FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Dairy Technology)**

Semester: **V**

Course Code: **202200503**

Course Title: **Dairy Equipment Design**

Course Group: **Professional Core Course**

Course Objectives: The course aims to impart basic skills of mechanical engineering design theory like force, friction and stress analysis for design of machine components used in dairy industry and also Learn design procedure of bearings and spring.

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	2	0	4	50/18	50/17	25/9	25/9	150/53

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

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction:** Machine Design, Basic requirements of machine elements, Design of Machine Elements, Traditional Design Methods, Force system, Characteristics of force, System of force, Concurrent and non-Concurrent force system, Types of Friction, Laws of Friction	8
2	**Simple stress and strain:** Stress, Strain, Types of stresses and strains, Stress- strain relationship, Elasticity and elasticity limit, Hooke's law, Modulus of elasticity, Factor of safety, Poisson's Ratio, Bulk modulus, Shearing Stresses, Stresses due to bending moment and torsional moment	7
3	**Shear force and bending moments:** Introduction, Shear force and bending moment diagrams, types of beams, types of loads, Pure bending of beams, Flexural stress shearing stresses in beams relations between centre, Torsional and flexural loads, Relations between centre, Torsional and flexural loads	8
4	**Design of Dairy equipment:** Design of storage vessels/ tanks, horizontal and vertical tanks, design of insulated and un-insulated tanks, nozzles and mountings, design of agitation system components, baffles, power requirement for agitation, features of sanitary	10

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	equipment design.	
5	**Materials for Dairy Equipments:** Materials of Dairy equipment and its properties, Stainless steel, Composite materials, Static strength, ductility, Rigidity, hardness, fatigue, designing for fatigue conditions, Thermal expansion,	**5**
6	**Bearings and Spring:** Types of bearing, Journal and anti-friction bearing, selection of ball, tapered roller and thrust bearing, types of Springs, helical and leaf springs, Energy stored in springs, Design, and selection of springs.	**7**
	Total	**45**

List of Practicals/Tutorials:

1	Study of Concurrent and non-Concurrent force system
2	Study Laws of Friction and find out the frictional force
3	Analysis of Stress- strain relationship with example
4	Calculate the Stresses due to bending moment and torsional moment in component
5	Case study on Shear force and bending moment
6	Calculate the Torsional and flexural loads
7	Design of storage vessel used in dairy industry
8	Design of agitation system
9	Design Features and applications of bearings
10	Design features and applications of Springs

Reference Books:

1	Principles of Dairy Machine Design by S Ravi Kumar, www. Agrimoon.com
2	Design of Machine Element (Fourth Edition) by V. B. Bhandari (2018), McGraw HILL Education.
3	Dairy Engineering By S Ravi Kumar
4	Theory of Machines, by Sadhu Singh, Pearson Education
5	A Textbook of Machine Design by P. Sharma, Kataria S. K. & Sons.
6	A Textbook of Machine Design by R.S. Khurmi and J. K. Gupta (2006), Eurasia Publishing House (Pvt.) Ltd., Ram Nagar, New Delhi

Supplementary learning Material:

1	NPTEL and Coursera Video lectures.
2	www. Agrimonn.com

Pedagogy: Following one or more points can be incorporated as relevant pedagogy methods.

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits

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- 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**	
10%	50%	20%	10%	10%	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	Apply the knowledge of engineering fundamentals for material selection and manufacturing considerations in design and also understand of force and friction.	**15**
CO-2	Be able to apply knowledge of the stress and strain of mechanical components; and understand quantify factor of safety, shear stress and bending moment with torsional and flexural loads for simple mechanical components used in dairy industry	**45**
CO-3	To understand procedure of machine design and develop an ability to apply it for storage devices and agitation system.	**25**
CO-4	Be able to design and selection of journal bearing and spring for dairy industry	**15**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	October-2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	

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