**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

**Scheme**

**&**

**Syllabus**

**for**

**M.Tech (Food Technology)**

**III and IV semester**

**M.Tech (Food Technology), KUK w.e.f. session 2016-17**

**Semester-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sub Code** | **Subject Title** | **Credit Hours per week** | **External Marks** | **Internal Marks** | **Total Marks** |
| MFT-301 | Neutraceuticals and Functional Foods | 4 | 70 | 30 | 100 |
| \* | Elective-I | 4 | 70 | 30 | 100 |
| MFT-303 | Lab- Neutraceuticals & Functional Foods | 2 | 50 | 25 | 75 |
| MFT-304 | Seminar on Current Topic | 2 | -- | 25 | 25 |
|  | Total | 12  | 190 | 110 | 300 |

**Semester-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sub Code** | **Subject Title** | **Credit Hours** | **External Marks** | **Internal Marks** | **Total Marks** |
| MFT-401 | Dissertation and Viva Voce | 10 | 100 | 100 | 200 |

**\* ELECTIVE- I (any one of the following)**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Sub Code** | **Subject Title** |
| 1 | MFT-302 | Thermal Food Processing |
| 2 | MFT-305 | Technology of Frozen Foods |
| 3 | MFT-306 | Beverage & Snack Food Technology |

**Note-**

1. **The institute will intimate the DR (Secrecy) KUK in the start of semester reporting the elective papers being taught in particular year.**
2. **The pass marks in paper MFT 401 shall be 40% in internal and external separately and 40% in aggregate.**
3. **Minimum one Research Paper prior to submission of Dissertation in National / International referred Journals.**

**MFT-301 NUTRACEUTICALS AND FUNCTIONAL FOODS**

 **Credit hours 04**

 **Internal- 30**

 **External-70**

 **Exam Duration: 3hrs**

**Note- The examiner will set eight questions of 14 marks each taking two from each unit. The candidates are required to attempt five Questions in total, selecting at least one from each unit.**

**Unit – I**

Defining nutraceuticals and functional foods, Nature, type and scope of nutraceutical and functional foods

Nutraceutical and functional food applications and their health benefits, Nutraceutical compounds and their classification based on chemical and biochemical nature with suitable and relevant descriptions

**Unit – II**

Nutraceuticals for specific situations such as cancer, heart disease, stress, osteoarthritis, hypertension etc

Antioxidants and other phytochemicals, (isoflavones, lycopenes), their role as nutraceuticals and functional foods, Dietary fibers and complex carbohydrates as functional food ingredients

**Unit – III**

Protein as a functional food ingredient, Probiotic foods and their functional role, Herbs as functional foods, health promoting activity of common herbs

Cereal products as functional foods – oats, wheat bran, rice bran etc.

Functional vegetable products, oil seeds, spices and sea foods.

Coffee, tea and other beverages as functional foods/drinks and their protective effects

**Unit – IV**

Effects of processing, storage and interactions of various environmental factors on the potentials of such foods. Marketing and regulatory issues for functional foods and nutraceuticals .Recent development and advances in the areas of nutraceutical and functional foods.

**References**

1. Functional Foods, R. Chadwick,S. Henson,B. Moseley,G, Springer Science & Business Media, 2003
2. Methods of Analysis for Functional Foods and Nutraceuticals ,W. Jeffrey Hurst CRC Press, 2008
3. Handbook of Functional Dairy Products Functional Foods, Colette Shortt, John O'Brien, CRC Press, 2003
4. Handbook of Nutraceuticals and Functional Foods, Robert E.C. Wildman, Robert Wildman, Taylor C. Wallace, CRC Press, 2006

**MFT-302 THERMAL FOOD PROCESSING**

 **Credit hours 04**

 **Internal- 30**

 **External-70**

 **Exam Duration: 3hrs**

**Note- The examiner will set eight questions of 14 marks each taking two from each unit. The candidates are required to attempt five Questions in total, selecting at least one from each unit.**

**Unit – I**

 **Modelling of Thermal Food Processes:-**

Heat Transfer- Relationship between thermodynamics and thermal processing, modes of heat transfer, Thermo physical properties of food, Applications of heat and mass transfer in thermal food processing

**Unit-II**

**Quality and safety aspects of thermally processed foods:-**

Thermal processing of meat products, Thermal processing of Fishery products, Thermal processing of poultry products, Thermal processing of dairy products, thermal processing of canned foods, thermal processing of vegetables.

**Unit-III**

**Thermal processing of milk:-**

Pasteurization of milk; batch, flash and continuous

pasteurizer, HTST pasteurizer and design principle and thermal death kinetics, care and maintenance, UHT processing of milk, quality changes during processing of milk

**Unit-IV**

 **Innovations in Thermal Food Processes:-**

Ohmic heating for food processing, Radio frequency dielectric heating, Infra red heating, Pressure- Assisted thermal processing, pH -Assisted Thermal Processing,Time temperature integrators for Thermal Process Evaluation.

**References**

1. Heat and mass transfer , D.S.kumar, S.K. Kataria & Sons, 2013
2. Fundamentals of Engineering heat and mass transfer, [Frank P. Incropera](http://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Frank+P.+Incropera%22), John Wiley & Sons, 2011
3. Fundamentals of Engineering heat and mass transfer, R.C. Sachdeva, New Age Science, 2009
4. Thermal Food Processing: New Technologies and Quality Issues, Second Edition; Da-Wen Sun; CRC Press, taylor francis group
5. Dairy Engineering, [John Thomas Bowen](http://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22John+Thomas+Bowen%22), Wiley,1925
6. Milk and Milk Products , [Clarence Henry Eckles](http://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Clarence+Henry+ECKLES%22), [Willes Barnes Combs](http://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Willes+Barnes+COMBS%22), [Harold Macy](http://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Harold+MACY%22), McGraw-Hill Book Company, 1943
7. Food processing technology, Fellows P. J., Elsevier, 2009

**MFT-305 TECHNOLOGY OF FROZEN FOODS**

 **Credit hours 04**

 **Internal- 30**

 **External-70**

 **Exam Duration: 3hrs**

**Note- The examiner will set eight questions of 14 marks each taking two from each unit. The candidates are required to attempt five Questions in total, selecting at least one from each unit.**

**Unit – I**

**Fundamentals of Freezing:** Glass transitions in frozen foods and biomaterials,

Microbiology of frozen foods, Thermo -physical properties of frozen foods, Freezing loads and Freezing time calculation, Freezing methods and equipment. Innovations in freezing process .

**Unit – II**

**Facilities for the Cold Chain:**, Cold store design and maintenance, Transportation of frozen foods, Retail display equipment and management, Household refrigerators and freezers, Monitoring and control of the cold chain.

**Unit – III**

**Quality and Safety of Frozen Foods:** Quality and safety of frozen meat and meat product, Quality and safety of frozen poultry and poultry products, Safety and quality of frozen fish, Shellfish, and related products, Quality and safety of frozen vegetables, Quality and safety of frozen fruits, Quality and safety of frozen dairy products, Quality and safety of frozen ready meats, Quality and safety of frozen bakery products, Quality and safety of frozen eggs and egg products

**Unit – IV**

**Monitoring and Measuring Techniques for Quality and Safety:** Chemical Measurements, Sensory analysis of frozen foods, Foodborne illnesses and detection of pathogenic microorganisms, Shelf-life prediction of frozen foods.

**Packaging of Frozen Foods:** Introduction to frozen food packaging, Plastic packaging of frozen foods, Paper and card packaging of frozen foods, Packaging of frozen foods with other materials, Packaging machinery

**References**

1. Quality in Frozen Foods, Marilyn C. Erickson,Yen-Con Hung , Springer Science & Business Media, 1997.
2. Handbook of Frozen Foods, Y. H. Hui, Isabel Guerrero Legarretta, Miang Hoong Lim, K.D. Murrell, Wai-Kit Nip, CRC Press, 2004.
3. Managing Frozen Foods, Kennedy Chris J, Elsevier
4. Frozen Food Technology, C.P Mallete, Springer Science & Business Media, 1993

**MFT-306 BEVERAGE AND SNACK FOOD TECHNOLOGY**

 **Credit hours 04**

 **Internal- 30**

 **External-70**

 **Exam Duration: 3hrs**

**Note- The examiner will set eight questions of 14 marks each taking two from each unit. The candidates are required to attempt five Questions in total, selecting at least one from each unit.**

**Unit I**

**Types of beverages and their importance**- Status of beverage industry in india, manufacturing technology for juice-based beverages, synthethic beverages, still, carbonated, low calorie and dry beverages, isotonic and sports drinks.

Role of various ingredients of soft drinks, carbonated soft drinks, Speciality beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, dairy and imitation dairy based beverages.

**Unit II**

**Alcoholic beverages**- type, manufacture and quality evaluation, the role of yeast in beer and other alchoholic beverages, ale type beer, lager type beer technology of brewing process, equipment used for brewing and distillation, wine and related beverages, distilled beverages, distilled spirits

**Packaged and drinking water**- definition, types, manufacture and quality evaluation and raw and processed water, methods of water treatment, BIS quality standards of bottled water, mineral water, natural spring water, flavoured water, carbonated water.

**Unit- III**

**Technology for grain based snacks, whole grains**- roasted, toasted, puffed, popped and flakes, coated grains- Salted, spiced and sweetened. Flour based – batter and dough products, savoury, spiced and sweetened, formulated chips and wafers, papads, instant premixes of traditional Indian snack foods.

**Unit- VI**

**Formulation and processing technology for fruit and vegetable based snacks**:- Chips, wafers, coated nuts- salted, spiced and sweetened ,chikkis, extruded snack foods. Colouring, flavouring and packaging techniques, Equipment for frying, baking & drying, toasting, roasting and flaking, popping, blending, coating, chipping.

**References**

1. Extrusion of food Vol 2, Harper JM, CRC Press,1981.
2. Bakery technology & engineering, Matz SA, AVI Pub,1960
3. Beverages: Technology, Chemistry and Microbiology ; [A. Varnam](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22A.+Varnam%22), [J.M. Sutherland](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22J.M.+Sutherland%22); Chapman & Hall
4. Snack Food Technology, Samuel AM.1976 AVI Publ
5. Beverages: Carbonated and Non Carbonated. Woodroof JG & Phillips GF, AVI Publ.1974

**MFT-303 LAB- NUTRACEUTICALS AND FUNCTIONAL FOODS**

 **Credit hours 02**

 **Internal- 25**

 **External-50**

 **Experiments**

1. Extraction and estimation of nutraceuticals from isoflavones (legumes).
2. Extraction and estimation of nutraceuticals from capsaicinoids (Peppers).
3. Extraction and estimation of nutraceuticals from monounsaturated fatty acids (Oil seeds).
4. Extraction and estimation of nutraceuticals from lecithin (Legumes seeds).
5. Isolation and determination of lycopene from tomato products.
6. Extraction of plant phenolic substances by colorimetric and spectrophotometric techniques.
7. Preparation and evaluation of probiotic foods.
8. Determination and quantification of some nutraceutical and functional food by GLC and HPLC.
9. Extraction of tannins from banana peels.