



FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Food Processing Technology)

Semester: VIII

Course Code: 202070803

Course Title: Food Enzymology

Course Group: Professional Elective Course V

Course Objectives: Enzymes are applied at production, processing, and analyses in food industries. Enzymes are responsible for the changes of food characteristics such as texture, flavour, aroma, nutritional value. The changes produce both better quality foods and food spoilage. The students will have the basic and applied knowledge to analyze and utilize enzyme & its reactions in food processing and food analysis.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				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	Introduction to Enzymology: The concept, classification, properties of enzyme	05
2	Enzyme regulation: Concept of molecular regulation of enzyme production and operon (lac, ara, trp). Mechanism of enzyme activity, kinetics (MM constant, Lineweaver burke constant), inhibition (competitive, noncompetitive, uncompetitive, allosteric inhibition).	08
3	Immobilization of enzymes: Methods of Immobilization of enzymes & its application in foods	05
4	Starch, protein and lipid modifying enzymes: Starch modifying enzymes (maltodextrins and corn syrup solids: liquefaction, saccharification, dextrinization, isomerization for production of high-fructose-corn-syrup, fructose and fructo-oligosaccharides). Enzymes for protein modification (hydrolysates and bioactive peptides), Enzymes for Lipid modification	08



5	Enzymes as processing aids: Role of enzymes in Dairy processing (cheese making and whey processing). Role of enzymes in meat processing (tenderization and flavour development) and fish processing (De-skinning, collagen extraction etc.,) Egg processing.	06
6	Role of enzymes in Brewing & Baking: (fungal -amylase for bread making; maltogenic -amylases for anti-staling; xylanses and pentosanases as dough conditioners; lipases or dough conditioning; oxidases as replacers of chemical oxidants; synergistic effect of enzymes.	07
7	Role of enzymes in the production of flavours and inactivation of antinutritional factors: Enzyme-aided extraction of plant materials for production of flavours, production of flavour enhancers such as nucleotides, MSG; flavours from hydrolyzed vegetable/animal protein)	06
Total		45

List of Practicals / Tutorials:

1	To evaluate the papain activity
2	To estimate the enzyme activity
3	To detect production of enzyme by microorganism
4	Evaluation of chymosin activity
5	Estimation of V_m
6	Estimation of K_m
7	To study the enzymes related to chocolate liquefaction
8	To perform Paper chromatography
9	To perform gel filtration
10	Study of pectinase enzyme for fruit juice clarification

Reference Books:

1	Enzymes in Food Technology by Whitehurst, R.J. & Van-Oort, M. Second edition, Publisher Blackwell Publishing Ltd.
2	Microbial Enzyme Technology in Food Technology applications by Ray Ramesh C. and Rosell, Cristina M., (2016), CRC Press, Boca Raton, FL
3	Enzymes in Food Technology, First edition by Whitehurst, R.J. and Law, B.A. Publisher Sheffield Academic Press, Sheffield, UK
4	Enzymes In Food And Beverage Processing by Chandrasekaran Muthusamy Publisher: Taylor & Francis
5	Enzymes in Food Processing 3 rd Edition by Nagodawithana T. and Reed G. Publisher: Elsevier

Supplementary learning Material:

1	https://nptel.ac.in/courses/102102033 Introduction and Scope: Enzyme Science & Eng.
2	https://onlinecourses.nptel.ac.in/noc19_bt20
3	https://onlinecourses.swayam2.ac.in/cec20_bt20/preview
4	Application of Microbial Enzymes in Food Industry by Raveendran S., Parameswaran B., et al. (2018) Food Technology & Biotechnology Vol 56 (1):16-30
5	Application of enzymes. Available on https://www.youtube.com/watch?v=QNOivQcSjWc



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	
25%	40%	15%	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	Understand the fundamental, classification, nomenclature of enzyme, catalysis and their regulation specificities	15
CO-2	Conceptualize the action of enzymes as biocatalysts, kinetics of enzymatic reactions, enzyme immobilization techniques and applications	25
CO-3	Comprehend the application of enzymes in macronutrients modification, inactivation of antinutritional factors and as processing aids in food industry	30
CO-4	Understand the role and major applications of enzymes in brewing, baking, food flavour	30

Curriculum Revision:

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