BSHND 309: BIOTECHNOLOGY IN NUTRITION AND DIETETICS

Learning Objectives:

After attending this course and completion of an appropriate amount of independent study, students will be able to know about;

- Biotechnology, its important areas in food and nutrition. And how the major components of food and functional foods can be produced using microorganisms?
- Food bio-preservatives and the importance of fermentation and starter cultures?
- Genetically modified foods, plants and microbes, how they can be produced and what is their role in food and nutrition.

Theory Content:

- Introduction to food biotechnology
- History of Food Biotechnology
- Needs for food biotechnology
- Fermented food and their diversity
- Food fermentation, benefits
- Fermented foods of sub-continent
- Starter cultures and fermentation
- General criteria for starter cultures
- Food Bio-preservation
- Bacteriocins as food preservative
- Niacin as bacteriocin and mode of action
- Single cell oils (SCO), History of SCO production
- SCO, Oligeneous microbes and their criteria
- SCO, Safety and applications
- Microbial exopolysaccharides
- Importance of Microbial EPS
- Single cell proteins, production and applications
- Food flavors and role of biotechnology in production
- Natural vs synthetic flavors
- Food applications of algae
- Nutritional value of edible fungi -- Spirulina
- Production and processing of edible fungi
- Nutritive and non-nutritive Sweeteners
- Low calorie sweeteners and their production

- Metabolic Engineering, Introduction
- Aims of metabolic engineering
- Steps of metabolic engineering
- Metabolic Engineering and LAB
- ME of LAB for dairy products
- Functional foods and biotechnology
- Functional foods and biotechnology
- Genetically modified foods / microbes

Practical content:

- Intro to prebiotics and probiotics, their criteria and applications
- Lactobacilli and their selective media for growth
- Intro to beta galactosidase and transgalactosylation
- Bioconversion of lactose using beta-galactosidase to produce prebiotic galacto-oligosaccharides and discussion for factors affecting
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- Bioconversion of lactose using beta-galactosidase to produce prebiotic galacto-oligosaccharides and discussion for factors affecting
- Galacto-oligosaccharides quantification using thin layer chromatography and discussion
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- Lactose intolerance and concept of lactose free functional dairy products
- Production of dairy products (milk, yogurt) with reduced lactose and improved GOS

Teaching-Learning Strategies:

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments:

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination:

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended readings:

1. Shetty K., Paliyath G., Pommeto, Levin, R. E. (2006). Food Biotechnology. (2nd ed). Taylor and Francis Group, LLC.
2. Stahl, U., Donalies, U. E. B., & Nevoigt, E. (2008). Food Biotechnology. Advances in Biochemical Engineering /Biotechnology. Springer-Verlag Berlin Heiderberg.