Nidhi Division Indira Gandhi National Centre for Arts (IGNCA) Autonomous body of Ministry of Culture, Government of India was the Keynote Speaker.

- Prof. M M Sharma Library with VES College of Science, Arts and Commerce Library had jointly organized a National webinar on Copyright: Concerns & Challenges for Online Education, 15 JULY 2020 11.00 AM to 1.30 PM, DR. AKHTAR PARVEZ University Librarian, Maulana Azad National Urdu University (MANUU), DR. SHRIRAM PANDEY Assistant Professor, Department of Library and Information Science, Banaras Hindu University

- Prof. M M Sharma Library & Elsevier had arranged for an online training program on "Drug Repurposing Using Reaxys" on July 02, 2020 at 11.30am.

- Prof. M M Sharma Library & Elsevier had arranged for a web training session on Reaxys database on 4th June 4, 2020 at 11 am.

ACCESSIBILITY TO STUDENTS:

- **Printed Resources:** The library is open for students to access the printed resources for 361 days in the year from 8.30 AM to 8.30 PM on working days and 10.30 AM to 6.00 PM on holidays.

- **E-Resources:** The e-resources subscribed by the library are available for access 24X7 to all student in-campus (IP based access) and off-campus (Remote access, RemoteXS)

SUPPORT TO STUDENTS FOR SELF-LEARNING ACTIVITIES:

i. **Training programs and workshops** for e-resources, Literature Review, Author workshops and publication workshops are conducted regularly for UG, PG and PhD Scholars
ii. **Availability of work stations** to access e-resources, engage in swayam courses, coursera, etc.
iii. **Students can also view the recorded lectures** of ICT faculty in the e-library if required. Also available are some digital databases like language learning lab (For all students) and Computer Assisted Learning Modules.

5.7.2. Internet (4) **(Inst. Marks 04)**

1. ***Name of the Internet provider***	• NKN, Bharti, Reliance
2. ***Available bandwidth***	• 75Mbps - Bharti • 100Mbps - Tata • 1Gbps - NKN – NIC • These Leased Lines are distributed throughout the ICT Campus (Faculty, Support Staff and all Students).
3. ***Wi Fi availability***	• Whole campus
4. ***Internet access in labs, classrooms, library and offices of all Departments***	• Available in all Labs. • Available in all Computing Labs • Availability in departments and other units Lecture theatres, Class and Tutorial Rooms, Labs, Departments, Library, Administrative Office, Hostels. • Availability in faculty rooms. • LAN users in the all-buildings 1000+ and 2 LAN points in each room of Hostel-5 • Wireless Network at Hostel No. 1 to 4 (availability 24 x 7) and at some part of the main building area.
5. ***Cyber Security measures***	• Eset antivirus, Hardware Firewall installed, Mac address authentication of the systems for local network/internet access & user id for internet access

Table B. 5.7.2

Other informative sources/ measures

1. **Informative Website**	*ictmumbai.edu.in*
2. **Intranet**	*intranet.ict*
3. **Computers**	IPC Dept: UG Lab - 100 Computers, (All-in-One, i7,16Gb RAM, 1TB HDD), 35 Computers (All-in-One, i3, 2Gb RAM, 500 GB HDD) in internet access room for all students All are connected to Network having Internet facility.
4. **Servers**	Lenovo Servers 3No's (virtualization of servers with Hyper-V. Libsys, TallyERP, Ridgeline, ESSL, Solidworks) and DHCP, DNS connected to EMC SAN Box, NFS server HP blade – Class Room Lecture Recording, connected to HP SAN Box Lenovo Server – Estores Software
5. **Firewalls**	Sophos x g 310 (2 Nos)
6. **CCTV**	Campus – 400+ cameras
7. **Studio**	Video-Conferencing, connectivity to off-campuses at a time.
8. **License Software**	1. Microsoft Campus Licensing Agreement (Windows and Server o/s, Office 365, SQL Processor Based license) 2. MATLAB 2009b - (50 users) 3. Aspen – single user Research license 4. MOE- single user license 5. SolidWorks - (60 users) 6. Ansys CFD - (35 users) 7. Ansys Mechanical - (5 users) 8. Gabbi - Academic - 50 users, professional - 1

MIS (Management Information System)

Modules in working

1. Admission: Admissions of UG, PG and Ph.D. students.
2. Exam:
   a. Result process of UG and PG students through MIS software.
   b. Filling Feedback form by students and Generating Teacher Evaluation Report.
3. Account: Generating Student Fees Receipt.

Criterion 6	Continuous Improvement	75

6.1 Actions taken based on the results of evaluation of each of the COs, POs & PSOs (30)
(Inst. Marks 30)

POs	Target Value*	Attainment Level	Observation
PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve complex engineering problems.			
PO1	75%	71%	The engineering knowledge of the graduates was satisfactory; however, in some cases, there needs some improvement.
Action: • In the revised syllabus, more hands-on training or practical courses on basic engineering sciences has been increased. • The tutorial components in first- and second-year courses have been increased. • In the core engineering courses, the focus will be given to more active learning and case studies.			
PO2: Problem analysis: Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.			
PO2	75%	72%	The attainment is satisfactory; however, the target value has not been achieved.
Action: • In the revised syllabus, the tutorial slot for 'Seminar' in Sem VI has been increased to 6 hours a week. The student selects a topic of the seminar of their choice and tries to develop a critical understanding while going through the literature. Now, remote access to the e-Library has also been given to students. • The BTech Project is for two semesters (Sem VII and VIII). In Sem VII, the assessment is revised to give more emphasis on Literature review and Problem Analysis. It is expected that this PO attainment will increase further in the coming batches.			
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety and the cultural, societal, and environmental concerns.			
PO3	75%	72%	The attainment is satisfactory; however, the target value has not been achieved.
Action: • Projects based on New Product Development (NPD) and process development are given. • Seminar topics based on current trends in the food technology sector are presented. • In the core engineering courses like Food Engineering, Food Process Engineering, and Principles of Food Preservations, the emphasis on complex engineering problems has been given. • In the laboratory courses, like Food Processing and Engineering Lab (Sem VIII), the practical is framed to facilitate the develop solutions to engineering problems.			
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods, including design of experiments, analysis, interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	75%	72%	The attainment is satisfactory; however, the target value has not been achieved.

Action:

- The UG Project is for two semesters (Sem VII and VIII). The project component in Sem VIII is entirely experimental, and emphasis is given to experimental design, data analysis, and interpretation.
- In Sem VIII, a separate session is conducted on experimental design while conducting a practical course. The students study the subject Design and Analysis of Experiments in Sem V. It is expected that this PO attainment will increase further in the coming batches.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO5	75%	70%	The attainment is satisfactory; however, the target value has not been achieved.

Action:

- The students are taught one core subject Principles of Food Analysis in Sem V. This course is very crucial for this PO attainment.
- Demonstration of high-end equipment has been started in the form of a laboratory - Food Analysis II. Graduates are introduced to cutting-edge instruments, facilities, and state-of-the-art technology in Sem VI.
- In the practical, advanced statistical techniques like RSM have been introduced. The use of software like Design Expert and IBM SPSS is done.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	75%	72%	Being a graduate in food engineering and technology, the interaction between society and the students was good. They used to interact with people more during their survey and/or project. It is the reflection of those attributes. However, the target value has not been achieved and there is a scope for improvement.

Action:

- The BTech curriculum has one subject on Industrial Psychology and Human Resource Management.
- The department has initiated organizing sessions in line with this PO so that it can be improved further.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO7	75%	72%	Sustainability is one of the important factors necessary for any technology in the food sector. The attainment is satisfactory; however, the target value has not been achieved.

Action:

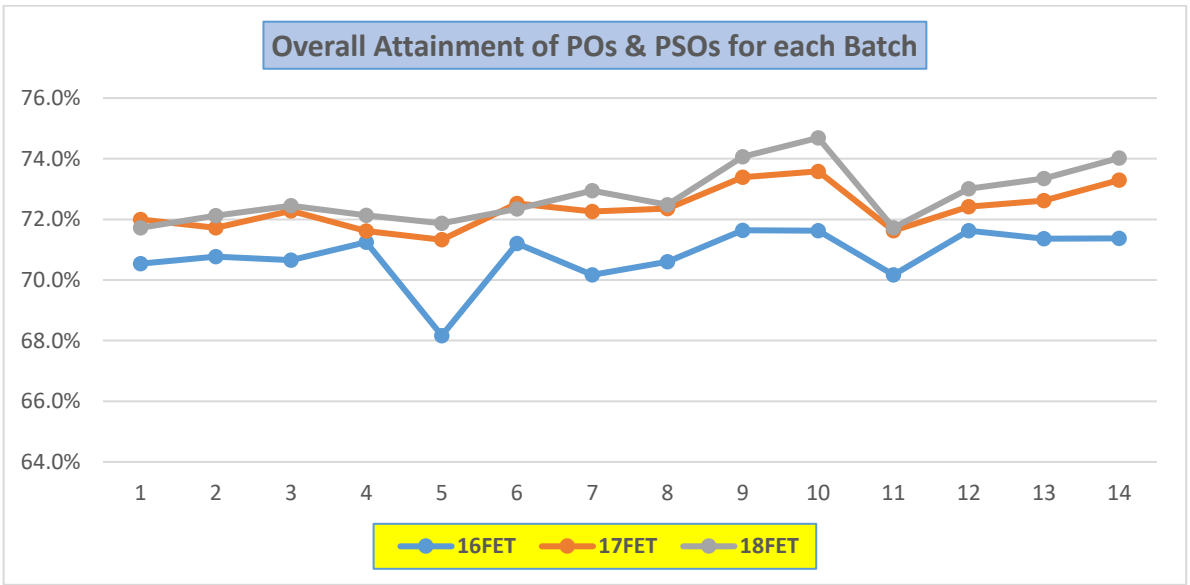
- One subject on Environmental Science and Technology has been introduced into the curriculum. Additionally, the seminar and project topics set for the BTech graduates are in line with achieving sustainability in the food industry. It is expected that this PO attainment will improve further.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	75%	72%	Some of the courses in the program emphasized the ethical issues related to food acceptability, which is also one of the major concerns in the food industry. The students were successfully cross the threshold barrier set. However, there is a scope for improvement.
Action: • Institute is organizing a set of seminars on different aspects of professional ethics. The duration of In-plant training has been increased, which will benefit them to learn professionalism and ethics. • The lecture taken by visiting industrial faculty shares their thoughts, which indirectly helps students achieve this PO.			
PO9 Individual and teamwork: Function effectively as an individual and as a member or leader in diverse teams and multidisciplinary settings.			
PO9	75%	73%	One of the special attributes of our students is their group efforts in a multidisciplinary approach which was mainly taken care of during the tutorial classes. However, there is a scope for improvement.
Action: • The In-plant training duration has been increased from 6 weeks to 10-12 weeks. During that, the students are assigned various group activities. It is expected that this PO will improve further. • There are various team-based competitions organized at the department and institute levels. • Some of the practical sessions have been organized through a team-based activity.			
PO10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
PO10	75%	73%	The attainment is satisfactory. However, we are trying to maintain the level and targeting for higher attainment.
Action: • In the core theory courses, students are asked to give presentations and group discussions • Writing a journal is mandatory for each laboratory course. This will improve their technical writing skill. • Department faculty organizes sessions on how to write seminar and project reports. A detailed guideline on the same is provided to the students. This will eventually help their technical writing skill.			
PO11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work as a member and leader in a team, to manage projects and in multidisciplinary environments.			
PO11	75%	71%	The students appreciated the subject well, which is reflected in their PO attainment. However, we are trying to maintain the level and targeting for higher.
Action: • All the B. Tech projects are given a problem statement in which the inclusion of Project Management and Finance are mandatory. Also, they study these subjects in their curriculum.			

• Institute organizes various talks on these aspects through which students will be benefitted.			
PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			
PO12	75%	72%	Theoretical knowledge with hands-on experience in the industry and critical discussions among themselves made the PO achievement possible. However, we are targeting 75% attainment.
Action: • Students are encouraged to active learning. We have been familiarized with multimedia tools in online teaching during the pandemic situation in the last two years. These made the classroom a blended learning environment. It is expected that this will reflect on their performance next year.			
PSO1: Able to know higher studies in food allied subjects			
PSO1	75%	72%	50% of the students who graduated here tend to opt for higher education. This is satisfactory and we are trying to improve further.
Action: • The department is organizing events like career opportunities in higher studies for our UG students. The speakers are the previous alumni of the department who opted for higher studies. It is expected that the students will be motivated and opt for higher studies more.			
PSO2: Able to involve in consumer awareness programs and food regulations			
PSO2	75%	73%	The consumer awareness attributes were less highlighted in the feedback from the PO attainment score was just about to the target value set.
Action: • In the project, these two components have been introduced. Also, these subjects are being taught in Sem VIII at the department level. • Department also motivates students to attend events on these themes.			

Table B.6.1

*The institute level PO attainment target is 70%.



6.2 Academic Audit and actions taken thereof during the period of Assessment (10)

(Inst. Marks 10)

Academic Audit is performed at the Institute Level by an independent authority designed to scrutinize the strategic management and oversight of academic standards and quality within institutes of their undergraduate programs.

It is based on existing documentation, such as Annual Review reports, Survey action plans, external Examiner reports, and other material such as documents prepared for professional accrediting bodies.

It is based on a process of self-evaluation carried out by the institute itself; The use of External Assessors to ensure objectivity.

The Audit evaluates the full range of institute activities, including academic partnerships, student exchanges, and study abroad, allowing balanced recommendations by the Panel.

Both report and action plan will be subject to consideration by the Deans of Faculty and Professional Services and approval by the Vice-Chancellor via the Boards of Faculty. The sample copy of the audit reports has been attached in Annexure 3.

At the department level also Academic Audit Committee has been formed. This has been constituted with three outside experts.

Also, the department's academic activities are taken care of by the Board of Studies. The Research Recognition Committee monitors the research-related activities. Last academic year, these two committees were revived. The action taken at the department level is available in the Minutes of the Meeting.

6.3 Improvement in Placement, Higher Studies and Entrepreneurship (15)

(Inst. Marks 15)

Assessment is based on improvement in:

- Placement: number, quality placement, core industry, pay packages, etc.
- Higher studies: performance in GATE, GRE, GMAT, CAT, etc., and admissions in premier institutions
- Entrepreneurs

Items	2021-22	2020-21	2019-20
	18FET	17FET	16FET
Total No. of Final Year Students (N)	18	17	14
No. of students placed in companies or Government Sector (x)	7	9	6
No. of students admitted to higher studies with valid qualifying scores (GATE or equivalent State or National Level Tests, GRE, GMAT, etc.) (y)	8	8	5
No. of students turned entrepreneurs in engineering/technology (z)	1	0	1
Total (x + y + z)	16	17	12
Placement Index: (x + y + z)/N	0.8898	1.000	0.857
Average Placement Index	0.915		
Assessment Points = 15 × Average Placement Index	13.725		

Table B.6.3

Assessment is based on improvement in:

Placement: number, quality placement, core industry, pay packages, etc.
In the graduating batch in 2020 (16FET), 14 students graduated. Out of them, 4 students were placed in the core industry and 2 students in the non-food allied industry. However, there is an improvement in the following batch. For the 17FET batch (graduated in 2021), eight students (50 % of the batch) got placed in the industry; out of that six were placed in core (food allied) industries. The companies hired are top manufacturers like Mapro Foods, Adani Wilmar, and Bakels India

Higher studies and performance in GATE, GRE, GMAT, CAT, etc.
The number of students who qualified GRE for the last three years (18FET, 17FET, and 16FET) is 5, 4, and 3, respectively.

In the graduating batch in 2021 (17FET), 8 candidates (50% of graduating batch) opted for higher studies. Out of them, 4 students qualified for GRE, 1 student qualified for GATE, and 3 students passed the CAT exam. The GRE-qualified graduates have been admitted to European and US universities such as Wageningen University and Research, Netherland; University of Illinois, USA; and Ohio State University, USA. One of the CAT qualified students got admission to the Indian Institute of Management (IIM) Ahmedabad. The GATE qualified graduate enrolled in the Indian Institute of Technology (IIT), Guwahati.

For the batch that graduated during the pandemic (2020; 16FET batch), the three students qualified GRE and got admitted to the University of Illinois, USA; and Ohio State University, USA. One student qualified CAT exam and did PGP in Management from IIM Indore.

Entrepreneurs
In the last three years, 46 graduate students have passed out and out of them, 2 graduates have started start-ups immediately after graduation.

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

(Inst. Marks 10)

Assessment is based on improvement in ranks/score in qualifying state level/national level entrance tests, percentage marks in Physics, Chemistry, and Mathematics in 12th Standard, and percentage marks of the lateral entry students.

Items		2021-22	2020-21	2019-20
National Level Entrance Examination *(JEE Mains)*	No. of Students admitted	18	15	14
	Opening Score/Rank	34	1095	92
	Closing Score/Rank	19161	18753	23991
State/Institute/Level Entrance Examination/Others *(MH CET)*	No. of Students admitted	2	5	6
	Opening Score/Rank	45	6	3
	Closing Score/Rank	32337	41731	20705
Name of the Entrance Examination for Lateral Entry or lateral entry details	No. of Students admitted	NA	NA	NA
	Opening Score/Rank	NA	NA	NA
	Closing Score/Rank	NA	NA	NA
Average CBSE/Any other Board Result of admitted students (Physics, Chemistry & Mathematics)		86 %	79 %	72 %

Table B.6.4

6.5 Remedial action taken on the observations made during last accreditation visit/New initiatives taken/New Facilities Introduced/Improvement made after the previous visit (10) (Inst. Marks 10)

Comments Given	Action Taken	Status
Concerns:		
Laboratory Practical	• Laboratory practical are conducted either individually or in a group of 2 students. • Faculty describes the background and provides the necessary instruction • Each practical is associated with an instruction manual • Well-defined rubrics are in place to assess the performance. • One lab assistant and one attendant are always present to assist the students	Implemented
Conditions of Laboratory	• Two UG Labs viz. Food Analysis and Food Processing Laboratories have been renovated in 2019-20. • Both the laboratories have more than 20 desks and all the equipped with the necessary equipment required for UG practical	Implemented
Benches of Classrooms	• This issue has been discussed at the Institute level. However, due to the pandemic situation, the implementation got delayed.	In process
Weakness/Areas of Improvement:		
More input on engineering and project is needed	• The present BTech curriculum contains five core courses in Food Engineering: o FDT1031: Principles of Food Preservations (Sem IV, 4 credits, Theory) o FDT1022: Food Engineering (Sem V, 4 credits, Theory) o FDT1027: Food Process Engineering (Sem VI, 4 credits, Theory) o FDP1022: Food Processing and Product Development Lab (Sem VI, 4 credits, Lab) o FDP1023: Food Processing and Engineering Lab (Sem VIII, 4 credits, Theory) • These 20 credits in Food Engineering constitute 28.1% of core credit courses offered by the department. In addition, there are courses of 40 credits related to General and Chemical Engineering out of a total of 205 credits in the entire four-year curriculum. In summative, there are 60 credits in Food, Chemical, and general Engineering courses. • The BTech projects are majorly focused on product development and process optimization including experimental design. The other components of the BTech project are project and process economics, plant layout, waste management, labeling, regulations, and so on. It is evaluated by Industry experts.	Implemented
Laboratories can be further improved although	• Two UG Labs viz. Food Analysis and Food Processing Laboratories have been renovated in 2019-20. • Both the laboratories have more than 20 desks and all the equipped with the necessary equipment required for UG practical	Implemented

they are adequate	• Prof. DV Rege Centre for Advanced Food Technology has been renovated and it is sponsored by HIMEDIA Lab., India. This is equipped with state-of-the-art facilities. • PTC Research Lab has been renovated • Conference room was constructed, and it is sponsored by Fine Organics Ltd., India	
Industrial visits should be increased	• Before the Pandemic, 11 the industry visits were organized in 2018-20. • In the last two years, during the pandemic, the students took part in virtual industry tours • In the revised curriculum in 2021, the industry internship for UG courses has been increased from 6 weeks to 10-12 weeks	Implemented
Deficiencies:		
A board of studies is to be formed where the input of other academicians from other institutes and industries may also be added	• The Board of Studies of the department has been revived in 2021. The committee constitutes of the Head of the Dept, two senior faculties from the department, one expert from Industry, and one from Academia from another institute. The meetings are conducted twice in an academic year in various academic activities of the department.	Implemented
A single subject is to be taught only by a single teacher	• The topic has been discussed at a stretch in the Faculty Meeting. The faculties have commonly agreed that students will be more benefitted by different perspectives if there is any faculty of common expertise. • Few subjects are taught by Industry and Academic experts as Visiting faculties. They are assigned part of the course content along with one faculty from the department • Few courses like Introduction to Food Systems (Sem III), Food Safety, Quality, and Regulations (Sem VIII) are taken entirely by a faculty. • The practical courses are entirely taken by a single faculty.	Implemented
The engineering portion is less in the old syllabus but improved a little in the current syllabus	• The present BTech curriculum contains five core courses in Food Engineering: o FDT1031: Principles of Food Preservations (Sem IV, 4 credits, Theory) o FDT1022: Food Engineering (Sem V, 4 credits, Theory) o FDT1027: Food Process Engineering (Sem VI, 4 credits, Theory) o FDP1022: Food Processing and Product Development Lab (Sem VI, 4 credits, Lab) o FDP1023: Food Processing and Engineering Lab (Sem VIII, 4 credits, Theory) • These 20 credits in Food Engineering constitute 28.1% of core credit courses offered by the department. In addition, there are courses of 40 credits related to General and Chemical Engineering out of a total of 205 credits in the entire four-year curriculum. In	Implemented

	summative, there are 60 credits in Food, Chemical, and general Engineering courses.	
Observations of Evaluators (Provide Justifications/Reasons)		
Proper awareness of OBE was missing among the stakeholders	• After the last NBA visit, the faculties are trained in outcome-based education (OBE). Each year during the orientation program of the first-year UG students, the Head of the Department describes all the vision, mission, PEOs, POs, and PSOs of the program. These are also disseminated in the classroom, corridor, labs, HoD cabin, website, and syllabus. • While conducting the lecture, the respective faculty discusses the course outcomes (COs) and knowledge level (K-level) of the respective course. • The feedback is taken from the stakeholders connecting the COs and POs.	Implemented
Description of process defining the vision, mission, and of PSOs are less	• Currently, the Board of Studies of the department takes care of the revision of the vision, mission, program educational objectives, program objectives, and syllabus revision. A specific hierarchy is followed for any amendments in either vision, mission, PEOs, POs, and syllabus. • In the beginning, the Departmental Syllabus Committee invites feedback from the stakeholders such as Alumni, Students, Industrialists, and Academicians on the curriculum and outcomes. The SWOC analysis is reviewed in the faculty common room meetings. The syllabus of the top US, European as well as Indian Institutes like NIT and IITs is also analyzed to check the distribution of the different courses. Based on the inputs and feedback, the revised curriculum is framed by Departmental Syllabus Committee. The revised curriculum is discussed in detail in the Board of Studies Meeting for approval. It is thereafter put on UG Program Committee. Academic Council provides the final approval for the revised syllabus.	Implemented
Curriculum needs to be improved with respect to engineering inputs	• The present BTech curriculum contains five core courses in Food Engineering: o FDT1031: Principles of Food Preservations (Sem IV, 4 credits, Theory) o FDT1022: Food Engineering (Sem V, 4 credits, Theory) o FDT1027: Food Process Engineering (Sem VI, 4 credits, Theory) o FDP1022: Food Processing and Product Development Lab (Sem VI, 4 credits, Lab) o FDP1023: Food Processing and Engineering Lab (Sem VIII, 4 credits, Theory) • These 20 credits in Food Engineering constitute 28.1% of core credit courses offered by the department. In addition, there are courses of 40 credits related to General and Chemical Engineering out of a total of 205 credits in the entire four-year curriculum. In summative, there are 60 credits in Food, Chemical, and general Engineering courses.	Implemented

Needs improvements in support to weak students, the conduct of experiments, quality of assignments, and papers to be published out of the project	• Due attention is paid to both advanced and slow learners as the need arises. For instance, for advanced learners, there are research and review papers published in Scopus-indexed journals based on the seminar and project work at the UG level. For slow learners, one-to-one interaction as the case may be is done in the courses where it is required. • An online library with remote access has been given to each student for their self-learning. • While taking the classes in an online forum, the lectures are recorded. The students now have the flexibility to revisit the content at per own pace. Also, the learning materials are shared with the students in electronic form. • The number of courses with a tutorial lecture in the first, second, third, and fourth years are 11, 12, 13, and 11, respectively. • Each lab course has an instruction manual and a well-defined rubric. The use of experimental design in practice has been implemented in Sem VIII • The continuous assessments are taken in the form of presentations, assignments, MCQs, and case studies. Complex or real problems are given as assignments or case studies. • The BTech projects are majorly focused on product development and process optimization including experimental design. • The number of papers published in International Peer-reviewed journals co-authored by our last two years of UG students (graduated in 2020 and 2021) is 5 with a cumulative impact factor of 19.631.	Implemented

Declaration

The head of the institution needs to make a declaration as per the format given below:

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 initiatedby the NBA in case any false statement/information is observed during pre-visit, visit, post visit and subsequent to grant of accreditation.

Date: 06/06/2022

Place: Mumbai

Signature

Head of the Institution with seal

VICE CHANCELLOR
Institute of Chemical Technology
(University under Section-3 of UGC ACT OF 1956)
N. P. Marg, Matunga, Mumbai - 400 019.

Sudhasis Chakraborty
I/c HOD, FETD. 6/6/2022