# Dr. N.G.P. ARTS AND SCIENCE COLLEGE

(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)
Approved by Government of Tamil Nadu & Accredited by NAAC with 'A$^{++}$' Grade (3rd Cycle - 3.64 CGPA)
Dr. N.G.P.-Kalapatti Road, Coimbatore-641 048, Tamil Nadu, India.
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## REGULATIONS 2023-24 for Post Graduate Programme

## (Outcome Based Education model with Choice Based Credit System)

## M.Sc. FOODS AND NUTRITION

(For the students admitted during the academic year 2023-24 and onwards)

**Eligibility:**

A pass in any one of the following Degree Courses of B.Sc. Nutrition and Dietetics, Nutrition, Food Service Management and Dietetics, Food Science and Quality Control, B.VOC-Food Processing Technology, Food Science and Nutrition, Botany, Zoology, Biochemistry, Biotechnology, Chemistry, Microbiology, Home science or Family and Community Science or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear andqualify for the M.Sc. Food and Nutrition Examination of this College after a course study of two academic years.

**Programme Educational Objectives:**

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To provide advanced knowledge on food science and nutrition to enhance the quality of life through the improvement of human health and nutritional status
2. To enable the students to implement the basic food science in operation
3. To develop skills and techniques in food preparation with conservation of nutrients and palatability using cooking methods generally employed
4. To help the students to contribute proper utilization of foods and prevent wastes
5. To understand the prevalence of malnutrition in our Country and gain knowledge on effective methods to combat malnutrition.

## PROGRAMME OUTCOMES:

On the successful completion of the program, the following are theexpected outcomes.

| PO Number | PO Statement |
|---|---|
| PO1 | To develop the knowledge of the students in the area of human nutrition, food science, food product development, food safety and quality management. |
| PO2 | Apply recently advanced novel foods in medical nutrition therapy and recommend the physical activity to manage the common diseases and metabolic disorder to achieve the fitness and wellbeing. |
| PO3 | Familiarize with the problems and plan, implement, monitor and evaluate interventional programs related to food and nutrition and security to the community. |
| PO4 | To build entrepreneurial values, attitudes, quality and desire in developing innovative food products by fulfilling quality parameters, used to meet the consumer needs nutritionally and commercially viable. |
| PO5 | To develop skills and techniques for the students to become professionals in service industries. |

## Total Credit Distribution

| Course | Credits | Total | | Credits | Cumulative Total |
|---|---|---|---|---|---|
| Core | 4 | 14x 100 | 1400 | 56 | 92 |
| Core Practical | 3 | 2 x 100 | 200 | 06 | |
| | 2 | 2 x 100 | 200 | 04 | |
| EDC | 4 | 1 x 100 | 100 | 04 | |
| Core Project Work | 8 | 1 x 200 | 200 | 08 | |
| Internship | 2 | 1 x 100 | 100 | 02 | |
| Electives | 3 | 3 x 100 | 300 | 09 | |
| Elective Practical | 3 | 1 x 100 | 100 | 03 | |
| | | | **2600** | **92** | **92** |

# PG
# CURRICULUM

## M.Sc. Foods and Nutrition
## AY 23-24

| Course Code | Course Category | Course Name | L | T | P | Exam (h) | Max Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CIA | ESE | Total | |
| **First Semester** | | | | | | | | | | |
| 233FN2A1CA | Core – I | Advanced Food Science | 4 | 1 | 1 | 3 | 25 | 75 | 100 | 4 |
| 233FN2A1CB | Core – II | Nutrition Through Life Cycle | 4 | 1 | 1 | 3 | 25 | 75 | 100 | 4 |
| 233FN2A1CC | Core – III | Nutritional Biochemistry | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A1CD | Core – IV | Food Chemistry | 4 | 1 | 1 | 3 | 25 | 75 | 100 | 4 |
| 233FN2A1CP | Core Practical – I | Food Science and Food Chemistry Practical | - | - | 4 | 3 | 40 | 60 | 100 | 2 |
| 233FN2A1DA | DSE - I | Functional Foods and Nutraceuticals | 4 | - | - | 3 | 25 | 75 | 100 | 3 |
| 233FN2A1DB | | Food Product Development | | | | | | | | |
| 233FN2A1DC | | Harvest Technology of Agricultural Produce | | | | | | | | |
| | | **Total** | **20** | **03** | **07** | | | | **600** | **21** |

| Course Code | Course Category | Course Name | L | T | P | Exam (h) | Max Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CIA | ESE | Total | |
| **Second Semester** | | | | | | | | | | |
| 233FN2A2CA | Core – V | Food Processing | 4 | 1 | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A2CB | Core - VI | Applied Physiology | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A2CC | Core - VII | Therapeutic Nutrition – I | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A2CD | Core - VIII | Macronutrients | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A2CP | Core Practical – II | Food Analysis | - | - | 6 | 3 | 40 | 60 | 100 | 3 |
| 233FN2A2CE | EDC | Computer Application in Nutrition | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A2DA | DSE - II | Food Biotechnology | 3 | - | - | 3 | 25 | 75 | 100 | 3 |
| 233FN2A2DB | | Food Waste and By-Product Utilization | | | | | | | | |
| 233FN2A2DC | | Food Toxicology | | | | | | | | |
| **Total** | | | **23** | **1** | **6** | | | | **700** | **26** |

BoS Chairman/HoD
Department of Food Science & Nutrition
Dr. N. G. P. Arts and Science College
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| Course Code | Course Category | Course Name | L | T | P | Exam (h) | Max Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CIA | ESE | Total | |
| **Third Semester** | | | | | | | | | | |
| 233FN2A3CA | Core – IX | Micronutrients | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A3CB | Core – X | Therapeutic Nutrition - II | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A3CC | Core – XI | Research Methodology and Statistics | 4 | 1 | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A3CD | Core – XII | Food Additives and Contaminants | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A3CP | Core Practical - III | Food Analytical Techniques | - | - | 6 | 3 | 40 | 60 | 100 | 3 |
| 233FN2A3CQ | Core Practical - IV | Therapeutic Nutrition- | - | - | 4 | 3 | 40 | 60 | 100 | 2 |
| 233FN2A3CT | IT | Internship | - | - | - | 3 | 40 | 60 | 100 | 2 |
| 233FN2A3DA | DSE - III | Instrumentation in Food Industry | 3 | - | - | 3 | 25 | 75 | 100 | 3 |
| 233FN2A3DB | | Food Packaging Techniques | | | | | | | | |
| 233FN2A3DC | | Food Microbiology | | | | | | | | |
| | | **Total** | **19** | **01** | **10** | | | | **800** | **26** |

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| Course Code | Course Category | Course Name | L | T | P | Exam (h) | Max Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CIA | ESE | Total | |
| **Fourth Semester** | | | | | | | | | | |
| 233FN2A4CA | Core – XIII | Public Health Nutrition | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A4CB | Core - XIV | Food Safety and Quality Management | 4 | - | - | 3 | 25 | 75 | 100 | 4 |
| 233FN2A4CV | Core – XV | Project and Viva Voce | - | - | 16 | 3 | 80 | 120 | 200 | 8 |
| 233FN2A4DP | DSE - IV | Food Quality Control | - | - | 6 | 3 | 40 | 60 | 100 | 3 |
| 233FN2A4DQ | | Nutrition in Health | | | | | | | | |
| 233FN2A4DR | | Food Fermentation Techniques | | | | | | | | |
| **Total** | | | **08** | **-** | **22** | | | | **500** | **19** |
| ***Grand Total** | | | | | | | | | **2600** | **92** |

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## DISCIPLINE SPECIFIC ELECTIVE

**Semester I (Elective I)**

(Student shall select any one of the following courses as Elective in first semester)

**List of Elective Courses**

| S. No. | Course Code | Name of the Course |
|---|---|---|
| 1. | 233FN2A1DA | Functional Foods and Nutraceuticals |
| 2. | 233FN2A1DB | Food Product Development |
| 3. | 233FN2A1DC | Harvest Technology of Agricultural produce |

**Semester II (Elective II)**

(Student shall select any one of the following courses as Elective in second semester)

**List of Elective Courses**

| S. No. | Course Code | Name of the Course |
|---|---|---|
| 1. | 233FN2A2DA | Food Biotechnology |
| 2. | 233FN2A2DB | Waste and By-Product Utilization |
| 3. | 233FN2A2DC | Food Toxicology |

**Semester III (Elective III)**

(Student shall select any one of the following course as Elective in Third semester)

**List of Elective Courses**

| S. No. | Course Code | Name of the Course |
|---|---|---|
| 1. | 233FN2A3DA | Instrumentation in Food Industry |
| 2. | 233FN2A3DB | Food Packaging Techniques |
| 3. | 233FN2A3DC | Food Microbiology |

**Semester IV (Elective IV)**

(Student shall select any one of the following courses as Elective in fourthsemester)

**List of Elective Courses**

| S. No. | Course Code | Name of the Course |
|---|---|---|
| 1. | 233FN2A4DP | Food Quality Control |
| 2. | 233FN2A4DQ | Nutrition in Health |
| 3. | 233FN2A4DR | Chemical Composition and Food Proportions |

**Self-study paper offered by the Department of Food Science and Nutrition**

| S. No. | Semester | Course Code | Course Name |
|---|---|---|---|
| 1 | III | 233FN2ASSA | Composite Home science |
| 2 | III | 233FN2ASSB | Diet Counseling |

## PG REGULATION (R5)

## (2023-24 and onwards)

## (OUTCOME BASED EDUCATION WITH CBCS)

Effective from the academic year 2023-24 and applicable to the students admitted to the Degree of Master of Arts/Commerce/Management/Science.

### 1.NOMENCLATURE

**1.1 Faculty:** Refers to a group of programmes concerned with a major division of knowledge. Eg. Faculty of Computer Science consists of Programmes like Computer Science, Information Technology, Computer Technology, Computer Applications, Cognitive Systems, Artificial Intelligence and Machine Learning and Cyber Security and Data Analytics etc.

**1.2 Programme**: Refers to the Master of Arts/Management/Commerce/Science Stream that a student has chosen for study.

**1.3 Batch**: Refers to the starting and completion year of a programme of study. Eg. Batch of 2023–2025 refers to students belonging to a 2-year Degree programme admitted in 2023 and completing in 2025.

**1.4 Course**: Refers to component of a programme. A course may be designed to involve lectures / tutorials / laboratory work / seminar / project work/ practical training / report writing / Viva voce, etc or a combination of these, to effectively meet the teaching and learning needs and the credits may be assigned suitably.

**a) Core Courses** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

**b) Extra Departmental Course (EDC):** A course chosen generally from a related discipline/subject, with an intention to seek exposure in the discipline relating to the core domain of the student.

**c) Discipline Specific Elective Course (DSE):** Elective courses are offered under main discipline/ subject of study.

**d)Internship/Industrial Training (IT)**

Students must undertake industrial / institutional training for a minimum of 15 days during the II semester summer vacation. The students will submit the report for evaluation during III semester.

**e) Project Work**: It is considered as a special course involving application of knowledge in problem solving/analyzing/exploring a real-life situation. The Project work will be given in lieu of a Core paper.

**f) Extra credits** Extra credits will be awarded to a student for achievements in co-curricular activities carried out outside the regular class hours. The guidelines for the award of extra credits are given in section two, these credits are not mandatory for completing the programme.

**g) Advanced Learner Course (ALC):** ALC is doing work of a higher standard than usual for students at that stage in their education. Research work / internships carried out in University/ Research Institutions/ Industries of repute in India or abroad for a period of 15 to 30 days.

## 2. STRUCTURE OF PROGRAMME

- Core Course
- Extra Departmental Course (EDC)
- Discipline Specific Elective (DSE)
- Industrial Training (IT)
- Project

## 3. DURATION OF THE PROGRAMME

A student is normally expected to complete the M.Sc. /M.Com. / M.A. Programme in 4 semesters. However, in any case not more than 5 consecutive semesters. Failing which the concerned BoS will identify suitable/ equivalent course.

## 4. REQUIREMENTS FOR COMPLETION OF A SEMESTER

Every student shall ordinarily be allowed to keep terms for the given semester in a program of his/ her enrolment, only if he/ she fulfills at least seventy five percent (75%) of the attendance taken as an average of the total number of lectures, practicals,

tutorials, etc. wherein short and/or long excursions/field visits/study tours organised by the college and supervised by the faculty as envisaged in the syllabus shall be credited to his attendance. Every student shall have a minimum of 75% as an overall attendance.

## 5. EXAMINATIONS

The end semester examinations shall normally be conducted after completing 90 working days for each semester. The maximum marks for each theory and practical course as follows,

**Mark distribution for Theory Courses**

Continuous Internal Assessment (CIA) : 40 Marks

End Semester Exams (ESE) : 60 Marks

Total : 100 Marks

**i) Distribution of Internal Marks**

| S.No. | Particulars | Distribution of Marks |
|---|---|---|
| 1 | CIA I (2.5 Units) (On completion of 45th working day) | 5 |
| 2 | Model ( All 5 Units) (On completion of 85th working day) | 5 |
| 3 | Attendance | 05 |
| 4 | Library Usage | 05 |
| 5 | Skill Enhancement * | 05 |
| | **Total** | **25** |

**Breakup for Attendance Marks:**

| S.No | Attendance Range | Marks Awarded |
|---|---|---|
| 1 | 95% and Above | 5 |
| 2 | 90% - 94% | 4 |
| 3 | 85% - 89% | 3 |
| 4 | 80% - 84% | 2 |
| 5 | 75% - 79% | 1 |

**Note:**
Special Cases such as NCC, NSS, Sports, Advanced Learner Course, Summer Fellowship and Medical Conditions etc. the attendance exemption may be given by principal and Mark may be awarded.

**Break up for Library Marks:**

| S.No | Attendance Range | Marks Awarded |
|---|---|---|
| 1 | 10h and above | 5 |
| 2 | 9h– less than 10h | 4 |
| 3 | 8h – less than 9h | 3 |
| 4 | 7h - less than 8h | 2 |
| 5 | 6h – less than 7h | 1 |

**Note:**
In exception, the utilization of e-resources of library will be considered.

***Components for "Skill Enhancement" may include the following:**

Class Participation, Case Studies Presentation/Term paper, Field Study, Field Survey, Group Discussion, Term Paper, Presentation of Papers in Conferences, Industry Visit, Book Review, Journal Review, e-content Creation, Model Preparation, Seminar and Assignment.

**Components for Skill Enhancement**
Any one of the following should be selected by the course coordinator

| S.No. | Skill Enhancement | Description |
|---|---|---|
| 1 | Class Participation | • Engagement in class<br>• Listening Skills<br>• Behaviour |
| 2 | Case Study Presentation/ Term Paper | • Identification of the problem<br>• Case Analysis<br>• Effective Solution using creativity/imagination |
| 3 | Field Study | • Selection of Topic<br>• Demonstration of Topic<br>• Analysis & Conclusion |

| | | |
|---|---|---|
| 4 | Field Survey | • Chosen Problem<br>• Design and quality of survey<br>• Analysis of survey |
| 5 | Group Discussion | • Communication skills<br>• Subject knowledge<br>• Attitude and way of presentation<br>• Confidence<br>• Listening Skill |
| 6 | Presentation of Papers in Conferences | • Sponsored<br>• International/National<br>• Presentation<br>• Report Submission |
| 7 | Industry Visit | • Chosen Domain<br>• Quality of the work<br>• Analysis of the Report<br>• Presentation |
| 8 | Book Review | • Content<br>• Interpretation and Inferences of the text<br>• Supporting Details<br>• Presentation |
| 9 | Journal Review | • Analytical Thinking<br>• Interpretation and Inferences<br>• Exploring the perception if chosen genre<br>• Presentation |
| 10 | e-content Creation | • Logo/ Tagline<br>• Purpose<br>• Content (Writing, designing and posting in Social Media)<br>• Presentation |
| 11 | Model Preparation | • Theme/ Topic<br>• Depth of background Knowledge<br>• Creativity<br>• Presentation |

| | | |
|---|---|---|
| 12 | Seminar | • Knowledge and Content<br>• Organization<br>• Understanding<br>• Presentation |
| 13 | Assignment | • Content and Style<br>• Spelling and Grammar<br>• References |

**ii) Distribution of External Marks**

**Total : 75**
**Written Exam : 75**

**Marks Distribution for Practical course**

**Total : 100**
**Internal : 40**
**External : 60**

**i) Distribution of Internals Marks**

| S. No. | Particulars | Distribution of Marks |
|---|---|---|
| 1 | Experiments/Exercises | 15 |
| 2 | Test 1 | 10 |
| 3 | Test 2 | 10 |
| 4 | Observation Notebook | 05 |
| | **Total** | **40** |

**ii) Distribution of Externals Marks**

| S.No. | Particulars | External Marks |
|---|---|---|
| 1 | Practical | 40 |
| 2 | Record | 10 |
| 3 | Viva- voce | 10 |
| | Total | **60** |

Practical examination shall be evaluated jointly by Internal and External Examiners.

**A) Mark Distribution for Project**

| | | |
|---|---|---|
| **Total** | **:** | **200** |
| **Internal** | **:** | **80** |
| **External** | **:** | **120** |

**i) Distribution of Internal Marks**

| S.No. | Particulars | Internal Marks |
|---|---|---|
| 1 | Review I | 30 |
| 2 | Review II | 40 |
| 3 | Attendance | 10 |
| | **Total** | **80** |

**ii) Distribution of External Marks**

| S.No | Particulars | External Marks |
|---|---|---|
| 1 | Project Work & Presentation | 100 |
| 2 | Viva -voce | 20 |
| | **Total** | **120** |

Evaluation of Project Work shall be done jointly by Internal and External Examiners.

**6 . Credit Transfer**

**a.** Upon successful completion of 1 NPTEL Course (4 Credit Course) recommended by the department, during Semester I to II, a student shall be eligible to get exemption of one **4 credit course** during the 3rd semester. The proposed NPTEL course should cover content/syllabus of exempted core paper in 3rd semester.

| S. No. | Course Code | Course Name | Proposed NPTEL Course | Credit |
|---|---|---|---|---|
| 1 | | | Option - 1 Paper title | 4 |
| | | | Option - 2 Paper title | |
| | | | Option - 3 Paper title | |

**b.** Upon successful completion of **2 NPTEL Courses** (2 Credit each) recommended by the department, during Semester I to II, a student shall be eligible to get exemption of **one 4 credit course** during the 3rd semester. Out of 2 NPTEL proposed courses, **at least 1 course** should cover content/syllabus of exempted core paper in 3rd semester.

**Mandatory**

**The exempted core paper in the 3rd semester should be submitted by the students for approval before the end of 2nd semester**

**Credit transfer will be decided by equivalence committee**

| S. No. | Course Code | Course Name | Proposed NPTEL Course | Credit |
|---|---|---|---|---|
| 1 | | | Option – 1 Paper title | 2 |
| | | | Option – 2 Paper title | |
| | | | Option – 3 Paper title | |
| 2 | | | Option – 1 Paper title | 2 |
| | | | Option – 2 Paper title | |
| | | | Option – 3 Paper title | |

**NPTEL Courses to be carried out during semester I – II.**

| S. No. | Student Name | Class | Proposed NPTEL Course | | Proposed Course for Exemption |
|---|---|---|---|---|---|
| | | | Course I | Option 1- Paper Title<br>Option 2- Paper Title<br>Option 3- Paper Title | Any one Core Paper in 3rd Semester |
| | | | Course II | Option 1- Paper Title<br>Option 2- Paper Title<br>Option 3- Paper Title | |

**Class Advisor** **HoD** **Dean**

**7. Internship/Industrial Training**

**Mark Distribution for Internship/ Industrial Training**

| | | |
|---|---|---|
| **Total** | **:** | **100** |
| **Internal** | **:** | **40** |
| **External** | **:** | **60** |

**i) Distribution of Internal Marks**

| S.No. | Particulars | Internal Marks |
|---|---|---|
| 1 | Review I | 15 |
| 2 | Review II | 20 |
| 3 | Attendance | 5 |
| | **Total** | **40** |

**ii) Distribution of External Marks**

| S.No | Particulars | External Marks |
|---|---|---|
| 1 | Internship /Industrial training Presentation | 40 |
| 2 | Viva -voce | 20 |
| | **Total** | **60** |

Internship/ Industrial training shall be evaluated jointly by Internal and External Examiners.

**9. Extra Credits: 10**

Earning extra credit is not essential for programme completion. Student is entitled to earn extra credit for achievement in Curricular/Co-Curricular/ Extracurricular activities carried out other than the regular class hours.

A student is permitted to earn a maximum of 10 extra Credits during the programme period. A maximum of 1 credit under each category is permissible.

| Category | Credit |
|---|---|
| Self study Course | 1 |
| CA/ICSI/CMA (Foundations) | 1 |

| | |
|---|---|
| CA/ICSI/CMA (Inter) | 1 |
| Sports and Games | 1 |
| Publications / Conference Presentations (Oral/Poster)/Awards | 1 |
| Innovation / Incubation / Patent / Sponsored Projects / Consultancy | 1 |
| Representation in State / National level celebrations | 1 |
| Awards/Recognitions/Fellowships | 1 |
| **Advanced Learner Course (ALC)*** | 2 |

Credit shall be awarded for achievements of the student during the period of study only.

**GUIDELINES**

**Self study Course**

A pass in the self study courses offered by the department.

The candidate should register the self study course offered by the department only in the III semester.

**CA/ICSI/CMA(Foundations)**

Qualifying foundation in CA/ICSI/CMA / etc.

**CA/ICSI/CMA(Inter)**

Qualifying Inter in CA/ICSI/CMA / etc.

**Sports and Games**

The Student can earn extra credit based on their Achievement in sports in University/ State / National/ International.

**Publications / Conference Presentations (Oral/Poster)**

Research Publications in Journals

Oral/Poster presentation in Conference

**Innovation / Incubation / Patent / Sponsored Projects / Consultancy**

Development of model/ Products /Prototype /Process/App/Registration of Patents/ Copyrights/Trademarks/Sponsored Projects /Consultancy

**Representation in State/ National level celebrations**

State / National level celebrations such as Independence day, Republic day Parade, National Integration camp etc.

**Awards/Recognitions/Fellowships**

Regional/ State / National level awards/ Recognitions/Fellowships

***Advanced Learner Course (ALC):**

ALC is doing work of a higher standard than usual for students at that stage in their education.

Research work/internships carried out in University/ Research Institutions/ Industries of repute in India or abroad for a period of 15 to 30 days will be considered as Advanced Learners Course.

## QUESTION PAPER PATTERN

### CIA Test I : [1½ Hours-2.5 Units] - 25 Marks

| SECTION | MARKS | DESCRIPTION | TOTAL | Remarks |
|---|---|---|---|---|
| Section – A | 8 x 0.5= 04 Marks | MCQ | 25 Marks | Marks secured will be converted To 5 mark |
| Section - B | 3 x 2 = 06 Marks | Answer ALL Questions Either or Type ALL Questions Carry Equal Marks | | |
| Section - C | 3 x 05 = 15 Marks | | | |

### CIA Test II/ Model [3 Hours-5 Units] - 75 Marks

| SECTION | MARKS | DESCRIPTION | TOTAL | Remarks |
|---|---|---|---|---|
| Section – A | 10 x 1 = 10 Marks | MCQ | 75 Marks | Marks secured will be converted To 5 mark |
| Section - B | 5 x 3 = 15 Marks | Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks | | |
| Section - C | 5 x 8 = 40 Marks | | | |
| Section - D | 1 x 10 = 10 Marks | Compulsory Question | | |

### End Semester Examination [3 Hours-5 Units] - 75 Marks

| SECTION | MARKS | DESCRIPTION | TOTAL |
|---|---|---|---|
| Section – A | 10 x 1 = 10 Marks | MCQ | 75 Marks |
| Section - B | 5 x 3 = 15 Marks | Answer ALL Questions (Either or Type Questions) Each Questions Carry Equal Marks | |
| Section - C | 5 x 8 = 40 Marks | | |
| Section - D | 1 x 10 = 10 Marks | Compulsory Question | |

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A1CA | ADVANCED FOOD SCIENCE | CORE | 4 | 1 | 1 | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The structure, classification and nutrient composition of foods
- Identify what foods are good sources for what nutrients
- Appropriate sensory evaluation tests to answer specific questions.

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Analyze the structure of foods and Compare the nutrient Composition of foods. | K4 |
| CO2 | Classify foods based on food processing and Explain the methods of processing different foods. | K5 |
| CO3 | Interpret the factors which affects the nutritive value offoods, Classify the methods of cooking different foods. | K4 |
| CO4 | Examine the postmortem changes in meat, Criticize the food quality, Analyze the medicinal value of foods | K5 |
| CO5 | Choose foods based on quality, Decide storage conditionsand subjective and objective evaluation of foods. | K4 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | | ✓ | ✓ | ✓ |
| CO2 | ✓ | | ✓ | ✓ | ✓ |
| CO3 | ✓ | | ✓ | ✓ | ✓ |
| CO4 | ✓ | | ✓ | ✓ | ✓ |
| CO5 | ✓ | | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A1CA | ADVANCED FOOD SCIENCE | SEMESTER I |
|---|---|---|

**Total Credits: 4**

**Total Instruction Hours: 72 h**

## Syllabus

**Unit I** Cereals 15 h

Rice - Structure, Composition and nutritive value, Parched Rice Products- Parched and Aromatic rice. Aging of Rice. Gluten formation and Factors Affecting gluten formation, Gelatinization and factors affecting. Changes in cooked starch, dextrinisation, Cooking Quality of Rice.

Wheat - Structure, composition and nutritive value. Wheat flour – types, functionality of components, baking qualities.

Millets- Jowar, Bajra, Maize and Ragi, Composition and nutritive value and Products. Changes during cereal cookery. Fermented and unfermented cereal based products.

**Unit II** Pulses, Fats and Oil 15 h

Pulses - Composition and nutritive value, methods of processing – dry and wet processing, vegetable protein mixes, Anti nutritional factors and eliminations. Digestibility of pulses and factors that reduce the digestibility. Factors affecting cooking quality.

Nuts and Oilseeds- Composition and nutritive value, nutritious food mixes from oil seeds.

Fats and Oil - Nutritional importance of oil and fats, Functions of oil and fats in foods, Sources, nutritional composition, rancidity – types and prevention, role of fat / oil in food preparations.

**Unit III** Vegetables and Fruits 14 h

Vegetables-Classification, Composition and nutritive value, selection. Changes and loss of nutrients during cooking of vegetables, Effect on cooking- pigments, sulphur containing vegetables,

Fruits - Composition and nutritive value, Enzymes in fruits and vegetable, Flavor constituents. Ripening of fruits. Storage of fruits and vegetables. Individual aroma compounds- vegetable, fruit.

Organic Farming- Types, Conventional farming, bio pesticides, organic manures.

Spices and condiments –Types, uses and abuses, Flavors (Natural and Synthetic)

medicinal uses, other aromatic- Vinegar and MSG.

Evaluation of foods - Subjective and objective evaluation of foods. Study of proximate constituents

**Unit IV** Milk and Egg 14 h

Milk - Composition, Physical and Chemical Properties - Effects of heat, acid and enzymes, Microbial Spoilage of milk. Milk Products and Types.

Egg - Structure, composition and nutritive value, Quality of egg, grading and selection, Changes during storage. Effects of heat on egg protein, Factors affecting coagulation egg protein, egg foam and factors affecting foam formation. Low cholesterol egg substitutes.

**Unit V** Fleshy Foods 14 h

Meat - Structure, composition and nutritive value, postmortem changes, ageing and tenderization of meat, curing, cuts and grades of meat, color of meat, changes of meat in cookery.

Poultry - Classification, composition, market forms, selection factors.

Fish - Classification, composition, kinds and characteristics of fresh fish, By-products and newer products of fish.

Pathogens and Food safety for fleshy foods.

**Text Books**

1 Srilakshmi,B 2015, "Food Science," 8th Edn., New Age International Private Ltd. New Delhi.

2 Manay & Shadaksharaswamy ,S.N. & M, 2008, "Food facts and Principles", New Age International Private Ltd NewDelhi..

**References**

1 Potter.N.N and Hotchkiss , 1996, " Food Science", CBS Publication

2 SunetraRoday ,I.N. 2015, —Food Science and Nutrition‖ Oxford Publisher. New Delhi

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A1CB | NUTRITION THROUGH LIFE CYCLE | CORE | 4 | 1 | 1 | 4 |

## PREAMBLE

This course has been designed for students to learn and understand

- The role of adequate nutrition in stages of life cycle
- The nutrition and food components and the deleterious effects of foods on the human body at various life-stages
- The importance of proper fueling for physical activity, pre and post workout

## COURSE OUTCOMES

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Plan diet for the stages of the life span. Learning nutritional requirements for disease prevention. | K4 |
| CO2 | Analyze specific dietary practices during lactation supplementary and weaning foods for infants. | K5 |
| CO3 | Nutrition for toddlers-physiological and cognitive development feeding skill and nutrition problems. | K5 |
| CO4 | Evaluate physical growth, eating disorders, physiological psychological and socio-economic factors effect nutritional status. | K5 |
| CO5 | Choose the fitness assessments and plan nutritional needs during exercise and sports. | K5 |

## MAPPING WITH PROGRAMME OUTCOMES

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | | | | | |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | ness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A1CB | NUTRITION THROUGH LIFE CYCLE | SEMESTER I |
|---|---|---|

**Total Credits: 4**

**Total Instruction Hours: 72 h**

## Syllabus

**Unit I** Nutrition in Preconception and pregnancy 13 h

Nutrition in Preconception-Introduction, factors contributing infertility in female, premenstrual syndrome, expansion in blood volume in pregnancy, nutrient intake for pre-conceptual women.

Nutrition in pregnancy - Stages of gestation, maternal physiological adjustments, weight gain during pregnancy and nutritional requirements for pregnancy, twin pregnancy miscarriage, preterm delivery, multi fetal pregnancies, pregnancy in obese women, gestational diabetes, pre-eclampsia, Intrauterine growth retardation.

**Unit II** Nutrition in Lactation and infants 16 h

Nutrition in Lactation - Physiological adjustments during lactation, Physiology of milk Production - hormonal controls and reflex action, problems of breast feeding, nutritional components of colostrums and mature milk, nutritional requirements during lactation. Human Milk bank-advantages and disadvantages Expressing and storing breast milk, Breast promotion network of India.

Nutrition in infants - Rate of growth, weight as the indicator, breast vs. bottle feeding, premature infant, Nutrition allowances, Nutrition and brain development feeding premature infants, low birth weight, implications for feeding and management in Pre-term and Low Birth Weight infants, supplementary foods and weaning foods.

**Unit III** Nutrition in Toddlers 12 h

Nutrition in Toddlers-Physiological and cognitive development, feeding skill and behavior, Nutrition in Preschool Children - Growth and development of preschool children, food habits, Micronutrient malnutrition among preschool children. Nutritional requirements for toddlers and mentally challenged Children. Implications of childhood obesity and other nutritional concerns

Nutrition in School Age – Early and middle childhood, physiological development, food habits, nutritional needs and feeding, RDA.

**Unit IV** Nutrition During Adolescence, Adulthood and Old age 16 h

Nutrition During Adolescence - Physical growth, physiological and psychological problems associated with pubertal changes, nutritional needs, eating disorders –

anorexia nervosa, bulimia nervosa, nutrition and medical problems in adolescent pregnancy and its requirements and complications.

Nutrition during Adulthood – Physiological changes of adulthood Nutrition and work efficiency for maintenance of health, RDA

Nutrition for Old Age - theories of ageing, physiological changes, Socio economic and psychological factors – nutritional requirements, factors affecting food intake, Nutrient requirements that influence organ function with ageing, Advances in geriatric nutrition.

**Unit V** Nutrition for sports and Special Condition 15 h

Sports and Exercise Fitness - Physical fitness assessment – cardio respiratory fitness, assessment of body composition, muscular fitness assessment, flexibility assessment, Role of carbohydrate, fat and protein as a fuel for exercise, fluid and electrolyte balance during prolonged exercise, nutritional requirements in sports, dietary intake before, during and after exercise, Pre-event Meal, Nutrition during higher altitudes, Nutrition during Space voyage soldiers, defense people, Nutrition for special children

**Text Books**

1 Mahan and Escott ,K & S, 2000, "Food Nutrition and Diet Therapy", 11th Edn. , W.S. Saunder's Company, USA.

2 Srilakshmi, B, 2010 "Dietetics", 6thEdn., New Age International Pvt. Ltd, New Delhi.

**References**

1 Shills, Olson, Shike, and Ross, E.M & M, 1999, "Modem Nutrition in Health and Disease", 6th Edition, Lippincott Williams and Wilkins Publications Philadelphia.

2 Brown, J.E, 2002, "Nutrition Through The Lifecycle", Wadsworth Thomson Learning, USA.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A1CC | NUTRITIONAL BIOCHEMISTRY | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The application of biochemistry in the field of Food and Nutrition
- The on assay techniques and instrumentation
- The role of nutrients in the body

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Infer on carbohydrate metabolism. | K4 |
| CO2 | Illustrate the cholesterol metabolism and the inborn errors of fat metabolism | K4 |
| CO3 | Explain the biosynthesisand importance of protein metabolism in biochemical analysis. | K4 |
| CO4 | Interpret the significance of nucleic acids in the field of biochemistry. | K5 |
| CO5 | Editorialize the principle and techniques involved in the field of biochemistry. | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | | | ✓ |
| CO2 | ✓ | ✓ | | | |
| CO3 | ✓ | ✓ | ✓ | ✓ | |
| CO4 | ✓ | ✓ | | | ✓ |
| CO5 | ✓ | ✓ | | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A1CC | NUTRITIONAL BIOCHEMISTRY | SEMESTER I |
|---|---|---|

**Total Credits: 4**

**Total Instruction Hours: 48 h**

## Syllabus

**Unit I** Carbohydrates 10 h

Carbohydrates – classification, functions. Glycolysis, TCA Cycle, HMP Shunt and Energy Production, Glycogenesis, Gluconeogenesis. Renal threshold for Glucose. Inborn Error of Carbohydrate Metabolism – Lactose Intolerance, fructosuria, Galactosemia.

**Unit II** Fatty Acids 10 h

Fatty Acids - Classification, Functions and Oxidation of Saturated and Unsaturated Fatty Acids, Biosynthesis of Cholesterol, Structure and Functions of Lecithin, Cephalin. Inborn errors of Fat Metabolism – Niemann-Pick Disease, Gouchers Disease

**Unit III** Protein 8 h

Protein- Classification, Function & Metabolism of Protein, Denaturation, Transamination, Deamination, Decarboxylation, Urea Formation and Protein Synthesis.

Amino acids – Classification, Function & Metabolism of Amino acids, phenylalanine, leucine, methionine and tryptophane.

Inborn errors of Amino acids – maple syrup urine disease, phenyl ketonuria.

**Unit IV** Nucleic acids 10 h

Nucleic acids – structure, function and properties of DNA and RNA. Biosynthesis and breakdown of purine and pyrimidine nucleotides. Assay Techniques: Bioassay techniques, molecular cloning, microbiological assay of vitamins. ELISA.

**Unit V** Techniques in nutritional biochemistry 10 h

Techniques in nutritional biochemistry- Separation of sugars and amino acids by chromatography. Electrophoresis separation of proteins. Colorimetry and spectrophotometer - principle and procedures. pH meter – working and application. Principle and procedure of operation of GC,HPLC and HPTLC. Elemental analysis by atomic absorption spectroscopy and flame photometry

**Text Books**


1 Lehininger A.L, 2000, "Biochemistry". 7Edition, Worth Publishers Inc., New York.

2 Deb A.C, 2004, "Fundamentals of Biochemistry", 8 Edition New Central Book Agency Pvt Ltd., Kolkata –India.


**References**


1 Shanmugam. A, 2004, "Fundamentals of Biochemistry for Medical Students", 7th Edition Karthik Printers, India.

2 Sathyanarayana. U and Chakrapani. U, 2004, "Biochemistry". 3rd Edition Books and Allied Publication ,Kolkata,India..

3 Tom brody, 2007, "Nutritional Biochemistry", 2nd Edition Academicpress,U.K.

4 Sharma.D and DevanshiSharma.C ,2015, "Nutritional Biochemistry",2nd Edition CBS publishing pvtltd,New Delhi.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A1CD | FOOD CHEMISTRY | CORE | 4 | 1 | 1 | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The gain insight into the chemistry of foods
- The chemistry underlying the properties of various food components
- Biochemical and enzymatic reactions that influence food quality with emphasis on food industry applications.

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Elaborate the structure and properties of water, ice, Elucidate the structure, formation, strength, types and permanence and Emulsions | K3 |
| CO2 | Explicate the chemistry of Reactions of mono and oligosaccharides, Use of Polysaccharides in gelatinization, retrogradation. | K4 |
| CO3 | Illustrate the structure, physicochemical properties, functional properties of amino acids. | K4 |
| CO4 | Explicate the classification, sources, composition, and properties, role of lipids in food flavor. | K4 |
| CO5 | Illuminate the chemistry of Individual aroma compounds- vegetable, fruit and spice and condiment. | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | | | |
| CO2 | ✓ | ✓ | | | |
| CO3 | ✓ | ✓ | ✓ | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A1CD | FOOD CHEMISTRY | SEMESTER I |
|---|---|---|

**Total Credits: 4**

**Total Instruction Hours: 72 h**

## Syllabus

**Unit I** Physio-Chemical Properties of Water and Foods 14 h

Structure and properties of water and ice, types of water, water absorbency, Water activity and Food spoilage, Sorption phenomena,

Gels: Structure, formation, strength, types and permanence Emulsions: formation, stability, surfactants and emulsifiers, Common food emulsifiers, functions of emulsifying agents, Foams: Structure, formation and stabilization.

**Unit II** Chemistry of Starch and Sugars 14 h

Reactions of mono and oligosaccharides, use of polysaccharides in foods: non-starch polysaccharides:β-glucans,glucomannans, cellulose, hemicelluloses, pectins, gums,agar, alginates, carrageenan

Starch: structure, properties of amylose and amylopectin, effect of process in gelatinization, methods for following gelatinization. Characteristics of some food starches. Effects of ingredients and conditions on gelatinization- retro gradation, polysaccharide hydrolysis, sugars and sweeteners: sugars, syrups, sugar alcohols, sugar products, Sugar substitutes, caramelization.

**Unit III** Chemistry of Proteins 15 h

Amino acids, peptides and proteins - structure, physicochemical properties, functional properties, chemical and enzymatic modifications - denaturation, Changes in protein during denaturation,non-enzymatic browning, and other chemical changes, processing induced physical, chemical and nutritional changes, texturized proteins, protein isolates, concentrates, protein hydrolyzate, Complementary proteins ,Milk substitutes, Effect of heat, acids & enzymes on milk component.

**Unit IV** Chemistry of Fats and Oils 14 h

Classification, sources, composition, and properties, role of lipids in food flavor. Effect of processing on chemical structure and physical properties; functional properties of fat and uses in food preparations, inter-esterification of fats. Lipids exposed to frying conditions, hydrogenated fat and irradiated foods Lipid-protein complexes, emulsions. Fat deterioration and antioxidants and fat substitutes.

**Unit V** Chemistry of Fruits, Vegetables, Spices and Condiments 15 h

Pectic Substances, Plant Pigments, Spices and Condiments, Pectin's, phenolic components, enzymatic browning in fruits and vegetables, volatile compounds from vegetables during cooking, different types of plant pigments – water and fat soluble pigments, properties and active principles of spices and condiments.

**Text Books**


1 ShakuntalaManay,Shadaksharaswamy, M., 2000, "Foods,Facts and Principles", 2nd Edn., New Age International Pvt Ltd Publishers, Delhi

2 Chandrasekhar.U., 2002, "Food Science and applications in Indian Cookery ", 10Edn., Phoenix Publishing House, New Delhi.


**References**


1 Swaminathan.M, 2005, "Food Science, Chemistry and Experimental Foods", Bappco Publishers, Bangalore.

2 Meyer,L.H.,2004,"FoodChemistry and Distributors", 4th Edn., CBS Publishers.

3 Paul, and Palmer, P.C., 2000, "Food Theory and Applications", JohnWileyand Sons, New York.

4 Chopra and Panesar , H.K, 2010, "Food Chemistry", New Narosa Publishing House, Delhi.

| 233FN2A1CP | FOOD SCIENCE AND FOOD CHEMISTRY | SEMESTER I |
|---|---|---|

**Total Credits:** 2
**Total Instructions Hours:** 48 h

| S.No | Contents |
|---|---|
| 1 | Gelatinization of Starch, Retrogradation and Syneresis |
| 2 | Microscopic examination of uncooked and gelatinized |
| 3 | Gluten Formation |
| 4 | Stages of Sugar Cookery, Preparation of Fondant, Fudge, Caramel and Toffee |
| 5 | Identification of freezing point of water |
| 6 | Scum formation, Boiling over and scorching of milk |
| 7 | Effect of Soaking, germination and fermentation of Pulses |
| 8 | Coagulation of egg white and egg yolk, Boiled Egg, Poached Egg, Omelets, Custards, Cake and Mayonnaise |
| 9 | Coagulation and precipitation of milk proteins |
| 10 | Changes observed in cooking meat, fish and poultry, testing the tenderness of meat |
| 11 | Smoking Temperature of different fats, Factors affecting absorption of fats |
| 12 | Effect of acids, alkali and heat on water soluble and fat soluble pigments |
| 13 | Enzymatic Browning and Methods of prevention |
| 14 | Estimation of pectin substance –Colorimetric methods |

**Note:** Out of 14 – 12 Mandatory

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A1DA | FUNCTIONAL FOODS AND NUTRACEUTICALS | DSE | 4 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- Medicinal benefits of natural Nutraceuticals belong to different phytochemical categories
- The functional foods and their role in the human health and well-being.
- The role of diet and dietary components in chronic diseases

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Analyze and Examine the basics and importance of nutraceuticals and functional foods. | K5 |
| CO2 | Determine the properties and structure of various nutraceuticals. | K4 |
| CO3 | Inspect nutraceuticals of plant origin and animal origin Importance of nutraceuticals in the field of medicine and therapy. | K5 |
| CO4 | Distinguish between functional foods and nutraceuticals.. Explain the role of fibers and syn-biotic with respect to health. | K4 |
| CO5 | Design the role of nutraceuticals as food remedies in the field of functional food industry. | K4 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | ✓ | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A1DA | FUNCTIONAL FOODS AND NUTRACEUTICALS | SEMESTER I |
|---|---|---|

**Total Credits: 3**

**Total Instruction Hours: 48 h**

## Syllabus

**Unit I** Introduction to Nutraceuticals as Science 9 h

Nutraceutical- Definition, Classification - Dietary supplements, Functional foods, Historical perspective, scope and future prospects, applied aspects of the Nutraceutical Science, Sources of Nutraceuticals and functional foods and their benefits

**Unit II** Properties, structure and functions of various Nutraceuticals 10 h

Properties, structure and functions of various Nutraceuticals Glycosides, Isoprenoidderivaties, Glucosamine, Octacosanol, flavonoids, carotenoids, polyunsaturated fatty acids, lecithin, choline and spingolipids, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate, Phytoestrogens, curcumin, organosulphur compounds as neutraceuticals.Formulation of functional foods containing nutraceuticals – stability, analytical and labelling issues.

**Unit III** Nutraceuticals of plantorigin 10 h

Plant secondary metabolites, classification and sub-classification - Alkaloids, phenols, Terpenoids, extraction and purification, applications, Concept of cosmoceuticals and aquaceuticals

**Unit IV** Functional Foods 10 h

Definition, Relation of functional foods and Nutraceutical (FFN) to foods and drugs, applications of herbs to functional foods, Concept of free radicals and antioxidants; In vitro and in vivo methods for the assessment of antioxidant activity. Nutritive and Non-nutritive food components with potential health effects, Soy proteins and soy isoflavones in human health;Functional foods from wheat and rice and their health effects.Vegetables, Cereals, milk and dairy products as Functional foods, Health effects of prebiotics, probiotic and synbiotic foods and effects

**Unit V** Food as remedies 9 h

Nutraceuticals in treatment for cognitive decline, Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers and Gastrointestinal disorder, Cancer, CVD, Diabetic Mellitus,

HIV etc, Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina, etc.Nutrigenomics-concept of personalized medicine. Use of Nanotechnology in functional food industry.

**Text Books**


1 Wildman,R.E.C., 2000, "Handbook of Nutraceuticals and Functional Foods", CRC Press, Boca Raton.

2 Jeffery, H. W. 2002, "Methods of Analysis for Functional Foods and Neutraceuticals", 1st Edn, CRC Press, New York.


**References**


1 Mahan.K and Escott.S., 2000, "Food Nutrition and Diet Therapy" 11th Edn., W.S. Saunder's Company, USA

2 Murray Robert, 1990, "Harper`s Biochemistry", 24th Edn, Prentice Hall International UK Ltd , UK.

3 Degbasis Bagchi,2010,"Biotechnologyin Functional FoodsandNutraceuticals". 10 Edn, CRC press Taylor & Francis group, London.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A1DB | FOOD PRODUCT DEVELOPMENT | DSE | 4 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The various aspects of food product develop food science and technology, packaging, nutrition values and marketing
- Modern aspects of nutritional science and novel food usage
- Recognize the potential for entrepreneurship through marketing

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Choose raw materials, portion control, standardizations for products. Make use of the technology and marketing on health concerns | K3 |
| CO2 | Categorize the products for development to the community | K4 |
| CO3 | Examine sensory and objective evaluation test, score card designing and Instruments used for texture evaluation. | K4 |
| CO4 | Select the types of food packing materials Explain the patent laws and code for IPR | K5 |
| CO5 | Select the types of food packing materials Explain the patent laws and code for IPR | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | ✓ | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A1DB | FOOD PRODUCT DEVELOPMENT | SEMESTER I |
|---|---|---|

**Total Credits: 3**

**Total Instruction Hours: 48 h**

## Syllabus

**Unit I** New product development 10 h

Definition and classification, characterization and factors shaping new product development. Phases in Food Product Development factors influencing in new product development Health concerns impact of technology and market place influence.

**Unit II** Formulation of new product development 10 h

Formulation of new product development for infants, preschool, sports person, elderly- Selection of raw materials, portion size, standardization methods, calculation of nutritive values, cost production, shelf life.

**Unit III** Sensory evaluation 9 h

Evaluation of food quality– Analytical Test – Conduct a sensory Evaluation Test – Designing score card, objective evaluation, Instruments used for texture evaluation. Maintaining suitable environmental conditions: laboratory setup and equipment

**Unit IV** Packaging 10 h

Packaging – Introduction, Types of packing materials and its characteristics. New product development – patent, patent laws, international code for Intellectual property rights (IPR).

**Unit V** Marketing 9 h

Concept of market and marketing – Approaches to study marketing and marketing functions, market structure, market efficiency and market integration. Role of government in promoting agricultural marketing. GST for newly developed product

**Text Books**

1 Baker, R.C 1988, " Fundamentals of New Food Product Development", 8th Edn. New Age International Private Ltd. New Delhi.

2 Fuller,. G.W2008, "New Food Product Development from Concept to Market place", New Age International Private Ltd, NewDelhi.

**References**

1 Sivarama Prasad ,A., 1985., "Agricultural marketing in India", Mittal Publication, New Delhi.

2 Aaron, Brody, JohaLord.,L& B., 2005, "New Food Product for a changing Market place", 2nd Edn.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A1DC | HARVEST TECHNOLOGY OF AGRICULTURAL PRODUCE | DSE | 4 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The safety control measures in handling foods from harvest to consumption agencies of control.
- Good agricultural and horticultural practices for food safety management
- Importance of pre- harvest physiology for the long term storage of horticultural crops

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Identify the role of Post-Harvest Technology in combating malnutrition in India | K3 |
| CO2 | Categorize the agents causes food spoilage | K4 |
| CO3 | Examine the physical and chemical methods to control insects and rodents. | K4 |
| CO4 | Prioritize the importance of storage structures for food grains. Explain the agencies that control food losses | K5 |
| CO5 | Discuss the role of new food products for the growing population along with product-process efficiency of food grains. | K6 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A1DC | HARVEST TECHNOLOGY OF AGRICULTURAL PRODUCE | SEMESTER I |
|---|---|---|

**Total Credits: 3**

**Total Instruction Hours: 48 h**

## Syllabus

**Unit I** Post harvest Technology 9 h

Introduction to Post Harvest Technology - Definition, importance and problem encountered.Conservation Agriculture- scope and need. Food loss in the post-harvest period, extent of losses from filed to market. Role of Post-Harvest Technology in combating malnutrition in India.

**Unit II** Agent causing food loss 10 h

Agents Causing Food Losses - Physical agents (moisture, temperature), Chemical agents, biological agents- insects- detection of insect infestation, rodents, birds, animals- Nature of damage, identification and preventive measures.

**Unit III** Spoiling Agents 11 h

Control of Spoilage Agents - Importance and methods of sanitary handling. Insect control methods- Physical methods and chemical methods including fumigation techniques. Improved methods of handling and transport of Food Commodities, Nutrient losses in spoiled grains.

**Unit IV** Storage and grains 10 h

Storage of Grains - Importance of storage structures- requirements, traditional and modern and underground and above ground storage and their improvements, FCI godowns- warehousing scheme, PDS.

**Unit V** Food Processing 8 h

Food Processing of Selected Food Items – wheat, rice, breakfast cereals, pulses, oil seeds. National programs to save grains, Agencies Controlling Food Losses - Role of SGC, FCI in controlling food losses.

**Text Books**


1 Norman N. Potter, 2007, "Food Science" 5th Edition, CBS Publishers & Distributor.

2 AlmalenduChakraverty, 2017, " Post Harvest Technology of Cereals, Pulses and Oilseeds" 3rd Edition, Oxford & IBH Publishing Co Pvt.Ltd


**References**


1 Boumans.G, 2012, "Grain Handling and Storage , 4th Edition, Elsevier Science Publishing, Netherlands.

2 Avantina Sharma, 2018, " Food Product Development" 1st Edition, CBS Publishers & Distributors.


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Department of Food Science & Nutrition
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

Dr.N.G.P. Arts and Science College
APPROVED

| BoS- 15th | AC - 15th | GB - 15th |
|---|---|---|
| 12/06/23 | 14/07/23 | 05/08/23 |

Academic Council
CHAIRMAN
Dr.N.G.P. Arts and Science College

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2CA | FOOD PROCESSING | CORE | 4 | 1 | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- about food processing sectors and strategies
- the latest techniques involved in processing of food groups
- the method of preservation and packaging

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Analyze the food processing sectors illustrate the different types of food commodities used for processing | K3 |
| CO2 | Choose the processing method of cereals and millets to reduce the Nutrients lost | K3 |
| CO3 | Compare the different processing techniques and fortification of Legumes and oil seeds | K4 |
| CO4 | Classify and integrate the processing methods of animal-based products and its by products | K4 |
| CO5 | Distinguish the thermal and non-thermal processing. Summarize the Recent trends in packaging technology | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| ✓ | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2CA | FOOD PROCESSING | SEMESTER II |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 60 h

**Syllabus**

**Unit I** Food Processing Sector 11 h

Food processing sector –vision and mission, opportunities, strategies in the Indian food processing sector. Strengths, Weakness, Opportunities and Challenges of food processing operations. Role of Governmental organizations in up gradation of food industries.

Food Processing: Importance of food processing, Types of processed foods, and its effect on nutritional properties of foods.

**Unit II** Cereals and Millets Processing 12 h

Rice – Parboiling, Milling, by products of milling and processed products-Rice flakes, puffed rice, popped rice, rice cakes, rice paper, instant rice and rice flour.

Wheat - Milling, by products of milling and processed products -whole wheat flour, refined flour, semolina, popped and puffed wheat.

Millets – Milling of Millet and it's by product, processed products - vermicelli and pasta.

Methods to eliminate anti-nutritional factors, fortified and enriched cereals and millets.

**Unit III** Legumes and Oil Seeds 12 h

Pulses and Legumes - Modern methods of milling and it's by product, process to eliminate the anti-nutritional factors. Processing of pulse-based products

Nuts and Oil Seeds – Milling and it's by products, extraction of oil - Lemon and moringa seed oil, preparation of hydrogenated fats, industrial fats, and low-fat spreads and virgin oil, Fortification of fats and oils. Processing of fat substitute and fat replacer. Concentration and isolation - peanut, soybean and coconut and other fortified and enriched foods.

**Unit IV** Milk, Meat, Fish and Egg 12 h

Milk and Milk products- Processing, Flavored milk and toned milk, by product of Cream- Butter, Buttermilk and ghee. Fermented (Cheese, yoghurt, and kefir) and

non- fermented (paneer, gelato and ice cream) milk products. Vegan milk - almond and soy milk.

Meat & poultry- Slaughtering, Processing and Preservation -chilled, frozen, cured and smoked meat. Processing of meat-based products-sausage & Nuggets

Fish - processing and by products of fish- fish liver oil, fish meal, fish protein concentrate, fish crackers.

Egg- preparation of egg white and egg yolk powder.

**Unit V** Fruits and Vegetable Processing Technologies 13 h

Fruits and vegetable processing- Drying and dehydration- Drum drying, tunnel, spray drying, freeze drying, solar drying and fluidized bed drying. Thermal processing (canning, blanching, and sterilization) and non-thermal processing (High Pressure Processing, Ozone and Pulse Electric Field Technology), Minimal Processing.

Mushroom - Production & Processing

Processing of beverages -Cocoa, processing of spices -Onion, garlic, ginger and masala powder. Extraction of volatile oil in spices-oleoresin

Recent trends in packaging technology: Modified Atmospheric Packaging and Controlled Atmospheric Packaging, Intelligent & Nano Active Packaging

**Text Books**

1 DS Warris, 2020. "Food Processing and Preservation" (Volume -I), CBS Publishers and Distributors & New Delhi.

**2** Subulakshmi.G and Shoba A Udipi V.K, 2017, "Food Processing and Preservation"(volume –I Edn.), New age International publishers & New Delhi.

**References**

1 Avantina Sharma, 2010, "Text Book of Food Science and Technology", 2nd Edn. IBDC Publishers, Lucknow.

2 Fellows.P.J., 2009,"Food Processing Technology- principle and practice", Wood head Publishing Ltd, Cambridge.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2CB | APPLIED PHYSIOLOGY | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the structure and functions of various systems in human body
- the functions of all the systems and its disease conditions
- the physiological aspects of hormones, drugs and nutrient interactions

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Illustrate the structure and functions of digestive and circulatory system | K2 |
| CO2 | Identify the anatomy and physiology of respiration, respiratory volumes and mechanism of excretory system | K3 |
| CO3 | Know the structure and functions of brain, classification and functions of nervous system | K4 |
| CO4 | Elaborate the structure and functions of endocrine system and immune system | K4 |
| CO5 | Classify the different types of enzymes and elaborate drug and nutrient interaction | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | ✓ | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2CB | APPLIED PHYSIOLOGY | SEMESTER II |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

**Syllabus**

**Unit I** Digestive system and circulatory System 9 h

Digestive system - Structure and functions of salivary gland, oesophagus, stomach, small intestine, large intestine, liver, gall bladder and spleen.

Circulatory System - Structure and functions of Heart and blood vessels, cardiac cycle and cardiac output. Heart beat - origin, conduction and regulation, circadian rhythm - bradycardia and tachycardia, ECG.

**Unit II** Respiratory system and excretory system 10 h

Respiratory system – Basic anatomy of the respiratory system, types of respiration, mechanism of respiration, transport of gases - oxygen (Bohr effect) and carbon dioxide, chloride shift (Hamburger Phenomenon), respiratory volumes - spirometer.

Excretory system - Excretory organs - structure of kidney and components and functions of nephron, formation and composition of urine, Hormonal regulation of kidney - diuresis and micturition.

**Unit III** Nervous system 9 h

Nervous system - Nerve cell and nerve fibre, reflex action - nerve impulse, receptors and reflex arc, classification and functions of nervous system - central nervous system - structure and functions of brain and spinal cord, autonomic nervous system - sympathetic and parasympathetic - transmitters.

**Unit IV** Endocrine and Immune system 10 h

Endocrine glands – Structure, function, hormonal secretion and actions - pineal, pituitary, thyroid, parathyroid, thymus, adrenal gland, pancreas, islets of Langerhans, ovary and testis.

Immune system: cells of the immune system, role of immune cells, Types of immunity - innate immunity and acquired immunity, Antigens and its functions, Immune responses - cell mediated and humoral immunity, antigen - antibody reactions, auto-immunity and hypersensitivity.

**Unit V** Enzymes and Drug 10 h

Enzyme – Introduction, classifications and biological functions of enzymes, enzyme activation, properties of enzymes, difference between enzyme, catalyst and whole cell.

Nutrient and drug interaction – Introduction, absorption, route of drug administration, excretion, basic concept, effect of nutrition on drugs, drug's effects on nutritional status, clinical significance and risk factors for drug nutrient interaction.

**Text Books**


1 Sarada Subramanyam, Madhavankutty. K and Singh .H.D 2020. "Textbook of Human Physiology, S.Chand & company Ltd, New Delhi.

**2** Sembulingam K&P 2013, "Essentials of Medical Physiology", 6th Edn., JAYPEE Brothers, Medical Publishers, New Delhi


**References**


1 Subrahmanyam, S. 2007, "Text Book of Human Physiology", S.Chand Publications, New Delhi, India.

2 Guyton, Hall, A.G. and J.B., 1996, "Text Book of Medical Physiology" 9th Edn., W.B. Sanders Company, Prism Books (Pvt.) Ltd. Bangalore.

3 Stites .D.P., Terr.A.I., and Parsiow. T.G., 1994, "Basic and Clinical Immunology", 10th Edition., Prentice Hall International Inc., New Jersey.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2CC | THERAPEUTIC NUTRITION - I | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the principles of medical nutrition therapy
- the causes and complications of different disease condition
- the importance of diet planning for various disease condition

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Summarize the principles of diet therapy and nutrition care process | K2 |
| CO2 | Explain the etiological factors and diet therapy for fever and infections | K2 |
| CO3 | Interpret the physiological changes and dietary modification for gastro intestinal and inflammatory diseases | K3 |
| CO4 | Infer the physiological changes and nutritional modifications for diabetes mellitus | K4 |
| CO5 | Explain the physiological changes and nutritional modifications for renal disease | K4 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | | ✓ | ✓ | | ✓ |
| CO4 | | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | ✓ | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2CC | THERAPEUTIC NUTRITION-I | SEMESTER II |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

**Syllabus**

**Unit I** Therapeutic Diets 9 h

Therapeutic Diets – Principles, objectives and diet therapy, review of hospital diets, type of dietitians, role of dietitian in the hospital and health care setting, Nutrition Care Process (NCP), diet planning and use of exchange list in nutrient calculation, diet counseling. Enteral and Parenteral nutrition.

**Unit II** Fever and Infections 10 h

Etiological factors and Dietary modifications for fever and infections, COVID -19 and allergy. Burns – Complications, Dietary management & mode of nutrition support and wound management of burns. Sepsis - Definition and Dietary management of Sepsis with or without Multiple Organ Dysfunction Syndrome (MODS). Dietary management for pre- and post-surgical diet.

Epidemiology, transmission of HIV, pathophysiology, clinical manifestations, HIV infection and other diseases, Immunity and AIDS virus, dietary management, Prevention and Control.

**Unit III** Gastro Intestinal Diseases 10 h

Diseases of Oesophagus: Esophagitis and Hiatus hernia. Disease of Stomach: Indigestion, acute and chronic gastritis and peptic ulcer, Gastroesophageal reflux disease. Disease of Intestine: constipation - atonic, spastic, and obstructive, diarrhoea - acute and chronic and steatorrhea. Inflammatory Diseases -Diverticulosis, diverticulitis, regional enteritis, ulcerative colitis, irritable bowel syndrome, malabsorption syndrome - sprue, Lactose Intolerance, Post-surgical complications and management.

**Unit IV** Obesity and Diabetes Mellitus 10 h

Nutritional Imbalances- Obesity and underweight, types of obesity, etiological factors, assessment of obesity, grades of obesity, theories - set point and fat cell theory, thermogenesis in obesity. Life style and Dietary modifications.

Diabetes Mellitus (Type I and II) - Epidemiology / Incidence - Classification - symptoms. Metabolic changes: complications, clinical findings -diagnostic tests.

Management of Diabetes - Food exchange list, Glycaemia index of foods, Carbohydrate counting and Resistant starch, Dietary management, Meal planning approaches - With and without Insulin and during sickness. Herbal plant remedies for diabetes mellitus.

**Unit V** Renal Diseases 9 h

Kidney – Etiology, Pathogenesis, Clinical manifestation, dietary management for kidney disease- acute and chronic glomerulonephritis, nephrosis, nephrotic syndrome, urinary calculi, acute and chronic kidney disease, End stage renal disease, renal agenesis, renal dysplasia, kidney transplant and dialysis.

**Text Books**

1 Srilakshmi B. , "Dietetics, 2014", 7th Edition, New Age International (P) Limited Publishers, New Delhi.

2 Mahan. B and Escott.S, 2007. "Krause's Food and nutrition Therapy", 12th Edition, Philadelphia, W.S. Saunder's Company, USA.

**References**

1 Garrow.J.S & James.W.P.T, J. 2006, Human Nutrition &dietetics, Churchill Livingstone, New York.

2 Mahan. B and Escott.S, 2000. "Food Nutrition and Diet Therapy", 12th edition Philadelphia, W.S. Saunder's Company, USA.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2CD | MACRONUTRIENTS | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the classification, and nutrient composition of foods
- the food sources and requirements for macronutrients
- the absorption and metabolism of macronutrients

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Interpret the utilization of energy, basal metabolism, and energy requirement. | K4 |
| CO2 | Explain the digestion, absorption and metabolism of carbohydrates and dietary fiber | K4 |
| CO3 | Summarize the protein digestion, absorption, metabolism, and its requirements | K5 |
| CO4 | Illustrate dietary fat, brown fat thermogenesis and therapeutic inhibition of fat absorption | K5 |
| CO5 | Ensure the importance of water and electrolyte balance | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | | ✓ | ✓ | ✓ |
| CO2 | ✓ | | ✓ | ✓ | ✓ |
| CO3 | ✓ | | ✓ | ✓ | ✓ |
| CO4 | ✓ | | ✓ | ✓ | |
| CO5 | ✓ | | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2CD | MACRONUTRIENTS | SEMESTER II |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

**Syllabus**

**Unit I** Energy 10 h

Energy - Definition, Units, Components of energy requirement, Determination of Energy Value of Food, Total energy Requirement, Basal Metabolic Rate and its measurements, Factors Affecting Basal Metabolic Rate, Thermic Effect of food Factors Affecting, Energy requirement during work, Resting Energy Expenditure, Specific dynamic actions, Recommended Dietary Allowances

**Unit II** Carbohydrates 10 h

Carbohydrates- Classification, Functions, Digestion, Absorption, Metabolism, Maintenance of Blood Glucose Levels, Hormonal control of blood sugar levels.

Dietary Fiber- Classification of dietary fiber, physiological and metabolic effects of fiber, role of fiber in the prevention of disease. Recommended dietary allowances and sources.

**Unit III** Proteins 10 h

Proteins & Amino acids – Functions, classification, sources, Digestion, absorption, metabolism, utilization and factors affecting, storage, assessment of quality of proteins, complimentary value of proteins and requirements. Factorial estimation for arriving at RDA of proteins for Indians.

**Unit IV** Lipids 8 h

Lipids- Classification, Fats in the Body and Food, Functions, Digestion and Absorption, Transport and Metabolism, Essential Fatty Acids, Brown Fat Thermogenesis, Therapeutic Inhibition of Fat Absorption and Sources.

**Unit V** Water and Electrolytes 10 h

Water- Definition, Distribution, Functions, Water Balance, Maintenance of Fluid /Water Balance, Water Depletion, Water Excess (Water Intoxication), Distribution of Electrolytes, Maintenance of Electrolyte balance, Acid Base Balance- The Control of Hydrogen Ion Concentration, Acid Base Buffers, Respiratory Regulation of pH, Renal Regulation of pH.

**Text Books**


1 Srilakshmi,B 2020, " Nutrition Science", 6th edition., New Age International Private Ltd. New Delhi.

**2** Groffer.S.S, Smith.J.L & Groff.J.L , 2009, " Advanced Nutrition and Human Metabolism", 5th edition, Wadsworth, USA.


**References**


1 Nicola Anderson & Claire Thomson, 2016, "Food and Nutrition" 1st edition, Hodder Education, London.

2 Berdainer.C.D & Zempleni., 2009, "Advanced Nutrition Macronutrients, Micronutrients and Metabolism". CRC Press, Taylor and Francis Group, USA.

| 233FN2A2CP | FOOD ANALYSIS | SEMESTER II |
|---|---|---|

**Total Credits:** 3
**Total Instructions Hours:** 72 h

| S.No | Contents |
|---|---|
| 1 | Determination of Moisture content |
| 2 | Determination of Carbohydrate by anthrone method |
| 3 | Estimation of protein content of foods by Lowry's method |
| 4 | Estimation of fat content of foods by Soxhlet method |
| 5 | Estimation of crude fibre |
| 6 | Estimation of Sodium and Potassium in processed foods |
| 7 | Estimation of Iron |
| 8 | Estimation of Phosphorus |
| 9 | Estimation of Calcium in milk and curd |
| 10 | Estimation of Ascorbic Acid in Citrus Fruits |
| 11 | Estimation of Iodine number and Acid number |
| 12 | Determination of Saponification Value of oil |
| 13 | Determination of Total Antioxidant Capacity |
| 14 | Estimation of Thiamine and Riboflavin |
| 15 | Determination of β -Carotene and Lycopene |

**Note:** Out of 15- 13 mandatory

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2CE | COMPUTER APPLICATION IN NUTRITION | EDC | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the concept of microsoft office
- the fundamentals of word, excel and power point
- the computer networks and multimedia in nutrition education

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Understand the fundamentals of MS word | K1 |
| CO2 | Apply the knowledge for creating a document and presentation | K2 |
| CO3 | Build and analysis the table and database for nutrition using MS Excel | K3 |
| CO4 | Apply the knowledge for creating nutrition web page. Expose the concepts of computer networks | K4 |
| CO5 | Develop the online application in nutrition education using multimedia tools | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| ✓ | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2CE | COMPUTER APPLICATION IN NUTRITION | SEMESTER II |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

**Syllabus**

**Unit I** Word Basics 10 h

Word Basics: Creating a new document, Formatting Text and Documents, Working with Headers and Footers, creating a simple table using the table menu, using menus and toolbars.

TEXT: Copy, delete, move, spell check character & page formatting, size, font, header, footer, bordering, coloring, margins, justification and graph. Understanding the concept of mail merge. Creating an article for publication.

PICTURE: Creation, editing, import and printing. Use of other available features.

**Unit II** PowerPoint Basics 10 h

Creating presentations - Insert, format, and modify slides. Insert and format tables, charts, and SmartArt graphics. Application of slide transitions and animations. Inserting audio, video and animating multimedia playback, recording sound. Presentation using google slides. Creating food and nutrition presentation.

**Unit III** MS Excel 10 h

Excel Basics: Overview of Excel features, creating a new worksheet, Selecting cells, moving cells, copying cells, sorting cell data, inserting rows, inserting columns, Deleting parts of a worksheet, entering and editing Formulas, Creating Nutrition database using MS Access.

**Unit IV** Multimedia 9 h

Introduction to Multimedia: Components of Multimedia, Multimedia software tools, Multimedia Applications, Multimedia and hypermedia, online applications in nutrition education, webpage creation and app development - nutrient calculation, pamphlet and brochures.

**Unit V** Applications of computer in nutrition 9 h

Nutrition Education and Counseling, Spread sheets in Nutrient and Diet calculations, Use of statistical software - R software, SPSS, and Graph pad prism Accessing Digital Library, barcode and QR code, e-Journals in Food Science and Nutrition, Relevant Nutrition software's.

**Text Books**


1 Gurvinder Singh and Rachhpal Singh, 2015, "P.C. Software and Programming in C", 4th Edition, Kalyani Publishers, Hyderabad.

**2** Deepak Bharihoke., 2010, "Fundamentals of Information Technology", 3rd Edition, Excel Book Publishers, Kerala.


**References**


1 Srivastava Chetan, 2014, "Fundamentals of Information Technology", 3rd edition, Kalyani Publishers, Hyderabad.

2 Ze Niam Li and Mark S.Drew, 2005, "Fundamentals of Multimedia", 1st edition, Prentice Hall India Learning Private Limited, New Delhi.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2DA | FOOD BIOTECHNOLOGY | DSE | 3 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the application of biotechnology in the field of Food and Nutrition
- the concepts of fermentation techniques and GM foods
- the fundamentals of enzymes and carbon footprint

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Elaborate the ethical aspects of food and agricultural biotechnology | K2 |
| CO2 | Interpret the fermentation techniques and emphasize the characteristics of probiotics product | K3 |
| CO3 | Examine the characteristics regulations and ethical concerns of GM foods | K4 |
| CO4 | Justify the role of biotechnology in meat, poultry, fish and milk processing | K4 |
| CO5 | Illustrate the effect of enzyme and inspect the components of footprint | K4 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | |
| CO2 | ✓ | ✓ | ✓ | ✓ | |
| CO3 | ✓ | ✓ | ✓ | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | |
| CO5 | ✓ | ✓ | ✓ | | |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| ✓ | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2DA | FOOD BIOTECHNOLOGY | SEMESTER II |
|---|---|---|

**Total Credits:** 3

**Total Instruction Hours:** 36 h

**Syllabus**

**Unit I** Food biotechnology 7 h

Biotechnology-Introduction, goals, ethical aspects of food and agricultural biotechnology, limitations, variety of changes shaping bioethics, hazardous materials used in biotechnology-handling and disposal, GMP, GLP.

Food biotechnology-Introduction, methods, food production, regulatory, safety and socio-economic considerations, Safety of food biotechnology, modern food biotechnology-definition, overview, potential benefits & risks.

**Unit II** Role of biotechnology in fermentation & Probiotics 7 h

Fermentation –Types of fermentation and fermenters, recovery and purification of products, fermentation and product recovery costs, factors affecting fermentation economics.

Probiotics - Features and composition, characteristics of a good probiotics, factors affecting viability in foods, probiotics products - quality assurance and regulatory issues, guidelines for the evaluation of probiotics in food.

**Unit III** Genetically modified foods 7 h

Genetically modified foods- Introduction, regulation and role of government, labeling, advantages of GM foods and assessment of the impact of GM foods on human health, social & ethical concerns about GM foods. Characteristics of Genetically modified fruits-apple, citrus, cherry, guava, papaya.

Characteristics of Genetically modified vegetables - tomato, soya bean, carrot, potato. Mushroom-identification, nutritional values, essentials of mushroom cultivation, opportunities and challenges.

**Unit IV** Role of biotechnology in animal source foods 7 h

Meat- Introduction, tenderization process, enzymatic tenderization.

Poultry- Introduction, slaughtering & processing, poultry nutrition impact.

Fish- Introduction, genetically engineered fish, fish feed biotechnology, benefits and disadvantages.

Milk-Natural components, milk processing operations, key products in dairy industry.

**Unit V** Enzymes and carbon footprint 8 h

Enzymes-Introduction, sources, purification, formulation of the final enzyme product, enzyme recovery, future of industrial enzymes. Enzymes sources, mechanism, functions -amylase, pectic, lactase, protease.

Carbon footprint-Introduction, ecological footprint of the global food system-primary components of footprint, Impact on other food system.

**Text Books**

1 GN Foster,2020, “Food biotechnology”,1st edition ,CBS Publishers & Distributors Pvt. Ltd, New delhi.

**2** V Sree Krishna, 2017, "Bioethics and Biosafety in Biotechnology", New Age International Publishers, New Delhi.

**References**

1 Johnson-Green Perry, 2018, "Introduction To Food Biotechnology", Taylor and Francis, England.

2 Byong H. Lee, 2014, "Fundamentals of Food Biotechnology", John Wiley & Sons Ltd, New York.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2DB | FOOD WASTE AND BY-PRODUCT UTILIZATION | DSE | 3 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the food processing by-products and their utilization
- the incorporation of by-products into various food products
- the emerging technologies to extract valuable bioactive chemicals from food waste

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Elaborate on the waste related to food industry | K3 |
| CO2 | Illustrate the principles and applications of the food processing by products | K3 |
| CO3 | Summarize the valorization of fruit and vegetable waste and loss quantification after harvest | K3 |
| CO4 | Explain the use of food by-products in industrial sector | K4 |
| CO5 | Illuminate the bio processing of meat waste to value-added bio-medical products | K4 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | | ✓ | ✓ |
| CO4 | ✓ | ✓ | | | |
| CO5 | ✓ | ✓ | | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| ✓ | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2DB | FOOD WASTE AND BY-PRODUCT UTILIZATION | SEMESTER II |
|---|---|---|

**Total Credits:** 3

**Total Instruction Hours:** 36 h

**Syllabus**

**Unit I** Industrial Food waste 7 h

Food waste: classification and properties, disposal and recycling in the context of change in the agricultural industry and emerging nutritional trends, origin of food waste, generated mass of the most important types of product-specific food waste. Possible mitigation measures for food processing wastes. Impact of waste disposal on environment and human health.

**Unit II** Cereals, Pulses and Sugar 8 h

Rice Processing Industries - Rice bran - Protein extraction method, rice hull and rice bran fiber.

Soyabean - Major Soybean by-products, tofu whey and its uses, source of various enzymes and applications of important soybean products.

Sugar Processing Industries - By-Products - flavorings and aromas, agglomerated product production from bagasse.

**Unit III** Fruit, Vegetables and Dietary Fiber 7 h

Fruit - Phenolic compounds as functional foods, fruit by-products sources and value-added products from fruit by-products.

Vegetable - Valorization of vegetable wastes, reasons and overall prevention of wastes, loss quantification of fruits and vegetables after harvest.

Dietary Fiber - Dietary fiber from fruits, vegetables, cereals and pulses, utilization of dietary fiber in different food industries.

**Unit IV** Dairy and Pre - Biotics 7 h

Dairy - By-products from the dairy processing industries, proteins from dairy waste and advances in milk fractionation for value addition.

Prebiotics from food processing by-products, oligosaccharides and polysaccharides from food processing and agricultural by-products.

**Unit V** Meat, Poultry and Seafood 7 h

Meat - By-Products and wastes generated during meat, beef and pork processing waste - Collagen, Gelatin.

Poultry - Proteins and Peptides derived from Chicken Processing By-Products and Waste, Valorization of Egg Waste.

Seafood processing - By-Products, bio medicals – fish protein hydrolyzate, peptides, chitin and chitosan.

**Text Books**


1 Anil Kumar Anal., 2018, "Food Processing By-Products and their Utilization", John Wiley & Sons Ltd., New York.

**2** Vassoreopoulou and Winfried Russ., 2007,"Utilization of By-Products and Treatment of Waste in the Food Industry", Springer, New York.


**References**


1 Charis M. Galanakis., 2020, "Food Waste Recovery Processing Technologies Industrial Techniques and Applications", Elsevier Inc., Netherlands.

2 J. Saxena., 2011, "Food Processing Waste Management Treatment and Utilization Technology", New India Publishing Agency, New Delhi.

3 Keith Waldron., 2007, "Handbook of Waste Management and Co-Product Recovery in Food Processing", Elsevier Inc., Netherlands.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A2DC | FOOD TOXICOLOGY | DSE | 3 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the principles of toxicology
- the clinical, emergency, environmental, medico-legal and occupational aspects of toxicology
- to prevent the toxic substances in food products

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Editorialize the mechanism of toxicology and biotransformation | K3 |
| CO2 | Determination of toxicants in food and its effects | K3 |
| CO3 | Summarize the regulations for genetically modified foods and allergenisity | K3 |
| CO4 | Infer food contaminants and heavy metal contamination and radioactive contamination | K4 |
| CO5 | Speculate the application of food additives and its toxicological effects | K4 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | | | ✓ | ✓ |
| CO2 | | ✓ | | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | ✓ | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A2DC | FOOD TOXICOLOGY | SEMESTER II |
|---|---|---|

**Total Credits:** 3

**Total Instruction Hours:** 36 h

**Syllabus**

**Unit I** Toxicology 7 h

Introduction to Toxicology – Definition, scope, history, principles, classification of toxic agents, characteristics of toxic exposure, interaction and tolerance, biotransformation. Mutagenesis, Mechanism of toxicity- Oncogenesis, Teratogenesis.

**Unit II** Food Toxins 7 h

Food Toxins – Natural and synthetic toxicants in foods, importance of natural toxins in food, toxicants of plant and animal origin. Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Food poisoning, toxin determination in foods and their management. Toxicity of macro and micro nutrient.

**Unit III** Food allergies and allergens 8 h

Food allergies and allergens: Natural sources and chemistry of food allergens; true/untrue food allergies, handling of food allergies. Safety of Genetically Modified food: potential toxicity and allergenisity of GM foods.

Manifestations of organ toxicity – neurotoxicity, hepatotoxicity, nephrotoxicity, hematotocicity and immunotoxicity.

**Unit IV** Contaminants in Food 7 h

Contaminants in Food: heavy metal contamination in food (mercury, arsenic lead, cadmium, chromium and aluminum) and their health impacts. Radioactive contamination of food.

Drug Residues in food: Fungicide and pesticide residues in foods, use of veterinary drugs.

**Unit V** Food Additives and Adulterants 7 h

Food Additives: Classification, functional role, limitations and toxicological effects of food additives; food processing generated toxicants: nitroso compounds, heterocyclic amines. Food adulteration and potential toxicity of food adulterants.

Agencies and statutes involved in regulation of toxic chemicals in India.

**Text Books**


1. Shibamoto & Bjeldanes, T & L, 2009, "Introduction to Food Toxicology", 2nd Edition, Elsevier Inc., Burlington.
2. Helferich, and Winter, W & C.K, 2001, "Food Toxicology", CRC Press, New Delhi.


**References**


1. Ernets Hodson, 2010, "A Text book of Modern Toxicology". A John Wiley & sons Inc, New York.
2. Stine.K.E and Brown.T.M., 2006, "Principles of Toxicology", 2nd Edition, CRC Press, New Delhi.
3. Duffus.J.H and Worth.H.G.J., 2006, "Fundamental Toxicology", The Royal Society of Chemistry, New Delhi.


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| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A3CA | MICRONUTRIENTS | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The Physiological and metabolic role of micro nutrients and its role in maintaining the human body
- The bio availability of vitamins and minerals and their inter relationship
- The importance of pseudo vitamins and antioxidants for maintenance of human health

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Elaborate the chemistry, biosynthesis, transport, utilization, storage of Fat-soluble vitamins. | K3 |
| CO2 | Determine the chemistry, physiological action, storage, transport, and biosynthesis of water-soluble vitamins | K3 |
| CO3 | Enumerate the absorption, utilization, deficiency, toxicity, sources and requirements of minerals. | K4 |
| CO4 | En detail the functions, intake, utilization, bio availability, storage, and output of trace elements. | K4 |
| CO5 | Express the chemistry, functions and Sources of the pseudo vitamins and antioxidant's role in maintaining human health. | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | | | ✓ |
| CO2 | ✓ | ✓ | | | ✓ |
| CO3 | ✓ | ✓ | | | ✓ |
| CO4 | ✓ | ✓ | | | ✓ |
| CO5 | ✓ | ✓ | | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A3CA | MICRONUTRIENTS | SEMESTER III |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

## Syllabus

**Unit I** Fat Soluble Vitamins 10 h

Vitamins - Introduction, Factors Influencing the Utilization of Vitamins.

Fat Soluble Vitamins - Vitamin A, D, E and K, Structure, Chemistry, biosynthesis, metabolism, absorption, transport, utilization, storage, bio availability and Methods of Assay. Deficiency and Diagnosis, Hyper Vitaminosis, Recommended Intakes and Dietary Sources.

**Unit II** Water Soluble Vitamins 9 h

Thiamine, riboflavin, niacin, vitamin B12, folic acid, pyridoxine, pantothenic acid, biotin and ascorbic acid - Structure, chemistry, biosynthesis, metabolism, Absorption, Transport, utilization, storage, bio availability and Methods of Assay. Deficiency and Diagnosis, Hyper Vitaminosis, Recommended Intakes, deficiency and Dietary Sources.

**Unit III** Macro Minerals 10 h

Calcium – Distribution of calcium in the body, functions, absorption, metabolism, transport, utilization, deficiency, toxicity and requirements. Regulation of calcium (Calcium Balance).

Phosphorus - Concentration in the body, functions, absorption, metabolism, transport, utilization, deficiency, toxicity, sources and requirements. Calcium - phosphorus ratio. Inter relationship between Calcium, Phosphorus and Parathyroid Hormone.

Sodium, Potassium, Magnesium and Sulphur - Distribution, functions, absorption, metabolism, utilization, deficiency, toxicity, sources and requirements, Sodium and Potassium Balance.

**Unit IV** Micro Minerals 10 h

Iron- Distribution, absorption, metabolism, functions, intake, transport and utilization, storage, Sources, requirements, deficiency, toxicity, bio availability of iron, Iron Turnover.

Iodine, Flourine and Zinc - Functions, absorption, metabolism, sources, requirements, deficiency and toxicity.

Trace Elements

Physiology, Functions, sources, requirements, deficiency and toxicity of copper, cobalt, molybdenum, manganese, selenium, boron, chromium.

**Unit V** Pseudo Vitamins and Antioxidants 9 h

Choline, carnitine, inositol, taurine, flavonoid, pangamate - Chemistry, functions, and Sources. Antioxidants - Reactive Oxygen Species, Free radical, Mechanism of Antioxidants, Functions. Relationship with aging, cancer, CVD, CRD, CKD, Diabetes, Stroke, Liver diseases.

**Text Books**


1 Srilakshmi, E. 2021, "Nutrition Science", New Age International Publishers, New Delhi.

2 Swaminathan, M. 2000, "Advanced Text Book foods Nutrition", Vol.1., Bappco Publication, Bangalore, India.


**References**


1 Mahan, Kathleen L. Krause 's, 2004, "Food, Nutrition and Diet Therapy", 11th edition, Elsevier Publishers, USA.

2 Mahtab S. Bamji, Prahalad Rao. N and Vinodhini Reddy, 2004," Text Book of Human Nutrition", Oxford IBH Publishing Co Pvt Ltd., USA.

3 Swaminathan, M. 2000, "Essentials of Foods and Nutrition", Volume I and II, Ganesh and Co., Madras, India.

4 Williams. S.R. 2013, "Nutrition and Diet Therapy", Times Mirror Masby College Publishing St. Laws, Toronto, Boston.

5 National Institute of Nutrition, 2020, "Recommended Dietary Allowances", ICMR, , Hyderabad.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A3CB | THERAPEUTIC NUTRITION - II | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The theoretical bases for nutrition intervention strategies with the physiological and biochemical changes of selected disease conditions
- The theories and principles of medical nutrition therapy into clinical practice
- The appropriate recommendations for the management of disease conditions

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Gain insight into the nutritional problems of liver and pancreatic disorders and the efforts to overcome them | K3 |
| CO2 | Understand the relationship between nutrition and cardiovascular diseases | K2 |
| CO3 | Develop knowledge in mineral metabolic disorders | K3 |
| CO4 | Interpret and apply the nutritional therapy in neuro and respiratory disorders | K4 |
| CO5 | Justify the various dietary modifications critically with evidence-based knowledge in cancer treatment | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | ✓ | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A3CB | THERAPEUTIC NUTRITION - II | SEMESTER III |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

## Syllabus

**Unit I** Nutrition therapy in liver, biliary and pancreas diseases 10 h

Diseases of the liver: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for acute and chronic hepatitis, alcoholic and non-alcoholic fatty liver disease, cirrhosis, hepatic encephalopathy/coma.

Diseases of the hepatobiliary and pancreas: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for cholelithiasis, cholecystitis, choledocholithiasis, acute and chronic pancreatitis.

**Unit II** Nutrition therapy in cardiovascular diseases 10 h

Diseases of the cardiovascular system: atherosclerotic risk factors, etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for hypertension, atherosclerosis, metabolic syndrome, ischemic heart disease, peripheral arterial disease and congestive heart failure.

Role of metabolic factors in clinical interpretation of ECG. Role of functional foods in cardiovascular health. Stress- definition, types and management.

**Unit III** Nutrition therapy in musculoskeletal, bone and mineral metabolic disorders 9 h

Disorders of the musculoskeletal, bone and mineral metabolism: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for osteoarthritis, gout, osteoporosis, rickets, osteomalacia, hypophosphatemia, hyperphosphatemia, hypomagnesemia, hypermagnesemia, hypercalcemia, hypocalcemia.

Disorders of the endocrine system: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for hypothyroidism, hyperthyroidism, polycystic ovarian syndrome.

**Unit IV** Nutrition therapy in neurological and respiratory disorders 10 h

Disorders of the neurological system: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for dysphagia, Alzheimer's

disease, Parkinson's disease, epilepsy. Nutritional management in spinal trauma and Neuro trauma.

Diseases of the respiratory system: Etiology, pathophysiology, clinical manifestations, diagnosis and medical nutrition therapy for LRTI and URTI, asthma, chronic obstructive pulmonary disease, tuberculosis, cystic fibrosis, pneumonia, acute respiratory distress syndrome, respiratory failure.

**Unit V** Nutrition therapy in cancer 9 h

Neoplastic diseases: Development, Characteristics and identification of cancer cells. Etiological risk factors in cancer. Role of diet in the etiology of cancer. Metabolic alterations during cancer. Nutritional manifestations associated with cancer. Feeding problems related to cancer therapy (surgery, radiation therapy and chemotherapy). Role of functional foods in prevention of cancer.

**Text Books**


1 Mahan L. K. & Escott-Stump S., 2021, Krause's "Food & nutrition therapy", 15th ed., Saunders/Elsevier, Netherlands.

2 Escott-Stump S., 2015, "Nutrition and diagnosis-related care", 8th ed., Wolters Kluwer, United States.


**References**


1 Whitney E. N. Rolfes S. R. Crowe T. & Walsh A., 2023, "Understanding nutrition", 5th edn., Cengage Learning, Boston.

2 Nix S. Williams S. R. & Mowry L, 2022, "Williams' basic nutrition and diet therapy", Elsevier, Netherlands.

3 Krause and Mahan's, 2021, "Food & the Nutrition Care Process", 15th ed., Elsevier, Netherlands.

4 Kane K. & Prelack K., 2019, "Advanced medical nutrition therapy" Jones & Bartlett Learning, Burlington.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A3CC | RESEARCH METHODOLOGY AND STATISTICS | CORE | 4 | 1 | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The details of sampling designs, measurement, scaling techniques and methods of data collection.
- The procedure of interpretation and writing research reports.
- Application of statistical procedure in numerical data analyzes to draw inferences.

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Classify research and choose a hypothesis to plan research along with sampling techniques. | K4 |
| CO2 | Choose and simplify the data collection methods. Organize and analyze the data. | K5 |
| CO3 | Comparison and contrast the results obtained from the data. | K5 |
| CO4 | Statistically analyze the acquired data and explain the results. Measure the reliability of the research data. | K5 |
| CO5 | Justify the results using the test of significance. Provide a theoretical conclusion from the obtained data. | K6 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | | ✓ | ✓ |
| CO4 | ✓ | ✓ | | | |
| CO5 | ✓ | ✓ | | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A3CC | RESEARCH METHODOLOGY AND STATISTICS | SEMESTER III |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 60 h

## Syllabus

**Unit I** Fundamentals of Research 10 h

Meaning of research, objectives of research, types of research and their application, selection and formulation of research problems- hypothesis, research design, sampling methods – random sampling methods and non-random sampling methods, sampling errors & sample size calculation.

**Unit II** Collection and organization of data 14 h

Primary Data collection methods - Questionnaire, schedule method, interview method, case study method & experimentation method, sources of secondary data, precautions while using secondary data.

Editing and Coding the Data

Organization of Data - classification of data, formation of discrete and continuous frequency distribution, tabulation - role, general rules of tabulation, types of tables.

**Unit III** Report writing 12 h

Representation of Data - Diagrammatic and graphical representation - significance of diagrams, graphs and charts- general rules for constructing diagrams - types of diagrams.

Interpretation and Report Writing - Meaning of interpretation and precautions , Format of thesis writing - front page, main text, bibliographical citations and appendices.

Publishing the research work - writing of abstract and article- content, style, grammar, reference citation.

Plagiarism - Definition, types, importance and examples of plagiarism.

**Unit IV** Measures of Central Tendency 12 h

Measures of Central Tendency - Mean, median, mode, their relative advantages and disadvantages. Measures of dispersion – mean, standard deviation, quartile deviation. Co-efficient of variation, percentile and percentile ranks. Association of attributes and contingency tables.

**Unit V** Tests of significance 12 h

Tests of significance – large and small sample- t' and F' test, tests for independence using chi-square test. Analysis of variance- one-way and two-way classifications, Correlation, coefficient of correlation and its interpretation, rank correlation, regression equations and predictions

**Text Books**


1 Pillai .R.S.N., Bagavathi .V., 2019, "Statistics (Theory & Practice)", 8th Edition, S Chand Publishing Company, New Delhi.

2 Gupta, S.P., 2017, "Statistical Methods", Sultan Chand & Sons Publication, New Delhi.


**References**


1 C.R. Kothari , Gaurav Garg, 2019, "Research Methodology, Methods and Techniques", 4th Edition, New Age International Publishers, New Delhi.

2 Ramakrishnan, P., 2019, "Biostatistics", Sara Publication, India.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A3CD | FOOD ADDITIVES AND CONTAMINANTS | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- Gain insight about the food additives
- The significance of food additives
- The impact of contaminants on human health

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Elaborate the role of Food additives | K2 |
| CO2 | Explicate the regulatory aspects of food additives | K3 |
| CO3 | Illustrate the principle and applications of food additives in food processing sectors | K4 |
| CO4 | Summarize the importance of flavors in foods and its significance as food additives | K4 |
| CO5 | Illuminate the harmness of adulteration and contaminants and explicate the Consumer Protection Act | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | | |
| CO5 | ✓ | ✓ | ✓ | | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A3CD | FOOD ADDITIVES AND CONTAMINANTS | SEMESTER III |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

## Syllabus

**Unit I** Food additives 10 h

Definitions, classification and functions, preservatives, antioxidants, colours and flavors, emulsifiers, sequesterants, humectants, hydrocolloids, sweeteners, acidulents, buffering salts, anticaking agents, etc. – chemistry, food uses and functions in formulations, indirect food additives; toxicological evaluation of food additives. Proteins, starches and lipids as functional ingredient; isolation, modification, specifications, functional properties and applications in foods.

**Unit II** Functionality of food additives 08 h

Regulatory and legal aspects, sensory properties of foods, additives of natural origin, synthetic additives. Health and safety aspects of food additives. Present status of various food additives. Controversial food additives Saccharin, history, function, controversy status, aspartame, nitrite and nitrate compounds, nitrosamines.

**Unit III** Additives to improve acceptability 10 h

Permitted food colors, natural and artificial, food flavours, natural and artificial, sweeteners natural and artificial, antimicrobials, aerating agents, antistaling agents, bodying agents, clouding agents, curing agents clarifiers, dietary supplements, dietary fiber , emulsifiers, enzymes, fat replacers, gelling agents, leavening agents, stabilizers, surfactants, tenderizers, texturizers, thickeners, vitamins, nutraceuticals, viscosity modifiers, whipping agents

**Unit IV** Flavor technology 10 h

Types of flavours, flavours generated during processing – reaction flavours, flavor composites, stability of flavours during food processing, analysis of flavours, extraction techniques of flavours, flavours emulsions; essential oils and oleoresins; authentication of flavours etc.

**Unit V** Food adulteration 10 h

Food adulteration, definition, reasons for food adulteration, methods of adulteration, and methods of detection. Consumer's responsibilities, consumer organizations. The

prevention of food adulteration Act, 1954. The consumer protection Act 1986, normal food adulterants in coffee, tea leaves, edible oil, milk, spice powders

**Text Books**


1 Gerorge, A.B., 2006, "Encyclopedia of Food and Color Additives" Vol. III. CRC Press, United States.

2 Branen, A.L., Davidson PM & Salminen S, 2001, "Food Additives", 2nd Ed.Marcel Dekker, New York.


**References**


1 Madhavi, D.L., Deshpande, S.S & Salunkhe, D.K. 2006, "Food Antioxidants: Technological, toxicological and Health Perspective", Marcel Dekker, New York.

2 Nakai S & Modler HW. 2000. "Food Proteins and Processing Applications" Wiley VCH, New Jersey.

| 233FN2A3CP | FOOD ANALYTICAL TECHNIQUES | SEMESTER III |
|---|---|---|

**Total Credits:** 3
**Total Instructions Hours:** 72 h

| S.No | Contents |
|---|---|
| 1 | Different plant sample extraction methods |
| 2 | Qualitative phytochemical analysis in various plant samples |
| 3 | Estimation of chlorophyll |
| 4 | Estimation of curcumin in turmeric |
| 5 | Estimation of total phenol content present in fresh fruits |
| 6 | Estimation of capsaicin in calorimetric method |
| 7 | Determination of trypsin inhibitor in pulses |
| 8 | Determination of tannin content |
| 9 | Determination of phytic acid in millets |
| 10 | Determination of Gossypol |
| 11 | Determination of Cyanogen |
| 12 | Estimation of Cellulose in plant material |
| 13 | Invitro Protein Digestibility |
| 14 | Determination of Amylose |
| 15 | Estimation of alkaloids (Quantitative test) |

**Note:** Out of 15- 13 mandatory

## References


1 Sadasivam. S., and Manickam. A., 2008, "Biochemical Methods", 3rd Edition, New Age International Publishers, New Delhi.

2 Suzanne Nielsen.S., 2007 "Food Analysis", 4th Edition, Springer, New York.

3 AOAC International, 2005, "Official Methods of Food Analysis", 18th Edition, Maryland.

4 Suzanne Nielsen.S., 2017, "Food Analysis Lab Manual", 3rd Edition,Springer, New York.

| 233FN2A3CQ | THERAPEUTIC NUTRITION | SEMESTER III |
|---|---|---|

**Total Credits:** 2
**Total Instructions Hours:** 48 h

| S. No | Contents |
|---|---|
| 1 | Diet for chronic energy deficiency, overweight, obesity, diabetes mellitus |
| 2 | Diet for pre and post-operative period |
| 3 | Diet for fever and convalescence |
| 4 | Diet for nutritional deficiencies – PEM, VAD, IDA, IDD, Osteoporosis, B-complex vitamin deficiency, Vit-D deficiency |
| 5 | Diet for HIV/AIDS |
| 6 | Diet for burns |
| 7 | Diet for critically ill – enteral nutrition |
| 8 | Diet for critically ill – parenteral nutrition |
| 9 | Diet for GI diseases |
| 10 | Diet for liver diseases |
| 11 | Diet for cardiovascular diseases |
| 12 | Diet for respiratory disorder |
| 13 | Diet for neurological disorder and neuro trauma |
| 14 | Diet for cancer and immunity |

**Note:** Out of 14 - 12 mandatory

## References


1. Kane K. & Prelack K., 2019, "Advanced medical nutrition therapy", Jones & Bartlett Learning, Burlington.
2. Escott-Stump S., 2015, "Nutrition and diagnosis-related care", Wolters Kluwer, United States.
3. Nix S. Williams S. R. & Mowry L., 2022, "Williams' basic nutrition and diet therapy", Elsevier, Netherlands.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A3DA | INSTRUMENTATION IN FOOD INDUSTRY | DSE | 3 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The instruments used in food industries for food analysis
- The working principle and instrumentation of various instruments used for food analysis
- The various methods, strategies, proper selection and identification of instruments, Installation and operation of instrumentation

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Explain the basic working principle of instruments used for food analysis | K4 |
| CO2 | Determine the rheological properties of food | K5 |
| CO3 | Illustrate the working principle and applications of spectroscopic analysis of food components | K4 |
| CO4 | Summarize the applications of chromatographic techniques | K5 |
| CO5 | Appraise the techniques and applications of isotopic and immune techniques in food | K5 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | | ✓ | ✓ | ✓ | |
| CO3 | ✓ | ✓ | | ✓ | ✓ |
| CO4 | ✓ | ✓ | | | |
| CO5 | ✓ | ✓ | | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| ✓ | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A3DA | INSTRUMENTATION IN FOOD INDUSTRY | SEMESTER III |
|---|---|---|

**Total Credits:** 3

**Total Instruction Hours:** 36 h

## Syllabus

**Unit I** Nature and Concept of Food analysis 7 h

Basic instrumentation: Working principle, components and applications of pH meter, Dialysis machine, ultra filtration, Reverse osmosis. Principle for Centrifugation and Ultracentrifugation, Calorimetry: Bomb calorimeter.

**Unit II** Principle of Rheological Analysis 7 h

Rheological parameters, rheological methods, instruments and application, Refractometer, viscometer, penetrometer, farinograph, extensiograph, amylograph, tenderometer. Analysis of texture and flavor profile.

**Unit III** Spectroscopic analysis of food components 7 h

Principle, instrumentation & application of Colorimetric (colorimeter, UV-Vis spectrophotometer, IR Spectroscopy, Inductively coupled plasma atomic emission spectroscopy (ICP-AES) and NMR.

**Unit IV** Chromatographic analysis of food components 8 h

Theory & Principle, chromatographic parameter components of chromatography & types (paper, thin layer, partition) Advance chromatography: GC, HPLC, HPTLC, UHPC (principle, instrumentation &application) and types of detector.

**Unit V** Electrophoresis analysis of Food Components 7 h

Working Principles, Application, Separation technique & analysis: Electrophoresis: Paper & gel, Agarose 2D Gel Electrophoresis.

## Text Books

1 Suzanne Nielsen.S., 2002, "Introduction to the Chemical Analysis of Foods", CBS Publishers, New Delhi.

2 Fennama, O.R., 1976, "Principles of Food Science and Food Chemistry". Marcel Dekker, New York.

**References**


1 King, R.D., 1978, "Developments in Food Analysis Techniques", Publishers Ltd, London.

2 Fung, D.Y.C. and Matthews, R., 1983, "Instrumental Methods for Quality Assurance in Foods", Marcel Dekker, Inc. New York.

3 Raghuramulu N., Madhavan Nair K. and Kalyansundaram S, 1970, "A manual of laboratory techniques" edited by NIN, ICMR, Hyderabad.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A3DB | FOOD PACKAGING TECHNIQUES | DSE | 3 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The purpose and the need for food packaging technology
- To impart knowledge and skills related to designing packaging system in food products
- The developing skills in handling of packaging equipment

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Identify the functions of packaging materials for different foods. | K3 |
| CO2 | Elucidate the characteristics, application of packaging of foods | K4 |
| CO3 | Analyze the packaging techniques, implication and its application. | K4 |
| CO4 | Compare the recent advancements in food packaging industry | K5 |
| CO5 | Choose the Standards for labeling concerned in food industries. | K5 |

**MAPPING WITH PROGRAMME OUTOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A3DB | FOOD PACKAGING TECHNIQUES | SEMESTER III |
|---|---|---|

**Total Credits:** 3

**Total Instruction Hours:** 36 h

## Syllabus

**Unit I** Food packages 7 h

Introduction of Food packaging, Need of food packaging, Role of packaging in extending shelf life of foods, Types of Packaging material-primary, secondary & tertiary, characteristics, applications in food industry. Different forms of packaging-Rigid, semi- rigid, flexible,Brik -pak system,Bag in Box ystem.

Packaging Materials-Glass, Metal (steel and Aluminum cans),Aluminum Foils and metalized Films, Paper and paper boards, BOPP,CPVC, Plastics and its application.

**Unit II** Packaging of cereal and pulse products & edible oil 7 h

Packaging of cereal products- Spoilage factors, Packaging of whole grains(Bulk &Consumer Packs) - Jute bags, HDPE sacks, Packaging of milled grains( flours)-LDPE, LLDPE, HMHDPE,BOPP, Co- extruded films, Packaging of Cereal based convenience products and weaning products.

Trends in packaging of Biscuits- wrapping material, packaging style and preparation stages.

Packaging of Edible oil- spoilage factors, package types, critical polymers & Indian standards of packaging edible oil, vanaspati and ghee

**Unit III** Packaging of Milk, Egg, Sugars and Confectioneries 7 h

Packaging of Milk and milk products (Milk Powder,Butter,Yogurt,Cheese. Packaging Materials for Egg and its technique.

Sugar and chocolate confectioneries-Packaging requirements, packaging materials-cellulosics, polyolefins, vinyls, Polyester & polyamides, Aluminium foils, Metallised films.

**Unit IV** Technology in development of Food packaging 8 h

MAP packaging- Techniques of MAP, Different Modified Atmospheres, Packaging Materials, ,Role of Gases in MAP, Application of Gas Packing for Shelf Life Extension of Foods-Effect of MAP on fresh meat, fish ,poultry & processed meats, Advantages and Disadvantages of MAP

Active and Intelligent Packaging, Sustainable Packaging, Degradable Packaging Polyermers-Biodegradable, Photodegradable Packaging, Packaging Waste Management.

**Unit V** Labeling & Laws 7 h

Labeling- Purpose of labels, , Critical elements of food label, type of label, Labels for freight containers, labeling regulations, bar code, Nutrition labeling, health claims, mandatory labeling provisions. Recent Trends in Labeling

Packaging Laws and regulations -SWMA, PFA Rule, Other Labelling Rules.

**Text Books**


1. N. I. I. R. Board, 2010, "Handbook on modern packaging industries". Asia Pacific Business Press Inc., New Delhi.
2. NIIR Board, "Food Packaging technology", 2020, 3rd edition, NIIR Project Consultancy Services., New Delhi.


**References**


1. Lee, D. S., Yam, K. L., and Piergiovanni, L. 2008. "Food packaging science and Technology". CRC press, New York.
2. Francis, F. J. (1999). Wiley encyclopedia of food science and technology. John Wiley and Sons Inc. Germany
3. Griffrin, R.C, "Principles of Food Packaging", 2002, 2nd Edition, Avi pub Co. Westport.
4. Gordon L. Robertson, "Food Packaging Principles and Practice", 2013, 3rd Edition, CRC Press, Baco Raton.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A3DC | FOOD MICROBIOLOGY | DSE | 3 | - | - | 3 |

**PREAMBLE**

This course has been designed for students to learn and understand

- The interactions between microorganisms and the food environment
- Effects of fermentation in food production and the microbiological quality of the food product
- The role of microorganisms in food safety

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Intricate the factors affecting the growth of microorganisms in food– pH, temperature, moisture, oxidation. | K2 |
| CO2 | Illustrate the role of Microorganism in Food Safety. Outline GMP and HACCP. | K2 |
| CO3 | Summarize and identify the fermented food – Bread, dairy products, beverage, fish and meat products. | K3 |
| CO4 | Explain the Spoilage of food - cereals, vegetables, fruits, egg and milk & canned foods. | K3 |
| CO5 | Evaluate the Food borne diseases. Investigation of food poisoning outbreaks by Bacteria and Mycotoxins. | K3 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | | |
| CO2 | ✓ | ✓ | ✓ | | |
| CO3 | ✓ | ✓ | ✓ | | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A3DC | FOOD MICROBIOLOGY | SEMESTER III |
|---|---|---|

**Total Credits:** 3

**Total Instruction Hours:** 36 h

## Syllabus

**Unit I** Food and Microorganisms 07 h

Important microorganisms in food- Bacteria, Mold and Yeast, Factors affecting the growth of microorganisms in food – pH, moisture, oxidation– reduction potential, nutrient content and inhibitory substances and biological structure.

**Unit II** Microbes In Food Fermentation 07 h

Microbes associated with typical food fermentation- Bread, pickle, Sauerkraut, fermented fish and meat products, Fermented dairy products : Yoghurt and cheese & Fermented beverages : Wine and beer.

**Unit III** Control of microorganisms in foods: Food Preservation 07 h

Microbiological spoilage problems and preventive measures associated with typical food products- Vegetables, fruits, Meat, Fish, Poultry, egg and milk & canned foods.

**Unit IV** Bacterial Agents of Food Borne Illness 08 h

Food poisoning and Food borne infections – Salmonella, E.coli, Staphylococcus, Clostridum, Listeria, Shigella, Campylobacter, Vibrio, Mycobacterium and Bacillus.

**Unit V** Non- Bacterial Agents of Food Borne Illness 07 h

Food borne viruses; helminths, nematodes and protozoa. Detection & Enumeration of microbes in foods

**Text Books**

1 Frazier. W.C and D.C West off., 2017, "Food Microbiology", 5th Edition, McGraw Hill Education Publishers, Boston.

2 Martin R Adams, Maurice O Moss, Peter McClure, 2015, "Food Microbiology", 4th edition, Royal Society of Chemistry Publication, Burlington.

**References**


1 David A. Golden, James M. Jay, Martin J. Loessner, 2006 ,"Modern Food Microbiology" 7th edition, Springer-Verlag, New York.

2 Roger. Y. Stainer, 2003, "Basic Food Microbiology", 2nd edition, CBS Publishers, United States.

| 233FN2ASSA | SELF STUDY: COMPOSITE HOME SCIENCE | SEMESTER III |
|---|---|---|

**Total Credits:** 1

**Syllabus**

**Unit I** Food and Nutrition

Food Science and Quality Control, Macro and Micro – Nutrients, Human Nutritional Requirements, Assessment of Nutritional Status, Food Biotechnology

**Unit II** Institutional Management and Dietetics

Advanced Management and Organization, Management of Human Resources, Experimental Quantity Cookery, Financial and Profit Management, Quantity Food Preparation Techniques, Food Service and, Delivery Systems Marketing, Therapeutic Dietetics

**Unit III** Child and Human Development

Human Development – Rights perspective, Principles and Theories of Human Development. Early Childhood Care and Development – Strategies, Monitoring and Supervision. Children with special needs and Children at Risk (Child Labor, Street Children, Child Abuse, Chronically Sick); Intervention Programs. Socialization in various family contexts across different cultures. Advances in Assessment of Children.

Clothing and Textiles- Textile Chemistry – Fibers and dyes. Dyeing, printing and finishing of fibers yarns and fabrics. Textile and Apparel Industry – Fundamental of business, specifications, quality control agencies and marketing. Historic and Traditional Textiles of world with emphasis on India. Curriculum and Teaching in clothing and textiles, analysis and development of curriculum; teaching methods and aids. Consumer and Textiles and Clothing. Recent developments in Textile and Clothing.

**Unit IV** Home and Community Resource Management

Concept of Home management, System approach to family, Input, Output and feedback. Family Resources – Management of Resources like time energy and money; Basic characteristics of Resources; Efficient methods of utilization of Resources. Family Life Cycle – Demands upon resources like time, energy and money. Concept of Ergonomics – its importance and application in home. Concept of Communication process and its importance in family; Barriers in Communication process; Measures for Effective Communication. Concept of Work Simplification – its importance in home; Simple pen and pencil technique. Consumer Education –

Laws protecting consumer; Role of consumer society in protecting consumer; Kinds of adulteration; Identification of adulteration.

**Unit V** Home Science Extension Education

Curriculum Development for Formal Education in Home Sciences. General and Special Methods of Teaching Home Science. Media and Materials for promoting Home Science in Formal / Non – formal / Adult / Extension Education. Non – formal and Adult Education in Home Science. Extension Education in Home Science. Women in Changing India and Plans for their development. Self – Employment and Entrepreneurship through Home Science. Programs of extension in Home Science. Measurement and Evaluation including monitoring and supervision for Formal / Non – formal / Adult Education / Extension Education.

**Text Books**

1. Premlata Mullick, 2012."Textbook of Home science", Kalyani publications, Coimbatore.
2. Serena Shekar, 2013, "Text book of Home science", Extension education, New Delhi.

| 233FN2ASSB | SELF STUDY: DIET COUNSELING | SEMESTER III |
|---|---|---|

**Total Credits:** 1

## Syllabus

**Unit I** Practical consideration in giving dietary advice and counselling

a) Factors affecting and individual food choice b) Communication of dietary advice c) Consideration of behavior modification d) Motivation.

**Unit II** Counselling and educating patient

a) Introduction to nutrition counselling b) Determining the role of nutrition counseller c) Responsibilities of the nutrition counseller d) Practitioner v/s client managed care, e) Conceptualizing entrepreneur skills and behavior, f) Communication and negotiation skills.

**Unit III** Teaching aids used by dietitians

Charts, leaflets, posters etc., preparation of teaching material for patients suffering from Digestive disorders, Hypertension, Diabetes, Atherosclerosis & Hepatitis and cirrhosis.

**Unit IV** Use of Computers in Counseling

a) Use of computers by dietitian b) Dietary computations, c) Dietetic management d) Education/ training e) Information storage, f) Administrations g) Research

**Unit V** Computer applications for counseling

a) Execution of software packages b) Straight line, frequency table, bar diagram, pie chart, Preparation of dietary charts for patients c) Statistical computation- mean, median, standard deviation, conclusion and regression test.

**Text Books**

1 Premlata Mullick Joshi .Y .K , 2003, "Basic Clinical Nutrition", JAYPEE Brothers, New Delhi.

2 Mahan.K and Escott.S., 2000., "Food Nutrition and Diet Therapy", 11th Edition.,W.S. Saunder's Company, Philadelphia, USA.

**References**


1 Gibney.M.J, 2004., "Public Health Nutrition" , 1st Edition, Black Well Scientific Publications, Oxford.

2 Wadhwa.A, 2003, "Nutrition in the Community", 1st Edition, Elite Publications, New Delhi.


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Academic Council CHAIRMAN Dr.N.G.P. Arts and Science College

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A4CA | PUBLIC HEALTH NUTRITION | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- the concept of health and nutrition interrelationship
- the assessment techniques of health status in the community
- the factors to organize nutritional intervention programmes

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Understand the role of public health nutritionist and concept of public health nutrition | K1 |
| CO2 | Comprehend the nutritional status assessment of different age group | K2 |
| CO3 | Identify the preventive measures of non-communicable diseases | K3 |
| CO4 | Justify the role of nutrition intervention and nutrition education programmes | K4 |
| CO5 | Gain knowledge on the functions of various national and international organizations in public health | K1 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | | | ✓ |
| CO3 | ✓ | | | ✓ | ✓ |
| CO4 | ✓ | | ✓ | ✓ | |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| ✓ | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A4CA | CORE: PUBLIC HEALTH NUTRITION | SEMESTER IV |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

## Syllabus

**Unit I** Concept of public health nutrition 10 h

Introduction to public health nutrition, definition and scope. Relationship between health and nutrition, role of public nutritionists in the hospitals community health, policy making and Research; Population dynamics - Demographic transition, population structure, population policy, nutrition and quality of life interrelationship.

**Unit II** Nutritional Status Assessment Techniques 8 h

Definition, Methods of Assessment – Nutritional anthropometry, clinical, biochemical and biophysical assessment. Dietary assessment – Food weighment survey, 24 hour recall, food diary and food frequency, food surveillance, nutritional surveillance and Food and Nutrition security status.

**Unit III** Preventive measures of communicable diseases 10 h

Definition of epidemiology – causes, signs and symptoms, treatment and prevention of communicable diseases, respiratory infections, emerging infectious diseases, dengue, filarisis. Types of immunity – active and passive, Immunization agents – vaccine, Immunization schedules, Expanded programme on Immunization, chemoprophylaxis, non-specific measures.

**Unit IV** Nutrition Intervention 10 h

Nutrition Intervention programmes: Nutritious Noon Meal Programme, ICDS, Anemia Mukt Bharat, Poshan Abhiyan and National Nutrition Mission.

Nutrition Education: Objectives and Methods used integration of nutrition education principles of planning, executing and evaluating, and problems in conducting nutrition education programmes.

**Unit V** National and International Organizations 10 h

National organization – History, objectives and functions of ICAR, ICMR, NIN, CFTRI, DFRL, NIPCCID, NFI and FSSAI – Food fortification Resource Center, Eat Right India Movement, E – Public Distribution System.

International Organizations - History, objectives and functions of WHO, FAO, UNICEF, FFHC, WFP, CARE, CRS, AFPRO, GAIN, SUN and IFPRI.

**Text Books**


1 Park K., 2023, "Textbook of Preventive and Social Medicine", 27th Edition, Banarsidas Bhanot Publishers, Jabalpur.

2 Owen, A.Y. and Frackle, R.T., 2002, "Nutrition in the Community", The Art of Delivering Services, 2nd Edition Times Mirror/Mosby.


**References**


1 Bamji, M.S., Rao, P.N. Reddy, V., 2003, "Textbook of Human Nutrition", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

2 Beaton, G.H. and Bengoa, J.M., 2000, "Textbook of Human Nutrition, Oxford and IBH Publishing" Co. Pvt. Ltd., New Delhi.

3 Beghin I. Cap M. and Dujardan B., 1988, "A Guide to Nutritional Status Assessment" WHO, Geneva.

4 Bhatt D.P., 2008, "Health Education", Khel Sahitys Kendra, New Delhi.

| Course Code | Course Name | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 233FN2A4CB | FOOD SAFETY AND QUALITY MANAGEMENT | CORE | 4 | - | - | 4 |

**PREAMBLE**

This course has been designed for students to learn and understand

- to understand about the food safety and quality assurance
- to know about national and international food standards
- to gain knowledge on food laws

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Develop the knowledge about the quality control and quality assurance in food Industry. | K1 |
| CO2 | Explain various government regulations and its application in quality control. | K2 |
| CO3 | Categorize the food standards for each food commodity. | K3 |
| CO4 | Prioritize the food laws and develop knowledge on patent. | K4 |
| CO5 | Examines the risk associated with food and its safety measures. | K1 |

**MAPPING WITH PROGRAMME OUTCOMES**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | ✓ | | ✓ | ✓ | ✓ |
| CO2 | ✓ | | | ✓ | ✓ |
| CO3 | ✓ | | ✓ | ✓ | ✓ |
| CO4 | ✓ | | ✓ | ✓ | ✓ |
| CO5 | ✓ | | | ✓ | ✓ |

| | | | |
|---|---|---|---|
| ✓ | Skill Development | ✓ | Entrepreneurial Development |
| ✓ | Employability | | Innovations |
| | Intellectual Property Rights | | Gender Sensitization |
| | Social Awareness/ Environment | | Constitutional Rights/ Human Values/ Ethics |

| 233FN2A4CB | CORE: FOOD SAFETY AND QUALITY MANAGEMENT | SEMESTER IV |
|---|---|---|

**Total Credits:** 4

**Total Instruction Hours:** 48 h

## Syllabus

**Unit I** Food safety and Quality control 10 h

Principles of food safety and quality - Food Safety System - Quality attributes - Total Quality Management. Good Manufacturing Practices - Risk Analysis, Risk Management, Risk Assessment, Risk Communication - Traceability and authentication. Quality control - Importance, Functions and stages of quality control in food industry. Food quality assurance - HACCP structured approach, principles, benefits and limitations, Role of Food quality control officer, Employment opportunities as Food quality control officer.

**Unit II** Government regulations in quality control 10 h

Indian Standards - FAO/WHO, FSSAI, AGMARK, BIS, ISI, CPA, PFA, FPO, MPO.

International Standards Codex Alimentarius, ISO - 9001:2000, 22000:2005

Standards, WTO, FAO, APEDA, JECFA, EPA.

**Unit III** Food Standards 10 h

Food Standards - Cereal and Cereal Products - bread, biscuits, cakes, pasta products. Fruit Products - jam, jellies, ketchup, sauce, squashes. Oil and Fats - coconut oil, groundnut oil, palm oil, rice bran oil, olive oil, sunflower oil, ghee, Vanaspati. Milk and products -Skimmed milk powder, partly skimmed milk powder, condensed sweetened milk. Other products-coffee, tea, sugar, honey, toffees.

**Unit IV** Food safety laws 10 h

Food Laws and regulation, Food labeling and Packaging laws. Role of central and state government in imparting quality control-Role of central food laboratory and state food laboratories. Patent -Definition, requirements, patent laws in India, administrator, need for patent system, guidelines for application, non-patentable

**Unit V** Food safety risks and its management 8 h

Dimensions of risk perception-Consumer perception on food risks and safety, risk and benefits associated with new food technologies. Risk communication. Food Adulteration and cross contamination, Food additives - Intentional and unintentional additives, regulatory bodies. Hygiene practices, GRAS.

**Text Books**

1 Potter.N.N and Hotchkins. J. H., 2007, "Food Science", CBS Publishers, India.

2 Singh A.K., 2018, "Managing food safety risks in the Agri-food industries". Oxford Publication, UK.

**References**

1 Vasconcellos J. A., 2003, "Quality Assurance for The Food Industry: A Practical Approach". CRC press, New Delhi.

2 Kilcast, D., 2010, "Sensory Analysis for Food and Beverage Quality Control: A Practical Guide". Elsevier, Netherlands.

| 233FN2A4CV | CORE: PROJECT AND VIVA VOCE | SEMESTER IV |
|---|---|---|

**Total Credits:** 8
**Total Instruction Hours:** 192 h

**Syllabus**

OBJECTIVES:

To initiate research work and gain knowledge in industrial and community sector

**CONTENTS**

Project can be done in any specialized area

1. Food Processing
2. Food Analysis
3. Clinical nutrition
4. Community nutrition
5. The students could work with NGOs / Government agencies / International agencies/ Hospitals / Food Industries / Research Institutes

**RULES**

- The students should submit the research work in soft and hard copy with minimum 100 pages, Times new roman, font size 12, 1.5 line spacing.
- The students will be guided and supervised by a member of the teaching faculty of the concerned department. The dissertation in which the research culminates should reflect the student's own work.
- Minimum one research publication in peer reviewed/reputed journals.
- Research work should be presented during External Viva voce.

| 233FN2A4DP | DSE PRACTICAL: FOOD QUALITY CONTROL | SEMESTER IV |
|---|---|---|

**Total Credits:** 3
**Total Instructions Hours:** 72 h

| S.No | Contents |
|---|---|
| 1 | Estimation of moisture and ash content in food samples |
| 2 | Qualitative tests for pectin in fruits |
| 3 | Estimation of titrable acidity in fruits |
| 4 | Determination of citric acid in fruits and vegetables |
| 5 | Determination of acetic acid in fruits and vegetables |
| 6 | Determination of chlorophyll and anthocyanins in fruits and vegetables |
| 7 | Determination of methylene blue dye reduction test in milk |
| 8 | Estimation of lactose in milk |
| 9 | Estimation of total soluble solids in liquid foods |
| 10 | Estimation of specific gravity in foods |
| 11 | Determination of peroxide value |
| 12 | Food Adulteration - Test to detect adulteration |

**Note:** Out of 12 - 10 mandatory

**References**


1. King, R.D., 2008, "Developments in Food Analysis Techniques - 1, Applied Science", Ed Publishers Ltd., London.
2. FSSAI Manual, 2003, "Manual Method of analysis of various food products", New Delhi.

| 233FN2A4DQ | DSE PRACTICAL: NUTRITION IN HEALTH | SEMESTER IV |
|---|---|---|

**Total Credits:** 3
**Total Instructions Hours:** 72h

| S.No | Contents |
|---|---|
| 1 | Menu planning for pregnant mother carrying twins. |
| 2 | Menu planning for preterm delivery. |
| 3 | Menu planning for lactating mother carrying twins. |
| 4 | Menu planning for adult and geriatrics. |
| 5 | Menu planning for mountaineering and sea voyage. |
| 6 | Menu planning for special children. |
| 7 | Menu planning for IT professionals working on different shifts. |
| 8 | Menu planning for soldiers. |
| 9 | Menu planning for swimmers. |
| 10 | Menu planning for weight lifters. |
| 11 | Menu planning for athletes. |
| 12 | Menu planning for students during examination |

**Note:** Out of 12 - 10 Mandatory

**References**


1. Avantina Sharma, 2019, "Principles of Therapeutic Nutrition and Dietetics", First Edition, CBS Publishers & Distributors Pvt.Ltd., New Delhi.
2. National Institute of Nutrition, 2020, "Dietary Guidelines for Indians" -A Manual
3. Mudambi R., and Rajagopal M.V., 2007, "Fundamental of Foods, Nutrition and Diet Therapy", Fifth Edition, New Age International Publishers, New Delhi.

| 233FN2A4DR | DSE PRACTICAL: FOOD FERMENTATION TECHNIQUES | SEMESTER IV |
|---|---|---|

**Total Credits:** 3
**Total Instructions Hours:** 72 h

| S.No | Contents |
|---|---|
| 1 | Preparation of Bread |
| 2 | Preparation of Idly Dosa batter |
| 3 | Preparation of Probiotic drink-Rice water |
| 4 | Preparation of Curd, Yogurt |
| 5 | Preparation of Cheese, kefir |
| 6 | Preparation of Sauerkraut, Kimchi |
| 7 | Preparation of Vinegar - honey, coconut |
| 8 | Preparation of Fermented Pickled cucumber |
| 9 | Preparation of Wine - Grape, Pineapple |
| 10 | Preparation of Kombucha |
| 11 | Preparation of Natto, tempeh |
| 12 | Preparation of Soy sauce and miso |

**Note:** Out of 12- 10 mandatory

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