GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3171410
Semester – VII
Subject Name: Food Enzymology

Type of course: Open Elective
Prerequisite: Nil
Rationale: Enzymes are used in food industries in production, processing, and analyses. Enzymes are responsible for the changes of many characteristics of foods such as texture, flavour, nutritious value, and aroma. The changes produce both better quality foods and food spoilage. The students will have the basic and applied knowledge to analyze and utilize enzyme reactions in foods, food processing and food analysis.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1.	**Introduction to Enzymology: The** concept, classification, properties of enzyme.	**04**
2.	**Enzyme regulation: Concept** of molecular regulation of enzyme production and operon (lac, ara, trp). Mechanism of enzyme activity, kinetics (MM constant, Line weaver burke constant), inhibition (competitive, noncompetitive, uncompetitive, allosteric inhibition).	**06**
3	**Immobilization of enzymes :**Methods of Immobilization of enzymes & its application in foods	**03**
4.	**Starch, protein and lipid modifying enzymes:** Starch modifying enzymes (maltodextrins and corn syrup solids: liquefaction, saccharification, and 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.	**07**
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.	**03**
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);	**04**
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)	**03**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**20**	**15**	**15**	

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Whitehurst,R.J. & Van-Oort,M., (2010), Enzymes in Food technology, Second edition, Blackwell Publishing Ltd
2. Ray, Ramesh C., and Rosell, Cristina M., (2016) Microbial enzyme technology in food applications, CRC Press, Boca Raton, FL, ISBN 9781498749848
3. Whitehurst, R.J. and Law, B.A. (2002) Enzymes in Food technology, First edition, Sheffield Academic Press, Sheffield, UK

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the chemical principles of enzyme catalysis, including regulation	10
CO-2	Show insight in the action of enzymes as biocatalysts and in factors that influence enzyme activity	20
CO-3	Understand the kinetics of enzymatic reactions	20
CO-4	Purify and quantify the enzymes and its activity	20
CO-5	Analyse options for applying enzymes in food industry and their inhibitors	30

List of Experiments:

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 Vm
6) Estimation of Km
7) To study the enzymes related to chocolate liquefaction
8) To perform Paper chromatography
9) To perform gel filtration