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फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

SU/BOS/Sci & Tech/ **No 0 0 3 5 5**

Date : 15/09/2021

To,

**17 SEP 2021**

The Director,  
Departments of Technology,  
Shiva'ji University,  
Kolhapur.

**Subject:** Regarding revised syllabus of **Ph. D. Coursework of Food Technology** under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabus of **Ph. D. Coursework of Food Technology** under the Faculty of Science and Technology.

This syllabus will be implemented from the academic year 2020-21 i.e. from June 2020 onwards.

You are therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

**Dy. Registrar**

Copy to :-

1.	I/c Dean, Faculty of Science & Technology	2.	Computer Centre/ IT Cell
3.	Chairman, BOS in Architecture	4.	Affiliation Section (U.G./P. G.)
5.	OE 4 Section	6.	P. G. Admission Section
7.	Eligibility Section	8.	P. G. Seminar Section
9.	Appointment Section	10.	P.G. Est.

**Shivaji University Kolhapur**

**Syllabus for Ph D Coursework in**

**Food Technology Engineering 2020-21**

**Paper III (Elective I)**  
**Advances in Food Analytical Techniques**

**Teaching Scheme:**

**Theory: 4hrs/ week**

**Examination Scheme:**

**Theory Examination: 80 Marks**

**Term Work: 20 Marks**

**Unit I**

Gas liquid chromatography: principle; different types of detectors and its applications: discharge ionization detector (DID), electron capture detector (ECD), flame photometric detector (FPD), Hall electrolytic conductivity detector (ElCD), helium ionization detector (HID), Nitrogen phosphorous detector (NPD), mass selective detector (MSD), photo-ionization detector (PID), pulsed discharge ionization detector (PDD), various applications of GLC.

High performance liquid chromatography (HPLC): different types of HPLC and their principles; Normal phase chromatography, Reverse phase chromatography, Size exclusion chromatography, Ion exchange chromatography, Bioaffinity chromatography, various Applications of HPLC.

**Unit II**

Blanching adequacy, non enzymatic browning, Analysis of fats and oil (FFA, PV, RM value) Sensory evaluation: different scales, training, skills and importance for consumer acceptance. Quantification of sensory attributes, artificial tongue, Artificial Nose. Texture analysis, Differential Scanning Calorimetry(DSC), Scanning Electron Microscopy (SEM) and Rapid methods of thermal analysis.

**Unit III**

Differential scanning calorimetry: principles and its applications, Atomic absorption: principles and its applications.

Gas chromatography-mass spectrometry (GC-MS): principles and applications in foods; Liquid chromatography-mass spectrometry (LC-MS): principles and applications; Electrophoresis: Principles and different types, current tools used to assess the safety of food.

**Unit IV:**

Application of modern techniques including spectroscopy, flame photometry, X-ray

analysis of foods, Mass spectroscopy, Infrared (IR), Nuclear magnetic resonance (NMR) and Refractometry. Enzymes in food analysis. Supercritical fluid extraction in food analysis. Rapid methods for detection of food pathogens, biosensors, automation and use of computers in food analysis.

Reference:

1. Doyle, M. P., & Buchanan, R. L. (Eds.). (2012). Food microbiology: fundamentals and frontiers. American Society for Microbiology Press.
2. Grob, R. L., & Barry, E. F. (Eds.). (1977). Modern practice of gas chromatography (Vol. 2). New York: Wiley.
3. Lawrence Jack Bradshaw, Introduction to Molecular Biological Techniques, Prentice-Hall, 1966
4. Niessen, W. M. (2006). Liquid chromatography-mass spectrometry. CRC press.
5. Rouessac, F., & Rouessac, A. (2013). Chemical analysis: modern instrumentation methods and techniques. John Wiley & Sons.
6. Singh, U. S., & Singh, R. P. (2017). Molecular methods in plant pathology. CRC Press.
7. Tagu, D. (2006). Techniques for molecular biology. Science Publishers.
8. Watson, J. D. (2012). The polymerase chain reaction. Springer Science & Business Media.
9. Welz, B., & Sperling, M. (2008). Atomic absorption spectrometry. John Wiley & Sons.

### **Paper III (Elective II)**

#### **Recent Trends in Nutraceuticals and Functional Foods**

**Teaching Scheme:**

**Theory: 4hrs/ week**

**Examination Scheme:**

**Theory Examination: 80 Marks**

**Term Work: 20 Marks**

#### **Unit I**

Introduction to Nutraceutical and Functional Foods

Organizational elements, classification of nutraceuticals, dietary supplements, fortified foods, functional foods and phytonutraceuticals. Scope involved in the industry, Indian and global scenario.

#### **Unit II**

Concept, Biochemistry of nutrition and dietetics

Classification of food components based on nutritional value, nutritional assessment of carbohydrates, proteins and fats, recommended dietary intake, acceptable dietary intake, nitrogen balance, protein efficiency ratio, net protein utilisation. Basics of energy balance - Basal Metabolic Rate (BMR), Body Mass Index (BMI) and Standard Dynamic Action (SDA) with special reference to nutraceutical industry.

#### **Unit III**

Nutrition related diseases and disorders

Carbohydrates, Protein, amino acids, Fat, vitamins and minerals - Excess and deficiency, symptoms, prevention and management, Role of nutraceuticals with special reference to diabetes mellitus, hypertension, hypercholesterolemia, cancer, glands in the prevention and treatment, Role of nutraceuticals and functional foods in pediatrics, geriatrics, sports, pregnancy and lactation.

#### **Unit IV**

Measurement of functional component and their bioavailability

Need for measurement, safety quality assurance and cost — bioavailability: definition, factor affecting, chemical measurement and physical testing and microbiological testing- functional foods and vitro studies.

References:

1. Goldberg, I. (2012). Functional foods: designer foods, pharmafoods, nutraceuticals. Springer Science & Business Media.

2. Klaenhammer, T. R. (2007). Probiotics and prebiotics. In Food Microbiology: Fundamentals and Frontiers, Third Edition (pp. 891-907). American Society of Microbiology.
3. Lockwood, B. (2007). Nutraceuticals: a guide for healthcare professionals. Pharmaceutical Press.
4. Maffei, M. (Ed.). (2003). Dietary supplements of plant origin: a nutrition and health approach. CRC Press.
5. Mazza, G. (Ed.). (1998). Functional foods: biochemical and processing aspects (Vol. 1). CRC Press.
6. Neeser, J. R., & Bruce German, J. (2004). Bioprocesses and biotechnology for functional foods and nutraceuticals. Marcel Dekker.
7. Tracy, Timothy S., Kingston, Richard L. (Eds.) . (2007) Herbal Products Toxicology and Clinical Pharmacology
8. Wildman, R. E. (2016). Handbook of nutraceuticals and functional foods. CRC press.
9. Young, J. (1996). Functional foods: strategies for successful product development. Financial Times Retail & Consumer Pub..