FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Food Processing Technology)**

Semester: **VI**

Course Code: **202070603**

Course Title: **Food Process Equipment Design**

Course Group: **Professional Core Course**

Course Objectives: The students of food processing technology should be able to design the food process equipments, machines from the first principle considering their change in properties during the processing.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50/18	50/17	25/9	25/9	150/53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Design Consideration:** Stress created due to static and dynamic loads, design stress, elastic instability, combined stresses and theories of failure, brittle fracture, creep, temperature effects, radiation effects, and effects of fabrication method	06
2	**Heat Exchangers:** Introduction, Types of heat exchangers, design of shell and tube heat exchanger, plate heat exchanger design	09
3	**Pressure Vessel Design:** Introduction, operating conditions, design condition and stress, design of shell and its component,	06
4	**Evaporators:** Evaporators, types of evaporators, entrainment separators, materials of construction, design consideration, design problem	08
5	**Handling equipments:** Design considerations and design problem of belt conveyor, bucket elevator and screw conveyor	06

6	**Dryers:** Structural and thermal design, selection of dryer	**05**
7	**Process hazards and safety measures in equipment design:** Introduction, hazards in process industries, analysis of hazards, safety measures in equipment design, pressure relief devices	**05**
	Total	**45**

List of Practicals / Tutorials:

1	Problem based on mass and energy balance
2	Design based on evaporator
3	To determine the economy of single effect evaporator
4	To determine the economy of multiple effect evaporator
5	To determine the overall heat transfer coefficient in Agitated vessel
6	Design of shell & tube heat exchanger
7	Design of multiple shell and multiple pass heat exchanger
8	Design of dryer
9	Design of PHE
10	Design of material handling equipments

Reference Books:

1	Handbook of Food Processing Equipment (Food Engineering Series) 2016, George Saravacos, Athanasios E. Kostaropoulos
2	Heat Exchanger Design Handbook -2013, Kuppan Thulukkanam
3	Heat Exchangers: Selection, Rating, and Thermal Design, Third Edition- 2012, Sadik Kakaç, Hongtan Liu
4	Design of Multiple Effect Evaporator – 2011, Sukanchan Palit
5	Bulk Materials Handling Handbook -2014, Jacob Fruchtbaum

Supplementary learning Material:	
1	http://www.ucc.ie/en/ace-dfsct/
2	http://www.sciencedirect.com/science/book/
3	http://ciftinnovation.org/food-processing

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Industrial/ Field visits
- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model

making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	18%	22%	22%	23%	0%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will be able to understand the process and design the food processing equipment or machine from first principle	**20**
CO-2	Students understand different process hazards and material hazards which may cause synergetic effect in failure of food processing equipment or machine	**20**
CO-3	Detailed knowledge of heat exchanger, its design and application in food industry	**30**
CO-4	To understand the dryer, Pressure vessel, material handling equipments design, which are mainly used in the food industry	**30**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025