Annamalai University
(Accredited With ‘A’ Grade by NAAC)

Faculty of Engineering and Technology
Department of Chemical Engineering

M.Tech., Food Processing Technology
(Choice Based Credit System)

Handbook
Regulations and Syllabus
2019 - 2020
(onwards)
ANNAMALAI UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

M.E. / M. Tech (Two-Year Full Time & Three-year Part Time) DEGREE PROGRAMME (CBCS)

REGULATIONS -2019

1. Conditions for Admission
Candidates for admission to the first year of the four-semester M.E / M.Tech Degree programme in Engineering shall be required to have passed B.E / B.Tech degree of Annamalai University or any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time. The admission for M.E Part Time programme is restricted to those working or residing within a radius of 90 km from Annamalainagar. The application should be sent through their employers.

2. Branches of Study in M.E / M.Tech
The Branch and Eligibility criteria of programmes are given in Annexure I

3. Courses of study
The courses of study along with the respective syllabi and the scheme of Examinations for each of the M.E / M. Tech programmes offered by the different Departments of study in the Faculty of Engineering and Technology are given separately.

4. Choice Based Credit System (CBCS)
The curriculum includes three components namely Program Core, Program Electives and Open Electives, Mandatory Learning Courses and Audit Courses in addition to Thesis. Each semester curriculum shall normally have a blend of theory and practical courses.

5. Assignment of Credits for Courses
Each course is normally assigned one credit per hour of lecture / tutorial per week and 0.5 credit for one hour of laboratory or project or industrial training or seminar per week. The total credits for the programme will be 68.

6. Duration of the programme
A student of M.E / M.Tech programme is normally expected to complete in four semesters for full-time / six semesters for part-time but in any case not more than four years for full-time / six years for part-time from the date of admission.

7. Registration for courses
A newly admitted student will automatically be registered for all the courses prescribed for the first semester, without any option. Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day. Registration for the Thesis Phase - I and Phase-II shall be done at the appropriate semesters.
8. Electives

8.1 Program Electives

The student has to select two electives in first semester, another two electives in the second semester and one more in the third semester from the list of Program Electives.

8.2 Open Electives

The student has to select two electives in third semester from the list of Open Electives offered by the Department and/or other departments in the Faculty of Engineering and Technology.

8.3 MOOC (SWAYAM) Courses

Further, the student can be permitted to earn credits by studying the Massive Open Online Courses offered through the SWAYAM Portal of UGC with the approval of the Head of the Department concerned. These courses will be considered as equivalent to open elective courses. Thus the credit earned through MOOC courses can be transferred and considered for awarding Degree to the student concerned.

8.4 Value added courses (Inter Faculty Electives)

Of the two open elective courses, a student must study one value added course that is offered by other Faculties in our University either in second or third semester of the M.E programme.

9. Industrial Project

A student may be allowed to take up the one program elective and two open elective courses of third semester (Full Time program) in the first and second semester, to enable him/her to carry out Project Phase-I and Phase-II in an industry during the entire second year of study. The condition is that the student must register those courses in the first semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

10. Assessment

10.1 Theory Courses

The break-up of continuous assessment and examination marks for theory courses is as follows:

First assessment (Mid-Semester Test-I) : 10 marks
Second assessment (Mid-Semester Test-II): 10 marks
Third Assessment : 5 marks
End Semester Examination : 75 marks

10.2 Practical Courses

The break-up of continuous assessment and examination marks for Practical courses is as follows:

First assessment (Test-I) : 15 marks
Second assessment (Test-II) : 15 marks
Maintenance of record book : 10 marks
End Semester Examination : 60 marks

10.3 Thesis work

The thesis Phase I will be assessed for 40 marks by a committee consisting of the Head of the Department, the guide and a minimum of two members nominated by the Head of the Department. The Head of the Department will be the chairman. The number of reviews must be a minimum of three per semester. 60 marks are allotted for the thesis work and viva voce examination at the end of the third semester. The same procedure will be adopted for thesis Phase II in the fourth semester.
10.4 Seminar / Industrial Training

The continuous assessment marks for the seminar / industrial training will be 40 and to be assessed by a seminar committee consisting of the Seminar Coordinator and a minimum of two members nominated by the Head of the Department. The continuous assessment marks will be awarded at the end of the seminar session. 60 marks are allotted for the seminar / industrial training and viva voce examination conducted based on the seminar / industrial training report at the end of the semester.

11. Student Counselors (Mentors)

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counselor (mentor) for those students throughout their period of study. Such student counselors shall advise the students in selecting open elective courses from, give preliminary approval for the courses to be taken by the students during each semester, and obtain the final approval of the Head of the Department monitor their progress in SWAYAM courses / open elective courses.

12. Class Committee

For each of the semesters of M.E / M.Tech programmes, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from first to fourth semesters for Full time and first to sixth semesters for Part-time will be as follows:

- Teachers of the individual courses.
- A Thesis coordinator (for Thesis Phase I and II) shall be appointed by the Head of the Department from among the Thesis supervisors.
- A thesis review committee chairman shall be appointed by the Head of the Department.
- One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.
- All counselors of the class and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.

The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory courses / 40 marks for practical courses, for Industrial Training and for Thesis work (Phase-I and Phase-II) will be finalized for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of Examinations.

13. Temporary Break Of Study

A student can take a one-time temporary break of study covering the current semester and / or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-
semester test. However, the student must complete the entire programme within the maximum period of **four years for Full time / six years for Part time.**

14. **Substitute Assessments**
A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end of semester examination may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees. A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

15. **Attendance Requirements**
The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds. A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register and repeat the same semester in the subsequent academic years.

16. **Passing and declaration of Examination Results**
All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average (GPA) and cumulative grade point average (CGPA) and prepare the mark sheets.

<table>
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<tr>
<th>Marks Range</th>
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<tr>
<td>90 to 100 marks</td>
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<td>Grade ‘A’</td>
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<tr>
<td>70 to 79 marks</td>
<td>Grade ‘B’</td>
</tr>
<tr>
<td>60 to 69 marks</td>
<td>Grade ‘C’</td>
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<tr>
<td>55 to 59 marks</td>
<td>Grade ‘D’</td>
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<tr>
<td>50 to 54 marks</td>
<td>Grade ‘E’</td>
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<td>Less than 50 marks</td>
<td>Grade ‘RA’</td>
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<td>Withdrawn from the</td>
<td>Grade ‘W’</td>
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<tr>
<td>Examination</td>
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</table>

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

- **S** - 10; **A** - 9; **B** - 8; **C** - 7; **D** - 6; **E** - 5; **RA** - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.
A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

CGPA is similarly calculated considering all the courses taken from the time of admission.

17. Awarding Degree

After successful completion of the programme, the degree will be awarded with the following classifications based on CGPA.

For First Class with Distinction the student must earn a minimum of 68 credits within four semesters for full-time / six semesters for Part time from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must earn a minimum of 68 credits within two years and six months for full-time / three years and six months for Part time from the time of admission and obtain a CGPA of 6.75 or above.

For Second class, the student must earn a minimum of 68 credits within four years for full-time / six years for Part time from the time of admission.

18. Ranking of Candidates

The candidates who are eligible to get the M.E / M.Tech degree in First Class with Distinction will be ranked on the basis of CGPA for all the courses of study from I to IV semester for M.E / M.Tech full-time / I to VI semester for M.E / M.Tech part-time.

The candidates passing with First Class and without failing in any subject from the time of admission will be ranked next to those with distinction on the basis of CGPA for all the courses of study from I to IV semester for full-time / I to VI semester for M.E / M.Tech part-time.

19. Transitory Regulations

If a candidate studying under the old regulations M.E. / M.Tech could not attend any of the courses in his/her courses, shall be permitted to attend equal number of courses, under the new regulation and will be examined on those subjects. The choice of courses will be decided by the concerned Head of the department. However he/she will be permitted to submit the thesis as per the old regulations. The results of such candidates will be passed as per old regulations.

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.
### ANNEXURE 1

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Department</th>
<th>Programme (Full Time &amp; Part time)</th>
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<td>Chemical Engineering</td>
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<td>B.E. / B.Tech – Chemical Engg, Petroleum Engg, Petrochemical Technology</td>
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<td>iii. Industrial Bio Technology</td>
<td>B.E. / B.Tech - Chemical Engg, Food Technology, Biotechnology, Leather Technology</td>
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<td>iv. Industrial Safety Engineering</td>
<td>B.E. / B.Tech – Any Branch of Engineering</td>
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<td>ii. Environmental Engineering &amp; Management</td>
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<td>iii. Geotechnical Engineering</td>
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<td>iv. Disaster Management &amp;Engg.</td>
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<td>ii. Smart Energy Systems</td>
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<td>iii. Power System</td>
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<td>i. Process Control &amp; Instrumentation</td>
<td>B.E. / B.Tech – Electronics and Instrumentation Engg, Electrical and Electornics Engg, Control and</td>
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<td>Welding Engineering</td>
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DEPARTMENT OF CHEMICAL ENGINEERING
M.Tech. FOOD PROCESSING TECHNOLOGY

VISION
Our vision is to be a leading Chemical Engineering Department in the Nation, to create and develop technocrats, entrepreneurs and business leaders

MISSION
The department fosters chemical engineering as a profession that interfaces engineering and all aspects of basic sciences to disseminate knowledge in order to prepare the students to be successful leaders and practitioners and to meet the present and future needs of the society by highest degree of standards and ethics.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. To provide adequate education, training, research and development services in the field of food processing technology.
2. To impart knowledge on the causes of food spoilage and methods of processing and preserving food.
3. To identify and select processing equipments and preservation methods appropriate for specific foods.
4. To describe the effect of preservation methods on the quality of food.
5. To provide adequate knowledge about food plant, equipments used in food industry, food safety, food laws and business management in food industry.

PROGRAMME OUTCOMES (POs):

Upon successful completion of this programme the students will be able to understand about the;
1. Importance and physiochemical properties of food and significance of microorganisms related to food and agrochemical residues in foods
2. Important pathogens and spoilage microorganisms in food and methods to control spoilage and food borne diseases.
3. Processing and preservation of food by heat, non-thermal and low temperature techniques and principles and current practices of food processing techniques.
4. Specific unit operations and processing methods required to produce a given food product, waste recycling and recovery systems.
5. Formulation and processing of foods, addition of food additives, flavouring, colouring, and packaging.
6. Structure and operation of food plant, mass and energy balances for a given food process, food plant equipments, instrumentation, food safety, food laws and regulation, research and development and business management.
7. Proper cryogenic fluid for particular application like freezing of foods, medical application.
8. Significance of toxicology, relevance of nutraceuticals and functional foods.
9. Processing, preservation and transportation of meat, poultry meat and fish.
10. Formulation and processing of snack foods, breads, cakes, chocolates and confectioneries
11. Production and processing of beverages, juices, dairy and dairy products.
12. Processing and preservation of fruits and vegetables.

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# FACULTY OF ENGINEERING AND TECHNOLOGY
## DEPARTMENT OF CHEMICAL ENGINEERING

Program: M.Tech  
Specialization: Food Processing Technology

**CURRICULUM - 2019**

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Total: 15
### M.Tech Food Processing Technology (PART TIME) - DEGREE PROGRAMME

**Choice Based Credit System (CBCS)**

**REGULATION - 2019**

**Courses of Study and Scheme of Examination**

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PROGRAMME ELECTIVES

1. Cereals, Legumes and Oil Processing Technology
2. Baking Technology
3. Fruits and Vegetable Preservation Technology
4. Meat, Poultry and Fish Processing Technology
5. Beverage Technology
6. Chocolates and Confectionery Technology
7. Food Safety and Quality Control
8. Food Laws and Regulations
9. Food Packaging Technology
10. Nutraceuticals and Functional Foods
11. Food Toxicology
12. Waste Recycling And Resources Recovery Systems
13. Industrial Organization and Business Management
14. Agrochemicals and Residues in foods
15. Flavour Chemistry and Technology

AUDIT COURSE

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.
OPEN ELECTIVES

1. Cryogenic Engineering
2. Juice Processing Technology
3. Process Instrumentation and Control in Food Processing
4. Snack Food Technology
### COURSE OBJECTIVES:

- To learn about the characteristics and compositions of foods.
- To study the importance and significance of microorganisms related to food.
- To know about carbohydrates, proteins and lipids.
- To study about food spoilage.


### REFERENCES:


COURSE OUTCOMES:
At the end of the course the learners will be able to
1. Know about the physiochemical properties and the nutritional values of carbohydrates, proteins, lipids and amino acids.
2. Understand the role of microorganisms on food materials.
3. Learn about food colorants.
4. Know food spoilage.
5. Know about food borne diseases.

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CHFTPC12     FOOD PROCESSING TECHNOLOGY     L  T  P  C
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COURSE OBJECTIVES:
Enable the students to know about
- Processing of food by heat.
- Processing by non-thermal methods.
- Processing by low temperature methods.
- Various dehydration equipments.

Processing by heat: Blanching– pasteurization– sterilization and UHT processing– canning–
extrusion cooking– dielectric heating– microwave heating– baking– roasting and frying. Retort
processing of Ready to eat (RTE) products. Drying – water activity– microbial spoilage due to
moisture. Dehydration of fruits, vegetables, milk, animal products– Newer methods of thermal
processing – batch and continuous.

Processing by low Temperature and irradiation – refrigeration– freezing – dehydrofreezing. Food
irradiation– history and mechanism– the electro-magnetic spectrum– forms of radiant energy.
Principles of using electromagnetic radiation in food processing– ionizing radiations – non
ionizing radiations– advantages – disadvantages. Controlling undesirable changes in food during
irradiation.

Processing by drying, concentration and evaporation : Various methods employed in production
of dehydrated commercial products– selection of methods based on characteristics of foods to be
produced– advantages and disadvantages of different methods– sun-drying– tray drying– tunnel
changes during drying control of chemical changes–desirable and undesirable changes.
Packaging and storage of dehydrated products. Ultra-filtration– reverse osmosis– Freeze drying
and freeze concentration.

Processing by non-thermal methods: High pressure– pulsed electric field– hurdle technology.
GRAS – permissible limits for chemical preservatives – legal aspects for gamma irradiation. Use
and application of enzymes and microorganism in processing and preservation of foods– food
fermentations– pickling– smoking etc; Food additives: Definition– types and functions–
permissible limits and safety aspects. Controlled Atmosphere preservation – Modified
Atmosphere preservation technology.

REFERENCES:
1. Desrosier, N.W. and James, N., “Technology of food preservation”, 2007, AVI.
Publishers.
Publishers.
and Distributors, New Delhi.

COURSE OUTCOMES:
At the end of the course, the student will be able to
1. Understand about sterilization, pasteurization and blanching processes.
2. Know about CA and MA methods of preservation.
3. Understand the role of refrigeration and freezing techniques for the processing and preservation of food.
4. Know about various dryers.
5. Know about non-thermal preservation methods.

### Mapping with Programme outcomes

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### CHFTMC15

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Meaning of research problem– Sources of research problem– Criteria– Characteristics of a good research problem– Errors in selecting a research problem– Scope and objectives of research problem.

Approaches of investigation of solutions for research problem– data collection– analysis– interpretation– Necessary instrumentations

Effective literature studies approaches– analysis Plagiarism– Research ethics,

Effective technical writing– how to write report– Paper Developing a Research Proposal– Format of research proposal– a presentation and assessment by a review committee


COURSE OUTCOMES:
At the end of this course, students will be able to
1. Analyze research related information
2. Follow research ethics
3. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

REFERENCES:
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

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COURSE OBJECTIVES:
- To train the student to analyze food components
- To make the students aware of the standards of food quality
- To study about the different engineering properties of foods
- To study the methods of determining the quality and properties of different foods

LIST OF EXPERIMENTS
1. Estimation of Glucose
2. Estimation of Protein
3. Estimation of free fatty acids
4. Estimation of Acid Value
5. Estimation of Saponification Value of Oil
6. Drying characteristics of vegetables.
7. Estimation of Curcumin in Turmeric Powder
8. Estimation of Chlorophylls in Bitter Guard
9. Estimation of Fructose
10. Estimation of Lactic Acid in Fermented Cabbage
11. Estimation of Inulin
12. Estimation of preservative level in juices
13. Determination of Microbial load in Meat and Meat products

**COURSE OUTCOMES:**
1. Students would be able to assess the quality of the food
2. Students would be able to develop newer methods of food analysis
3. The students have gained knowledge of engineering properties of food material.
4. Students would be able to estimate the glucose, protein and free fatty acid contents of food.
5. Students can estimate the saponification value and acid value of oils.

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**COURSE OBJECTIVES:**
- To train the student to analyze food components
- To make the students aware of the standards of food quality
- To study about the different preparation methods of food products
- To study the methods of determining the quality and properties of different foods
LIST OF EXPERIMENTS

1. Production of Wine from Grapes
2. Osmatic Dehydration of Vegetables
3. Estimation of Total Soluble Solids in fruits and vegetables
5. Estimation of acidity in fruit juices and pulps (Tomato pulp)
6. Preparation of candies and chocolates
7. Determination of vitamin C (Ascorbic acid) in fruits and vegetables
8. Production of Icing Sugar
9. Determination of fruit content in fruit juices
10. Preparation of snack foods based on cereals, nuts, fruits and vegetables
11. Lyophilization
12. Preparation of Jam
13. Preparation of Marmalades

COURSE OUTCOMES:

1. Students would be able to assess the quality of milk, milk products, fruits and vegetables.
2. Students would be able to develop newer methods for the production of food products.
3. The students have gained knowledge of engineering properties of food materials.
4. Students can able to prepare chocolates, jam and snack foods.
5. Students would able estimate the acidity and fruit content in fruit juices.

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COURSE OBJECTIVES:

- Enable the students to understand about transport phenomena.
- To know about thermal processing of food.
- To know about drying of milk, fruit juices and liquid foods.
- To learn about membrane filtration.


Principles of other food processing such as membrane filtration (ultra- osmosis – reverse osmosis – dialysis) – pulsed electric – irradiation – other non-thermal technologies.

REFERENCES:


COURSE OUTCOMES:

At the end of the course, the student will be able to

1. Understand the transport phenomena with respect to foods.
2. Know about canning, sterilization and aseptic processing, HTST, UHT. Understand about sterilization, pasteurization and blanching processes.
3. Understand the principles of mass and energy balance.
4. Understand the process of freezing and thawing.
5. Understand membrane filtration, pulsed electric and irradiation.

| Mapping with Programme outcomes |
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**COURSE OBJECTIVES:**
Enable the students to understand about
- Milk and its composition, properties and uses of milk constituents.
- Quantitative analysis of milk.
- Manufacturing processes of milk products.
- Food hygiene.


Homogenization: Classification– single stage and two stage homogenizer pumps– power requirement– care and maintenance of homogenizers– aseptic homogenizers– Evaporation and


REFERENCES:

COURSE OUTCOMES:
At the end of the course, the students will be able to know about
1. Milk constituents, sampling of milk, cream, condensed milk and analysis of butter and cheese.
3. The steps involved in the processing of milk.
4. Various dairy equipments used in dairy industry.
5. Dairy plant layout and design.

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COURSE OBJECTIVES:
- To train the student to analyze food components
- To make the students aware of the standards of food quality
- To study about the different engineering properties of foods
- To study the methods of determining the quality and properties of different foods

LIST OF EXPERIMENTS
1. Qualitative & Quantitative analysis of Iron in Wheat flour
2. Determination of Riboflavin, Thiamine in fortified flours by HPLC
3. Qualitative & Quantitative analysis of Benzoic acid in beverages
4. Analysis of Non-Nutritive Sweeteners (Saccharin) in beverages
5. Estimation of Total fat in Meat and Meat products
6. Determination of Meat swelling capacity
7. Determination of Total Volatile bases in fish and frozen fish
8. Determination of moisture content, sodium chloride and ash content in dried fish
9. Adulteration- Testing for food adulteration in various foods
10. Determination of starch & Acidity in the canned fish
11. Estimation of Gluten in wheat flour
12. Analysis of Milk

COURSE OUTCOMES:
1. Students would be able to assess the quality of wheat flour, meat and fish.
2. Students would be able to develop newer methods of food analysis.
3. The students have gained knowledge of engineering properties of food materials.
4. Students can able to know various analyses related to juices and beverages.
5. Student can know the production and analysis of milk products like butter, cheese.

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COURSE OBJECTIVES:

- To train the students in the field work related to Food technology and to have a practical knowledge in carrying out work at Food technology
- To train and develop skills in solving problems during execution of certain works related to Food technology

The students individually undergo a training program in reputed concerns in the field of Food technology during the summer vacation (at the end of second semester for full-time/ IV semester for part time) for a minimum stipulated period of four weeks. At the end of the training, the student has to submit a detailed report on the training they had, within ten days from the commencement of third semester for full time/fifth semester for part time. The student will be evaluated by a team of staff members nominated by head of the department through a vivavoce examination

COURSE OUTCOME:

1. The student can face the challenges and practice with confidence
2. The student will be benefitted by the training with managing the situation arises during the execution of work related to food process industries.

Semester III

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Dissertation Phase – I and Phase – II

Teaching Scheme Lab work: 20 and 30 hrs/week for phase I and II respectively

COURSE OBJECTIVES:

At the end of this course, students will be able to

- Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
- Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
- Ability to present the findings of their technical solution in a written report.
• Presenting the work in International/ National conference or reputed journals.

Syllabus Contents:
The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following:
• Relevance to social needs of society
• Relevance to value addition to existing facilities in the institute
• Relevance to industry need
• Problems of national importance
• Research and development in various domains

The student should complete the following:
• Literature survey
  Problem Definition
• Motivation for study and Objectives
• Preliminary design / feasibility / modular approaches
• Implementation and Verification
• Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:
• Experimental verification / Proof of concept.
• Design, fabrication, testing of Communication System.
• The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II
• As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
• The dissertation may be carried out preferably in-house i.e. department’s laboratories and centers OR in industry allotted through department’s T & P coordinator.
• After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include Springer/Science Direct. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.

• Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
• Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.
• Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the phase-I work.
• During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
• Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress.
• Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work.

COURSE OUTCOMES:
Students will be able to
1. Study and execute new technical problems related to food processing technology.
2. Know different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
3. Present the findings of their technical solution in a written report.
4. Gain knowledge to transform technology into commercials by scaling up.
5. Present the work in International/ National conference or reputed journals.

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PROGRAMME ELECTIVES

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COURSE OBJECTIVES:
• Enable the students to learn about the structure and composition of cereals, legumes and oilseeds.
• To know about the processing of wheat, rice, corn, barley and oats.
• To know about the processing and storage of edible oil.
• To learn various oil extraction processes.


REFERENCES:

COURSE OUTCOMES:
At the end of the course, the student will be able to
1. Learn about the structure and composition of cereals, legumes and oilseeds.
2. Know about the processing of rice, wheat, barley, corn and oats.
3. Know about the equipments used for the processing of cereals.
4. Understand the production of edible oil, flour, protein concentrates and isolates.
5. Understand about the mechanism of oil extraction and oil refining.
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### COURSE OBJECTIVES:

To acquaint the student about
- Various raw materials used in bakery industry.
- Different bread making methods.
- Production of cakes and biscuits.
- Production of various cookies.


REFERENCES:

COURSE OUTCOMES:
1. This course equips students to have knowledge about the functional properties of various essential ingredients such as flour, yeast, water, salt and other ingredients such as sugar, fat, milk, colour, flavor used for the making of bread.
2. The students will be able to know about the manufacturing processes of various breads.
3. The students will be able to know the making of biscuits.
4. The students will be able to know the making of cakes and cookies.
5. The students will be able to learn various baking products other than bread like pastries, wafers.
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### CHFTPEXX

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### COURSE OBJECTIVES:
To enable the students about the:
- Preprocessing of fresh fruits and vegetables.
- Freezing of fruits and vegetables and associated problems.
- Dehydration of fruits and vegetables.
- Different packaging of processed fruits and vegetables.


Canning, Juices & Concentrates– Different unit operations involved in fruit and vegetable–Pulp/juice extraction– concentration– Bulk aseptic packaging of fruit and vegetable pulps– juices and concentrates– aseptic packaging of fruit drinks– juices and other products– Bottling–canning – essential principles– different types of cans– unit operations in canning– blanching–exhausting– processing conditions– Fruit Juice– pulp– Nectar and concentrates– general and
specific processing– different packing including aseptic– vegetable purees and pastes– processing of tomato and tomato products.


REFERENCES:

COURSE OUTCOMES:
1. This course equips students to have knowledge about the processing of fruits and vegetables like handling, grading, cleaning and pretreatments.
2. The students will be able to learn various freezing methods of fruits and vegetables.
3. The students will be able to know about different drying methods like sun drying, cabinet drying, tray drying, spray and vacuum drying.
4. The students will be able to know pulp and juice processing.
5. At the end of the course students able to understand about fruit and Vegetable products and Standards.

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COURSE OBJECTIVES:
To acquaint the student about the
- Structure and composition of meat.
- Various slaughtering types.
- Processing and preservation of poultry meat.
- Processing, preservation and transportation of fish.


REFERENCES:
COURSE OUTCOMES:
At the end of the course, the students will be able to know about
1. Chilling, freezing, canning, cooking, drying and pickling of meat.
2. Slaughtering, dressing, handling, storage and preservation of poultry meat.
3. Post mortem changes in fish muscle, freezing of fish and shell fish.
4. Importance of marine products.
5. Handling, preservation and transportation of fish.

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COURSE OBJECTIVES:
To acquaint the student about the
- Definition, classification and ingredients used for the manufacture of beverages.
- Knowledge and skills of process techniques and equipments used for the production of beverages.
- Processing of coffee beans, cocoa beans.
- Manufacturing process of beer.


Occurrence—chemistry of the cocoa bean—changes taking place during fermentation of cocoa bean—processing of cocoa bean—cocoa powder—cocoa liquor manufacture.


Beverage industries– Effective application of quality controls– sanitation and hygiene in beverage industry–Quality of water used in beverages– threshold limits of various ingredients according to PFA– EFSA and FDA – Absolute requirements of Soluble solids– titrable acidity in beverages.

REFERENCES:

COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Understand various concepts, principles and procedures involved in processing of beverages.
2. Know the processing of coffee and cocoa beans.
3. Know the various unit operations involved in the food beverage manufacturing.
4. Know the manufacture of alcoholic beverages based on fruit juices, cereals and sugar cane.
5. List the quality control steps in beverage preparation.

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37
COURSE OBJECTIVES:

- Enable the students to understand the definition and importance of confectionery products.
- To learn about the ingredients used for the manufacture of chocolate.
- To know about the processing of chocolates.
- To know the manufacture of caramel, toffee and fudge.


REFERENCES:


COURSE OUTCOMES:
1. This course equips students to have knowledge about confectionary and chocolate products, sugar based confectionaries, ingredients, chocolate and cocoa products.
2. The students will be able to know the manufacturing practices of confectionery products.
3. The students can know the manufacture of sugar confectioneries like lollipops, gums and jellies.
4. The students can know the manufacture of caramels, toffee and fudge.
5. The students can understand the flour specification and ingredients used for flour confectioneries.

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COURSE OBJECTIVES:
To acquaint the student about
- The concept and importance of food safety in food process industry.
- Various food safety as well as food hygiene programs.
- Food safety regulations and management systems.
- Hazard analysis and risk assessment.

Food safety concept– Importance of food safety in the food processing industry– Risk classification– National and international food regulatory agencies– General food laws – food safety regulations– Nutritional labelling regulation (mandatory and optional nutrients, nutritional descriptors and approved health claims) – Microbial contamination (including cross-contamination/indirect contamination) – Chemical contamination– Physical contamination– Allergen contamination


REFERENCES:

COURSE OUTCOMES:
At the end of the course, the students will be able to understand about
1. Concept of food safety.
2. Various food safety programs.
4. Food hygiene programs.
5. Food safety regulations and management systems.
### Mapping with Programme outcomes

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### COURSE OBJECTIVES:

- Enable the students to understand the history and origin of food laws.
- To learn about food quality, safety and testing.
- To know about food laws and implementing agencies, food safety and standards.
- To know the international scenario in food regulation.


therein– Integrated Food Law – Multi departmental – multilevel to single window control system– consumer protection Act


REFERENCES:

COURSE OUTCOMES:
1. This course equips students to have knowledge about food quality standards like BIS, Agmark, other optional standards and the difference between mandatory and optional standards.
2. The students will be able to know about food safety systems including quality standards, testing of ingredients, additives and standards of weight and measurements.
3. The students will be able to know various food laws and implementing agencies.
4. The students will be able to understand the international scenario in food regulation.
5. The students will be able to know the necessity of harmonized food standards for international trade.

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42
COURSE OBJECTIVES:
To acquaint the student about
- Various packaging materials and their properties.
- Packaging systems and methods used for the packaging of fresh and processed foods.
- Packaging of fruits and vegetables.
- Packaging design.


REFERENCES:
COURSE OUTCOMES:
1. This course equips students to have knowledge about various functions of food packaging.
2. The students can able to know different packaging materials and their properties.
3. The students can understand various packaging systems and methods.
4. The students will know the packaging of fruits and vegetables.
5. The students will be able to know the packaging design and environmental issues in packaging.

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COURSE OBJECTIVES:
- Enable the students to understand the definition, concept and evolution of nutraceuticals and functional foods market.
- To learn about natural occurrence of phytochemicals and isolation of phytochemicals from plant materials.
- Enable the students to know the isolation of phytochemicals from plant materials.
- To know the development of functional food.


Isolation of phytochemicals from plant materials– Care in handling and storage of raw materials with minimal damage to sensitive bioactive compounds– Extractive methods for maximum recovery and minimal recovery and minimal destruction of active material– stability studies– Recent developments in the isolation– purification and delivery of phytochemicals.


REFERENCES:

COURSE OUTCOMES:
At the end of the course, the students will be able to know about the
1. Significance and relevance of nutraceuticals and functional foods in the management of diseases and disorders.
2. Isolation of phytochemicals from plant materials.
3. Definition, types and relevance related to Prebiotics, probiotics and symbiotics.
5. Concept of personalized medicine.

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COURSE OBJECTIVES:

- To understand the principles of toxicology, classification and characteristics of toxic agents.
- To learn about the natural toxins in food.
- To know about food allergies and sensitivities.
- To study about environmental contaminants.


Natural Toxins in Food– Natural toxins of importance in food – Toxins of plant and animal origin– Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins) – Natural occurrence– toxicity and significance– Food poisoning– Mycotoxicoses of significance– Determination of toxicants in foods and their management.


Environmental Contaminants – Drug Residues in Food– Fungicide – pesticide residues in foods– heavy metal and their health impacts– use of veterinary drugs (e.g. Malachite Green in fish and β- agonists in pork) – other contaminants in food– Radioactive contamination of food– Food adulteration– potential toxicity of food adulterants.


REFERENCES:

COURSE OUTCOMES:
The students will be able to understand the
1. Biotransformation and mechanisms of toxicity.
2. Natural toxins in food.
3. Food allergies and sensitivities.
4. Environmental contaminants and drug residues in food.
5. Food additives and toxicants added or formed during food processing.

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COURSE OBJECTIVES:
- To know about the types of food processing wastes.
- To learn various treatment methods.
- To study the utilization of by-products.
- To learn biomethanation and biocomposting.


Biomethanation and biocomposting technology for organic waste utilization– incineration – efficient combustion technology– Integration of new and renewable energy sources for waste utilization.
REFERENCES:

COURSE OUTCOMES:
The students will be able to understand the
1. The importance of waste recycling and recovery system.
2. Treatment of plant wastes.
3. Various technologies available for the utilization by-products from fruits and vegetable processing industries.
5. Biomethanation and biocomposting technology.

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COURSE OBJECTIVES:
- Enable the students to understand the definition, scope and techniques in operational research.
- To learn about the structure and operation of food plant.
- To know about deterministic and probabilistic models.
- To know about industrial cost accounting, purchase procedure, budget and budgetary control.


REFERENCES:

COURSE OUTCOMES:
1. This course equips students to have knowledge about food plant management.
2. Students will be able to know about the structure and operation of food plants.
3. The students will understand about building of deterministic and probabilistic models.
4. The students will learn about network models, computer applications.
5. Students will be able to know about industrial cost accounting.

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COURSE OBJECTIVES:
- Enable the students to know the classification of agrochemicals
- To know about agrochemical residues
- To study various veterinary drugs.
- To know the chemicals used in grains and spices.


Agrochemical residues– Pesticides– fungicides– herbicides– permitted levels– toxicity details– methods to remove these residues.


Veterinary drugs including antibiotics and hormones– purpose of use– classification– residue levels – its associated hazards and toxicity.

Uptake of agrochemicals from soil– water– environment– packaging by plant foods– Concept of organic farming and systems.

REFERENCES:

COURSE OUTCOMES:
The students will be able to understand about
1. Agrochemicals including growth regulators.
2. The agrochemical residues.
3. Various chemicals used in grains and spices.
4. Veterinary drugs.
5. The concept of organic farming.
COURSE OBJECTIVES:

- Enable the students to understand the science behind flavouring foods.
- To know the legal aspects on use of flavours in food products.
- To understand the biogenesis of flavours in food.
- To study about sensory evaluation of flavours.

Sources of flavours (natural–processed and added) – Flavour composites (natural– semi-synthetic– synthetic).

Biogenesis of flavours in food– natural and processed foods (Maillard Reaction – lipid Oxidation).

Analysis of Flavour (Subjective and objective) –Formulations of flavours– adulteration– Flavour emulsions– Flavour production in fermented foods– Off-flavours in foods.

Spices and spice-based products as flavours– Plantation crops as flavours– tea, coffee, cocoa and vanilla.

Sensory evaluation of flavours– selection of flavourist– flavours and legal issues.

REFERENCES:

COURSE OUTCOMES:
The students will be able to know about
1. Various natural and processed flavours, their properties and sources.
2. The formulation of flavours.
3. Spices and spices based products as flavours.
4. Sensory evaluation of flavours.
5. The legal issues related to the addition of flavours.

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COURSE OBJECTIVES:
This course enables the students to
- Learn about the concept of cryogenics and its applications.
- Understand various cycles of cryogenics.
- Know about cryogenic refrigerators for different applications, handling and instrumentation of cryogenic fluids.
- Storage and transportation of cryogenic fluids.


Thermophysical properties of cryogenic fluids – VLE data on mixtures of cryogenic liquids– Prediction of thermodynamic properties – Transport properties of cryogenic fluids– Unique properties of noble gases and Hydrogen isotopes – selection of proper cryogenic fluid for freezing of foods – medical application


REFERENCES:

COURSE OUTCOMES:
The students equips students
1. For selecting the proper cryogenic fluid for particular application like freezing of foods, medical application.
2. To know cryogenic liquefaction processes.
3. To learn thermophysical properties of cryogenic fluids.
4. About cold exchange in cryogenic fluids.
5. About the storage and transportation of cryogenic fluids.

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<th>CHFTOEXX</th>
<th>JUICE PROCESSING TECHNOLOGY</th>
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**COURSE OBJECTIVES:**
This course enables the students to
- Learn about the basic fundamentals of juice processing.
- Know the processing of fruits.
- Learn about fruit beverages.
- Know the equipments used for juice extraction.

Juice Processing— Present status of juice processing in India and Abroad— Recent advances in juice processing technology— Prospects of future growth in juice processing in India.


Juice Processing: – orange juice— Grape juice— Lemon & Lime juice— Pineapple juice— Apple juice— Mango juice.

Fruits Beverages & other processing— Fruit Beverages— Orange squash— Grape fruit squash— Lemon squash— Pineapple squash— Syrups— Rose— Sandal— Pineapple— Orange— Mulberry & Apple— Carbonated beverages— lemon— lime— pineapple— Fruit juice concentrate— tamarind juice concentrates and fermented beverages— tropical fruit beverages— Manufacture of non alcoholic beverages.

Equipments & tools for juice extraction— Equipments for fruit juices— Washing equipment— sorting— extraction equipments— Halving & burring machine— Roller type press— Crusher for grape berries— Pulping equipment— Straining and screening— filtration equipment— flash pasteurizer.

**REFERENCES:**

COURSE OUTCOMES:
The students would know about
1. The recent advances in juice processing
2. Fruits and its processing.
3. Fruit beverages.
4. The manufacture of non alcoholic beverages.
5. Various equipments and tools used for the extraction of juices.

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<th>CHFTOEXXX</th>
<th>PROCESS INSTRUMENTATION AND CONTROL IN FOOD PROCESSING</th>
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COURSE OBJECTIVES:
- Enable the students to provide sound knowledge in the concepts of process instrumentation.
- To gain the knowledge related to the measurements in food processing.
- To learn about controllers and indicators.
- To study about computer based monitoring and control.


Measuring and controlling devices in food processing– role– Classification – types of transducers– Selection of transducers– Actuating and controlling devices.


Computer – Based Monitoring and Control – Introduction – Importance of monitoring and control – Hardware features of a data acquisition and control – Remote data acquisition – signal interfacing – Examples of computer based measurement and control in food processing.
REFERENCES:

COURSE OUTCOMES:
1. This course equips students to have knowledge of field instrumentation.
2. The students will be able to know the application of control systems in various processes.
3. The students would know the measurements in food processing.
4. The student will be able to understand various controllers and indicators.
5. The students would understand computer based monitoring and control.

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COURSE OBJECTIVES:
- Enable the students to provide sound knowledge on grain based snacks.
- To know about flour based products.
- To learn about extruded snack foods.
- To review current practices for preparation of fried chips and other snacks.


REFERENCES:

COURSE OUTCOMES:
1. This course equips students to have knowledge on grain based snacks.
2. The students would know about flour based snacks.
3. The students will be able to understand the formulation and processing of extruded snack foods.
4. The students would know the colouring, flavouring and packaging of snack foods.
5. The students will be able to know the equipments used for frying, baking, roasting, and toasting.