



**DEPARTMENT OF TECHNOLOGY,
SHIVAJI UNIVERSITY KOLHAPUR
FINAL YEAR B.TECH**

Scheme of Teaching and Examination: Semester- VII (Food Technology)

Subject Code	Subject	Teaching Scheme with Credits (Hours / Week)				Examination Scheme (Marks)					
		L	T	P	Total Credits	Theory			Practical		
						Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
FT 411	Meat, Poultry and Fish Processing Technology	04	-	-	04	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT 412	Legume and Oilseed Technology	04	-	-	04	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT413	Food Quality and Safety Management	04	-	-	04	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT414	Food Biotechnology	04	-	-	04	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT415	Elective –I	03	-	-	03	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT411L	Meat, Poultry and Fish Processing Technology Laboratory	-	-	02	01	-	-	-	EOE	50	20
FT412L	Legume and Oilseed Technology Laboratory	-	-	02	01	-	-	-	EPE	50	20
FT413L	Food Biotechnology Laboratory	-	-	02	01	-	-	-	IOE	50	20
FT414L	Major Project-Phase I	-	-	04	02	-	-	-	IOE	100	20
FT416	Internship II	-	-	-	01	-	-	-	IOE	50	20
	Total	19	-	10	25	-	500	-	-	300	-

Audit Course V

HS411	Introduction to Indian Constitution	02	-	-	-	Institute Level	--	---	---	----	----
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Total contact hours per week: **29+2=31**

Elective I	
1. Functional Foods & Nutraceuticals :	(FT 415.1)
2. Beverages Technology :	(FT 415.2)
3. Refrigeration Engineering :	(FT 415.3)
4. Database Management :	(FT 415.4)

Note: Tutorials and Practical to be conducted in batches with batch strength not exceeding 15 students

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

IPE: Internal Practical Evaluation

EPE: External Practical Examination

IOE: Internal Oral Evaluation

EOE: External Oral Examination

Note: There will be an industrial training for minimum 30 days after semester VI. This will cover the study of a reputed Food industry from standpoint of Food Technology. The students will submit a report of the training. This particular activity is equivalent to one credit and it carries 50 marks as an Internal Oral Evaluation (IOE) which is included in Semester VII. The students will follow one specific format recommended by the Program Advisory Board for submission of their industrial training report.

MAJOR PROJECT (Phase I)

Teaching Scheme: P: 4 hour/week

Credits: 02

The students are required to carry out one of the following projects related to field of Food Technology.

1. Process based Project: Manufacture of product.
2. Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
3. Experiment based Project: Experimental investigation of basic or applied research problem.
4. Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation under the guidance of one or more faculty members.

The activity will be undertaken at the beginning of the seventh semester in consultation with concerned guide and it must be completed in eighth semester. The project work is to be carried out by a group of students (not more than five students in a group).

The students will submit the report to the respective guide, present their work at the end of Semester. They need to cover the following aspects related to their project topic:

- Introduction to the Project topic
- Detailed Literature Survey on the topic.
- Plan/outline of the Project work.
- Submitting requirements for execution the project work.

Based on the first phase work, it is desirable that the project group will publish a review article in a reputed and relevant Journal. The project group has to deliver Project Progress presentation using LCD provided by the institute.

The project progress will be evaluated by a research and review committee of internal teachers. The committee includes concerned guide, the Program Coordinator, and other faculty members at the Department. This particular activity is assigned 100 marks as an IOE. The committee will evaluate the performance of the project group.

The students will follow one specific format recommended by the Program Advisory Board for submission of their Project Report.

INDUSTRIAL TRAINING REPORT

Credit: 1

The industrial training after Semester VI and before commencement of Semester VII will cover the study of reputed food industries from standpoint of food technology. The report of the training is required to be submitted by the students. The evaluation of this particular activity is included in this Semester VII.

Scheme of Teaching and Examination: Semester- VIII (Food Technology)

Subject Code	Subject	Teaching Scheme with Credits (Hours / Week)				Examination Scheme (Marks)					
		L	T	P	Total	Theory			Practical		
						Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
FT421	Post Harvest Technology of Plantation Crops	04	-	-	04	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT422	Design and Development of New Products	04	-	-	04	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT423	Waste Management of Food Industries	03	-	-	03	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT424	Elective-II	03	-	-	03	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT425	Food Plant Design and Layout	04	-	-	04	CIE	50	20	-	-	-
						SEE	50	20	-	-	-
FT426	Entrepreneurship Development for Food Technologists	02	-	-	02	-	-	-	IOE	50	20
FT421L	Post Harvest Technology of Plantation Crops Laboratory	-	-	02	01	-	-	-	IOE	50	20
FT422L	Design and Development of New Products Laboratory	-	-	02	01	-	-	-	EOE	50	20
FT423L	Major Project-Phase II	-	-	06	03	-	-	-	IOE	100	40
						-	-	-	EOE	50	20
	Total	20	-	10	25	-	500	-	-	300	-

Audit Course VI										
HS422	Professional Ethics	02	-	-	-	Institute Level	-	-	-	-

Total contact hours per week: **30+2=32**

Elective II	
1. Flavors Technology	: (FT 424.1)
2. Snack Foods Technology	: (FT 424.2)
3. Sugar Technology	: (FT 424.3)
4. Energy Systems and Technology	: (FT 424.4)

Note: Tutorials and Practical to be conducted in batches with batch strength not exceeding 15 students

CIE: Continuous Internal Evaluation
 IPE: Internal Practical Evaluation
 IOE: Internal Oral Evaluation

SEE: Semester End Examination
 EPE: External Practical Examination
 EOE: External Oral Examination

ELECTIVE-II (OPEN ELECTIVE)

Besides the departmental electives there is a concept of open elective listed under Teaching Scheme: L: 3 hours/week Credits: 3

The interested students have to choose the open elective from any of the specialized program available on the campus. The students have to contact the concerned course teacher and attend the classes in the respective course which will be taught by the concerned teacher.

MAJOR PROJECT (PHASE II)

Teaching Scheme: P: 06 hours /week

Credits: 3

In the second phase of the Project Work, all the project groups will carry out actual execution the work planned as stated as an outcome of the first phase in the seventh semester. They will submit the final project report in two hard bound copies along with soft copy to the guide. The guide will submit one copy to the Program office and the other copy will be owned by him/her. The report will be prepared in a standard format as provided by the Program Advisory Board.

Generally, the report will consist of Introduction, Review of Literature, Materials and Methods, Result & Discussion, Summary & Conclusion and References. There may be little variation in project report writing depending on the nature of the respective project problem under investigation.

The objective of the project is to make use of the knowledge gained by the students at various stages of the B.Tech Food Technology Program. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the students at the end of the studies.

This particular activity will be for 100 marks as an Internal Practical Evaluation (IPE). The same research and review committee will carry out the assessment of the project groups.

For External Practical Examination (EPE) carrying 50 marks, there will be external examiners to assess the project work. The research and review committee along with the external examiner will examine each of the project groups through VIVA VOCE and physical verification of the project models if any. The students group using the LCD will demonstrate their work to all the examiners.

Detailed Evaluation and Examination Scheme

1. Out of total 100 theory marks, 50 marks are assigned for Continuous Internal Evaluation (CIE). In CIE, obtaining minimum 20 marks is essential. It is similar to term work, the completion of which is mandatory to become eligible to appear for the Semester End Examination (SEE). Failing to complete the term in a particular course i.e. not obtaining 20 marks in CIE out of 50 shall be treated as term not granted in that course and it is on the part of the course teacher to officially inform the particular case through the respective Program Coordinator and the Director to the University Examination Section. The section will take a kind note of the same and it will not issue the hall ticket of the particular students for the SEE in the particular course/s.
2. CIE (50 marks) includes :
 - Internal Test - I, of 20 marks in 5th week on 1st & 2nd Unit
 - Internal Test - II, of 20 marks in 10th week on 3rd & 4th Unit
 - Activities for the students: 10 marks. It is at the course teacher's discretion to get the assignments of varied nature completed by the students. However, the course teacher will plan to cover those course objectives that suit course learning outcomes and program outcomes that may not be covered in the internal tests.
3. For the Semester End Examination (SEE), 100 marks (3 hours) paper will be set and finally it will be converted to 50 marks. The students must secure minimum 40 % i.e. 20 marks in SEE as the University examination passing head.
4. Final theory marks (out of 100) will be the addition of CIE (out of 50 marks) and SEE (out of 50 marks).
5. Internal Practical/Oral Evaluation (IPE/IOE) will be on the basis of Internal Oral/ Practical/Tutorials/Seminar in which students must secure minimum 40% i.e. 20 marks. It is similar to the term work, the completion of which is mandatory to be eligible to appear for the Semester End Examination (SEE).
6. External Practical/Oral Examination (EPE/EOE) will be conducted under the supervision by some external course expert. The minimum score 40% i.e. 20 marks is required to be secured as the University's passing head in EPE/EOE.
7. *Semester End Examination duration will be 4 hrs.
8. Equivalence for the Course: As elaborated at the end of this whole curriculum document.

Academic Autonomy:

1. Flexibility in deciding Structure and Contents of Curriculum with reasonable frequency for changes in the same.
2. Continuous Assessment of Students performance with newly adopted - Credit System based on award of grade.
3. Credits are simply a means of attaching relative values to courses of different components. These are a currency of learning and in general regarded as a measure of the time typically required to achieve a given curricular outcome.
4. All theory courses under each Program/Discipline are unitized.

Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow him/her to progress at an optimum pace suited to his/her ability or convenience. Each course by every student needs to fulfill minimum requirements of credits for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the Program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All Programs are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course: Process Modeling and Simulation: 5 credits (4-0-2)

The credits indicated for this course are computed as follows:

4 hours/week lectures = 4 credits

0 hours/week tutorial = 0 credit

2 hours/week practical = $2 \times 0.5 = 1$ credit

The contact hours in this case of 5 credits course is 6 hours per week. (4 h Lectures + 0 h Tutorial + 2 h Practical = 6 hours per week.)

For each lecture or tutorial credit, the self study component is 1 hour/week and 1 hour/week for laboratory work of 2 hours/week. In the above example, the student is expected to devote $4 + 1 = 5$ hours per week on self study for this course, in addition to class contact of 6 hours per week.

Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance and allows the students to progress at an optimum pace suited to individual ability and convenience.

Features of Credit System at Shivaji University, Kolhapur:

Every course is allotted credits based on its academic importance/weightage.

1. All Courses may not have same credits.
2. There will be 23 to 28 Credits / Semester.
3. Absolute Grading System with 7 Passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.
4. Getting FF grade in 4 heads in one academic year, he/she is considered as failed.
5. Continuous Evaluation: Unit Test I i.e. T_1 [20 marks], and Unit Test II i.e. T_2 [20 marks]. Activities will be for 10 marks and the course owner/in charge will have discretion to decide the nature of activities.
6. Standardization of courses: Normally each course is unitized in 6 numbers. Unit Test I on Units I and II while Unit Test II on Units III & IV, SEE will be based on all the Units of the course curriculum.
7. Unit Test I & Unit Test II will be supervised and evaluated by internal course teachers while SEE will be evaluated mostly by external and internal teachers as joint examiner ships.
8. Any request for re-test will not be entertained after internal test.

9. For both the semesters' failure courses, re-examination will be only after the even Semester End Examination. No re-examination will be conducted for odd semester courses in even semester or vice-versa.

Attendance rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such conditions, the attendance requirement will be a minimum of 75 % of the classes actually held. A student with less than 75 % attendance in a course during the semester, in lectures, tutorials and practical taken together (as applicable), will be awarded the 'F' grade in that course irrespective of his/her performance in the tests.

Taking into account the consolidated attendance record for the whole semester, the course in charge in consultation with the Program Coordinator will award 'XX' grade to the student who is deficient in attendance. For the purpose of attendance calculation, every scheduled practical class will be counted as one Unit irrespective of the number of contact hours.

Attendance record will be maintained based upon roll calls (or any equivalent operation) in every scheduled lecture, tutorial and practical class. The course owner will maintain and consolidate attendance record for the course (lectures, tutorials and practical together, as applicable).

Evaluation system:

1. Semester Grade Point Average (SGPA) =

$$\frac{\sum (\text{course credits in passed courses} \times \text{earned grade points})}{\sum (\text{Course credits in registered courses})}$$

2. Cumulative Grade Point Average (CGPA) =

$$\frac{\sum (\text{course credits in passed courses} \times \text{earned grade points}) \text{ of all Semesters}}{\sum (\text{Course credits in registered courses}) \text{ of all Semesters}}$$

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below:

Ist Division with distinction: CGPA \geq 8.25 and above

Ist Division : CGPA \geq 6.75 and $<$ 8.25

IInd Division : CGPA \geq 6.25 and $<$ 6.75

As per AICTE Handbook (2011-12), gradation is as follows:

Grade Points	Equivalent Percentage Range
6.25	55
6.75	60
7.25	65
7.75	70
8.25	75

Conversion of CGPA to corresponding equivalent percentage marks for CGPA > 5.0 may be obtained using the following equation:

$$\text{Equivalent Percentage marks} = (\text{Respective CGPA} \times 10) - 7.5$$

An example of these calculations is given below:

Typical academic performance calculations - I semester

Course no.	Course credits	Grade awarded	Earned credits	Grade points	Points Secured
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (Col 4 * Col 5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	0
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Semester Grade Point Average (SGPA) =

$$\frac{(124)}{(21)}$$

$$= 5.90$$

2. Cumulative Grade Point Average (CGPA) =

Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this sem.) = 248
Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\frac{\Sigma (124 + 124)}{44}$$

$$\frac{\sum (23 + 21)}{\dots} = 5.63$$

Chart for marks range and its corresponding grade and grade points

Audit
Courses:

Marks Range	Grade Points	Grade	Description of Performance
91-100	10	AA	Outstanding
86-90	09	AB	Excellent
76-85	08	BB	Very Good
66-75	07	BC	Good
56-65	06	CC	Fair
46-55	05	CD	Average
40-45	04	DD	Poor
Below 40	00	FF	Fail
--	--	\$	Passed in first attempt
--	--	PP	Passed (Audit Course)
--	--	NP	Not Passed (Audit Course)
--	--	** 2 nd *** 3 rd **** 4 th	One grade punishment for 2 nd , 3 rd , 4 th , ... attempt,

Additional courses shall be included as audit courses from the third semester onwards. While the performance of the student in audited courses shall be included in the Grade Card, these grades do not contribute to SGPA or CGPA of the concerned student.

Award of Degree:

Following rules prevail for the award of degree:

1. A Student has registered and passed all the prescribed courses under the general institutional and departmental requirements.
2. A student has obtained $CGPA \geq 4.5$.
3. A student has paid all the institute dues and satisfied all the requirements prescribed.
4. A student has no case of indiscipline pending against him/her.

5. Institute authorities shall recommend the award of B.Tech degree to a student who is declared to be eligible and qualified for above norms.

CGPA Improvement Policy for award of degree:

An opportunity shall be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to 4.00 but less than 4.50, to improve his/her grade by allowing him/her to appear for 100% examinations of maximum two theory courses of seventh and eighth semester. However, CGPA shall be limited to 4.5 even though the performance of a student as calculated through modified CGPA becomes greater than 4.5.

Class and Semester	:	Final Year B. Tech. (Food Technology), Part IV, Semester VII						
Course Title	:	Meat, Poultry and Fish Technology				Course Code	:	FT 411
Teaching Scheme (Hours)	:	4 hours/ week = 4 X 13 weeks = 52 hours minimum				Total Credits	:	04+01=05
		Tutorial = Nil						
		Practical= 2 hours/ weeks						
Evaluation Scheme (Marks)	:	CIE = 50 SEE= 50	EOE= 50	:	Total Grand =150	Duration of SEE	:	3 hours
Revision	:	Third				Month	:	June, 2019

Pre-requisites	:	The students should have the knowledge of Food Preservation
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	List skills based on the Bloom's Taxonomy decide whether it come under Cognitive, Affective domain, Psychomotor domain
Course Assessment Methods: <ol style="list-style-type: none"> Continuous Internal Evaluation: Unit Test I and Unit Test II, Home Assignments Semester End Examination 		
Course Objective: <ol style="list-style-type: none"> To understand the current status of livestock as well as the nutritional profile of meat, poultry (egg and chicken) and fish etc. To learn processing methods used to prepare different types of meat, poultry and fish based products To gain knowledge of different methods used for grading To learn different techniques used for stunning and slaughtering of the animal 		

5. To learn processing methods used to preserve egg and fish
6. To learn and understand the quality control techniques used to standardized the products

Course Outcome

1. Students will be able to understand the status of livestock as well as the nutritional profile of meat, poultry (egg and chicken) and fish
2. Students will learn the processing methods used to prepare different types of meat, poultry and fish based products
3. Students will be able to describe different methods used for grading
4. Students will be able to describe different techniques used for stunning and slaughtering of the animal
5. Students will be able to learn the processing methods used to preserve egg and fish
6. Students will be able to describe the quality control techniques used to standardized the products

Syllabus	Hours
UNIT – I Introduction Sources and developments of meat and poultry industries and importance in national economy	8
UNIT –II Muscle Muscle structure, chemical composition and physico-chemical properties of meat muscle Abattoir design and layout	8
UNIT-III Slaughtering and Post-mortem changes of meat Slaughtering of animals and poultry, post-mortem inspection and grading of meat. Factors affecting post-mortem changes, properties and shelf life	10
UNIT-IV Processing and preservation of meat Processing and preservation of meat- mechanical deboning, aging or chilling, freezing, pickling, curing, cooking and smoking of meat and Meat tenderization	10

UNIT-V Egg		8
Egg structure, composition, quality characteristics, processing, preservation of eggs and their products.		
UNIT- VI Fish		8
Fish Types, examination, care in handling & transportation, processing, freezing, canning salting and drying of fish. Fish sauce and protein concentrates.		
Text Books and Reference Books	:	<ol style="list-style-type: none">1. Aberle Elton D., Forrest John C., Gerrard David E. and Mills Edward W. (2012). Principles of Meat Science.2. Albert Levie. (1967). Meat Hand Book.3rd Revised Edition3. Ralston Andrew Lawrie. (1981). Developments in Meat Science Volume 2.4. Singh Ra. (2013). Poultry Production.5. Frank Gerrard. (1951). Meat Technology: A Practical textbook for Students and butcher.

Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester VII			
Course Title	:	LEGUME AND OILSEED PROCESSING TECHNOLOGY		Course Code:	: FT412
Teaching Scheme (Hours)	:	Lectures 4 hours/weeks=4 x 13 weeks= 52 hours minimum Tutorial= 0 hour/week Practical= 02 hours/week		Total Credits	: 04+01=05
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EPE=50	Grand Total=150	Duration of SEE : 3 hours
Revision:	:	Third		Month	: June 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments
2. Semester End Examination.

Course Objectives:

1. To gain knowledge of present status and future prospects of legumes and oil Seeds
2. To create awareness about the processing and milling of major legume and oilseed.
3. To study the storage and handling techniques of major legume and oilseed
4. To study about the byproducts obtained during processing along with their uses.

Course Outcomes:

1. The students will have an understanding of the concepts of physiological characteristics of legumes and oilseeds
2. The students will have an ability to gain knowledge in processing of legumes and oilseeds
3. The students will have better understanding the tools and equipment used for post-harvest Technology of legumes and oilseeds
4. The students will have an ability to acquire confidence to get a placement in any kind of oilseeds and legumes processing industry
5. The students will have an understanding of legume and oilseed product's processing, packaging and storage conditions
6. The students will have thorough knowledge of value added products developed from legumes and oilseeds

Syllabus Content	Hours
UNIT I Present Status and future prospects of legumes and oil Seeds	6
Major legumes, oilseeds and pulses grown in the country and their application, present Status and future prospects of Pulse milling industry in India.	
UNIT II Morphology and classification of legumes, oilseeds and pulses	8
Morphology and Classification of legumes, oilseeds and pulses. Chemical composition and nutritional value. Antinutritional factors, their chemistry, methods of removal of antinutritional factors	
UNIT III Dehulling and Milling of oilseeds, legumes and pulses.	10
Methods of dehulling-. Home, cottage and commercial scale. Modern techniques of dehulling. Milling of oilseeds, legumes and pulses: Dal milling principles, methods, equipment and effect on quality. Principle products, fermented products of legumes.	
UNIT IV Processing of oilseeds, legumes and pulses.	10
Soaking principles, methods of soaking, sprouting, puffing, and roasting. Physical and bio-chemical changes during these processes	
Protein foods :tofu, miso, texturized vegetable protein, hydrolyzed vegetable protein, formulation and processing	
UNIT V Cooking quality of dhal	8

<p>Cooking quality of dhal, methods, factors affecting quality of dhal, cooking of dhal, quick cooking of dhal and instant dhal.</p> <p>UNIT VI Oil extraction and Refining of oils</p> <p>Oil extraction methods: mechanical Pressing. Solvent extraction process: principle, pretreatment - breaking, cracking, flaking, extraction principle and Desolventization. Factors affecting the extraction process.</p> <p>Refining of oils :</p> <p>Refining, degumming, neutralization, bleaching, filtration, deodorization of oils and their principles and process controls.</p>	10
Text Books	:
<ol style="list-style-type: none"> 1. Chakraverty A, Majumdar A.S, VijayaRaghavan G.S and Ramaswamy H.S. Hand Book of PostHarvest Technology. Marcel Dekker Inc., New York. Basel, 1999. 2. Chakraverty A. Post-Harvest Technology of Cereals, Pulses and Oil seeds. Oxford and IBH Publishing Co. Ltd., Calcutta. 3. Bailey's Industrial Oil and Fat Products: Processing Technologies Edible Oil and Fat Products: 5" by Fereidoon Shahidi 4. Chemistry and Technology of Oils & Fats by <u>M.M. Chakrabarty</u>, Allied Publishers, 2003 	
Reference Books	:
<ol style="list-style-type: none"> 1. Achhayya K.T. Oil seeds and Oil Milling in India. Oxford and IBH Publishing Co., New Delhi, 1999. 2. Heldman, D.R. and Singh R. P..Ed.IV 2009. Introduction to Food Engineering. ElsevierPub 3. Desrosier, N.W, "The Technology of Food Preservation", CBS Publishers and Distributors, New Delhi 1996. 4. Ruth H. Matthews: Pulses – Chemistry, Technology and Nutrition Mercel Dekker Inc. USA (1989) 	

Class and Semester	:	Final Year B. Tech. (Food Technology), Part IV, Semester VII			
Course Title	:	Food Quality & Safety Management	Course Code	:	FT 413
Teaching Scheme (Hours)	:	4 hours/ week = 4 X 13 weeks = 52 hours minimum	Total Credits	:	4+0=4
		Tutorial = Nil			
		Practical=00 hours/ weeks			
Evaluation Scheme (Marks)	:	CIE = 50 SEE= 50	EOE= 00	:	Total Grand =100
				:	Duration of SEE
Revision	:	Third	Month	:	June, 2019

Pre-requisites	:	The students should have the knowledge of Food Quality & Safety Management
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbibed	:	List skills based on the Bloom's Taxonomy decide whether it come under Cognitive, Affective domain, Psychomotor domain
Course Assessment Methods:		
1. Continuous Internal Evaluation: Unit Test I and Unit Test II, Home Assignments		
2. Semester End Examination		
Course Objective:		
1. This course helps the students to the basic knowledge of food quality and Safety aspects		
2. Introduce students to quality assessment of different food products		

3. Introduce students to various regulatory aspects for food business operators
4. Introduce the sensory assessment for different food products

Course Outcome:

1. Students will be able to understand the food quality aspects and need of food safety.
2. Students will be able to apply and analyse the quality assessment for perishable food products.
3. Students will be able to apply and analyse the quality assessment for non-perishable food products.
4. Students will be able to understand the various regulatory aspects for food business operators
5. Students will be able to understand the various voluntary standards for food processing industries.
6. Students will be able to understand, apply and analyse the sensory assessment for different food products

Syllabus	Hours
UNIT – I Introduction to food quality & Food safety management Food quality, its role in industry, Factors affecting quality control, Quality Attributes-Classification: Quality attributes, dominant attributes, hidden attributes	8
UNIT –II Methods of quality assessment of Perishable food material Sampling and specification of raw materials and finished products, Methods of quality assessment of food materials fruits, vegetables, dairy products, meat, poultry, egg and processed food products etc	8
UNIT-III Methods of quality assessment of Non Perishable food material	10

Methods of quality assessment of food materials Cereals, Bakery and confectionery, Spices and plantation Crop		
UNIT-IV Regulatory system in food processing Food laws and standards: FSSAI, Concept of Codex Alimentations/ /USFDA Food Safety Modernization Act (FSMA)/, BIS standards, BRC standards, International Food Standard (IFS)		10
UNIT-V Voluntary standards Food Safety management system: ISO 22000, HACCP, PRP and OPRP: GMP, GLP, GAP, GHP, GDP, Global Food Safety Initiative (GFSI) and Global-Gap.		8
UNIT- VI Sensory Evaluation Introduction -Panel Screening, Selection of Panel members, Requirements for conducting Sensory Evaluation and serving, Procedures, Methods of Sensory Evaluation, Instrumental analysis in quality control		8
Text Books and Reference Books	:	<ol style="list-style-type: none"> 1. Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. 2. "Principles of Sensory Evaluation of Food". Academic Press, New York. 2. Birk, G.G., Herman, J.G. and Parker, K.J. Ed. -1977. 3. "Sensory Properties of Foods". Applied Science, London. 3. Charalambous, G. and Inglett, G. 1981. 4. "The Quality of Foods and Beverages". (2 vol.set). Academic Press, New York. 4. Furia, T.E. Ed. 1980. 5. "Regulatory Status of Direct Food Additives". CRC Press, Florida. 5. Krammer, A. and Twigg, B.A. 1970. " 6. "Quality Control for the Food Industry". 3rd Edn. AVI, Westport. 6. Pattee, H.E. Ed. 1985. 7. "Evaluation of Quality of Fruits and Vegetables". AVI, Westport.

Class and Semester	:	Final Year B. Tech (Food Technology) Part IV Semester-VII							
Course Title	:	FOOD BIOTECHNOLOGY				Course Code:	:	FT 414	
Teaching Scheme (Hours)	:	Lectures 4 hours/weeks =4 x 13 weeks= 52 hours minimum				Total Credits	:	03+0=03	
		Tutorial= 0 hour/week							
		Practical= 2hours/week							
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	IPE= NIL IOE= 50 EPE= NIL	:	:	Grand Total= 150	Duration of SEE	:	3 Hrs
Revision:	:	Third				Month	:	June 2019	

Pre-requisites: The students should have basic knowledge of Food science, Food Processing and biochemical engineering

Type of Course: Theory

Course Domain: Core

Skills Imbided: List Skills based on the Bloom's Taxonomy decide whether it come under Cognitive, Affective domain, Psychomotor domain.

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II
2. Semester End Examination

Course Objectives:

1. To impart conceptual knowledge of regulatory and social aspects of Biotechnology.
2. To gain comprehensive knowledge of transgenic food safe for human consumption.

3. To introduce new techniques for production of fermented foods.
4. To instill knowledge regarding upstream and downstream processes of various fermented food products.

Course Outcomes:

1. Understanding knowledge regarding use of biotechnology in various fields.
2. Understanding knowledge regarding use of biotechnology in food sector which helps in producing different products.
3. Understanding the importance of microbiology in understanding biotechnology.
4. Students will be able to understand the fermented food technology to prepare various healthy products.
5. Students will be able to understand upstream and downstream processing improvement techniques in production of various nutrients and medicines.
6. Knowledge and understanding of production of recombinant proteins and additives to use in food technology, transgenic foods, diagnostic system used in food industry.

		Hours
UNIT-I Introduction to Food Biotechnology History and development of biotechnology. Regulatory, ethical and social aspects of biotechnology of foods.		8
UNIT-II Strain Improvement Techniques Methods of molecular cloning, immobilization of microbial and cultured plant cells. Plant and animal tissue culture.		8
UNIT III Application of Genetics Application of genetics to food production. Genetically modified foods (GMF).		8
UNIT-IV Upstream Processing Improvement Techniques Metabolic Engineering, Production of alcohol, organic acids, enzymes and immobilization of enzymes.		8
UNIT-V Downstream Processing Principles of designing of downstream processing. Product recovery of food flavor, color, polysaccharides, amino acids, vitamins, other volatiles, baker's yeast and single cell protein.		10
UNIT-VI Improvement Techniques in Fermented foods Traditional fermented foods like idli, dosa etc. Soy fermented foods. Other foods like beer, wine, distilled liquor vinegar.		10
Text Books	:	

1. Bains W. 1993, Biotechnology from A to Z, Oxford Univ. Press, Oxford.
2. Crueger, W. and Crueger A. 1984. Biotechnology: A Textbook of Industrial Microbiology. Science Tech. Madison, USA.
3. Joshi, V.K. and Pandey, A. Ed. 1999. Biotechnology. Food Fermentation, (2 Vol. set). Education Publ. New Delhi.

Reference Books	:	
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| | | <ol style="list-style-type: none">1. Knorr, D. 1982. Food Biotechnology. Marcel Dekker, New York.2. Stanburry P.P. and Whitaker, A. 1984. Principles of Fermentation Technology. Pergamon Press, Oxford UK.3. Steinkraus, K.H. 1983. Handbook of Indigenous Fermented Foods. Marcel Dekker, N. York. |
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Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester VII						
Course Title	:	Elective - I FUNCTIONAL FOODSAND NUTRACEUTICALS				Course Code:	:	FT 415 (FT 415.1)
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks=39 hours minimum				Total Credits	:	03+0=03
		Tutorial= 0 hour/week						
		Practical= 02 hours/week						
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EPE=Nil	:	Grand Total=100	Duration of SEE	:	3 hours
Revision:	:	Third				Month	:	Jun 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments
2. Semester End Examination.

Course Objectives:

1. To understand the all types of functional and nutraceutical food.
2. To understand the beneficial effects of functional and nutraceutical food.
3. To provide the students an in depth understanding of bio active components.
4. To understand the principle of specific consumer oriented foods.

Course Outcomes:

1. Better understanding of the concept of functional and nutraceutical foods.
2. Able to gain knowledge of processing of transgenic food and health.
3. Understand the tool used for functional and nutraceutical foods.
4. Thorough knowledge of beneficial effects of functional and nutraceutical foods.
5. Able to acquire confidence to get a placement in any kind of nutraceutical and functional food Industry.
6. To able to design specific consumer oriented food.

	Hours
UNIT I : Introduction	
Scope, importance and renewed emphasis on speciality foods, health foods, functional foods, Nutraceutical, infant and baby foods, adolescent/ teen age foods, foods for pregnant ladies and nursing mothers, geriatric foods.	8
UNIT II : Specific consumer oriented foods	6
Defense persons, Space / astronaut, High altitude mountain climbers, Disaster situation –crises, care, and maintenance.	
UNIT III : Transgenic plant foods with health claims	6
Prebiotics and Probiotics , Genetically modified foods, Proprietary foods, Supplementary foods.	
UNIT IV : Beneficial Effects Functional Foods and Nutraceuticals	6
Beneficial Effects of Spices, gamma-linolenic acid, Spirulina, antioxidants and other food Constituents.	
UNIT V: Bioactive components	5
Sources, extraction methods, uses and health benefits.	

UNIT VI : Development of Functional Foods

8

Low sugar, low calorie foods, foods to address specific physiological disorders

Text Books

:

1. Functional food and nutraceuticals, Aluko, Rotimi E., 2012
2. Functional Foods, Maria Saarela, 2nd Edition, 2011, Woodhead Publishing
3. Handbook of Nutraceuticals and Functional Foods, Robert E. C. Wildman, 2nd Edition, 2006, CRC Press.

Reference Books

:

1. Introduction to functional food science, Dr. Danik Martirosyan, Third edition, vol. I, Dallas TX, USA.

Class & Semester	:	Final Year B. Tech (Food Technology) Part I, Semester VII			
Course Title	:	ELECTIVE I : BEVERAGES TECHNOLOGY			Course Code: : FT 415 (FT 415.2)
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks= 39 Tutorial = 0 hours/week Practical= 0 hours/week			Total Credits : 03+0=03
Evaluation Scheme (Marks)	:	CIE =50	IPE=Nil	:	Duration of SEE : 3 hours
		SEE =50	IOE=Nil	:	
			EPE= Nil	:	
			Grand Total=100		
Revision:	:	Third			Month : June 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of Beverage
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization
Course Assessment Methods: 1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments 2. Semester End Examination.		

Course Objectives:

1. This course helps the students to apply basic food science knowledge and get to know present status and future scope of beverage Industry
2. Introduce students to Ingredients and equipment's required for beverage manufacturing
3. Introduce students to manufacturing of Non Alcoholic and Alcoholic Beverages
4. Introduce students to Quality aspects of all kinds of Beverage

Course Outcomes:

1. Understand the Scope and future prospectus of beverages.
2. Understand and apply the Ingredients and equipment's required for beverage manufacturing.
3. Understand and apply the manufacturing of Non Alcoholic Beverages.
4. Understand and apply the manufacturing of Alcoholic Beverages
5. Describe the principles involved in the Beverage manufacturing
6. Understand and apply the quality and regulatory aspects of all kinds of Beverage

Unit I: Introduction

Types of beverages, Status of beverage industry in India, Scope and importance of Beverage Industry

Hours

5

UNIT II Water

Definition and different types of Water, Manufacturing processes of drinking Water, Water Treatment, BIS quality standards of bottled water; mineral water, natural spring water, flavoured Water, carbonated water.

6

UNIT III Ingredients and Equipment's used in Beverage Manufacturing

Major and Minor Ingredients used for Beverages manufacturing as per regulatory standards of FSSAI and Equipment's used for Beverages manufacturing

6

UNIT IV Non Alcoholic Beverages

Manufacturing process of Non Alcoholic beverages and packaging low-calorie and dry beverages, Isotonic and sports drinks, dairy based fruit beverages, Specialty beverages, tea, coffee, Quality Control aspects of Non Alcoholic beverages

8

UNIT V Carbonated Drink

History and types of soft drinks, Role of various ingredients of soft drinks, manufacturing process of Carbonated beverages. Quality Control aspects of carbonated Beverages and Packaging aspects in Carbonated Beverages

8

UNIT VI Alcoholic and Miscellaneous Beverages

Manufacturing process of Alcoholic beverages and packaging, Quality Control aspects of Alcoholic

Beverages, Coconut water, sweet toddy, sugar cane juice, coconut milk, flavoured syrups		6
		8
Text Books	:	
<ol style="list-style-type: none"> 1. Hardwick WA. 1995. Handbook of Brewing. Marcel Dekker. 2. Hui YH et al 2004. Handbook of Food and Beverage Fermentation Technology. Marcel Dekker. 3. Priest FG & Stewart GG. 2006. Handbook of Brewing. 2nd Ed. CRC. Richard PV. 1981. 4. Commercial Wine Making - Processing and Controls. AVI Publ. 		
Reference Books	:	
<ol style="list-style-type: none"> 1. Varnam AH & Sutherland JP. 1994. Beverages: Technology, Chemistry and Microbiology. 2. Chapman & Hall. Woodroof JG & Phillips GF. 1974. Beverages: Carbonated and NonCarbonated. AVI Publ. 		

Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester VII			
Course Title	:	Elective – I REFRIGERATION ENGINEERING		Course Code:	: FT 415 FT 415.3
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks= 39 hours minimum Tutorial= 0 hour/week Practical= 02 hours/week		Total Credits	: 03+0=03
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EPE=Nil	Grand Total=100	Duration of SEE : 3 hours
Revision:	:	Third		Month	: Jun 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.			
Type of Course	:	Theory			
Course Domain	:	Core			
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization			

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments
2. Semester End Examination.

Course Objectives:

1. This course able to apply basics of refrigeration engineering knowledge
2. Introduce students to methods of refrigerant, chemical requirement.
3. Inform students about Necessity of refrigeration, compressor and condenser.
4. Introduce students to various application methods of different types of food products.

Course Outcomes:

1. Understand the need for refrigeration process.
2. Understand the various refrigerants for food processing.
3. Identify the constituents of compressors refrigerants and condenser.
4. Describe the principle involved in refrigeration technique
5. Thorough knowledge of understanding the in inorganic refrigerant, Brines.
6. Apply the principles of refrigeration in different food products.

	Hours
UNIT 1 : Refrigeration and air conditioning- Necessity of refrigeration and air conditioning, Factors affecting comfort air conditioning History of refrigerants, Classification of Refrigerants: Primary refrigerants – Secondary Refrigerants: Halo carbon refrigerants.	5
UNIT II : Azeotrope refrigerants: Inorganic refrigerants, Ammonia, Air - Carbon dioxide, Sulphur dioxide, Water Hydro carbon refrigerant, Designation system for refrigerants: Designation system for Dichloro-tetrafluoro-ethane.	8
UNIT-III : Chemical requirements of refrigerants: Physical properties of refrigerants Secondary refrigerants: Brines- Applications of various brines. Types of Refrigerators : Air Refrigerator, Vapour refrigerator , Advantages and Disadvantage of vapour compression refrigeration system over air refrigeration system.	6
UNIT IV : Compressor : Classification – Suction pressure, Discharge pressure, Compression ratio, Suction volume, Stroke volume, Clearance factor, Compressor capacity, Volumetric efficiency Reciprocating compressor : Parts of a reciprocating compressor - Cycle of a reciprocating compressor Rotary compressor, Centrifugal compressor, Advantages and disadvantages of a centrifugal compressor.	6
UNIT V : Condensers : Working of a condenser, Factors affecting the condenser capacity, Heat rejection factor Classification of condensers : Air cooled condensers, Water cooled condensers – Tube in condenser – Shell and coil condenser, Fouling factor – Difference between air cooled and water cooled condensers – Evaporative condenser.	6
UNIT VI :	8

Ice manufacturing: principle of ice production Application of refrigeration in different food products, Fruits and vegetables Examples of Food processing by refrigeration and storage – Meat products – fish – poultry products – dairy products Food Freezing – Freezing systems – Indirect contact systems Plate Freezers – air blast Freezers – Freezers for liquid foods Direct contact systems – Air blast – Immersion.

Text Books

:

1. Required: Heating and Cooling of Buildings, Kreider, J.F., Curtiss, P.S. and Rabl, A., 2002., 2nd Edition, McGraw-Hill, New York, NY.
2. Refrigeration and Air Conditioning, Arora C.P., Tata McGraw Hill Pub. Company, New Delhi - 2000.
3. "Principles of Refrigeration", Dosset, R.J., John Wiley & Sons, 2001.
4. Industrial Refrigeration Hand Book, Wilbert F. Stoecker, McGraw-Hill, 1998.

Reference Books

:

1. Modern Refrigeration and Air Conditioning, Andrew D. Althouse, Carl H. Turnquist, Alfred F. Bracciano, Goodheart-Wilcox, 18th Edition, 2003.

Class & Semester	:	Final Year B. Tech (Food Technology) Part I, Semester VII						
Course Title	:	ELECTIVE I: DATABASE MANAGEMENT				Course Code:	:	FT 415 (FT 415.4)
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks=39 hours minimum				Total Credits	:	03+0=03
		Tutorial= 0 hour/week						
		Practical= 0 hours/week						
Evaluation Scheme (Marks)	:	CIE = 50 SEE = 50	IPE=Nil IOE=Nil EPE= Nil	:	Grand Total=100	Duration of SEE	:	3 hours
Revision:	:	Third				Month	:	June 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good command of English and Database Management
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments
2. Semester End Examination.

Course Objectives:

1. This course helps the students to apply basic science of database system
2. Inform students the rational model
3. Inform students the Integrity Constraints and Design
4. Inform students the file and system structure
5. Introduce students to the crash recovery

Course Outcomes:

1. Understand the basic of database system
2. Understand and apply the Rational model
3. Understand and apply the Integrity constraints and design
4. Apply and Analyse the file and system structure
5. Apply and Analyse the crash recovery
6. Understand, Apply and analyse the database system

		Hours
Unit I: Introduction: Purpose of Database Systems, Data abstraction, Data Models, Entities and Entity sets, Mapping Constraints, E-R Diagram, Reducing E-R Diagrams to Tables		8
UNIT II Relational Model: Structure of Relational Databases, The Relational Algebra, Structured Query Language (SQL).		8
UNIT III Integrity Constraints and Design: Domain Constraints, Referential Integrity, Functional Dependencies		7
UNIT IV File and System Structure: Overall System Architecture, File Organization, Organization of Records into Blocks, Sequential Files, Mapping Relational Data to Files, Data Dictionary Storage		8
UNIT V Crash Recovery: Failure Classification, The storage Hierarchy, Transactions Model, Log-Based Recovery, Shadow Paging, Failure with Loss of Non-Volatile Storage		8

Text Books	:	
1. DataBase System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.) Fourth Edition 2. DataBase System Concept by Henry F. Korth, Abraham Silberschatz, (McGraw Hill Inc.)		

Reference Books	:	
<ol style="list-style-type: none">1. Principles of DataBase Systems by J.D. Ullman (Galgotia Publications)2. DataBase Design by Wiederhold (McGraw Hill Inc.)3. Fundamentals of Database Systems – Masri and Navathe (Benjamin Cummings, 1989).4. Database design, application development & administration – Michael V. Mannino (MGH- International Edition)		

Class and Semester	:	Final Year B. Tech. (Food Technology), Part IV, Semester VII			
Course Title	:	Meat, Poultry and Fish Technology Laboratory		Course Code	: FT 411L
Teaching Scheme (Hours)	:	Practical = 2 hours/ weeks		Total Credits	: 1
Evaluation Scheme (Marks)	:	EOE=50	:	Total Grand =50	Duration of EOE : 2 hours
Revision	:	Third		Month	: June, 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good command of English and knowledge of basic science and engineering.
Type of Course	:	Practical
Course Domain	:	Core
Skills Imbided	:	Cognitive: Understand, Apply, Analyze, Evaluate, Create Affective : Awareness, Respond, Value, Organize Psychomotor: Perception, Imitation, manipulation, articulation
Course Assessment Methods: Practical Journal Assessment, Internal Oral Examination and External Practical Examination		
Course Objective: <ol style="list-style-type: none"> 1. To impart knowledge and skills on Pre-slaughtering operations used in Livestock 2. To impart knowledge and skills on slaughtering and dressing of Livestock 3. To impart knowledge on preservation techniques in meat/fish/poultry based products 4. To impart quality evaluation techniques used in Livestock processing industries Course Outcome:		

1. Students will be able to learn the skills required in pre-slaughtering.
2. Students will be able to learn the skills required for slaughtering and dressing of Livestock.
3. Students will be able to learn the preservation techniques used in meat/fish/ poultry based products.
4. Students will be able to learn the quality evaluation techniques used in Livestock processing industries.

Practical List:

1. Pre-slaughtering operations of meat animals and poultry birds
2. Slaughtering and dressing of meat animals
3. Preparation of meat based products
4. Preparation of poultry based products
5. Preparation of fish based products
6. Preparation of egg based products
7. Quality evaluation of meat products
8. Quality evaluation of poultry products
9. Quality evaluation of fish products
10. Quality evaluation of egg products
11. Quality evaluation of egg
12. Evaluation of fish quality
13. Byproducts utilization of egg/meat/poultry/fish processing industry
14. Visit to any meat and poultry processing industries

<i>Class & Semester</i>	:	Final Year B. Tech (Food Technology), Part IV, Semester VII									
<i>Course Title</i>	:	Legume and Oilseed Technology Laboratory					<i>Course Code:</i>	:	FT412L		
<i>Teaching Scheme (Hours)</i>	:	2 hr /week= 2 x13= 26 hours					<i>Credits</i>	:	1		
<i>Evaluation Scheme (Marks)</i>	:	IPE	:	Nil	EPE	:	50	<i>Duration of Exam (in case of External Evaluation)</i>	:	02 hours	
		IOE	:	Nil	EOE	:	Nil				
<i>Revision:</i>	:	Third					<i>Month</i>	:	June 2019		

Pre-requisites

: In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.

Type of Course

: Practical

Course Domain

: Core

Skills Imbued

: Cognitive: Understand, Apply, Analyze, Evaluate, Create

Affective: Awareness, Respond, Value, Organize

Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Practical Journal Assessment, Internal Oral Examination and External Practical Examination

Course Objectives:

1. To gain the practical experience to analyze the physico chemical properties of oil seeds and legumes
2. To have practical experience of processing of legumes and oil seeds
3. To develop protein rich products from oil extracted waste
4. To gain knowledge about milling of legumes

Course Outcomes:

1. The students will have an understanding of physical properties of legumes and oil seeds
2. The students will have practical experience of processing of legumes and oil seeds
3. The students will have practical experience to handle tools and equipment used for post-harvest Technology of legumes and oil seeds
4. The students will have practical experience to develop protein rich products from legumes and oil seeds
5. The Student will be able to understand technology for milling of legume
6. Student will be able to understand technology for Oil Extraction & Oil Seed Processing along with equipment.

Practical List :

1. Physical properties of legumes and oil seeds
2. Methods and principles of dehulling
3. Dal milling process.
4. Cooking quality of dal
5. Fermented product of legumes- dosa, idli, wada, dhokala,
6. Production of protein rich product.
7. Preparation of quick cooking dhal
8. Puffing of legumes
9. Preparation of composite legume flour
10. Determination of antinutritional factors in legumes
11. Extraction of oil
12. Visit to dal mill / oil industry

Lab Manual :

1. Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Reference Books :

1. Achayya K.T. Oil seeds and Oil Milling in India. Oxford and IBH Publishing Co., New Delhi, 1999
2. Guriqbal Singh, Harbhajan Singh Sekhon and Jaspinder Singh Kolar. Pulses. Agrotech
3. Jaswanth Singh and Shukla B.D. Post Harvest Technology of Oil Seeds. Central Institute of Agricultural
4. Chakraverty A, Majumdar A.S, VijayaRaghavan G.S and Ramaswamy H.S. Hand Book of PostHarvest Technology. Marcel Dekker Inc., New York. Basel, 1999.
5. Chakraverty A. Post-Harvest Technology of Cereals, Pulses and Oil seeds. Oxford and IBH Publishing Co. Ltd., Calcutta.

<i>Class & Semester</i>	:	Final Year B. Tech (Food Technology), Part IV, Semester VII									
<i>Course Title</i>	:	Food Biotechnology Laboratory					<i>Course Code:</i>	:	FT413L		
<i>Teaching Scheme (Hours)</i>	:	2 hr /week= 2 x13= 26 hours					<i>Credits</i>	:	1		
<i>Evaluation Scheme (Marks)</i>	:	IPE	:	Nil	EPE	:	Nil	<i>Duration of Exam (in case of External Evaluation)</i>	:	02 hours	
		IOE	:	Nil	IOE	:	50				
<i>Revision:</i>	:	Third					<i>Month</i>	:	June 2019		

Pre-requisites : In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, biological science, microbiology and food processing

Type of Course : Practical

Course Domain : Core

Skills Imbided : Cognitive: Understand, Apply, Analyze, Evaluate, Create
Affective: Awareness, Respond, Value, Organize
Psychomotor: Perception, Imitation, manipulation, articulation

Course Assessment Methods:

Practical Journal Assessment, Internal Oral Examination and External Practical Examination

Course Objectives:

1. To gain the practical experience to isolation of industrially important strains.
2. To have practical experience of various techniques used in biotechnology.
3. To develop
4. To gain in hand experience of producing fermented food products.

Course Outcomes:

1. Students will have practical experience to basic biotechnology.
2. Students will have practical experience of isolation and separation of DNA and proteins.
3. Students will have practical experience to handle tools and equipments used for various biotechnology experiments.
4. Students will have practical experience to develop fermented food products in laboratory.
5. Students will have ability to deal with the issues generated during actual fermentation processes.
6. Student will have practical experience of isolation and storage of important strains used in production of fermented foods.

Practical List :

1. Isolation and Preservation of industrially important Microorganisms.
2. Stabilization of strains of microorganisms useful in fermentation.
3. Scale up kinetic studies in different fermentation processes.
4. Isolation of DNA from bacterial cell.
5. Transformation in E.coli
6. Alcohol production
7. Organic acid production and purification
8. Agarose gel electrophoresis
9. SDS-PAGE
10. Column chromatography
11. Industrial Visit

Lab Manual

1. Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Reference Books

1. Biotechnology procedures and experiments handbook by S.Harisha
2. Guide to food biotechnology (1996) IFST
3. Mosier, N S and Ladisch,M.R(2009)Modern biotechnology. John Wiley and sons.

Class & Semester	:	Final Year B.Tech (Food Technology) Part IV, Semester VII						
Course Title	:	Major Project-Phase I			Course Code:	:	FT414L	
Teaching Scheme (Hours)	:	Lecture= Nil			Total Credits	:	02	
		Tutorial= Nil						
		Practical=4 hours/weeks=4 x 13 weeks= 52 hrs minimum						
Evaluation Scheme (Marks)	:	IOE= 100		:	Grand Total=100	Duration of IOE	:	-
Revision:	:	Third			Month	:	June 2019	

Pre-requisites : In order to complete the course studies successfully, it is important to have a good command of English. Other Pre-requisites include knowledge of basic food science, nutrition, processing, engineering and economics, etc. In addition the students need to revise the basic steps of research methodology.

Type of Course : Practical

Course Domain : Research competency

Skills Imbided : Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate
Affective : Awareness, Respond, Value, Organize
Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

The project work and the report will be evaluated by an internal assessment committee for 100 marks.

Course Objectives:

1. To develop the ability to undertake problem identification, formulation and solution
2. To apply their knowledge of basic science and engineering fundamentals in their project work

Course Outcomes: At the end of the course, Students will be able to

1. Apply their fundamental knowledge for demonstrating the depth technical competency in the area of Food Technology
2. Develop the ability to carry out research and development work
3. Apply oral, graphical and written communication in both technical and non-technical environment

Students are required to carry out one of the following projects related to field of Food Technology.

1. Process based Project: Manufacture of product.
2. Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
3. Experiment based Project: Experimental investigation of basic or applied research problem.
4. Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation under the guidance of one or more faculty members.

The activity will be undertaken at the beginning of the seventh semester in consultation with concerned guide and it must be completed in eighth semester. The project work is to be carried out by a group of students (not more than five students in a group).

The students will submit the report to the respective guide, present their work at the end of Semester. They need to cover the following aspects related to their project topic:

- Introduction to the Project topic
- Detailed Literature Survey on the topic.
- Plan/outline of the Project work.
- Submitting requirements for execution the project work.

Based on the first phase work, it is desirable that the project group will publish a review article in a reputed and relevant Journal. The project group has to deliver Project Progress presentation using LCD provided by the institute.

The project progress will be evaluated by a research and review committee of internal teachers. The committee includes concerned guide, the Program Coordinator, and other faculty members at the Department. This particular activity is assigned 100 marks as an IOE. The committee will evaluate the performance of the project group.

The students will follow one specific format recommended by the Program Advisory Board for submission of their Project Report.

Class & Semester	:	Final Year B.Tech (Food Technology) Part IV, Semester VII					
Course Title	:	Internship II			Course Code:	:	FT 416
Teaching Scheme (Hours)	:	Nil			Total Credits	:	2
Evaluation Scheme (Marks)	:	EPE= Nil	:	Grand	Duration of EOE	:	2 Hours
		IOE=50	:	Total=50			
Revision:	:	Third			Month	:	June 2019

Pre-requisites : The pre-requisite for this course is to have the idea of the overview of the fundamental courses of Food Technology.

Type of Course : Industrial Training

Course Domain : Core practice

Skills Imbided : Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate
Affective : Awareness, Respond, Value, Organize
Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

Students are evaluated during Internal Oral Examination. The evaluation will be based on the internship report as well as attendance and punctuality certificate issued by the concerned organization.

Course Objectives:

1. To expose students to the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions
2. To have hands-on experience in the students' related field so that they can relate and reinforce what has been taught at the university
3. To promote cooperation and to develop synergetic collaboration between industry and the university in promoting a knowledgeable society
4. To set the stage for future recruitment by potential employers

Course Outcomes: At the end of the course, the students will be able to

1. Acquaint to actual working environment
2. Acquire ability to utilize technical resources

3. Write technical documents and give oral presentations related to the work completed
4. Develop attitude of a team player and aptitude for lifelong learning

Course Description

The primary objective of internship is to expose students to meaningful and relevant workplace attachment to better connect their learning to the workplace and deepen their skills, so that they are better prepared for their transition to the workplace after graduation.

The Internship II after Semester VI and before commencement of Semester VII will cover the study of reputed food industries/ organization from standpoint of Food Technology. The report of the internship is required to be submitted by the students. The evaluation of this particular activity is included in Semester VII.

Class & Semester	:	Final Year B.Tech (Food Technology), Part IV, Semester VII										
Course Title	:	Introduction to Indian Constitution						Course Code:	:	HS411		
Teaching Scheme (Hours)	:	Lectures= 2 hr /Week= 2 x14= 28 hours						Credits	:	Nil		
Evaluation Scheme (Marks)	:	Assignments	:	50	Written Test	:	25	Duration of Exam	:	Not Applicable		
		Viva voce	:	25	Grand Total	:	100					
Revision	:	Third						Month	:	June 2019		

Pre-requisites : It has no any pre-requisites. Every citizen of the country ought to study the course content.

Type of Course : Audit Course at institute level

Course Domain : Humanities & Social Science

Skills Imbided : Cognitive: Understand, Predicting Situation, Comprehend,
Affective : Receive, Listen, Respond, Showing self-reliance, Organize
Psychomotor: Imitation, adaptation, articulation, origination

Course Assessment Methods:

The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives:

1. To get familiarity with preamble
2. To understand the fundamental rights and duties of citizens
3. To know about the union and state executives
4. To interpret and recognize the constitutional provisions
5. To understand and follow the electoral process

Course Outcomes: After completion of the course, students will be able to

1. Associate with constitution of India
2. State fundamental duties.
3. Describe union and state executives.
4. Discuss constitutional provisions
5. Illustrate electoral process
6. Report the role of democracy in welfare of society

Curriculum Content	Hours
Unit I: Introduction to Preamble	04
Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases.	
Unit II: Relevance of Directive principles of State Policy under Part – IV.	05
Fundamental duties & their significance.	
Unit III: Union Executive	04
President, Prime Minister, Parliament & the Supreme Court of India.	
Unit IV: State executive	05
Governors, Chief Minister, State Legislator and High Courts.	
Unit V: Constitutional Provisions	05
Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions.	
Unit VI: Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments.	05

Text Books:

1. Durga Das Basu: “Introduction to the Constitution of India” (Students Edn.) Prentice – Hall EEE, 19th/20th Edn. 2001.
2. R.C.Agarwal, “Indian Political System”, (1997) S.Chand and Company, New Delhi. Maciver and Page, “Society: An Introduction Analysis”, Mac Milan India Ltd., New Delhi.
3. K.L.Sharma, “Social Stratification in India: Issues and Themes”, (1997), Jawaharlal Nehru University, New Delhi.

Reference

Books:

1. An Introduction to Constitution of India” by M.V.Pylee, Vikas Publishing, 2002. Sharma, Brij Kishore, “Introduction to the Constitution of India: Prentice Hall of India, New Delhi.
2. U.R.Gahai, “(1998) Indian Political System “, New Academic Publishing House, Jalandhar.
3. R.N. Sharma, “Indian Social Problems “, Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, “(1997) Social Stratification and Change in India “, Manohar, New Delhi.

Class and Semester	:	Final Year B. Tech. (Food Technology), Part IV, Semester VIII			
Course Title	:	Post Harvest Technology of Plantation Crops	Course Code	:	FT 421
Teaching Scheme (Hours)	:	4 hours/ week = 4 X 13 weeks = 52 hours minimum	Total Credits	:	4+1=5
		Tutorial = Nil			
		Practical=2 hours/ weeks			
Evaluation Scheme (Marks)	:	CIE = 50 SEE= 50	IOE= 50	:	Total Grand =150
Revision	:	Third	Month	:	June, 2019

Pre-requisites	:	The students should have the knowledge of Processing of Spices and Plantation Crops
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	List skills based on the Bloom's Taxonomy decide whether it come under Cognitive, Affective domain, Psychomotor domain
Course Assessment Methods: <ol style="list-style-type: none"> 1. Continuous Internal Evaluation: Unit Test I and Unit Test II, Home Assignments 2. Semester End Examination 		
Course Objective: <ol style="list-style-type: none"> 1. This course helps the students to apply basic food science knowledge in spices and plantation crops. 2. Introduce students to major and minor spice processing aspects 3. Introduce students to Post-harvest technology of and processing of tea 4. Introduce students to Post-harvest technology of and processing of coffee 		

Course Outcome:

1. Students will able to understand the need of Spice processing.
2. Students will able to understand the Classification of the spices.
3. Students will able to understand the different Techniques used for extraction of functional ingredients from Spices
4. Students will able to identify the major and minor constituents of food and the chemical reactions in which they participate.
5. Students will able to describe the principals involved in the processing of the major types of food products.
6. Students will able for extraction of functional ingredients from Spices

Syllabus	Hours
UNIT – I Introduction Production and processing scenario of spice & plantation crops and its future scope, Importance and role of spices in food processing Classification and properties of spices and herbs – their products, including medicinal properties.	8
UNIT –II Major spices Ginger, chili, turmeric, onion and garlic, pepper and cardamom its Postharvest technology, composition, processed products	8
UNIT-III Minor spices Cinnamon, clove, coriander, cumin, all spice, sweet basil; caraway seed, cassia, nutmeg, mace, mint, saffron, ajowan, asafoetida	10
UNIT-IV Post-harvest technology of and processing of Plantation Post-harvest technology and processing aspects of cocoa, vanilla, annatto, herbs, seasoning and curry leaves	10
UNIT-V Post-harvest technology of and processing of tea and coffee Types of tea Post-harvest technology of types of tea Green, oolong and	8

<p>CTC, Technology of tea manufacturing process for green tea and black and instant tea. Grading, Packaging, Labeling, specification, Physiochemical and Microbial Quality evaluation of Tea as per food laws and regulations. Types of coffee Post-harvest technology of Coffee, Technology of coffee and instant coffee manufacturing process, Fermentation of coffee beans. Grading, Packaging, Labeling, specification, Physiochemical and Microbial Quality evaluation of coffee as per food laws and regulations.</p>	
<p>UNIT- VI Extraction of functional ingredients from Spices</p> <p>Techniques used to extraction of functional ingredients from minor and major spices. Spice oil, oleoresins and Coloring pigment. Packaging, Labeling and specification as per food laws and regulations.</p>	<p>8</p>
<p>Text Books and Reference Books</p>	<p>:</p> <ol style="list-style-type: none"> 1. K.G. Shanmugavelu. Spices and Plantation Crops. Oxford & IBH Publishing Co., New Delhi 2. J.W. Pursegrove, E.G. Brown, C.L. Green and Robins. Spices, Vol. I and II. SRJ Academic Press, New Delhi. 3. Kenji Hirasaka and Mitsuo Takemasa. 1998. Spice Science and Technology. Marcel Dekker, NY, USA. 4. H.Panda. Handbook on Spices and Condiments (Cultivation, Processing and Extraction). Asia Pacific Business Press Inc., New Delhi. 5. J.S. Pruthi. 2001. Spices and Condiments – Major Spices of India. National Book Trust, New Delhi. 6. S.Gupta. Handbook of Spices and Packaging with Formulae. Engineers India Research Institute, New Delhi 7. Handbook of Herbs and Spices (2012), 2nd edn, edited by K.V. Peter, Woodhead Publishing Ltd., 80 High Street, Sawston, Cambridge CB22 3HJ, UK. Volume 1

Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester-VIII						
Course Title	:	DESIGN AND DEVELOPMENT OF NEW PRODUCTS			Course Code:	:	FT422	
Teaching Scheme (Hours)	:	Lectures 4 hours/weeks=4 x 13 weeks= 52 hours minimum			Total Credits	:	04+01=05	
		Tutorial= 0 hour/week						
		Practical= 02 hours/week						
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EOE= 50	:	Grand Total=150	Duration of SEE	:	4 hours
Revision:	:	Third			Month	:	June 2019	

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization
Course Assessment Methods:		
1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments		
2. Semester End Examination.		
Course Objectives:		
1. Understanding the processes involved in the invention process, formulation, and development of new food products.		
2. Develop an appreciation of the food industry and how innovation is critical to the industry.		
3. Develop and enhance team cooperation and communication skills.		
4. Cultivate basic food science principles to problem solve during product development.		

Course Outcomes:

1. Formulate products by preparing laboratory samples and sourcing raw materials
2. Develop formulations to meet cost targets, ingredient statement, nutrition profile and sensory attributes of desired product.
3. Select optimal packaging system and materials that align packaging requirements with product quality attributes, product compatibility, line processing, sustainability and costs.
4. Determine label and nutrition facts specifications according to regulations for nutrition, product naming, and claims.
5. Determine food preservation technologies to address microflora in products or ingredients.
6. Assess microbiological risks from raw ingredients to finished product.

	Hours
UNIT I Introduction and Scope	6
Need, importance and objectives of formulation for new product development.	
UNIT II Formulation of New Product	8
Ideas, business philosophy and strategy of new product, Formulation based on sources availability and cost competitiveness for concept developments of new products	
UNIT III Technology for New Product	10
Adaptable technology and sustainable technology for standardized formulation for process development.	
UNIT IV Scale up and Trials	10
Process control parameters and scale-up, production trials for new product development at lab and pilot scale	
UNIT V Quality Assessment	8
Quality assessment of new developed products	
UNIT VI Marketing, Economics of New Product, Commercialization and Launching	
Market testing and marketing plan, Costing and economic evaluation of developed	10

products, Commercialization / product launch for marketing		
Text Books	:	
<p>1. New Food Product Design and Development: Beckley, Blackwell Publishing Oxford UK</p> <p>2. Sensory and Consumer Research in Food Product Design and Development Moskowitz, Blackwell Publishing Oxford UK</p>		
Reference Books	:	
<p>1. Desrosier, N.W, “The Technology of Food Preservation”, CBS Publishers and Distributors, New Delhi 1996.</p> <p>2. Ruth H. Matthews: Pulses – Chemistry, Technology and Nutrition Mercel Dekker Inc. USA (1989)</p>		

Class and Semester	:	Final Year B. Tech. (Food Technology), Part IV, Semester VIII						
Course Title	:	Waste Management of Food Industries				Course Code	:	FT 423
Teaching Scheme (Hours)	:	3 hours/ week = 3 X 13 weeks = 39 hrs				Total Credits	:	3
		Minimum						
		Tutorial = Nil						
Evaluation Scheme (Marks)	:	CIE =50	IPE=Nil	:	Grand Total=150	Duration of SEE	:	3 hours
		SEE =50	IOE=Nil	:				
			EOE= Nil	:				
Revision	:	Third				Month	:	June, 2019

Pre-requisites	:	The students should have the knowledge of Food Preservation
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	List skills based on the Bloom's Taxonomy decide whether it come under Cognitive, Affective domain, Psychomotor domain
Course Assessment Methods: <ol style="list-style-type: none"> Continuous Internal Evaluation: Unit Test I and Unit Test II, Home Assignments Semester End Examination 		
Course Objective: <ol style="list-style-type: none"> To study impact of waste generated in food industries on health and the environment To recognize and communicate common processing methods which converts food waste into valuable products To learn the working principles of treatment methods used for effluent and solid waste generated in food industries 		

4. To understand the utilization of waste generated in agro industries
5. To understand the properties waste generated in different food industries
6. To study treatment methods used for recycling the waste generated in food industries

Course Outcome

1. Students will able to learn the impact of waste generated in food industries on health and the environment
2. Students will recognize and communicate common processing methods which converts food waste into valuable products
3. Students will able to describe the working principles of treatment methods used for effluent and solid waste generated in food industries
4. Students will able to describe the utilization of waste generated in agro industries
5. Students will able to describe the properties waste generated in different food industries
6. Students will able to learn the treatment methods used for recycling the waste generated in food industries

Syllabus	Hours
UNIT – I Introduction Types of waste and magnitude of waste generation in different food processing industries, concept, scope and importance of waste management and effluent treatment, Environmental Protection Act and specification for effluent of different food industries	6
UNIT –II Waste Characterization Temperature, pH, Oxygen demands (BOD, COD, TOD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues etc.	4
UNIT-III Effluent Treatment Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation Secondary treatments: Biological oxidation – trickling filters,	8

oxidation ditches, activated sludge process, rotating biological contractors, lagoons Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal		
UNIT-IV Treatment methods for solid wastes Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting pit		6
UNIT-V Waste utilization of agro industries Characterization and utilization of by-products from cereals (breweries), pulses, oilseeds, fruits and vegetables (wineries) and plantation crops (sugar industries)		8
UNIT- VI Waste utilization of animal and marine product industries Characterization and utilization of by-products from dairy, eggs, meat, fish and poultry processing industries		7
Text Books	:	<ol style="list-style-type: none"> 1. Marriott PhD Norman G. and Gravani Robert B. (2006). Principles of Food Sanitation, 5th Edition. 2. Verma L.R. Joshi and V.K. (2000). Postharvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management. Indus Publishing Co. New Delhi. 3. Bhide A. D. and Sundaresan B. B. (2010). Solid Waste Management in Developing Countries. 4. Tchobanoglous George and Kreith Frank. (2002). Handbook of Solid Waste Management.
Reference Books	:	<ol style="list-style-type: none"> 1. Joshi V. K. and Sharma S. K. (2011). Food Processing Waste Management: Treatment and Utilization Technology. 2. AFST (I) and CFTRI. Proceedings of the Symposium on By-products From food Industries: Utilization and Disposal.

Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester VIII			
Course Title	:	Elective - II FLAVOURS TECHNOLOGY		Course Code:	FT 424 (FT 424.1)
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks= 39 hours minimum Tutorial= 0 hour/week Practical= 02 hours/week		Total Credits	03+0=03
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EPE=Nil	Grand Total=100 Duration of SEE	3 hours
Revision:	:	Third		Month	Jun 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization
Course Assessment Methods: 1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments 2. Semester End Examination.		
Course Objectives: 1. To impart compressive overview production and processing scenario flavor. 2. To gain knowledge of natural and synthetic flavor. 3. To introduce knowledge on biogenesis of flavor 4. This course helps to the students for sensory evaluation of flavor and legal issues.		

Course Outcomes:

1. Identify the type and sources of flavor.
2. Understand the principles of natural and processed food flavor.
3. Understand the various sensory evaluation techniques.
4. Students will able to utilize the formulation of flavor and standardization of flavor in food product.
5. Students will able to classify and explain flavor rules and regulations.
6. Student will be able to understand adulteration in flavor emulsion and extrusion methods.

	Hours
UNIT I : Introduction (4 Hrs)	
Production and processing scenario of flavor.	5
UNIT II : Types and sources of flavors (8 Hrs)	
Types of flavors, Sources of flavors (natural, processed and added), Flavor composites (natural, semi-synthetic and synthetic), Flavors production in fermented foods.	8
UNIT III : Biogenesis of flavors (6Hrs)	
Biogenesis of flavors in food – natural and processed foods (Maillard Reaction and Lipid Oxidation).	6
UNIT IV : Extraction and analysis of flavor components (8Hrs)	
Extraction of flavors from various sources, conditions and extracting agents. Analysis of flavors components (Subjective and objective).	6
UNIT V : Sensory evaluation (6Hrs)	
Sensory evaluation of flavors, selection of flavors, flavors and legal issues.	6
UNIT VI : Flavors in industries (8 Hrs)	
Formulations of flavors, Flavors of soft drinks, Baking and confectionery industries, Standards specification of flavors, Adulterations in Flavor emulsions.	8

Text Books	:	
<p>1. Food Flavorings. Ashurst PR. 1994. 2nd Ed. Blackie.</p> <p>2. Handbook of Flavor, Characterization:Sensory Analysis,Chemistry and Physiology. Marcel Dekker. Deibler D & Delwiche J. 2004.</p> <p>3. Food Flavour Technology. Taylor A. 2002. Sheffield Academic Press.</p>		
Reference Books	:	
<p>1. Flavor Chemistry and Technology. Heath HB & Reineccius G.1986. AVI Publ.</p> <p>2.Fenaroli's Handbook of Flavor Ingredients. Burdock GA. 2004. 5th Ed.CRC Press.</p>		

Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester VIII			
Course Title	:	Elective - II SNACK FOODS TECHNOLOGY		Course Code:	FT 424 (FT 424.2)
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks= 39 hours minimum Tutorial= 0 hour/week Practical= 02 hours/week		Total Credits	03+0=03
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EPE=Nil	Grand Total=100 Duration of SEE	3 hours
Revision:	:	Third		Month	Jun 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization
Course Assessment Methods: 1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments 2. Semester End Examination.		
Course Objectives: 1.This course is about knowledge and gets to know about savory flavors. 2.Introduce students to methods of frying, baking, drying, heat processing, flaking, blending, coating & chipping. 3.Inform students on technical mechanism of extrusion. 4.Introduce students to various types of traditional and industrial snacks food.		

Course Outcomes:

1. To give a general outline about the principles, structure and composition, economic importance and storage of different cereals and their products.
2. To acquaint the students with various methods and technologies of value addition to various food materials such as rice, oil, spices and extrusion.
3. Understand properties of ingredients used in extrusion of snack food and reactions of these ingredients during processing into extruded products.
4. Characterize the chemical composition of edible cereal grains in relation to nutritional values and functional properties.
5. On completion of the course, the student will be able to understand about how to process snack foods, preparation of different types of products using.
6. After completing this course students will get to know about the nutritional profile and consumer demand for snack foods.

	Hours
UNIT I : Introduction	5
Importance and scope of snack food technology. Present status of snack foods industries.	
UNIT II : Various types of snack food	8
Technology for grain-based snacks: whole grains – roasted, toasted, puffed, popped and flakes, coated grains-salted, spiced and sweetened; flour based– batter and dough based products; savoury and farsans; formulated chips and wafers, papads, instant premixes of traditional Indian snack foods.	
UNIT III : Technology for fruit and vegetable based snacks	6
Technology for fruit and vegetable based snacks: Chips, wafers.	
UNIT IV : Technology for coated nuts	6
Technology for coated nuts – salted, spiced and sweetened; chikkis.	
UNIT V : Extruded snack foods	6
Formulation and processing technology, coloring, flavoring and packaging, Raw materials & their role.	
UNIT VI : Equipments	8
Equipments for frying, Baking and drying, toasting, roasting and flaking, popping, blending, Coating and chipping.	

Text Books	:	
<ol style="list-style-type: none">1. Snack foods processing. Edmund WL. AVI Publ2. The Technology of Extrusion Cooking. Frame ND .1994. Blackie Academic.3. Snack Food. Gordon BR. AVI Publ.4. Snack Food Technology. Samuel AM.1976. AVI Publ.5. Extruded foods. Matz.		
Reference Books	:	
<ol style="list-style-type: none">1. New protein foods, vol.I,II, A.L. Altschul.2. Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.		

Class & Semester	:	Final Year B. Tech (Food Technology) Part II, Semester VIII					
Course Title	:	ELECTIVE-II : SUGAR TECHNOLOGY			Course Code:	: FT 424 (FT 424.3)	
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks= 39 hours minimum			Total Credits	: 03+0=03	
		Tutorial= 0 hour/week					
		Practical= 0 hours/week					
Evaluation Scheme (Marks)	:	CIE = 50	IPE= Nil IOE=Nil	:	Grand Total=100	Duration of SEE	: 3 hours
	:	SEE = 50	EPE= Nil	:			
Revision:	:	Third			Month	: June 2019	

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good command of English and Sugar Processing
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization
Course Assessment Methods: <ol style="list-style-type: none"> 1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments 2. Semester End Examination. 		

<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. This course helps the students to apply basic food science knowledge and get to know sugar processing 2. Inform students the role of various unit operations and machinery required for sugar processing 3. Introduce students to roles of various chemicals for sugar processing 4. Introduce students to the different quality aspects of produced sugar
<p>Course Outcomes:</p> <ol style="list-style-type: none"> 1. Understand and apply the basic food science of Sugar 2. Understand and apply the effective utilization of sugar cane to develop Sugar 3. Understand and analyse the equipments required for sugar processing 4. Understand and analyse the chemical required for sugar processing 5. Understand, apply and analyse the effective utilization of sugarcane to develop jaggary 6. Understand and analyse the various quality aspects of sugar

	Hours
<p>Unit I:</p> <p>Introduction: Brief account of Sugar Industry and Sugar Manufacturing Process Composition of Sugarcane and Juice, Importance of juice clarification, Weighing and metering of juice (Maxwell Boulogne Scale & Magnetic Flow Meters)</p> <p>Juice Heating: Types of juice heater, construction & working of tubular heater, removal of condensate and non-condensable gases, vacuum equalization, scaling of tubes, cleaning & testing of heater, concept of vapor line & dynamic juice heater. Effect of heat on juice, Purpose of primary and secondary heating. Construction and working of Direct Contact Heater (DCH), Plate Heater (PHE), advantages & disadvantages.</p>	8
<p>UNIT II</p> <p>Clarification: Techniques of clarification; Defecation, Sulphitation & Carbonation, clarificants used in Sugar manufacture. Lime; specification, storage - Preparation of milk of lime; rotary lime slacker, classifier, MOL tanks, lime pumps, use of hydrated lime powder. Sulphur; specification & storage, production of sulphur dioxide gas - combustion of sulphur, construction & working of sulphur burner, film type sulphur burner. Liming & Sulphitation; Effect of liming & sulphitation on cane juice, simultaneous liming & sulphitation.</p>	6

<p>UNIT III</p> <p>Subsidiation and Filtration: construction & working of Dorr clarifier, operation of Dorr, velocity of juice in clarifier, flash tank cleaning & maintenance of clarifier, Vacuum filter; construction and working, effect of washing on pol in cake, filtrate receivers, baby condenser, vacuum pump, filtrate clarification system.</p> <p>UNIT IV</p> <p>Evaporation: Introduction, Construction & Working of Robert type evaporator, Rellieux's principles, working of multiple effect evaporator, factors affecting heat transfer and performance of evaporators.</p> <p>Pan Boiling: Vacuum Pan, Continuous Pan: Boiling Technique</p> <p>UNIT V</p> <p>Refine of Sugar : Crystallisation: Crystallisation while cooling, air cooled & water cooled crystalliser, vertical crystalliser, cooling and reheating of massecuite, transient heater, molasses exhaustion, Centrifugals: Continuous Centrifugals – construction & working, importance of rpm & screen size, factors affecting</p> <p>UNIT VI</p> <p>Manufacturing of Khandasari Sugar: Specification of Khandasari Sugar, Extraction & Clarification of Cane Juice Open Pan Boiling System, Centrifugation Drying & Packing,</p> <p>Manufacturing of Jaggry/ Gur : Extraction of Juice, Clarification of Gur, Concentration of Juice, Drying & grading of Gur, Storage of Gur</p>	<p>6</p> <p>6</p> <p>6</p> <p>7</p>
<p>Text Books</p>	<p>:</p>
<p>1. Principles of Sugar Technology Vol. 2 - Peter Honig 2. Cane Sugar Handbook - D P Kulkarni 3. Handbook of Cane Sugar Technology – R B L Mathur. 4. Introduction to Cane Sugar Technology – G H Jenkins.</p>	

Reference Books	:	
<ol style="list-style-type: none">1. Hand Book of Cane Sugar Engineering – E Hugot2. Introduction to Sugar Technology – Chen & Chou3. Sakhar Nirmiti – By S.V. Karmarkar4. Handbook of Cane Sugar Technology- By Jenkins G.H.5. Cane Sugar Manufacture in India - By D.P. Kulkarni		

Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester VIII				
Course Title	:	Elective-II : Energy Systems and Technology			Course Code:	FT 424 (FT 424.4)
Teaching Scheme (Hours)	:	Lectures 3 hours/weeks=3 x 13 weeks=39 hours minimum			Total Credits	03
		Tutorial= 00 hour/week				
		Practical= 00 hours/week				
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EPE=Nil	:	Grand Total=100	Duration of SEE : 3 hours
Revision:	:	Third			Month	June 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic energy systems
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization
Course Assessment Methods: 1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments 2. Semester End Examination.		
Course Objectives: 1. To gain knowledge of basic concepts of renewable energy systems 2. To gain knowledge regarding utilization methods, merits & demerits of various renewable energy systems 3. To develop the ability of student to analyse issues related various energy systems 4. To develop the ability of student to identify issues and communicate issues within the subject area		

Course Outcomes:

1. Students will have good understanding of renewable energy systems, its components and interaction between components
2. Students will have profound knowledge in special field such as solar energy, wind energy
3. Students will have ability to analyse issues related various energy systems
4. Students will be familiar with innovation and innovation process compared to traditional processes
5. Students will able to conduct research and development in the renewable energy systems
6. Students will have an ability to identify issues and communicate issues within the subject area

	Hours
UNIT I Introduction Energy chains, Energy demand, Energy crises, Worlds production & consumption of energy resources, Impact of energy on sustainable development Energy Management & planning: Energy management principles, Energy & pollution trade off, objectives of energy management, energy strategy & energy planning.	6
UNIT II Solar Energy Introduction, utilization methods, merits & demerits of solar energy utilization, potential of solar energy, solar radiation, data for India, solar thermal collectors, concentrators & reflectors, collector efficiency, application of solar energy, solar cooker, solar water heating, solar dryer, solar distillation, solar photovoltaic systems, solar pond.	6
UNIT III Wind Energy and Geothermal Energy Wind Energy: Introduction, potential & scope, classification & types of wind machines, application of wind energy, merits & limitations of wind energy. Site selection for wind farm, wind map of India, wind energy station in India. Geothermal Energy: Introduction, types of geothermal resources, potential of geothermal resources in India & world. Environmental problems in utilization of geothermal resources.	8
UNIT IV Tidal Energy Tides, tidal range, tidal power, suitably sites & prospects. Types of tidal power plants, single basin, modulated single basin & double basin schemes, main equipment, energy	7

storage.		8
UNIT V Biomass Energy Resources Biomass energy, biomass energy from cultivated crops & from waste organic matter, biomass conversion processes, incineration & thermo chemical, biochemical conversion of biomass, urban solid waste to energy by incineration & from landfill biogas projects, pyrolysis plants, biogas plants. UNIT VI Hydro Energy Introduction, India’s Hydro reserves, merits & limitations, low head , medium head, high head schemes, hydro turbines, economics.		
Text Books	:	
<div>1. Environmental studiesby Benny Joseph,</div> <div>2. Environmental Biology by K. C. Agarwal,</div> <div>3. Environmental Encyclopedia by Cunningham, W. P. Cooper, T. H. Hepworth, Jaico Pub.</div>		
Reference Books	:	
<div>1. Energy & Ecology by David M.Gates, Sinaur Associates</div> <div>2. Non Conventional Energy Sourcesby G.D.Rai,</div> <div>3. Power Technologies by Stephenson,</div> <div>4. Energy Technology by S.Rao & B.B.Parulekar</div>		

Class & Semester	:	Final Year B. Tech(Food Technology) Part IV, Semester VIII						
Course Title	:	FOOD PLANT DESIGN AND LAYOUT				Course Code:	:	FT425
Teaching Scheme (Hours)	:	Lectures 4 hours/weeks=4 x 13 weeks=52 hours minimum				Total Credits	:	04
	:	Tutorial= 00 hour/week						
	:	Practical= 00 hours/week						
Evaluation Scheme (Marks)	:	CIE =50 SEE =50	IPE=Nil IOE=Nil EPE= 50	:	Grand Total=100	Duration of SEE	:	3 hours
Revision:	:	Third				Month	:	June 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good knowledge of basic food science and food engineering.
Type of Course	:	Theory
Course Domain	:	Core
Skills Imbided	:	Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate Affective : Awareness, Respond, Value, Organize Psychomotor: Imitation, manipulation, articulation, naturalization
Course Assessment Methods:		
1. Continuous Internal Evaluation: Unit Test I & Unit Test II, Regular Tutorial, home assignments		
2. Semester End Examination.		
Course Objectives:		
1. To gain knowledge of basic concepts of plant layout and design with special reference to food process industries		
2. To gain knowledge regarding selection of plant location		
3. To develop the ability of student for plant layout and equipment layout		
4. To develop the ability of student for economics and cost analysis for plant designing		

Course Outcomes:

1. Students will have knowledge of advanced unit operations specific to the food industry and of the criteria for the design of complex food plants
2. Students will have knowledge and understanding of the processes, transportation, fuel, and energy and their integration with the skills of food Technology in the design of complex food plants
3. Students will have ability of analysis of food manufacturing processes and their representation in a flow-sheet of the plant.
4. Students will have ability to identify the critical control points where product or process can be compromised, draw, using standard symbols, and factory layouts.
5. Students will be confident, within a food production environment, that they can lead and initiate processing related to foods in a safe and creative manner.
6. Students will have knowledge of waste treatment and management of food plant

	Hours
Unit I Introduction Basic concepts of plant layout and design with special reference to food process industries. Application of HACCP concept, ISO, FPO & MPO requirements in food plant layout and design.	8
Unit II Plant Location Influence of location on plant layout, location factors, location theory and models, Economic plant size, types of manufacturing processes like continuous, repetitive and intermittent processes.	8
Unit III Plant Layout Preparation of a Plant Layout, Plant Layout problem, importance, objectives, classical types of layouts. Evaluation of layout. Advantages of good layout	8
Unit IV Plant Building Considerations in building design, type of factory buildings, choice of building construction, material for floors, foundation, walls, doors, windows, drains etc, ventilation, fly control, mold prevention and illumination in food processing industries.	8

Unit V Plant layout & Equipment Layout		12
Plant layout:		
Plant layout and design of bakery and biscuit industries; fruits and vegetables processing industries including beverages; milk and milk products; meat, poultry and fish processing industries.		
Equipment layout in Food Industries :		
Basic understanding of equipment layout and. Preparation of flow sheets for material movement and utility consumption in food plants.		
Unit VI Cost Analysis		8
Fixed cost, variable cost, depreciation, method of economic analysis, profitability analysis of a plant		
Text Books	:	
<div>1. Plant Layout and Design by James M.Moore (1962), Mac Millan, New York</div> <div>2. Plant Design for Chemical Engg. By Peterse & Timmerhaus, McGraw Hil</div> <div>3. Textbook of Dairy Plant Layout and Design by Prof. Lalat Chander by ICAR, Pusa, Deplhi Publication,2004.</div> <div>4. Food Process Design by Zacharias B. Maroulis published by Marcel Dekker, Inc , Cimarron Road, Monticello, New York 12701, U S A</div> <div>5. Food plant engineering systems by Theunis C. Robberts, CRC Press, Washington</div>		
Reference Books	:	
<div>1. Facility Planning And Layout Design by Chandrashekar Hiregoudar, Technical Publications, 2017</div> <div>2. Applied guide to process and plant design by Sean Moran Elsevier, 2015</div> <div>3. Project Engg. of process plants by Rase & Brrow t John Willey & Sons</div> <div>4. Chemical Engineering Plant Design by Vilbrant & Dryden, Tata McGraw Hill</div> <div>5. Plant Design & Economics for Chemical Engineering, by Peters & Timmerhaus, McGraw Hill</div>		

Class and Semester	:	Final Year B. Tech. (Food Technology), Part II, Semester VIII						
Course Title	:	Entrepreneurship development for food Technologists				Course Code	:	FT 426
Teaching Scheme (Hours)	:	2 hours/ week = 2 X 13 weeks = 26 hours minimum				Total Credits	:	2+0=2
		Tutorial = Nil						
		Practical= Nil						
Evaluation Scheme (Marks)	:	CIE = 00	EOE= 00	:	Grand Total =50	Duration of SEE	:	NIL
		SEE= 00	IOE = 50	:				
Revision	:	Third				Month	:	June, 2019

Pre-requisites	:	The students should have the knowledge about to become a Entrepreneur
Type of Course	:	Theory
Course Domain	:	Entrepreneurship
Skills Imbided	:	List skills based on the Bloom's Taxonomy decide whether it come under Cognitive, Affective domain, Psychomotor domain
Course Assessment Methods: Internal Oral Exam, Assignments		
Course Objective: 1.This course helps the students to the basic knowledge of entrepreneurship and raising the funds for to become food business operator. 2.Introduce students for conducting market research 3.Introduce students to prepare the detail project report for business 4.Introduce students to managerial skills for Small and medium-sized enterprises (SMEs)		

Course Outcome:

1. Students will able to understand the entrepreneurship and raising the funds for becoming food business operator.
2. Students will able to analyze the market status and explore the scope for new product development
3. Students will able understand and apply the knowledge for preparation of detail project report
4. Students will able to acquire the knowledge about different segments in food processing to establish the set up
5. Students will have knowledge of the regulatory and legal aspects for business development
6. Students will have managerial skill for food business development

Syllabus	Hours
Unit I Entrepreneurship Concept/Meaning, Need, Competencies/qualities of an entrepreneur	2
Unit II Entrepreneurial Support System District Industry Centers (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institutes (SISIs), Small Industries Development, Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC), Khadi Village and Industries Commission (KVIC), other relevant institutions/organizations/NGOs at State level	6
Unit III Market Survey and Opportunity Identification (Business Planning) Identification and Guidance Business Plant, Market, Assessment, Procedures for registration of small scale industry, List of items reserved for exclusive manufacture in small scale industry, Assessment of demand and supply in potential areas of growth, Understanding business	6

opportunity, Considerations in product selection, Data collection for setting up small ventures		
UNIT-IV Project Report Preparation Preliminary Project Report, Techno-Economic feasibility report, Project Viability		4
Unit V Managerial Aspects of Small Business Principles of Management (Definition, functions of management viz planning, organization , coordination and control, Operational Aspects of Production, Inventory Management, Basic principles of financial management, Marketing Techniques, Personnel Management, Importance of Communication in business		5
Unit VI Legal Aspects of Small Business Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules, Factory Act and Payment of Wages Act,		3
Text Books and Reference Books	:	<ol style="list-style-type: none"> 1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana) 2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi 3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi 4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi

Class and Semester	:	Final Year B. Tech. (Food Technology), Part IV, Semester VIII			
Course Title	:	Post Harvest Technology Plantation Crops Laboratory		Course Code	: FT 421L
Teaching Scheme (Hours)	:	Practical= 2 hours/ weeks		Total Credits	: 1
Evaluation Scheme (Marks)	:	CIE = 00 SEE= 00	EOE= Nil IOE = 50	Grand Total = 50	Duration of IOE : 2 hours
Revision	:	Third		Month	: June, 2019

Pre-requisites	:	In order to complete the course studies successfully, it is important to have a good command of English and knowledge of basic science and engineering.
Type of Course	:	Practical
Course Domain	:	Core
Skills Imbided	:	Cognitive: Understand, Apply, Analyze, Evaluate, Create Affective : Awareness, Respond, Value, Organize Psychomotor: Perception, Imitation, manipulation, articulation
Course Assessment Methods: Practical Journal Assessment, Internal Oral Examination and External Practical Examination		
Course Objective: 1.To impart knowledge and skills of Physical and Chemical analysis of different Spice Samples 2. To impart knowledge and improve analytical skills of Spice and Plantation crops To impart knowledge of adulteration detection and sensory characteristics of Spices based products To impart quality evaluation techniques used in Spice and Plantation based Products		

Course Outcome:

1. Students will be able to learn the skills required for Physical and Chemical analysis of Spices
2. Students will be able learn the skills required for Extraction of functional ingredients from Spices.
3. Students will be able to learn the identification of Spice and its Characteristics
4. Students will be able to learn the manufacturing and quality evaluation of dried Spices and powdered spice

Practical List:

1. Physical analysis of different Spice Samples
2. Chemical analysis of different Spice Samples
3. Demonstration of process of oil extraction spices.
4. Demonstration of process of oleoresin extraction from different Spices
5. Study of detection of adulteration in spices.
6. Study of sensory characteristics of Spices and oleoresin
7. Demonstration of Dehydration of ginger, process of turmeric
8. Preparation of curry powder
9. Preparation of Spice Album
10. Demonstration of processing of locally available spices and herbs
11. Visit to the Spice processing Plant

Class & Semester	:	Final Year B. Tech (Food Technology), Part IV, Semester VIII									
Course Title	:	Design And Development Of New Products Laboratory					Course Code:	:	FT422L		
Teaching Scheme (Hours)	:	2 hr /week= 2 x13= 26 hours					Credits	:	1		
Evaluation Scheme (Marks)	:	IPE	:	Nil	EPE	:	Nil	Duration of Exam (in case of External Evaluation)	:	02 hours	
		IOE	:	Nil	EOE	:	50				
Revision:	:	Third					Month	:	June 2019		

Pre-requisites: In order to complete the course studies successfully, it is important to have a good knowledge of basic food science, nutrition and food processing.

Type of Course: Practical

Course Domain: Core

Skills Imbided: Cognitive: Recall, Understand, Apply, Analyze, Synthesize

Affective : Awareness, Respond, Value, Organize Psychomotor:
Perception, Imitation, manipulation, articulation

Course Assessment Methods:

1. Continuous Internal Evaluation: Unit Test I & Unit Test II
2. Semester End Examination

Course Objectives:

1. To gain the practical experience to develop new food product
2. To gain knowledge about the formulations.
3. To gain knowledge about Innovation in Food Packaging
4. To gain knowledge about legal issues in product Development

Course Outcomes:

1. Successfully produce food prototypes or food concepts
2. The students will have understanding formulations for new food product.
3. The students will have practical experience of processing new food product.
4. The students will have practical experience to handle tools and equipment used for processing new food product
5. The students will have practical experience to develop nutrition rich products.

6. The Student will be able to understand technology for processing new food product

Practical List :

1. Market survey of existing various products
2. Formulation of new products based on corporate decision /need based
 - a. Protein-energy rich
 - b. Low calorie (fat replacer)
 - c. Low sodium content
 - d. Glycemic index based
 - e. Cholestrolemic index based
3. Product development based on above formulation depending on local sources/ technology
4. Quality assessment
 - a. New product development for
 - b. Infant / weaning foods
 - c. Geriatric
 - d. Physiological status
5. Visit to industry

Lab Manual :

1. Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow.

Reference Books :

1. Desrosier, N.W, "The Technology of Food Preservation", CBS Publishers and Distributors, New Delhi 1996.
2. New Food Product Design and Development: Beckley, Blackwell Publishing Oxford UK

Class & Semester	:	Final Year B.Tech (Food Technology) Part IV, Semester VIII			
Course Title	:	Major Project-Phase II	Course Code:	:	FT423L
Teaching Scheme (Hours)	:	Lecture= Nil	Total Credits	:	03
		Tutorial= Nil			
		Practical=6 hours/weeks=6 x 13 weeks= 78 hrs minimum			
Evaluation Scheme (Marks)	:	IOE= 100	:	Grand	Duration of Exam (in case of External Examination) : 2 Hours
		EOE=50		Total=150	
Revision:	:	Third	Month	:	June 2019

Pre-requisites : In order to complete the course studies successfully, it is important to have a good command of English. Other Pre-requisites include knowledge of basic food science, nutrition, processing, engineering and economics, etc. In addition the students need to revise the basic steps of research methodology.

Type of Course : Practical

Course Domain : Research competency

Skills Imbided : Cognitive: Recall, Understand, Apply, Analyze, Synthesize, Evaluate
Affective : Awareness, Respond, Value, Organize
Psychomotor: Imitation, manipulation, articulation, naturalization

Course Assessment Methods:

The project work and the report will be evaluated by an internal assessment committee for 150 marks.

Course Objectives:

1. To develop the ability to undertake problem identification, formulation and solution
2. To apply their knowledge of basic science and engineering fundamentals in their project work

Course Outcomes: At the end of the course, Students will be able to

1. Apply their fundamental knowledge for demonstrating the depth technical competency in the area of Food Technology
2. Develop the ability to carry out research and development work
3. Apply oral, graphical and written communication in both technical and non-technical environment

In the second phase of the Project Work, all the project groups will carry out actual execution the work planned as stated as an outcome of the first phase in the seventh semester. They will submit the final project report in two hard bound copies along with soft copy to the guide. The guide will submit one copy to the Program office and the other copy will be owned by him/her. The report will be prepared in a standard format as provided by the Program Advisory Board.

Generally, the report will consist of Introduction, Review of Literature, Materials and Methods, Result & Discussion, Summary & Conclusion and References. There may be little variation in project report writing depending on the nature of the respective project problem under investigation.

The objective of the project is to make use of the knowledge gained by the students at various stages of the B.Tech Food Technology Program. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the students at the end of the studies.

This particular activity will be for 100 marks as an Internal Practical Evaluation (IPE). The same research and review committee will carry out the assessment of the project groups.

For External Practical Examination (EPE) carrying 50 marks, there will be a external examiners to assess the project work. The research and review committee along with the external examiner will examine each of the project groups through VIVA VOCE and physical verification of the project models if any. The students group using the LCD will demonstrate their work to all the examiners.

Class &Semester	:	Final Year B.Tech (Food Technology), Part IV, Semester VIII									
Course Title	:	Professional Ethics						Course Code:	:	HS422	
Teaching Scheme (Hours)	:	Lecture= 2 hr /Week= 2 x13= 26 hours						Credits	:	Nil	
Evaluation Scheme (Marks)	:	Assignments	:	50	Written Test	:	25	Duration of Exam	:	Not Applicable	
		Viva voce	:	25	Grand Total	:	100				
Revision	:	Third						Month	:	June 2019	

Pre-requisites : It does not require any pre-requisite as such but eager to know about our profession's connectivity and role and responsibility towards society and environment.

Type of Course : Audit Course at institute level

Course Domain : Humanities and Social Sciences

Skills Imbided : Cognitive: Understand, Predicting Situation, Comprehend,
Affective : Receive, Listen, Respond, Showing self-reliance, Organize
Psychomotor: Imitation, adaptation, articulation, origination

Course Assessment Methods:

The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives:

- 1.To understand of the relation between engineering and society/environment
2. To be aware of ethics and responsibility of engineers as professionals
3. To be able to make ethical judgments and solve problems
4. To develop attitudes required of engineers and values shared by engineers

Course Outcomes: At the end of the course, the students will be able to

1. Realize the role of engineers towards society and environment
2. Demonstrate ethical practices and responsibility as a professional
3. Take ethical judgments and solve problems
4. Develop engineers attitude with sharing of values

Curriculum Content	Hours
Unit I: Engineer, Society and Environment	07
1. Understanding of the relation between engineering and society/Environment. 1.1 Understanding of the effects and impacts of science and technology on human society. 1.2 Understanding the effects and impacts of science and technology on the natural environment. 1.3 Understanding the characteristics of the modern globalized world.	
Unit II: Ethics and engineering Profession	07
2 Understanding of ethics and responsibilities of engineers as Professionals. 2.2 Understanding of the roles and responsibilities of engineers in Society. 2.3 Understanding of the basic concepts and theories of ethics. 2.4 Understanding the relation between law and ethics and having basic legal literacy. 2.5 Understanding of the nature of professional ethics. 2.6 Understanding of the purposes and roles of codes of ethics and those of conduct set by engineering societies and associations. 2.7 Understanding of the social responsibility (SR) of organizations (companies in particular). 2.8 Understanding of ethics in specific areas (and knowledge of concrete cases) 2.9 Understanding the nature of ethics in research and development	
Unit III: Ethical Perception and Problem solving	06
3 Ability to make ethical judgments and solve problems. 3.2 Understanding and application of methods to identify related factors in ethical issues and to make a structural analysis of them. 3.3 Understanding and application of methods to analyze technical factors in ethical issues and make structural analysis of them. 3.4 Understanding and application of methods to analyze organizational factors and provide organizational solutions. 3.5 Ability to design one's conduct to solve ethical problems Based on the abilities to analyze factors gained through 3.2–3.4, 3.6 Comprehensive problem-solving capability	
Unit IV: Engineer's attitude and Social Responsibility	06
4 Attitude required of engineers and values shared by engineers. 4.1 Attitude to think autonomously and independently based on an understanding of the responsibility of an engineer. 4.2 Attitude to accept a diversity of values (recognizing the existence of the various value systems different from their own as well as the multiplicity of values). 4.3 Attitude to share values (such as safety emphasized in the codes of ethics) to which engineers should assign paramount importance. 4.4 Attitude and willpower to act on ethical judgments of their own.	
Reference :	
Books	
1. Charles D. Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.	
2. Seth, M. L., "Principles of Economics", Lakshmi Narain Agarwal, Agra.	
3. Agarwal, A. N., "Indian Economy", Vikas Publishing House Pvt. Ltd., New Delhi.	
4. Datta R. and Sundharam, "Indian Economy", K. P. M., S. Chand & Co. Ltd., New Delhi	
5. Prof. M P Raghavan, "Professional Ethics in Engineering", SCITECH Publication(India) Pvt.Ltd, Second Edition	

Equivalence of Final Year B.Tech (Food Technology)

Semester VII and VIII

The above detailed syllabus is a revised version of the Final Year. BTech (Food Technology) course being conducted by the Shivaji University at the Technology Department of the University. This syllabus is to be implemented from June 2019, (Academic year 2019-20). The prime feature of this revision is the transformation of the existing curriculum into the Outcome based curriculum as specified in NBA rules and regulations.

The Equivalence for the subjects of Food Technology at Final Year B Tech Semester VII and VIII pre-revised course under the faculty of Engineering and Technology is as follows.

Final Year B.Tech Semester VII (Food Technology)

Sr.No	Final Year B.Tech (Food Technology) Semester VII Pre-revised syllabus	Final Year B.Tech (Food Technology) Semester VII Revised syllabus	Remark
1.	Meat, Poultry and Fish Processing Technology	Meat, Poultry and Fish Processing Technology	Change in no of lectures
2.	Legume and Oilseed Technology	Legume and Oilseed Technology	Change in no of lectures
3.	Food Quality & Safety Management	Food Quality & Safety Management	Change in no of lectures
4	Food Biotechnology	Food Biotechnology	Change in no of lectures
5.	Elective –I	Elective –I	No change
6.	Major Project Phase I	Major Project Phase I	Change in no of lectures
7.	Laboratory-I Meat, Poultry and Fish Technology Lab	Meat, Poultry and Fish Technology Laboratory	Slight change in nomenclature
8.	Laboratory- II Legume and Oilseed Technology Lab	Legume and Oilseed Technology Laboratory	Slight change in nomenclature
9.	Laboratory- III Food Quality & Safety Management Lab	-	Removed the lab and the experiments are submerged in other subjects

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10.	Laboratory- IV Food Biotechnology Lab	Food Biotechnology Laboratory	Slight change in nomenclature
11.	Seminar & Industrial Training Report	Internship II	Seminar shifted to Semester VI and Industrial training is renamed as per AICTE circular
12.	Audit Course V Professional Ethics	-	Shifted to semester VIII
13.	-	Audit Course V Introduction to Indian Constitution	Shifted from semester VIII

Final Year B.Tech Semester VIII (Food Technology)

Sr.No	Final Year B.Tech (Food Technology) Semester VIII Pre-revised syllabus	Final Year B.Tech(Food Technology) Semester VIII Revised syllabus	Remark
1.	Post Harvest Technology of Plantation Crops	Post Harvest Technology of Plantation Crops	Change in no of lectures
2.	Design and Development of New Products	Design and Development of New Products	Change in no of lectures
3.	Waste Management of Food Industries	Waste Management of Food Industries	No change
4.	Elective-II	Elective-II	No change
5.	Food Plant Design and Layout	Food Plant Design and Layout	Change in no of lectures
6.	Major Project (Phase-II)	Major Project (Phase-II)	Change in no of lectures
7.	Post Harvest Technology of Plantation Crops Lab	Post Harvest Technology of Plantation Crops Laboratory	Change in nomenclature
8.	Design and Development of New Products Lab	Design and Development of New Products laboratory	Change in nomenclature
9.	Entrepreneurship Development for Food Technologists	Entrepreneurship Development for Food Technologists	No change
10.	Audit Course VI Introduction to Constitution of	-	Shifted to semester VII with title

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	India		change.
11.	Waste Management of Food Industries Lab	-	Removed the lab and the practical are submerged in other subjects
12.		Audit Course VI Professional Ethics	Shifted from semester VII

Audit course have not been assigned any credits. The students will be evaluated for these courses by the concerned course in charge. There will be grade conferred to the student. The grade will be based on conversion of marks obtained out of 50. (Obtaining passing grade is essential). Please refer to chart in the detail examination scheme. The chart shows the marks range and the respective grade.