

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.



CIRCULAR NO.SU/SCIENCE & TECHNOLOGY STUDIES/SYLL./B.VOC./78/2022.

It is hereby informed to all concerned that, on the recommendation of Ad-hoc Board in Vocational Studies and Dean, Faculty of Science & Technology the Hon'ble Vice-Chancellor has **accepted the curriculum of following B.Voc. Courses under Choice Based Credit and Grading System** in his emergency powers under Section-12 [7] of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith:

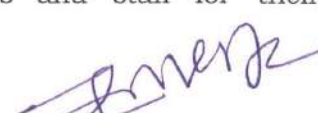
| Sr.No. | Course Name                                                 | Semester      |
|--------|-------------------------------------------------------------|---------------|
| 1      | B.Voc in Software Development                               | (I & II)      |
| 2      | B.Voc in Medical Laboratory Technology                      | (I & II)      |
| 3      | B.Voc in Multimedia & Animation- Structure & syllabus [New] | (Sem-I to VI) |
| 4      | B.Voc in Multimedia & Animation [old]                       | (Sem-V&VI)    |
| 5      | B.Voc in Organic Agriculture                                | (Sem-V & VI)  |
| 6      | B.Voc in Bioproducts Technician                             | (Sem-I to VI) |
| 7      | M.Voc in Food Processing Technology                         | (Sem-I to IV) |

This is effective from the **Academic Year 2020-21 and 2021-22** and onwards. This curriculum is also available on the University website [www.bamu.ac.in](http://www.bamu.ac.in).

All concerned are requested to note the contents of the circular and bring notice to the students, teachers and staff for their information and necessary action.

University campus,  
Aurangabad-431 004.  
Ref. No.SU/B.voc./Curri./2021-22

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**Deputy Registrar,  
Academic [Syllabus]  
Section.**

Date: 20.01.2022

**Copy forwarded with compliments to :-**

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- 1] **The Principal All Affiliated Concerned Colleges, Dr.Babasaheb Ambedkar Marathwada University, Aurangabad.**
  - 2] **The Director, University Network & Information Centre, UNIC, with a request to upload the curriculum along with this Circular on University Website.**
- Copy to :-**
- 1] The Director, Board of Examinations & Evaluation, Dr.BAMU, A'bad
  - 2] **The Concerned Section, Examination Branch,**
  - 3] The Section Officer, [Eligibility Unit],
  - 4] **The Programmer [Computer Unit-1] Examinations, section, Dr.BAMU, A'bad**
  - 5] **The Programmer [ Computer Unit-2] Examinations, section, Dr.BAMU, A'bad**
  - 6] The In-charge, [E-Suvidha Kendra],
  - 7] The B.Voc Section, Dr.BAMU,A'bad
  - 8] The Public Relation Officer,
  - 9] The Record Keeper,

**DR. BABASAHEB AMBEDKAR  
MARATHWADA UNIVERSITY  
AURANGABAD**



SYLLABUS OF  
BACHELOR OF VOCATIONAL  
IN

**B.Vov in - Food Processing  
Technology  
SEMESTER- I & IV**

**Choice Based Credit System**

Effective from the Academic Year

**2020-21 and 2021-22 & Onwards**

**DR. BABASAHEB AMBEDKAR  
MARATHWADA UNIVERSITY,  
AURANGABAD.**



**Syllabus of  
M.VOC (FOOD PROCESSING TECHNOLOGY)**

**Semester-I -IV**

**[ Effective from 2020-21&onwards]**

Approved  
Barhak  
20/01/22

Curriculum for Master of Vocational Education (M.VOC) in Food Processing Technology (Choice Based Credit System)

**This M.Voc (in Food Processing Technology) program is divided in four semesters having 120 credits.**

**Preamble:**

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad is offering a two year Master Program in Vocational Education (M.VOC) in Food Processing Technology from Academic year 2020-21. The curriculum design of this program is undertaken in the following framework (Preamble).

Although there has been remarkable progress in all sectors of education in last couple of decades, the less regulated area of the education sector- vocational training—seems to have lost its significance/importance. This has led to the widening gap between the supply and demand for skilled manpower across various food processing industries and R&D organizations. This shortage of skills has translated directly into unemployment among an increasing number of graduates who pass-out every year and are forced to be re-trained in order to become marketable. This program is designed to produce a skilled manpower so that wide variety of options in different sectors of Food Processing would be available and it will improve the opportunities for the unemployed youths in the country in both the private and public sector

According to recent survey of FICCI (Federation of Indian Chambers of Commerce & Industry) on skilled man in food processing industries, it has been observed that a majority percentage of organizations are dissatisfied with the skills of the available trained manpower. For instance, 58% of the respondents were dissatisfied with technical skills and knowledge needed for the job. Also 72% showed discontent with employees' ability to use appropriate and modern tools, equipment, and technologies specific to their job roles. This programme aims to provide some solution for this problem and this would facilitate to improve:

**Quality over training**

- High drop-out rates
- Linkages with Universities and industry
- Inadequacy of resources

B This program is intended to offer practical, hands-on training and skills needed to pursue an occupation. It will provide options to the students to select the courses of their choice which are directly aligned to land a job in a chosen profession or a skilled trade. The end result of this program is to enable an



individual to at train self-employment.

**Program Educational Objectives:**

The objectives of M.Voc (in Food Processing Technology) program are to produce graduates who -

- Are equipped with time advanced knowledge of in Food Processing Technology to address multi-disciplinary demand of manufacturing, and process in modern industries in capacity of productive Senior System Developers, Senior System Integrators and Plant Supervisors.
- Have an acute knowledge base to practice Food Processing Technology in the areas of Processing, manufacturing, and process control in industry and Government settings meeting the growth expectations of stakeholders.
- Have an ability to pursue higher studies and succeed in academic and professional careers.
- Have the ability to address professional demands individually and as a team member communicating effectively in technical environment using modern tools.
- Recognize the need for and possess the ability to engage in lifelong learning.
- Should be sensitive to consequences of their work both ethically and professionally for productive professional career.

**Program Outcomes (PO):**

**Program Outcomes:**

Vocational Education is education that prepares the students for specific job role in various sectors in food processing industries and Professional organization. It trains the students from a trade, technician or professional position in R & D organizations for specific job roles.

The program outcomes are the skills and knowledge which the students have at each exit level/at the time of graduation. These outcomes are generic and are common to all exit levels mentioned in the program structure.

- i. Students with vocational training can find work in several state and central government organizations, non-profit groups, and academic institutions and in private sectors as well.
  - ii. This program prepares students for specific types of occupations and Frequently for direct entry into the market.
-

- iii. After completion of this program students will have enough competences, to get benefit from market opportunities.
- iv. This program would enable students to update their knowledge and professional skills for entering the work force executing income generating activities or occupying better positions.
- v. At each exit level of this program, students will be able to
  - a. Apply knowledge of general education subjects and skill development subjects to the conceptualization of food processing technologies.
  - b. Designing and formulation of new food products, on the basis of consumers demands, development of methodology/technologies of food processing, design that meet solutions needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
  - c. Conduct and undertake investigations of problems of including design of processing technology for various type food, food analysis, food quality and safety aspects and interpretation of data in order to provide valid conclusions.
  - d. Create, select and apply appropriate processing technology/techniques, resources, modern processing tools in order to improve the quality, safety and the shelf life fresh and process food.
  - e. Communicate effectively on minimal processing activity and value addition to the farmers/producers/grower at large, such as being able to comprehend and write effective reports, design documentation and make effective presentations.
  - f. Demonstrate understanding of the social, health, safety, legal and cultural issues and the consequent responsibilities relevant to Food processing.
  - g. Understand and commit to professional ethics and responsibilities and norms/regulation for manufacturing of process food and its effects on health.
  - h. Understand the impact of food processing technologies solutions in a societal context and demonstrate technical know-how and understanding of food safety, quality for sustainable development.

**Eligibility:****Eligibility criteria for Admission:**

1. Eligibility for admissions and reservation of seats for M. Voc. Food Processing Technology shall be according to the rules that no student shall be eligible for admission to M. Voc. Food Processing Technology unless he/she has successfully completed the examination conducted by a Board / University at the undergraduate level in, B.Voc / B.Sc. / B Tech. Degree in Food Processing Technology / Food Technology and analysis / Food Technology / Food Process Engineering / Chemistry / Biochemistry / Botany / Zoology / Microbiology / Home Science or Nutrition as one of the subjects in their curriculum.
2. The course of study of M.VOC shall be divided in to four semesters and university examination will be held at the end of every semester in the months of November/December (for semester I & III) and May/June (for semester II & IV) or as fixed by the University.
3. Semester examination will be open to regular candidates who have been on the rolls of a college affiliated to this University and meet the attendance and other requirements.

**Admission / Promotion Process:**

Admission will be done on the basis of Percent mark obtained by candidate in Common entrance test conducted by college or admission criteria as decided by the authority for first semester.

The students will have to clear / qualify at least 50% of theory papers / courses from second semester and all papers / courses (inclusive of theory and practical) from first semester for getting promoted to second year.

Dropout students will be allowed to register for second year as and when the concerned courses are offered by the College, however he/she should not exceed more than twice the duration of the course from the date of first registration at the Centre. Therefore, for obtaining M.VOC degree a student will have to complete all semesters successfully within 2 years/4 semesters.

#### **Choice Based Credit System (CBCS):**

Choice-based credit system is going to be adopted by this Centre. This provides flexibility to make the system more responsive to the changing needs of our students, the professionals and society. It gives greater freedom to students to determine their own pace of study. The credit-based system also facilitates the transfer of credits. Students will have to earn 102 credits for the award of two years Master of Vocation (M. Voc)

#### **Credit-to-contact hour Mapping:**

- (a) One Credit would mean equivalent of 15 periods of 60 minutes each for theory/lecture.
- (b) For lab course/ workshops/internship/field work/project, the credit weightage for equivalent hours shall be 50% that for lectures /workshop
- (c) For self- learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

#### **Attendance:**

Students must have 75 % of attendance in each course for appearing examination, otherwise he / she should be strictly not allowed for appearing the semester examination of each course. Frequent absence from regular lecture/practical course may lead to disqualification from CIA process in respective subject.

#### **Departmental Committee:**

The Departmental Committee (DC) of the Centre will monitor smooth functioning of the program.

#### **Results Grievances / Redressal Committee**

Grievances / redressal committee should be constituted in the department to resolve all grievances relating to the evaluation. The committee shall consist of Head of the department, the concerned teacher of a particular course and senior faculty member of Department of Committee. The decision of Grievances / redressal committee will have to be approved by Department committee.



#### **Evaluation Methods:**

□The assessment will be based on 20: 80 ratio of continuous internal assessment (CIA) and semester end examination (SEE). Performance will be decided after combining performance in CIA and SEE. In case of failure in SEE in particular course(s), exam will be conducted in immediate subsequent semester. However, if a student fails in CIA (considering independent CIA score), he/she may appear for the same CIA, at his/her own responsibility in the next academic year, when the same course is offered during regular academic session.

□In case a student fails in certain course(s) in a particular semester and the same course(s) are modified/ revised/ removed from the curriculum in due course, the student will have to appear as per the newly framed curriculum and/or pattern in subsequent semester, at his/her own responsibility.

#### **Continuous Internal Assessment (CIA):**

For 4 credit courses-

□There will be 20 marks for Continuous Internal Assessment. Two internal tests (of 20 marks each) will be conducted, after completion of 40% and 80% of the curriculum respectively. Average performance of the two sets will be considered for final marks-memo preparation. The setting of question papers and the assessment will be done by concerned teacher.

#### **Semester End Examination (SEE):**

□The semester end theory examination for each theory course of 4 credits will be of 80 marks. Therefore, the total marks shall be 100 for 4 credit theory course (80 marks semester end exam + 20 marks CIA).

□Semester end examination (SEE) time table will be declared by the departmental committee (as per the university annual calendar). The paper setting and assessment of theory courses, laboratory courses and project will be done by external (50 %) and internal (50%) examiners. However, in case of non-availability of external examiner for either paper setting or assessment or both, department committee will be empowered to take appropriate decision.

□ Pattern of semester end question paper will be as below:

**For 4 credit courses-**

- The semester end examination of theory course will have two parts (20+60 = 80 Marks)
- Part A will be consisting of 10 questions having 2 marks each (multiple choice questions / fill in the blanks/ answer in one sentence) as compulsory questions and it should cover entire syllabus
- Part B will contain 05 questions of 12 marks each with equal weightage on every unit. Each of these questions will have two options, from which students will have to attempt anyone.
- 20 to 30% weightage can be given to problems/ numerical (wherever applicable) wherein use of non-programmable scientific calculator may be allowed.
- Number of sub questions (with allotment of marks) in a question may be decided by the examiner.

□ Assessment of laboratory courses and project will be carried out at the end of semester. Student must perform at least eight experiments from each laboratory course. The semester end practical examination will be conducted at the end of each semester along with the theory examination.

Every student will have privilege for going through the assessed answer sheets (both CIA and SEE). Grievance, if any, should be immediately communicated to the Director, through concerned subject teacher.

□Grievance Applications received will be discussed by the Departmental committee and grievance redressal committee will be appointed accordingly.

The decisions of redressal committee will be discussed by the Departmental committee for necessary approval(s).

□At the end of each semester, the Departmental Committee will assign grades to the students.

□The Director of the Centre shall send all results to the Director, Board of Assessment and evaluation for further processing

#### **Earning Credits:**

□At the end of every semester, a letter grade should be awarded in each course for which a student had registered. A student's performance should be measured by the number of credits that he/she earned by the weighted Grade Point Average (GPA). The SGPA (Semester Grade Point Average) should be awarded after completion of respective semester and the CGPA (Cumulative Grade Point Average) should be awarded at the final exit.

#### **Grading System:**

- The grading reflects a student-own proficiency in the course. A ten point rating scale shall be used for the evaluation of the performance of the students to provide letter grade for each course and overall grade for the Master Programme. Grade points are based on the total number of marks obtained by him / her in all heads of the examination of the course. The grade points and their equivalent range of marks are shown in Table-I

**Table – I : Ten point grade and grade description**

| Marks<br>Obtained (%) | Grade Point | Letter<br>Grade | Description            |
|-----------------------|-------------|-----------------|------------------------|
| 90-100                | 9.00- 10    | O               | Outstanding            |
| 80-89                 | 8.00-8.99   | A <sup>++</sup> | Exceptional            |
| 70-79                 | 7.00-7.99   | A <sup>+</sup>  | Excellent              |
| 60-69                 | 6.00-6.99   | A               | Very Good              |
| 55-59                 | 5.50-5.99   | B <sup>+</sup>  | Good                   |
| 50-54                 | 5.00-5.49   | B               | Fair                   |
| 45-49                 | 4.50-4.99   | C <sup>++</sup> | Average ( Above)       |
| 41-44                 | 4.01-4.49   | C               | Average                |
| 40                    | 4.0         | P               | Pass                   |
| < 40                  | 0.0         | F               | Fail ( Unsatisfactory) |
|                       | 0.0         | AB              | Absent                 |

- Non-appearance in any examination / assessment shall be treated as the students have secured zero marks in that subject examination / assessment.
- Minimum P grade (4.00 grade points) shall be the limit to clear / pass the course / subject. A student with F grade should be considered as “failed” in the concerned course and he / she has to clear the course by appearing in the next successive semester examinations. There should be no revaluation or recounting under this system.
- Every student shall be awarded grade points out of maximum 10 points in each subject (based on 10 point scale). Based on the grade points obtained in each subject, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) shall be computed. Results should be announced at the end of each semester and CGPA should be given at final exit.

**Computation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average)**

Grade in each subject / course should be calculated based on the summation of marks obtained in all five units.

The computation of SGPA and CGPA should be as below

- Semester Grade Point Average (SGPA) is the weighted average points obtained by the



students in a semester and should be computed as follows –

$$\text{SGPA} = \frac{\text{Sum (Course Credits) X Number of Grade Points in concerned Course Gained by the Student}}{\text{Sum (Course Credits)}}$$

The SGPA should be mentioned on the grade card at the end of every semester.

- The Cumulative Grade Point Average (CGPA) should be used to describe the overall performance of a student in all semester of the course and should be computed as under.

$$\text{CGPA} = \frac{\text{Sum (All six CGPA Semester SGPA)}}{\text{Total Number of Semesters}}$$

The SGPA and CGPA shall be rounded off to the second place of decimal. Grade

#### Card

Results should be declared by the Centre and the grade card (containing the grades obtained by the student along with SGPA) should be issued by the university after completion of every semester. The grade card should be consisting of following details.

- Title of the courses along with code opted by the student.
- Credits associated with the course.
- Grades and grade points secured by the student.
- Total credits earned by the student in a particular semester.
- Total credits earned by the students till that semester.
- SGPA of the student.
- CGPA of the student (at final exit).

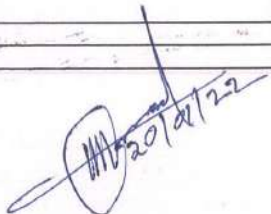
#### Cumulative Grade Card

The grade card showing details grades secured by the student in each subject in all semesters along with overall CGPA should be issued by the University at final exit.

## Course Structure

### M.VOC Food Processing Technology (Pattern 2020)

| Sr. No.                                                                                                   | Course Code | Name of the Course                                   | Contact Hours Per Week       |      |      | Evaluation Scheme |     | Credit |
|-----------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------|------------------------------|------|------|-------------------|-----|--------|
|                                                                                                           |             |                                                      | L                            | T    | P    | CIA               | SEE |        |
| SEMESTER – I                                                                                              |             |                                                      |                              |      |      |                   |     |        |
| 1                                                                                                         | CC100       | Constitution of India                                | 2                            | 0    | 0    | 10                | 40  | 2      |
| 2                                                                                                         | FPTMVOC111  | Advances in Food Microbiology                        | 3                            | 1    | 0    | 20                | 80  | 4      |
| 3                                                                                                         | FPTMVOC112  | Advances in Food Chemistry & Nutrition               | 3                            | 1    | 0    | 20                | 80  | 4      |
| 4A                                                                                                        | FPTMVOC113A | Advances in Food Processing                          | 3                            | 1    | 0    | 20                | 80  | 4      |
| 4B                                                                                                        | FPTMVOC113B | Advances in Food Engineering                         |                              |      |      |                   |     |        |
| 5A                                                                                                        | FPTMVOC114A | Post-Harvest Management of fruits & Vegetables       |                              |      |      |                   |     |        |
| 5B                                                                                                        | FPTMVOC114B | Technology of Cereals, Legumes & Oilseeds            | 3                            | 1    | 0    | 20                | 80  | 4      |
| 6                                                                                                         | FPTMVOC115  | Project Management                                   | 3                            | 1    | 0    | 20                | 80  | 4      |
| 7                                                                                                         | FPTMVOC116  | Lab-Course Advances in Food Processing               | 0                            | 0    | 6    | 00                | 100 | 3      |
| 8                                                                                                         | FPTMVOC117  | Industrial Project – Phase I                         | 100 hours (through semester) |      |      | -                 | 150 | 5      |
| Students have to choose any one subject from Sr. No. 4A and 4B and any one subject from Sr. No. 5A and 5B |             |                                                      |                              |      |      | Total Credits     |     | 30     |
| SEMESTER – II                                                                                             |             |                                                      |                              |      |      |                   |     |        |
| 1                                                                                                         | FPTMVOC211  | Novel Food Packaging Technology                      | 3                            | 1    | 0    | 20                | 80  | 4      |
| 2                                                                                                         | FPTMVOC212  | Beverage and Snack Food Technology                   | 3                            | 1    | 0    | 20                | 80  | 4      |
| 3                                                                                                         | FPTMVOC213  | Nutraceuticals and Health Foods                      | 3                            | 1    | 0    | 20                | 80  | 4      |
| 4                                                                                                         | FPTMVOC214  | Statistical & Research Methodology                   | 3                            | 1    | 0    | 20                | 80  | 4      |
| 5A                                                                                                        | FPTMVOC215A | Food safety and quality management                   | 3                            | 1    | 0    | 20                | 80  | 4      |
| 5B                                                                                                        | FPTMVOC215B | Techniques in Food Analysis                          |                              |      |      |                   |     |        |
| 6                                                                                                         | FPTMVOC216  | Mini Project                                         | ----                         | 0    | ---- | 00                | 150 | 5      |
| 7                                                                                                         | FPTMVOC217  | Industrial Project – Phase II                        | 100 hours (through semester) |      |      | -                 | 150 | 5      |
| Students have to choose any one subject from Sr. No. 5A and 5B                                            |             |                                                      |                              |      |      | Total Credits     |     | 30     |
| SEMESTER – III                                                                                            |             |                                                      |                              |      |      |                   |     |        |
| 1                                                                                                         | FPTMVOC311  | Food Additives                                       | 4                            | 0    | 0    | 20                | 80  | 4      |
| 2                                                                                                         | FPTMVOC312  | Mini Project                                         | ----                         | ---- | ---- | 00                | 200 | 6      |
| 3                                                                                                         | FPTMVOC313  | Industrial Project – Phase III                       | 400 hrs (through semester)   |      |      | -                 | 600 | 20     |
| Total Credits                                                                                             |             |                                                      |                              |      |      |                   |     | 30     |
| SEMESTER – IV                                                                                             |             |                                                      |                              |      |      |                   |     |        |
| 1                                                                                                         | FPTMVOC411  | Intellectual Property Rights                         | 4                            | 0    | 0    | 20                | 80  | 4      |
| 2                                                                                                         | FPTMVOC412  | Case Study Report of Any Existing Industrial Project | ----                         | ---- | ---- | 00                | 200 | 6      |
| 3                                                                                                         | FPTMVOC413  | Industrial Project – Phase IV                        | 400 hrs (through semester)   |      |      | -                 | 600 | 20     |
| Total Credits                                                                                             |             |                                                      |                              |      |      |                   |     | 30     |
| Total Credits for Four Semesters                                                                          |             |                                                      |                              |      |      |                   |     | 120    |


  
 20/01/22



## Semester Wise Course Layout

|                                    |                                      |                 |
|------------------------------------|--------------------------------------|-----------------|
| <b>Course Code No.- FPTMVOC111</b> | <b>No. of Credits -04</b>            | <b>Hours-60</b> |
| <b>Course title</b>                | <b>Advances in Food Microbiology</b> |                 |

### Course objective

#### To Study-

- Scope of food microbiology and food safety
- Important genera associated with food
- Techniques for enumeration of microbes and methods (traditional to advanced) for preserving food
- Role of different microorganisms in food spoilage, food fermentation and food-borne diseases

### Course outcomes

- Describe the characteristics of foodborne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification.
- Explain why microbiological quality control programmes are necessary in food production.

### Course Contents

#### Unit 1

(10 Hrs)

Growth and survival of microorganism in foods; spoilage organisms of milk, fruits, vegetables, grains and oilseeds, meat And poultry.

#### Unit 2

(10 Hrs)

Physical and chemical method to control microorganisms. Biochemical changes caused by microorganisms; Microbes in Food fermentation, putrefaction, lipolysis;

#### Unit 3

(10 Hrs)

Antagonism and synergism in microorganisms; Food Poisoning and food borne infections; Microbial toxins.

#### Unit 4

(10 Hrs)

Food hygiene and sanitation: Contamination during handling And processing and its control; indicator organisms; Rapid methods in detection of microorganisms

#### Unit 5

(10-Hrs)

Food Fermentations; Traditional fermented foods of India and other Asian countries; Probiotics and prebiotics; Fermented foods based on milk, meat and vegetables; Fermented Beverages.

#### Unit 6

(10 Hrs)

Tutorials and Assignments based on Unit 1 to 5

## References

- Adams MR and Moss MO. (1995). Food Microbiology. 4th edition. New Age International (P) Limited Publishers, New Delhi, India.
- Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
- Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
- Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.
- Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.

|                                    |                                                   |                 |
|------------------------------------|---------------------------------------------------|-----------------|
| <b>Course Code No.- FPTMVOC112</b> | <b>No. of Credits -04</b>                         | <b>Hours-60</b> |
| <b>Course title</b>                | <b>Advances in Food Chemistry &amp; Nutrition</b> |                 |

#### **Course objective**

- To go beyond basic chemistry and nutrition in to advances with the aim of developing healthy and nutritious foods for normal and special category of population groups.

#### **Course outcome**

- Understand the relationship between food, nutrition and health.
- Understand the functions of food.
- Learn about various food groups and balanced diet

#### **Course Contents**

- Unit 1** (10 Hrs)  
Definition and importance; major food constituents and their Physicochemical properties; role of water in food.
- Unit 2** (10 Hrs)  
Carbohydrates, proteins and lipids: classification, physical, chemical, nutritional, and functional properties and their Structural correlations;
- Unit 3** (10 Hrs)  
Auto-oxidation of lipids and rancidity. Properties of minerals, vitamins ,pigments ,anti-oxidants, flavor  
Components, allergens, toxins and anti-nutritional factors in foods
- Unit 4** (10 Hrs)  
Interaction of constituents in food systems; Changes during Storage and processing; Browning reactions in foods. Digestion, absorption ,transport and metabolism of nutrients in Human system; protein quality evaluation.
- Unit 5** (10 Hrs)  
Food groups and their typical composition; essential nutrients sources, functions, deficiency diseases; requirements and recommended dietary allowances
- Unit 6** (10 Hrs)  
Tutorials and Assignments based on Unit 1 to 5

#### **References**

1. Bamji MS, Krishnaswamy K, Brahman GNV (2009). Textbook of Human Nutrition, 3rd Edition. Oxford and IBH Publishing Co. Pvt. Ltd.



2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
3. Srilakshmi,(2005), Dietetics, Revised 5th edition. New Age International Ltd.
4. Wardlaw MG, Paul M Insel Mosby 1996). Perspectives in Nutrition, Third Edition.
5. Codex Guidelines on Nutrition Labelling (CAC/GL 2\_1985) (Rev.I\_1993). Rome, Food and Agriculture Organisation of the United Nations / World Health Organisation, 1993.

|                                     |                                    |                 |
|-------------------------------------|------------------------------------|-----------------|
| <b>Course Code No.- FPTMVOC113A</b> | <b>No. of Credits -04</b>          | <b>Hours-60</b> |
| <b>Course title</b>                 | <b>Advances in Food processing</b> |                 |

#### Course objective

- To develop an insight among the students about the existing modern techniques so as to aware them about their methodology and applications in food processing

#### Course outcome

- After successful completion of the Course, Students will have knowledge on the fundamentals of food science and nutrition, food chemistry and biochemical changes during processing and preservation, nutraceuticals, also students will be able to understand and apply sensory evaluation of food.

#### Course Contents

- Unit 1** (10 Hrs)  
Scope of food processing; historical developments; principles of food processing and preservation. Processing and preservation by heat blanching, pasteurization, sterilization and UHT processing, canning
- Unit 2** (10 Hrs)  
Extrusion cooking, dielectric heating, microwave heating, Baking, roasting and frying, etc. Processing and preservation by low-temperature-refrigeration, freezing,
- Unit 3** (10 Hrs)  
CA,MA,and dehydro-freezing Processing and preservation by drying, concentration and Evaporation Types of dryers and their suitability for different food Products; ultra-filtration, reverse osmosis.
- Unit 4** (10 Hrs)  
Processing and preservation by non-thermal methods, irradiation, high pressure, pulsed electric field, hurdle technology.
- Unit 5** (10 Hrs)  
Use and application of enzymes and microorganisms in processing and preservation of foods; food fermentations, pickling, smoking etc; Food additives: definition, types and functions, permissible limits and safety aspects.
- Unit 6** (10 Hrs)  
Tutorials and Assignments based on Unit 1 to 5

#### Reference

- Barbosa-Canovas 2002. Novel Food Processing Technologies. CRC.
- Dutta AK & Anantheswaran RC.1999. Hand Book of Microwave Technology for Food Applications.

- Frame ND, (Ed.), 1994, The Technology of Extrusion Cooking, Blackie, Gould GW. 2000.
- New Methods of Food Preservation, CRC, Shi J, (Ed) 2006, Functional Food Ingredients

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|------------------------------------|-------------------------------------|-----------------|
| <b>Course Code No.- FPTMVO113B</b> | <b>No. of Credits -04</b>           | <b>Hours-60</b> |
| <b>Course title</b>                | <b>Advances in Food Engineering</b> |                 |

#### Course objective

- To provide knowledge about selected trends and development in food packaging technologies and materials aiming at assuring the safety and quality of foodstuffs in order to design an optimized package which satisfies all legislative, marketing and functional requirements sufficiently, and fulfils environmental, cost and consumer demands as well as possible.

#### Course outcome

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

- Apply knowledge of food engineering to design new process.
- Understand pump selection and velocity of flowing fluids.
- Able to calculate through different dimensions.
- Able to calculate freezing time.

#### Course Contents

##### Unit 1

(10 Hrs)

Introduction to food engineering & processes; principles of Thermodynamics and heat transfer applied to food engineering; Fundamentals of heat and analogy to mass transfer in food processing

##### Unit 2

(10 Hrs)

Kinetics of biological reactions - kinetics of reactions occurring in processed foods, reaction velocity constant, order of reaction; quality changes during storage of foods; application of Arrhenius equation to biological reactions, Food chilling and freezing—Precooling and cold storage; CA and MA; Properties of frozen foods; freezing point depression; General introduction to enthalpy change during freezing;

##### Unit 3

(10 Hrs)

Method for thermal process evaluation - Commercial sterility, pasteurization and sterilization methods based on slowest heating region; determination of the process time based on region of greatest temperature lag; the process equivalence in terms of minutes at 121.1 °C;

##### Unit 4

(10 Hrs)

Calculation of process time for fluids on stream line flow and turbulent flow heated in heat exchangers; general introduction to aseptic canning process, hydrostatic sterilizer and aseptic

Packaging practices and design problems.

##### Unit 5

(10 Hrs)

Plank's equation for predicting rates of product freezing; Cryogenic freezing and IQF; design of

food freezing equipment Such as air blast freezers, plate freezer sand immersion freezers. Process Heat Transfer - Modes of heat transfer and overall heat transfer; thermal properties of foods such as specific heat and thermal conductivity; Fourier's law, steady state and unsteady state conduction; heat exchange equipment; energy balances; rate of heat transfer; thermal boundary layer; heat transfer by forced convections; heat transfer to flat plate and in non-New to nian fluids; heat transfer in turbulent flow; heating and cooling of fluids in forced convection outside tubes; natural convection.

Unit 6

(10 Hrs)

Tutorials and Assignments based on Unit 1 to 5

**Suggested Readings:**

- Brennan JG, Butter JR, Corel IND & Lilly AVE. 1990. Food Engineering Operations. Elsevier.
- Charm SE, McCabe WL, Smith JC & Harriott P. 1993. Unit Operations of Chemical Engineering. McGraw Hills.
- Earle RL. 1985. Unit Operations in Food Processing. Pergamon Press. Fellows P. 1988.
- Food Processing Technology. VCH. Ellis Horwood. Heldman DR & Singh RP. 1995. Food Process Engineering. AVI Publ.
- McCabe WL & Smith JC. 1971. Fundamentals of Food Engineering. AVI Publ.
- Sahay KM & Singh KK. 1994. Unit Operation of Agricultural Processing. Vikas Publ. House.
- Singh RP & Heldman DR. 1993. Introduction to Food Engineering. Academic Press.



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|------------------------------|------------------------------------------------|----------|
| Course Code No.- FPTMVOC114A | No. of Credits -04                             | Hours-60 |
| Course title                 | Post-Harvest Management of fruits & Vegetables |          |

#### Course objective

- To impart knowledge of different methods of fruits and vegetable processing.
- To learn about processing of various spices, tea, coffee and cocoa.

#### Course outcome

On completion of course the students will be able to

- Understand technologies of post-harvest technology and its role in providing better quality produce to the consumer
- Understand importance of prevention of losses
- Understand functional foods and nutraceuticals

#### Course Contents

- Unit 1** (10 Hrs)  
Indian and global scenario on production and processing of fruits and vegetable; Quality requirements of raw materials for processing; sourcing and receiving at processing plants;
- Unit 2** (10 Hrs)  
Primary processing: grading, sorting, cleaning, washing, peeling, slicing and blanching; minimal processing Processing for pulp, puree and concentrates, especially from mango, tomato, guava, papaya, apple, pineapple, pomegranate, grapes-etc.
- Unit 3** (10 Hrs)  
Aseptic packaging, canning, RTS fruit beverages, IQF and Frozen fruits and vegetables; for peas, mango pulps Technology for processed products like pickles, chutneys, sauces particularly from raw mango and other regional fruits And vegetables of importance.
- Unit 4** (10 Hrs)  
Technology for processed products like pickles, chutneys, Sauces particularly from lime and other regional fruits and vegetables of importance. Processing of fruits for candies, bars, toffees, jams and jellies, squashes and syrups using locally available fruits like papaya and mango.
- Unit 5** (10 Hrs)  
Processing of fruits for candies, bars, toffees, jams and jellies, squashes and syrups using locally available fruits like aonla and other under-utilized fruits. Dehydration of fruits and vegetables using various drying Technologies likes sun drying, solar drying (natural and forced convection), osmotic, tunnel drying, fluidized bed drying, freeze drying, convectional and adiabatic drying; application store resins ,dried figs, vegetables, Intermediate moisture fruits and vegetables.Fruit powders using spray drying.
- Unit 6** (10 Hrs)  
Tutorials and Assignments based on Unit 1 to 5

#### References

1. Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & Vegetables, ICAR, New Delhi

2. W B Cruse.2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India
3. Manay, S. & Shadaksharaswami, M.2004. Foods: Facts and Principles, New Age Publishers
4. Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products, Tata Mc Graw-Hill publishing company limited, Second edition.
5. Srivastava, R.P. and Kumar, S. 2006 . Fruits and Vegetables Preservation- Principles and Practices. 3rd Ed. International Book Distributing Co

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|-------------------------------------|------------------------------------------------------|-----------------|
| <b>Course Code No.- FPTMVOC114B</b> | <b>No. of Credits -04</b>                            | <b>Hours-60</b> |
| <b>Course title</b>                 | <b>Technology of Cereals, Legumes &amp; Oilseeds</b> |                 |

#### Course objective

- To teach technology of milling of various cereals
- To impart technical knowhow of pulses and oilseeds refining

#### Course outcome

On completion of this subject, students should be able to demonstrate a knowledge and understanding of:

- The chemistry and nutritional composition of grains and grain products and the functional role of grain and other food components during processing.
- The structure of grains and the impact of grain characteristics on milling and grain utilisation.
- The concept of quality in relation to grains and grain-based products.
- The importance of quality control in grain storage, handling and processing.
- Milling of grains and the factors influencing flour quality.

#### Course Contents

##### Unit 1

(10 Hrs)

General introduction and production and utilization trends; Structure and composition of common cereals, pulses and Oilseeds.

##### Unit 2

(10 Hrs)

Wheat: Type and physic chemical characteristics; wheat milling –products and by products; factors affecting quality parameters; physical, chemical and rheological tests on wheat flour; additives

Used in bakery products; flour improvers and bleaching agents;

##### Unit 3

(10 Hrs)

Manufacture of bakery products, pasta products and various processed real based foods; manufacture of whole wheat *atta*, Blended flour and fortified flour. Rice: Classification, physic chemical characteristics; cooking quality; rice milling technology; by-products of rice milling and Their utilization;

##### Unit 4

(10 Hrs)

Parboiling of rice- technology and effect on quality Characteristics; aging of rice-quality changes; processed products based on rice. Corn: Types and nutritive value; dry and wet milling, manufacture of value-added products; processing of barley,

oats, Sorghum and millets

**Unit 5**

(10 Hrs)

Legumes and oilseeds: composition, anti-nutritional factors, processing and storage; processing for production of edible oil, meal, flour, protein concentrates and isolates; extrusion cooking technology; snack foods; development of low cost protein foods

**Unit 6**

(10 Hrs)

Tutorials and Assignments based on Unit 1 to 5

**References**

1. Kent, N.L. 2003. Technology of Cereal, 5th Ed. Pergamon Press.
2. Chakraverty. 1988. Post Harvest Technology of Cereals, Pulses and Oilseeds, revised Ed., Oxford & IBH Publishing Co. Pvt Ltd.
3. Marshall, Rice Science and Technology. 1994. Wadsworth Ed., Marcel Dekker, New York.
4. Manay, S. and Sharaswamy, M. 1987. Food Facts and Principles. Wiley Eastern Limited

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|------------------------------------|----------------------------|------------------|
| Course Code No.- <b>FPTMVOE115</b> | No. of Credits - <b>04</b> | Hours- <b>60</b> |
| <b>Course title</b>                | <b>Project Management</b>  |                  |

**Course Objectives-**

To introduce students to project management and use this skill-set in relevant fields

**Course Outcomes-**

After completion of the course, students should be able to –

- 1 Apply Project management in essential skill-set for many careers and day to day problems
- 2 Apply Project Management to manage projects at work

**Course Contents**

**Unit 1**

**(10 Hrs)**

Introduction of Project Management, Project Success, Types of Structure Organizations, Project Management Office, Stakeholders Management

**Unit 2**

**(10 Hrs)**

Types of Projects and Project Life Cycle, Project Life Cycle Phases & Project Appraisal, Methods of Project Selection, Market and Demand Analysis

**Unit 3**

**(10 Hrs)**

Financial Analysis, Capital Budgeting Techniques, Risk Management, Stand Alone Risk Analysis, Hillier Model, Simulation Analysis, Product Mix and Plant Capacity Analysis

**Unit 4**

**(10 Hrs)**

Project team building, conflict, negotiation, HRM Issues and time Management, Project Time Management- Introduction, Project Time Management (Project Scheduling), Project Time Management- PERT Networks, Project Time Management- CPM, probability models in networks

**Unit 5**

**(10 Hrs)**

Time and Cost Relationship, Crashing of Networks, Introduction to Project Cost Management, Cost Control (Tools and Techniques), Cost Estimation, Introduction to Quality Management, Cost of Quality, Quality Management (Six-Sigma Tools), Procurement Management



## **Unit 6**

**(10 Hrs)**

Tutorials and Assignments based on Unit 1 to 5

### **TEXT:**

1. The certified six sigma Green Belt Handbook, by Roderick A. Munro and Govindarajan Ramu and Daniel J. Zrymiak; ASQ Quality Press and Infotech Standards India Pvt. Ltd., ISBN-978087389891:
2. The Certified Six Sigma Black Belt Handbook by T. M. Kubiak and Donald W. Benbow; Pearson Publication, ISBN- 9788131728697

### **SUGGESTED READING:**

1. Fundamentals of Quality Control and Improvement by Mitra, Amitava; Wiley India Pvt Ltd, ISBN- 9781118491645

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|------------------------------------|-----------------------------------------------|-----------------|
| <b>Course Code No.-</b> FPTMVOC116 | <b>No. of Credits -04</b>                     | <b>Hours-60</b> |
| <b>Course title</b>                | <b>Lab Course Advances in Food Processing</b> |                 |

#### **Course objective**

- To develop an insight among the students about the existing modern techniques so as to aware them about their methodology and applications in food processing

#### **Course outcome**

- After successful completion of the program, Students will have knowledge on the fundamentals of food science and nutrition, food chemistry and biochemical changes during processing and preservation, nutraceuticals, also students will be able to **understand and apply sensory evaluation of food.**

#### **List of Practicals**

1. Seaming and testing of cans
2. Tin coating measurement
3. Tests for sulphide stain and crystal size of tin
4. Determination of thermal inactivation time of enzymes
5. Thermal processing of foods; ; Concentration of foods
6. Dehydration of foods
7. Refrigeration, Freezing Of foods;
8. Use of chemicals in preservation of foods
9. Fermented food products; Extrusion cooking of foods
10. Visit to a food processing plant

#### **Suggested Readings:**

- 1 Arsdel WB, Copley M J & Morgan A I. 1973. Food Dehydration. 2<sup>nd</sup> Ed. Vols. I, II. AVI Publ.
- 2 Desrosier N W & James N. 1977. Technology of Food Preservation. 4<sup>th</sup> Ed. AVI. Publ
- . Fellows PJ. 2005
3. Food Processing Technology: Principle and Practice. 2<sup>nd</sup> Ed. CRC. Jelen P. 1985. Introduction to Food Processing. Prentice Hall.

4. Potter N N & Hotchkiss 1997. Food Science. 5th Ed. CBS. Potty V H & Mulky MJ. 1993. Food Processing. Oxford & IBH

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|-----------------------------|-----------------------------|-------|
| Course Code No.- FPTMVOC117 | No. of Credits -05          | Hours |
| Course title                | Industrial Project- Phase I |       |

**(Review of Literature / Industrial Process, Formulation of Topic, Experimental Plan)**

Students are expected to go through review of literature on a particular technical aspect and/or pay industrial visit to identify a point of further study and investigation. The student (or group of students), thereafter, would propose a subject on basis of literature review and/or industrial orientations and will have to present a short seminar on his/her proposal to the board of examiners constituted by faculties of the department. If approved, he/she will be allowed to work on that particular project. Within a week after this approval, the student(s) will have to finalize their topic/subject of project and duly officiate it.

During phase – I of Industrial Project, it is expected that the student(s) will–

- i. Build up a concrete fundamental of the concept on which they are going to work
- ii. Carry out thorough literature survey to find out scope of work in the particular field
- iii. Thereby, finalizing the topic of further study/investigation and finally, draft a systematic experimental plan to achieve projected goal
- iv. Deliver regular presentations
- v. Systematically document the above activities in bound volume and submit one copy to the department, one copy to concerned faculty and retain one copy with him/her.

## Second Semester

|                  |                                 |                    |          |
|------------------|---------------------------------|--------------------|----------|
| Course Code No.- | FPTMVOC211                      | No. of Credits -04 | Hours 60 |
| Course title     | Novel Food Packaging Technology |                    |          |

### Course objective

- To impart comprehensive overview of the scientific and technical aspects of food packaging.
- To instill knowledge on packaging machinery, systems, testing and regulations of packaging

### Course outcome

- On successful completion of this course students should be able to:
- Apply major food preservation techniques and explain underlying principles.
- Analyse and evaluate novel food processing methods including non-thermal food processing techniques using pressure, light, sound and microwave.
- Outline the purpose and principles of food packaging and examine the operations involved in packaging material manufacture.
- Critique environmental issues, regulations and quality control associated with food packaging

### Course Contents

#### Unit 1

(10 Hrs)

Definitions, objectives and functions of packaging and packaging materials; Packaging requirements and selection of packaging materials; Types of packaging materials: Paper: pulping, fibrillation and beating, types of papers and their testing methods;

#### Unit 2

(10 Hrs)

Glass: composition, properties, types of closures, methods of bottle making; Metals: Tin plate containers, tinning process, components of tinplate, tin free steel (TFS), types of cans, aluminum containers, lacquers; Plastics: types of plastic films, laminated plastic materials, co-extrusion, Edible films, biodegradable plastics.

#### Unit 3

(10 Hrs)

Properties of materials such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, their methods of testing and evaluation; Barrier properties of packaging materials:

#### Unit 4

(10 Hrs)

Theory of permeability, factors affecting permeability, permeability coefficient, gas transmission rate (GTR) and its measurement, water vapour transmission rate (WVTR) and its measurement, prediction of shelf life of foods, selection and design of packaging material for different foods. Food packaging systems: Different forms of packaging such as rigid, semi rigid, flexible forms and different packaging system for (a) dehydrated foods (b) frozen foods (c) dairy

products (d) fresh fruits and vegetables (e) meat, poultry and seafood's.

**Unit 5**

**(10 Hrs)**

Packaging equipment and machinery: Vacuum, CA and MA packaging machine; gas packaging machine; seal and shrink packaging machine; form and fill sealing machine; aseptic packaging systems; bottling machines; carton making machines.

**Unit 6**

**(10 Hrs)**

Tutorials and Assignments based on Unit 1 to 5

**References**

1. Robertson GL, Food Packaging – Principles and Practice, CRC Press Taylor and Francis Group, 2012
2. Paine FA and Paine HY, A Handbook of Food Packaging, Blackie Academic and Professional, 1992
3. Coles R, McDowell D, Kirwan MJ Food Packaging Technology. Blackwell, 2003



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|------------------------------------|--------------------------------------------|----------|
| Course Code No.- <b>FPTMVOC212</b> | No. of Credits -04                         | Hours 60 |
| Course title                       | <b>Beverages and Snack Food Technology</b> |          |

#### Course objective

- To develop the skills for processing of different types of alcoholic and non-alcoholic beverages with a brief knowledge of packaged drinking water manufacturing industry and Indian snack food markets.

#### Course Outcomes:

After learning this subject

- Students will be able to know different types of beverages found in India as well as international market.
- Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.
- Students will have thorough knowledge of different types of cereal based snacks food items available in market.
- Students will get brief knowledge of fruits and vegetables based snacks

#### Course Contents

##### Unit 1

(10 Hrs)

History, importance of beverages and status of beverage industry, Types of Beverages, packaged drinking water Processing

##### Unit 2

(10 Hrs)

Juice based beverages processing, Synthetic, still, carbonated, low-calorie and dry beverages, isotonic and sports drinks, dairy based, alcoholic beverages fruit beverages, speciality beverages, tea, coffee, cocoa, spices, plant extracts, etc.

##### Unit 3

(10 Hrs)

FSSAI specifications for beverages, Ingredients, manufacturing and packaging processes and equipment for different beverages; Water treatment and quality of process water Sweeteners, colorants, acidulants, clouding and clarifying and flavouring agents for beverages Carbondioxide and carbonation Quality tests and control in beverages; Miscellaneous beverages Coconut water, sweet toddy, sugarcane juice, coconut milk, flavoured syrups

##### Unit 4

(10 Hrs)

Overview of grain-based snacks: whole grains – roasted, toasted, puffed, popped and flakes Coated grains-salted, spiced and sweetened Flour based snack– batter and dough based products; savoury and farsans; formulated chips and wafers, papads.

#### **Unit 5**

**(10 Hrs)**

Technology for fruit and vegetable based snacks: chips, wafers, papads etc. Technology for coated nuts – salted, spiced and sweetened products- chikkis, Sing bhujia, Technology for RTE puffed snack-sand puffing, hot air puffing, explosion puffing, gun puffing etc

#### **Unit 6**

**(10 Hrs)**

Tutorials and Assignments based on Unit 1 to 5

#### **References**

1. Edmund WL. Snack Foods Processing. AVIPubl.
2. Frame ND. 1994. The Technology of Extrusion Cooking. Blackie Academic.
3. Gordon BR. 1997 Snack Food. AVIPubl
4. Dubey SC. 2002. Basic Baking. The Society of Indian Bakers, New Delhi.
5. Francis FJ. 2000. Wiley Encyclopedia of Food Science & Technology. John Wiley & Sons.
6. Manley D. 2000. Technology of Biscuits, Crackers & Cookies. 2nd Ed. CRC Press.
7. Pyler EJ. Bakery Science & Technology. 3<sup>rd</sup> Ed. Vols. I, II. Sosl and Publ.

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|-----------------------------------|----------------------------------------|-----------------|
| <b>Course Code No.</b> FPTMVOC213 | <b>No. of Credits -04</b>              | <b>Hours 60</b> |
| <b>Course title</b>               | <b>Nutraceuticals and Health Foods</b> |                 |

### Course objective

- The objectives of this course are to provide students with an overview of the field of functional foods, nutraceuticals and natural health products. The course enables students to understand the functional food concept as related to ingredient efficacy and safety

### Course outcome

Upon completing this course, the student will be able to:

- describe components of nutraceutical and functional foods
- evaluate the standards of evidence required for efficacy and safety assessment of nutraceutical and functional foods
- explain the regulatory framework required in North America for substantiated health claims

### Course Contents

#### Unit 1 (10 Hrs)

Introduction to nutraceuticals: definitions, synonymous terms, Basis of claims for a compound as a nutraceutical, Regulatory issues for nutraceuticals including CODEX.

#### Unit 2 (10 Hrs)

Concept of angiogenesis and the role of nutraceuticals /functional foods; Nutraceuticals for cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, joint pain, immune enhancement,

#### Unit 3 (10 Hrs)

Age-related macularde generation, endurance performance and mood disorders—compounds and their mechanisms of action, dosage levels, contraindications if any etc

#### Unit 4 (10 Hrs)

Manufacturing aspects of selected nutraceutical such as lycopene, iso flavonoids, prebiotics and probiotics, glucosamine, phytosterols etc.; Formulation of functional foods containing nutraceuticals—

Stability and analytical issues, labeling issues

#### Unit 5 (10 Hrs)

Clinical testing of nutraceuticals and health foods;

Interactions of prescription drugs and nutraceuticals; Adverse effects and toxicity of nutraceuticals; nutrigenomics—an introduction and its relation to nutraceuticals

#### Unit 6 (10 Hrs)

Tutorials and Assignments based on Unit 1 to 5

### References

1 Saarela M. 2011. Functional Foods: Concept to Product, 2nd edition. Oxford, Cambridge. Woodhead Publishing Ltd

2 Bagchi D. 2014. Nutraceuticals and Functional Foods Regulations in the United States and Around the World 2nd edition. Elsevier.

3 Schmidl MK and Labuza TP. 2000. Essentials of Functional Foods, Functional Foods and Nutraceutical series. Technomic Publishing Co., Inc.

4 Zawistowski J. 2010. Tangible Health Benefits of Phytosterol Functional Foods. J. Smith and E.

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|------------------------------------|---------------------------------------------|-----------------|
| <b>Course Code No.- FPTMVOC214</b> | <b>No. of Credits -04</b>                   | <b>Hours 60</b> |
| <b>Course title</b>                | <b>Statistical and Research Methodology</b> |                 |

**Course Objectives:**

- The purpose of the course is to impart knowledge on different advanced statistical methods for its applications in Food & Nutrition related disciplines.
- To understand some basic concept of Research and its Methodology
- The emphasis will be more on solving practical problems with basic understanding of the theoretical concepts.

**Course Outcomes:** At the end of the course, the students should able to understand,

1. Analysis of data to draw valid inferences.
2. To understand the working of statistical methods and its applications to several situations.
3. To develop statistical models and to study the several characteristics of data structures.

**Course Contents**

**Unit 1**

**(10 Hrs)**

Definition concepts for understanding statistical measures, popular concepts and misuse of statistics, Normal distribution and its property's, Normal distribution Binomial distribution Probability, use of normal probability tables, area under normal distribution, data management planning of data analysis-coding of response, preparation of code book ,Coding of data ,Use of statistical programmes-Ms-excel, SPSS

**Unit 2**

**(10 Hrs)**

Quantitative analysis descriptive statistics, descriptive statistics, inferential statistics, uses and limitations, summation sign and its properties proportions, percentage, ratios Measures of central tendency-mean, median, mode-arithmetic mean and its uses, mid-range geometric mean, weighted mean Measures of dispersion /variation ,kurtosis, skewness Grouped data-frequency distribution, histogram, frequency polygons, percentiles, quartiles, tertiles, ogive Large and small samples tests and interpretation-test for single proportions and difference between proportions, larges ample test for single mean and difference between means „Small sample



**Unit 3****(10 Hrs)**

General features ,goodness of fit, independence of attributes, Correlation and Regression and its interpretation Basic concepts, Linear regression and correlation coefficient, regression and prediction, Rank correlation, product –moment method, Analysis of variance and its interpretation -one factor analysis of variance, two-factor analysis of variance

**Unit 4****(10 Hrs)**

Tabulation and Organization of data frequency distributions, cumulative frequency distribution, tables Graphical presentation of data–histograms, frequency polygon, ogive Stem and leaf plot, box and whiskers plot, Graphs for nominal and ordinal data–pie diagram, bar graphs of different types, graphs for relation between two variables, lines diagrams. Use of illustrations, Caution in visual display of data

**Unit 5****(10 Hrs)**

Basic components of are search report prefatory material ,introduction and review of related literature ,methodology, results, discussion, conclusion, summery, abstract, Bibliography and appendices.

**Unit 6****(10 Hrs)**

Tutorials and Assignments based on Unit 1 to 5

**References:**

1. Fundamentals of biostatistics-Veer Bala Rastogi, Ane books publication
2. Biostatistics-PRama Krishanan, Saraspublication An introduction to biostatistics-N. Gurumani, MJP publication.

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|-----------------------------|------------------------------------|----------|
| Course Code No.- FPTMVOC215 | No. of Credits -04                 | Hours 60 |
| Course title                | Food safety and quality management |          |

#### Course objective

- To provide an insight of basic tastes and derived tastes in food.
- To understand basic sensory quality attributes of raw and processed foods.
- To understand the objective and subjective methods of sensory evaluation and their application in industry.

#### Course outcome

- Understand and apply the principles of sensory science in product development and optimization, studies of alternative processing, packaging and storage, as well as relating sensory to physical properties of food.
- Able to analyze color, flavor, texture and other sensory characteristics of food for quality assurance.
- Able to measure consumer perception and acceptance of food products.

#### Course Contents

- Unit 1** (10 Hrs)  
Concept of quality: Quality attributes-physical, chemical, Nutritional ,microbial, and sensory; their measurement and evaluation; Sensory *vis-à-vis* instrumental methods for testing quality
- Unit 2** (10 Hrs)  
Concepts of quality management: Objectives, importance and functions of quality control; Quality management systems in India; Sampling procedures and plans; Food Safety and Standards Act, 2006; Domestic regulations;
- Unit 3** (10 Hrs)  
Global Food safety Initiative; Various organizations dealing With inspection, traceability and authentication, certification and quality assurance (PFA, FPO, MPO, AGMARK, BIS); Labeling issues
- Unit 4** (10 Hrs)  
Quality assurance, Total Quality Management; GMP/GHP/GLP/GAP; Sanitary and hygienic practices; HACCP; Quality manuals, documentation and audits; Indian & International quality system standards like ISO and Food Codex;
- Unit 5** (10 Hrs)  
Export import policy, export documentation; Laboratory quality procedures and assessment of

laboratory performance; Applications in different food industries; Food Adulteration and food safety. IPR and Patent

**Unit 6** (10 Hrs)

Tutorials and Assignments based on Unit 1 to 5

**References**

- 1 Rao, E. S. (2013). Food Quality Evaluation (1st ed.). Variety Book Publishers, New Delhi.
2. deMan, J. (2007). Principles of Food Chemistry (3rd ed.).
3. Springer. Meilgard. (1999). Sensory Evaluation Techniques (3rd ed.). CRC Press LLC
4. Harry T. Lawless, Barbara P. Klien. (1991) Sensory Science Theory and Applications in Food. Marcel Dekker, New York.
- 5 George, A. B. (2004). Fenaroli's Handbook of Flavor Ingredients (5th ed.). CRC Press

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|-----------------------------|-----------------------------|----------|
| Course Code No.-FPTMVOC215B | No. of Credits -04          | Hours 60 |
| Course title                | Techniques in Food Analysis |          |

#### Course objective

- The course will focus on providing graduate students with a detailed knowledge of modern techniques used in research and development as well as inspection of food products in industry, analytical laboratory and government. The course is composed of lectures and hands-on laboratories

#### Course outcome

1. Apply valid sampling techniques to food materials having widely diverse properties and volumes;
2. Select appropriate analytical techniques for specific food components;
3. Compare advanced and conventional techniques and instruments to analyse chemical and physical properties of foods;
4. Apply a range of chemical analyses of food components;

#### Course Contents

##### Unit 1 (10 Hrs)

Sampling techniques; Water activity, its measurements and significance in food quality; Calibration and standardization of Different instruments.

##### Unit 2 (10 Hrs)

Spectroscopic techniques using UV/V is, fluorescence, IR, FTIR, NIR, NMR, atomic absorption, ICP, polarimetry, refractometry, Microscopic techniques in food analysis (light microscopy, SEM, TEM, XRD, particle size analysis, image analysis etc.)

##### Unit 3 (10 Hrs)

Chromatographic techniques: Adsorption, column, partition, Affinity, ion exchange, size exclusion, GC, GLC, HPLC, HPTLC, GCMS, LCMS

##### Unit 4 (10 Hrs)

Separation techniques: Gel filtration, dialysis, electrophoresis, sedimentation, ultrafiltration and ultracentrifugation, solid phase extraction, super critical fluid extraction, isoelectric focusing, isotopic techniques, manometric techniques.

##### Unit 5 (10 Hrs)

Special techniques: Immuno assay techniques; Isotopic, non-isotopic and enzyme immuno assays; surface tension; enzymatic methods of food analysis; thermal methods in food analysis (Differential scanning calorimetry and others).

##### Unit 6 (10 Hrs)

Tutorials and Assignments based on Unit 1 to 5

#### References

1. Frazier, R. A., Ames, J.M. and Nursten, H.E. (Eds.). 2000. Capillary electrophoresis for food analysis: method development. Cambridge: The Royal Society of Chemistry. 127 p.
2. Horwitz, W. and Latimer, G.W. (Eds.). 1998. Official methods of analysis of AOAC International. 16th ed. Gaithersburg: AOAC International.
3. MacRae, R. (Ed.). 1988. HPLC in food analysis. London: Academic Press

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|------------------------------------|---------------------------|--------------|
| <b>Course Code No.- FPTMVOC216</b> | <b>No. of Credits -05</b> | <b>Hours</b> |
| <b>Course title</b>                | <b>Mini Project</b>       |              |

#### **Course outcome**

- Critical thinking in problem solving
- Presentation and communication skills
- Report organization and writing skills
- Independent learning and information integration skills
- Project management skills

#### **Activity**

Students or group of students have to prepare a comprehensive project proposal based on theory and laboratory courses they have covered in semester I and will be covering under semester II during the semester under supervision of project guide after approval of the proposal by the director, students will be allowed to work on project. Working model / Demonstration model of the project along with the project report have to be submitted to the project guide before the semester end examination. Final evaluation of mini project course work will be based on power point presentation, demonstration and viva-voce examination



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| <b>Course Code No.-FPTMVOC217</b> | <b>No. of Credits -05</b>            | <b>Hours</b> |
| <b>Course title</b>               | <b>Industrial Project – Phase II</b> |              |

Experimental work to be continued with the approved project. Final evaluation will be based on power point presentation, demonstration and viva-voce examination

### Third Semester

|                            |                    |          |
|----------------------------|--------------------|----------|
| Course Code No.-FPTMVOC311 | No. of Credits -04 | Hours 60 |
| Course title               | Food Additives     |          |

#### Course Objectives

- To expose the students to the use of different chemical additives in foods during food processing and preservation

#### Course Outcomes

- To understand the principles of chemical preservation of foods
- To understand the role of different food additives in the processing of different foods and their specific functions in improving the shelf life, quality, texture and other physical and sensory characteristics of foods
- To know the regulations and the monitoring agencies involved in controlling the safer use of additives in foods

#### Course Contents

**Unit 1 Acidity Regulators –** (10 Hrs)  
definition, chemical structure, role and importance, pH modulation and taste, acidity profile, permitted acidity regulators, levels of usage and food applications. Preservatives of chemical and microbial origin; mode of action on spoilage organisms and pathogens, factors affecting the performance of preservatives, active forms of preservatives, necessity in a food and levels of usage; permitted preservatives and food applications. Case studies / illustrations

**Unit 2 Preservatives** (10 Hrs)  
Preservatives of chemical and microbial origin; mode of action on spoilage organisms and pathogens, factors affecting the performance of preservatives, active forms of preservatives, necessity in a food and levels of usage; permitted preservatives and food applications. Case studies / illustrations

**Unit 3 Color and Artificial Sweeteners** (10 Hrs)  
Color – Natural and synthetic food colors, their chemical structure, shades imparted, stability, permitted list of colors, usage levels and food application. Artificial Sweeteners – list, structure, taste profile, permitted list, usage levels and food applications.

**Unit 4 Emulsifiers, Stabilizers** (10 Hrs)

Emulsion, surface tension, oil in water and water in oil emulsion, Hydrophilic and Lipophilic balance (HLB), role of emulsifiers, different classes of emulsifiers and their chemical structure, their HLB values and role in emulsion stabilization; role of different stabilizers and other substances in emulsion stability; emulsion formation process and equipment; measurement of emulsion stability; permitted emulsifiers and stabilizers and food applications.

**Unit 5 Thickeners**

(10 Hrs)

Thickeners -definition, chemical structure, role in food processing and product end characteristics, list of permitted thickeners and food applications.

**Unit 6**

(10 Hrs)

Tutorials, Assignments, Demonstrations and Presentation based on Unit 1 to 5

**REFERENCES: WEB SUPPORT:**

*Text Books:*

1. Mahindru, S. N. Food Additives- Characteristics Detection and Estimation, TATA McGraw Hill, 2000
2. Wilson, R. Ingredient Handbook Sweeteners, Blackwell, 2007

*References:*

1. Emerton, V. Food Colors, Blackwell, 2008
2. Peter A Williams and Glyn O Philips, Gums and stabilizers for the Food Industry, RSC, 2006.
3. Brannen, A. L. Food Additives 2nd Edition, CRC press, 2002

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|------------------------------------|---------------------------|--------------|
| <b>Course Code No.- FPTMVOC312</b> | <b>No. of Credits -06</b> | <b>Hours</b> |
| <b>Course title</b>                | <b>Mini Project</b>       |              |

#### **Course Outcomes:**

On completion of this course, students should be able to

- Recognize elements of a modular FMS in CIM lab
- Recognize elements of unit manufacturing cell in CIM lab
- Conceptualize role of computer in modern manufacturing
- Develop program for controlling operations of modular FMS/unit manufacturing cell in CIM Lab
- Apply programming logic in complex industrial operations

#### **Activity**

Group of students (max.03) have to undertake project on part of modular FMS /unit manufacturing cell in CIM lab. Each group should decide a specific task on the unit and get it approved by the faculty – in - charge. Flowchart and program should be developed by the group thereafter to accomplish the said task. Demonstration of the program along with the project report have to be submitted to the project guide before the semester end examination. Final evaluation of Mini Project coursework will be based on power-point presentation, demonstration and viva-voce examination

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| <b>Course Code No.-</b> | <b>FPTMVOC313</b> | <b>No. of Credits -20</b>             | <b>Hours</b> |
| <b>Course title</b>     |                   | <b>Industrial Project – Phase III</b> |              |

Experimental work to be continued with the approved project. Final evaluation of Industrial Project -Phase III coursework will be based on power-point presentation, demonstration (if the experimental work is at requisite matured stage) and viva-voce examination.



### Fourth Semester

|                            |                              |          |
|----------------------------|------------------------------|----------|
| Course Code No.-FPTMVOC411 | No. of Credits -04           | Hours 60 |
| Course title               | Intellectual Property Rights |          |

#### Course Objectives

1 This course is intended mainly to acquaint students with fundamental concepts of IPR, basics of patent law, know the requirements of patentability, learn how to read and interpret patent specifications, analyze patent office procedures and case studies for developing the basic understanding for drafting a patent specification.

The course also looks forward to give fundamental ideas and procedures of other dimensions of IPR namely Copyright, Design and GI. Mostly, Indian perspectives of IPR will be discussed

#### Course Outcomes

On completion of the Course, students should be able to-

- 1 Recognize the different dimensions of Intellectual Properties and subsequent Rights
- 2 Discuss basic traits pertaining to different dimensions of 3 Intellectual Property 3 Acts Express requirements of a Patent Specification
- 4 Describe steps of Patent prosecution
- 5 Recognize practices of patent office

#### Course Contents

##### Unit 1: Introduction to IPR and Patents

(10 Hrs)

Introduction to Intellectual Property, Concept of property and rights in IPR, Meaning of intellectual in IPR, Characterises of IP, Kinds of IPR, Rights granted by IP, Intangible economy, Traits of intangibility, Enforcement of IP; Patents - Introductory concepts, Subject matter, Patents in India, To file or not to file a patent, Publish or Patent, Who can file a patent, When and how to file a patent, Requirements of a patent application, Types of Patent application.

##### Unit 2: Patents

(10 Hrs)

Patent law as concepts, Understanding the patent act and rules, Preliminary sections, Preliminary

rules, Reading patent act and rules; Patentability of Inventions, Inventions not patentable, Novelty, Anticipations, Inventive step, Capable of Industrial Application, Person skilled in art, Prior knowledge; Drafting of patents -Complete and Provisional specifications, Contents of specifications, Structure of a patent specification, Drafting of Provisional specification, Drafting of Complete specification; Patent search; Case study'

**Unit 3: Patent Prosecution** (10 Hrs)

Powers of Controller, Patents of Addition, Priority Dates, Publication of Application, Request for Examination, Examination of Application, Expedited Examination of Application, Search for Anticipation, Procedure in case of Anticipation, Consideration of Report of Examiner, Refuse, Require Amendment, and Division of Applications, Dating of Application and Anticipation Potential infringement orders regarding substitutions of applicants Putting Applications in Order for Grant, Amendments during Prosecution, Introduction to Opposition to Grant of Patents Pre-Grant Opposition, Post-Grant Opposition, Opposition in General.

**Unit 4: Practices at Patent Office** (10 Hrs)

Secrecy Provisions, Grant of Patents, Rights conferred by Grant, Rights of Co-Owners of Patents and Power of Controller to give directions, Patent obtained by Fraud of True and First Inventor, Term of Patent, Restoration of Lapsed Patents, Surrender of Patents, Revocation of Patents, Register of Patents, Patent Office and its Establishment, Patent Agents, Use and Acquisition by Government, Penalties; Introduction to compulsory licensing.

**Unit 5: Trademark, GI, Design, Copyright** (10 Hrs)

Trade Marks, International Arrangements, Trade marks in India, What can be protected, Registration of trade mark, Rights and Defenses; Geographical Indication; Design; Introduction to copyright - Copyright in India, Criteria of protection, Subject matter, Rights an infringement, Educational exceptions; Case studies.

**Unit 6:** (10 Hrs)

Tutorials, Assignments, Demonstrations and Presentation based on Unit 1 to 5.

**REFERENCES: WEB SUPPORT:**

1. Lectures of Professor Feroz Ali (Department of Humanities and Social Sciences, IIT

Madras) on 'Intellectual Property available with NPTEL;  
<https://nptel.ac.in/courses/109/106/109106137/2>

Lectures of Professor Feroz Ali (Department of Humanities and Social Sciences, IIT Madras) on 'Patent Laws for Scientists and Engineers' available with NPTEL;  
<https://nptel.ac.in/courses/110/106/110106081/>

**SUGGESTED READING:**

1. V. K. Ahuja, 'Intellectual Property Rights in India', Lexis Nexis; ISBN: 978-9351433880

2 V. K. Ahuja, 'Law Relating to Intellectual Property Rights', Lexis Nexis;  
ISBN: 978 8131251652

3 'Intellectual Property Laws', Universal's Legal Manual, ISBN: 978-9350355855 'Manual of  
Patent Office Practice and Procedure-2019',

4 The Office of Controller General of Patents, Designs & Trademarks; IPO "The Patents Act-  
1970"; IPO 'Manual of Designs Practice and Procedure', The Office of Controller General of  
Patents, Designs & Trademarks; IPO 'Manual of Trademarks Practice and Procedure', The  
Office of Controller General of Patents, Designs & Trademarks; IPO "Practice and Procedure  
Manual", Copyright Office,

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|------------------------------------|-------------------------------------------------------------|--------------|
| <b>Course Code No.- FPTMVOC412</b> | <b>No. of Credits -06</b>                                   | <b>Hours</b> |
| <b>Course title</b>                | <b>Case Study Report of Any Existing Industrial Project</b> |              |

#### **Course Outcomes:**

On completion of this course, students should be able to -

1. Recognize the underlying factors of problem identification/manufacturing support in industrial realm
- 2 Apprehend the procedural steps towards root cause analysis and comprehensive solution approach
- 3 Conceptualize financial planning issues in commissioning a project
- 4 Realize pay off and benefit cost analysis

#### **Activity**

Students (group of max 3 students) should identify one industrial project commissioned in industry - to alleviate certain problem/to support existing manufacturing facility. They are expected to study the project in depth and submit a detailed report to the department on -

- i. Problem identification process
- ii. Justification for machineries installation
- iii. . Economic Considerations (elements of cost, capital cost, facility cost etc.)
- iv. Payoff and cost benefit analysis
- v. Installation aspects & safety measures installed
- vi. Co-working of the project with existing systems in the plant
- vii. Benefit factors

Final evaluation will be based on presentation, and viva-voce examination

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| <b>Course Code No.- FPTMV0C413</b> | <b>No. of Credits -20</b>            | <b>Hours</b> |
| <b>Course title</b>                | <b>Industrial Project – Phase IV</b> |              |

Students are expected to work on concluding part of the experimental work, analyze the results, standardize the complete work with optimum aesthetic integration before submitting to the department. A neatly prepared report in soft-format (CD) should be submitted to the department along with the project. Final evaluation of Industrial Project -Phase IV coursework will be based on power-point presentation, demonstration and viva-voce examination.