आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

SCHOOL OF BIOTECHNOLOGY

BACHELOR OF SCIENCE
(FOOD TECHNOLOGY)

[III YEAR PROGRAMME]

CHOICE BASED CREDIT SYSTEM (CBCS)
COURSE STRUCTURE AND SYLLABUS

[Applicable w.e.f. Academic Session: 2022-23]
[*As per CBCS guidelines given by UGC*]

IFTM UNIVERSITY

N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244001
Website: www.iftmuniversity.ac.in

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SCHOOL OF BIOTECHNOLOGY

Study and Evaluation Scheme

of

Bachelor of Science

(Food Technology)

Choice Based Credit System (CBCS)

[Applicable w.e.f. Academic Session - 2022-23]

[As per CBCS guidelines given by UGC]

Summary

Programme:	**Bachelor of Science (Food Technology)**
Programme Level:	**Degree (Under Graduation)**
Duration:	**Three years (Six semesters) Fulltime**
Medium of Instruction:	**English**
Minimum Required Attendance:	**75%**
Maximum Credits:	**146**

IFTM University, Moradabad
Bachelor of Science (Food Technology)

Preamble

Our society has evolved over time and so has the food that we consume. Food is at the epicenter of human existence. There's a growing impetus on healthy food which eventually leads to a healthy lifestyle. In this case, the knowledge about the food and the technology that's used to prepare it, play a vital role. Food science is an emerging discipline that merges into various other disciplines like food chemistry, biochemistry, genetics, microbiology, food engineering and nutrition for its subject matter. Rapid urbanization around the world and lifestyle changes have led to tremendous growth in this field**.** Food science involves the study of the physical, biological, and chemical factors that constitute food. And food technology is taking this science ahead and applying it to the selection, preservation, processing, packaging, distribution, and safe consumption of food.

School of Biotechnology, IFTM University offers **B.Sc. (Food Technology)** to establish the Industry and Research sectors in Food Technology, trained and skilled human resources are required. The field is new and expanding, necessitating investments in infrastructure and technology. The global and local emphasis on developing new technological applications is rapidly expanding.

The current curriculum of B.Sc. Food Technology has been restructured to anticipate the future needs of the Food Technology sector, with a greater emphasis on imparting hands-on skills. The primary emphasis is on making the curriculum compatible with developments in the education, research, and industrial sectors. The uniqueness of the course is having industrial training along with Core Courses, Generic Elective, Ability Enhancement Compulsory Course, Discipline Specific Elective, Skill enhancement courses etc.

Programme Objectives: The program aims to achieve the following objectives:

- To apply fundamental technical knowledge and skills to find workable solutions to technological challenges and problems in diversified areas of Food Processing.
- Ability to apply standard practices and regulation in developing the food and allied products.
- Ability to employ modern technologies to produce new or value-added products in the area of Food Technology.
- To apply and communicate scientific knowledge to meet the needs of industry and the consumer for the production and marketing of safe and quality foods.
- Acquired the skills in planning, carrying out laboratory experiments and also handling scientific instruments while performing it.
- To understand the various Applications of Food Technology.
- Ability to test food for quality, safety and nutrition.
- Ability to develop sustainable solutions and understand their effect on society and environment.

- Ability to apply appropriate tools, techniques and understand utilization of resources appropriately in various laboratories.

PROGRAM OUTCOMES (PO):

Following Program Outcomes will be achieved:

PO1- Disciplinary Knowledge: Utilization the knowledge of science, engineering fundamentals, and techniques to the solution in the field of food technology and other allied subjects.

PO2- Communication Skills: Communicate effectively and write effective reports and design documentation, make effective presentations through seminars, project reports.

PO3- Problem Solving: Identify, formulate, review research literature, and analyze complex Food applications, problems and Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the food sustainability.

PO4- Practical executive skills: Acquire the practical knowledge and demonstrate the ability to design, conduct experiments and analyze data in the field of food technology

PO5- Information/digital Literacy: Learn how to use appropriate software's to apply for bulk scale/industrial production of technology-based food products

PO6- Self-directed learning: To develop an ability of working independently and to make an in-depth study of various disciplines of food technology.

PO7- Moral and ethical awareness: Understand the impact of the professional food technology solutions in societal and environmental contexts, and apply ethical principles and commit to professional ethics and responsibilities

PO8- Lifelong learning: To provides self-directed learning and lifelong learning skills to think independently and develop problem solving skills with respect to food industry

PO9- Advance learning: Ability to peruse advanced studies and research in Allied fields of Food science.

PO10- Intellectual Skills: Ability to analyze and solve problems, critical evaluation of scientific research and can apply knowledge to solve problems.

1. Eligibility

a. **Admission Criteria:** Admission to this undergraduate course shall be carried out through merit.

b. **Qualifying Examination:** 10 + 2 level with Physics, Chemistry and Maths/ Biology/ Home Science.

c. Marks 45% aggregate for general and OBC category and 40 % aggregate for SC/ST category.

2. Curriculum: B.Sc. courses shall be based on semester system which will be of three years duration, divided into three sessions and six semesters. Each session shall be of two semesters, Session- I shall comprise of two semesters i.e., semester-I and semester-II; Session-II shall comprise of two semesters i.e., semester-III and semester-IV; Session- III shall comprise of two semesters i.e., semester-V and semester-VI. The academic will follow the pattern as mentioned below:

Academic Calendar	Classes
I, III and V Semester	August to December
II, IV and VI Semester	January to May
Summer Vacation	June and July

3. Cancellation of Admission: If a student at any stage is found to have concealed any information or have furnished false documents or found to be indulged in gross indiscipline/ misconduct, his/ her admission shall be cancelled and fee deposited by the student shall not be refunded in any case.

Evaluation of Performance

1. **Programme:** Evaluation of performance of the students in a programme shall be a continuous process based on their performance in the class test, quizzes, assignments and the end semester examinations.
    a. **Theory papers in semester system (Maximum Marks: 100)**

    The evaluation will be done through two class test and one end semester examination. This will be in addition to quizzes, assignments, attendance, etc. Each class test will carry a weightage of 10 marks, and the end semester examination will carry a weightage of 70 marks. The remaining 10 marks will be awarded on the basis of attendance and performance in quizzes and assignments.

    b. **Practical in semester system (Maximum Marks: 100)**

    In each practical, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and understanding of the experiment done, which will carry a weightage of 30 marks. There shall be an end semester practical examination with or without an external examiner which will carry a weightage of 70 marks.
2. **Summer Training, Project, etc.:** Summer Training, Project and other learning-oriented activities shall have associated maximum marks and credits, as stated in the syllabus.
3. **Examination:**
    a. The minimum Grade required to pass in each Theory & Practical paper is 'GRADE D'.
    b. A candidate, in order to pass, minimum CGPA of 4.50 is required in a particular academic year inclusive of both semesters of that academic. And maximum numbers of Carryover paper permissible for promotion to next academic year are 06 theory/ practical / project papers.
    c. There shall be no minimum Grade required to pass in General Proficiency (GP). However, Grade obtained in General Proficiency (GP) shall be included in SGPA.
    d. In case of audit paper, the minimum Grade required to pass is Grade D. However, the Grade obtained in audit paper shall not be included in SGPA.

Groups of CBCS:

The 09 groups of courses have been identified to provide student comprehensive exposure to a large number of areas, leading to the holistic development of an individual. These groups / clusters are as follows:

1. Core Courses Theory (CC-T)
2. Core Courses Practical (CC-P)
3. Discipline Specific Elective (DSE)
4. Generic Elective (GE)
5. Ability Enhancement Compulsory Courses (AECC)
6. Skill Enhancement Courses (SEC)
7. Qualifying Paper/MOOCs/NPTEL/Mandatory Course/Value added courses (VAC)/Audit Paper
8. Summer Training Project Report *Viva voce* (STPR)
9. General Proficiency (GP)

1. Core Courses-Theory (CC-T):

Core courses of B.Sc. Program will provide a holistic approach to Food Technology graduates, giving them an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.

The core courses will provide more practical-based knowledge. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding of the subject. A wide range of core courses provides groundwork in the field of Principles of Food Processing, Food Microbiology, Food Chemistry, Food and Nutrition etc.

We offer core courses in semester I, II, III, IV, V, VI, during the B.Sc. Food Technology. There will be 4 credits for each core course offered depending upon the course content.

2. Core Courses-Practical (CC-P):

These courses includes various laboratories designed to provide the student solid foundation to the domain of Food Technology. These courses are of 1 credit each.

3. Discipline Specific Elective (DSE):

i. Elective courses may be offered by the main discipline of study is referred to as Discipline Specific Elective. The University offer discipline related Elective courses of interdisciplinary nature like Food Engineering, Principles of Food preparation, Food Industry by- Products and

Waste Utilization etc. There will be 4 credits for each Discipline Specific Elective course offered depending upon the course content.

ii. Project with a department faculty. It is the exploration of a specific topic within a field by an undergraduate student that makes an original contribution to the discipline.

4. Generic Elective (GE):

An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. This can be a core course offered in a discipline/subject which may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective. These courses include science courses from the disciplines of Physical Chemistry, Plant Physiology, and Introductory Biostatistics etc. These courses are of 4 credits each.

5. Ability Enhancement Compulsory Course (AECC):

These courses are actually Ability Enhancement Course (AEC) which is designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. These courses are of 4 credits each.

6. Skill Enhancement Courses (SEC):

These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. Courses like Modern Analytical Techniques, Techniques in Food Analysis, Food Quality Management etc. will provide skill based technical knowledge for working in special units in industries and to develop them as entrepreneur. These courses are of 4 credits each.

7. **Qualifying Paper/MOOCs/NPTEL/Mandatory Course/Value Added Courses (VAC)/Audit Paper:**

A Value-Added Course is an on-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen toper form well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day- to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a

general reasoning ability for a better performance, as desired in corporate world. This is recommended for every student to take at least one MOOC Course throughout the programme. Every student completing a MOOC course through only NPTEL.

8. Summer Training Project Report *Viva voce* (STPR):

The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other than their regular classes. It is essential to give students hand-on exposure and experience of how things and processes work in industries. This enhances students' exposure to practical learning.

9. General Proficiency (GP):

These courses are designed to develop the ability of students in communication and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language etc.

Summary of Credits

B.Sc. Food Technology: Three-Year (6-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S.No.	**Type of Course**	**Credit**	**Total Credits**
1.	**Core Course-Theory (CC-T)**	14 Courses of 4 Credits each (Total Credit14X4)	56
	Core Course-Practical (CC-P)	14 Courses of 1 Credit each (Total Credit14X1)	14
2.	**Discipline Specific Elective-Theory (DSE-T)**	3 Courses of 4 Credits each (Total Credit 3X4)	12
	Discipline Specific Elective-Practical (DSE-P)	1 Course of 3 Credits (Total Credit 1X3)	03
3.	**Generic Elective (GE)**	4 Courses of 4 Credits each (Total Credit 4X4)	16
4.	**Ability Enhancement Compulsory Course (AECC)**	5 Courses of 4 Credits each (Total Credit 5X4)	20
5.	**Skill Enhancement Courses (SEC)**	4 Courses of 4 Credits each (Total Credit 4X4)	16
6.	**Qualifying Paper/MOOCs/NPTEL/Mandatory Course/Value Added Courses (VAC)/Audit Paper**	1 Course of 0 Credit (Total Credit 1X0)	0
7.	**Summer Training Project Report *Viva voce* (STPR)**	1 Course of 3 Credits (Total Credit 1X3)	03
8.	**General Proficiency (GP)**	6 Courses of 1 Credit (Total credit 6x1)	06
TOTAL			**146**

School of Biotechnology

Programme: Bachelor of Science (Food Technology)
CHOICE BASED CREDIT SYSTEM
Effective from Session 2022-23

Course Code	CBCS BASKET	Credits			
Core Courses- Theory (CC-T)		**L**	**T**	**P**	**C**
BSB101T	Animal Science	3	1	0	4
BSB102T	Plant Science	3	1	0	4
BSB103T	Biochemistry and Metabolism	3	1	0	4
BFT201T	Principles of Food Processing	3	1	0	4
BFT202T	Food Microbiology	3	1	0	4
BSB203T	Chemistry II	3	1	0	4
BFT301T	Food and Nutrition	3	1	0	4
BSB302T	Enzymology	3	1	0	4
BFT401T	Food Chemistry	3	1	0	4
BFT402T	Food preservation Technology	3	1	0	4
Core Courses-Practical (CC-P)		**L**	**T**	**P**	**C**
BSB101P	Animal Science Lab	0	0	2	1
BSB102P	Plant Science Lab	0	0	2	1
BSB103P	Biochemistry and Metabolism Lab	0	0	2	1
BFT201P	Principles of Food Processing Lab	0	0	2	1
BFT202P	Food Microbiology Lab	0	0	2	1
BSB203P	Chemistry II Lab	0	0	2	1
BFT301P	Food and Nutrition Lab	0	0	2	1
BSB302P	Enzymology Lab	0	0	2	1
BFT401P	Food Chemistry Lab	0	0	2	1
BFT402P	Food Preservation Technology Lab	0	0	2	1
Discipline Specific Elective-Theory (DSE-T)		**L**	**T**	**P**	**C**
BFT303T	Food Engineering	3	1	0	4
BFT403T	Principles of Food Preparation	3	1	0	4
Discipline Specific Elective-Practical (DSE-P)		**L**	**T**	**P**	**C**
Generic Elective (GE)		**L**	**T**	**P**	**C**
BSB104T	Chemistry I	3	1	0	4
BSB204T	Plant Physiology	3	1	0	4
BSB404T	Introductory Biostatistics	3	1	0	4
BAG209	Production Technology of Fruit and Plantation Crops	3	1	0	4
Ability Enhancement Compulsory Course (AECC)		**L**	**T**	**P**	**C**
TPSD101	Professional Skill Development I	3	1	0	4
BSB205T	Environmental Science	3	1	0	4
BFT304T	Technology of Cereals, Pulses and Oil Seeds	3	1	0	4
Skill Enhancement Courses (SEC)		**L**	**T**	**P**	**C**
BSB305T	Modern Analytical Techniques	3	1	0	4
BFT405T	Techniques in Food Analysis	3	1	0	4
Qualifying Paper (QP)/MOOCs/NPTEL/VAC/Audit Paper		**L**	**T**	**P**	**C**
TEHU-301	Disaster Management (Audit Paper*)	0	0	0	-
Summer Training Project Report *Viva voce* (STPR)		**L**	**T**	**P**	**C**
General Proficiency (GP)		**L**	**T**	**P**	**C**

GP-101	General Proficiency	-	-	-	1
GP-201	General Proficiency	-	-	-	1
GP-301	General Proficiency	-	-	-	1
GP-401	General Proficiency	-	-	-	1

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
(CHOICE BASED CREDIT SYSTEM)
B.Sc. (FOOD TECHNOLOGY)

SEMESTER: I

S.No.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-T	BSB101T	Animal Science	3	1	0	20	10	30	70	100	4
2.	CC-T	BSB102T	Plant Science	3	1	0	20	10	30	70	100	4
3.	CC-T	BSB103T	Biochemistry and Metabolism	3	1	0	20	10	30	70	100	4
4.	GE	BSB104T	Chemistry I	3	1	0	20	10	30	70	100	4
5.	AECC	TPSD101	Professional Skill Development I	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
6.	CC-P	BSB101P	Animal Science Lab	0	0	2	-	-	30	70	100	1
7.	CC-P	BSB102P	Plant Science Lab	0	0	2	-	-	30	70	100	1
8.	CC-P	BSB103P	Biochemistry and Metabolism Lab	0	0	2	-	-	30	70	100	1
9.	GP	GP-101	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**06**	**-**	**-**	**340**	**560**	**900**	**24**

SEMESTER: II

S.No.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-T	BFT201T	Principles of Food Processing	3	1	0	20	10	30	70	100	4
2.	CC-T	BFT202T	Food Microbiology	3	1	0	20	10	30	70	100	4
3.	CC-T	BSB203T	Chemistry II	3	1	0	20	10	30	70	100	4
4.	GE	BSB204T	Plant Physiology	3	1	0	20	10	30	70	100	4
5.	AECC	BSB 205T	Environmental Science	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
6.	CC-P	BFT201P	Principles of Food Processing Lab	0	0	2	-	-	30	70	100	1
7.	CC-P	BFT202P	Food Microbiology Lab	0	0	2	-	-	30	70	100	1
8.	CC-P	BSB203P	Chemistry II Lab	0	0	2	-	-	30	70	100	1
9.	GP	GP-201	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**06**	**-**	**-**	**340**	**560**	**900**	**24**

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
(CHOICE BASED CREDIT SYSTEM)
B.Sc. (FOOD TECHNOLOGY)

SEMESTER: III

S.No.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-T	BFT301T	Food and Nutrition	3	1	0	20	10	30	70	100	4
2.	CC-T	BSB302T	Enzymology	3	1	0	20	10	30	70	100	4
3.	DSE-T	BFT303T	Food Engineering	3	1	0	20	10	30	70	100	4
4.	AECC	BFT304T	Technology of Cereals, Pulses and Oil Seeds	3	1	0	20	10	30	70	100	4
5.	SEC	BSB305T	Modern Analytical Techniques	3	1	0	20	10	30	70	100	4
6.	QP	TEHU-301	Disaster Management **(Audit Paper)#**	3	1	0	20	10	30	70 *****	100 *****	-
PRACTICALS / PROJECT												
7.	CC-P	BFT301P	Food and Nutrition Lab	0	0	2	-	-	30	70	100	1
8.	CC-P	BSB302P	Enzymology Lab	0	0	2	-	-	30	70	100	1
9.	GP	GP-301	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**18**	**06**	**04**	**-**	**-**	**340**	**560**	**900**	**23**

*** Internal Assessment**
 # The Subject (TEHU-301), Disaster Management will be offered as a compulsory audit course and each student has to pass the subject at the minimum by getting 35 marks out of 100.

SEMESTER: IV

S.No.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-T	BFT401T	Food Chemistry	3	1	0	20	10	30	70	100	4
2.	CC-T	BFT402T	Food Preservation Technology	3	1	0	20	10	30	70	100	4
3.	DSE-T	BFT403T	Principles of Food Preparation	3	1	0	20	10	30	70	100	4
4.	GE	BSB404T	Introductory Biostatistics	3	1	0	20	10	30	70	100	4
5.	SEC	BFT405T	Techniques in Food Analysis	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
7.	CC-P	BFT401P	Food Chemistry Lab	0	0	2	-	-	30	70	100	1
8.	CC-P	BFT402P	Food Preservation Technology Lab	0	0	2	-	-	30	70	100	1
9.	GP	GP-401	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**04**	**-**	**-**	**310**	**490**	**800**	**23**

Note- Industrial Training needs to be done in summer break after semester IV and will be considered for evaluation in semester V

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
(CHOICE BASED CREDIT SYSTEM)
B.Sc. (FOOD TECHNOLOGY)

SEMESTER: V

S.No.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-T	BFT501T	Fat Rich and Traditional Dairy Products	3	1	0	20	10	30	70	100	4
2.	CC-T	BFT502T	Food Safety and Microbial Standards	3	1	0	20	10	30	70	100	4
3.	DSE-T	BFT503T	Food Industry By-Products and Waste Utilization	3	1	0	20	10	30	70	100	4
4.	AECC	BFT504T	Food Packaging Technology	3	1	0	20	10	30	70	100	4
5.	SEC	BFT505T	Food Quality Management	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
6.	CC-P	BFT501P	Fat Rich and Traditional Dairy products Lab	0	0	2	-	-	30	70	100	1
7.	CC-P	BFT502P	Food safety and Microbial Standards Lab	0	0	2	-	-	30	70	100	1
8.	STPR	BFT503P	Industrial Training (Evaluation &*Viva voce*)	0	0	3	-	-	100	-	100	3
9.	GP	GP-501	General Proficiency	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**07**	**-**	**-**	**410**	**560**	**900**	**26**

SEMESTER: VI

S.No.	Category	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
							Mid Term Exam			External Exam		
				L	T	P	CT	AS +AT	Total			
THEORY												
1.	CC-T	BFT601T	Food Fermentation Technology	3	1	0	20	10	30	70	100	4
2.	CC-T	BFT602T	Food Quality Testing and Evaluation	3	1	0	20	10	30	70	100	4
3.	GE	BAG209	Production Technology of Fruit and Plantation Crops	3	1	0	20	10	30	70	100	4
4.	AECC	BFT603T	Technology of Meat, Poultry and Eggs	3	1	0	20	10	30	70	100	4
5.	SEC	Departmental Elective*	*Only one paper is to be chosen from the basket of departmental electives having 04 papers provided by the School	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT												
6.	CC-P	BFT601P	Food Fermentation Technology Lab	0	0	2	-	-	30	70	100	1
7.	CC-P	BFT602P	Food Quality Testing and Evaluation Lab	0	0	2	-	-	30	70	100	1
8.	DSE-P	BFT681P	Project	0	0	3	-	-	100	-	100	3
9.	GP	GP-601	**General Proficiency**	-	-	-	-	-	100	-	100	1
			TOTAL	**15**	**05**	**07**	**-**	**-**	**410**	**490**	**900**	**26**

LIST OF DEPARTMENT ELECTIVES*		
S.No.	**Course Code**	**Course Name**
1.	BFT604T/605T/606T/NCC-01	Project Management and Entrepreneurship/ Food Product Development and Evaluation/Food Fortification And Fermentation/NCC General

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. (Biotechnology/Food Technology) I Year (I Semester)

BSB101T ANIMAL SCIENCE

Objective(s): The objectives of this course are to:

- Understand the animal kingdom.
- Understand the taxonomic position of Protozoa to Chordates.
- Understand the general characteristics of animals belonging to protozoa to Chordates.
- Understand the body organization, origin and evolutionary relationship of different phylum.
- Understand the morphology and physiology of humans.

UNIT I: **(8 Sessions)**

Taxonomy & Classification: General principle of taxonomy and animal classification. Salient features and outline classification of invertebrates and vertebrates.

UNIT II: **(8 Sessions)**

Invertebrates: General characters of protozoa and human disease, type study of *Paramecium caudatum*; Origin of Metazoan metamerism and symmetry; General characters of Porifera; General characters of Coelentrata; General characters of Platyhelminthes, type study of *Taenia* and their parasitic adaptations; General character of phylum Annelids, type study of Leech; General characters of Mollusk, type study of *Pila globosa*; General character of Arthropoda and Echinodermata, external features of star fish.

UNIT III: **(8 Sessions)**

Vertebrates: Outline classification and characteristic features of phylum Chordata and class Mammalia.

UNIT IV: **(8 Sessions)**

Human Physiology I: Digestive System, Respiratory system, excretory system, Circulatory system-activity of the heart, Blood- composition and function, blood clotting mechanism; Human reproductive system.

UNIT V: **(8 Sessions)**

Human Physiology II: Nervous system- Structure of a typical neuron, conduction of nerve impulse, resting potential; Endocrine system, Muscular system-ultrastructure and chemical composition of skeletal muscle, mechanism of muscle contraction.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the taxonomy and the basis of the animal kingdom for skill development, employability and entrepreneurship development.
CO2: Understand the taxonomic positions of different phyla with their characteristics for skill development, employability and entrepreneurship development.
CO3: Understand the characteristics of vertebrates and phylum Mammalia for skill development,

employability and entrepreneurship development.
CO4: Understand Human physiology related to the Digestive, Circulatory and Reproductive systems for skill development and employability.
CO5: Understand the human physiology related to the Nervous system, Endocrine system and Muscular System for skill development and employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	1	3	1	1	2	2	1
CO2	3	3	1	1	3	1	1	2	2	1
CO3	3	3	1	1	3	1	1	2	2	1
CO4	3	3	3	1	3	1	1	2	2	1
CO5	3	3	3	1	3	1	1	2	2	1

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	2	1
CO2	3	2	1
CO3	3	1	1
CO4	3	3	1
CO5	3	3	1

Suggested Readings:

1. R. L. Kotpal. Modern Textbook of Zoology Invertebrate, 11th Edn., Rastogi Publications, 2014.
2. R. L. Kotpal. Modern Textbook of Zoology Vertebrate. 4th Edn., Rastogi Publications, 2015.
3. Dhami & Dhami, Invertebrate Zoology, 5th Edn., S. Chand Publication, 2006.
4. Dhami & Dhami, Chordata Zoology, R. Chand Publication, 2006.
5. Jordan & Verma, Invertebrate Zoology, S. Chand Publication, 2008.
6. Jordan & Verma, Chordate Zoology, S. Chand Publication, 2007.
7. R. A. Agarwal, Animal Physiology, S. Chand Publication**,** 2014**.**

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://www.ncbi.nlm.nih.gov/books
- https://www.shapeoflife.org/

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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BSB102T PLANT SCIENCE

Objective(s): The objectives of this course:

- Enables the students to understand the plant structure and physiology.
- Provides the basic knowledge of classification and taxonomy in plant kingdom, distribution, reproduction and their economic importance.

UNIT I: **(8 Sessions)**

Algae: General features, classification, distribution, range of thallus organization, reproduction, economic importance of algae, general characters of *Chlamydomonas*, Cyanobacteria- heterocyst, general characters of *Nostoc*.

UNIT II: **(8 Sessions)**

Fungi: General features, classification, distribution, range of thallus organization, reproduction, parasexual cycle and economic importance fungi, general characters of *slime mold*, lichens and its types.

UNIT III: **(8 Sessions)**

Bryophyta: General features, classification, distribution, range of thallus organization, reproduction, economic importance of bryophyte, general characters of *Riccia, Marchantia and Anthoceros*.

UNIT IV: **(8 Sessions)**

Pteridophyta: General features, classification, structure, reproduction, stellar evolution, heterospory and seed habit, economic importance of Pteridophytes, general characters of *Selaginella*.

UNIT V: **(8 Sessions)**

Gymnosperms & Angiosperms: General features, outline classification, structure, reproduction, Alternation of generation, structure of a flower, life cycle of angiosperm and economic importance.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the detailed structure, organization, classification, and properties of Algae for skill development, employability and entrepreneurship development.
CO2: Understand the elaborate idea about structure, organization, classification, and properties of Fungi for skill development and employability.
CO3: Understand the structure, organization, classification, and properties of the Bryophyte for skill development, employability and entrepreneurship development.
CO4: Understand the detailed knowledge about the structure, organization, classification, and properties of Pteridophytes for skill development, employability and entrepreneurship development.
CO5: Understand the detailed structure, organization, classification and properties of Gymnosperms & Angiosperms for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	1	3	1	1	1	1	1
CO2	3	3	1	1	3	1	1	1	1	1
CO3	3	3	1	1	3	1	1	1	1	1
CO4	3	3	3	1	3	1	1	1	1	1
CO5	3	3	3	1	3	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	1	1
CO2	3	1	1
CO3	3	1	1
CO4	3	1	1
CO5	3	1	1

Suggested Readings:

1. V. J. Chapman and D. J. Chapman, The Algae. 2nd edition, Palgrave Macmillan; 1973 edition, January 14, 2014.
2. Ganguli and Kar, College Botany Vol. I and II, 6th revised edition, New Central Book Agency; 1 January, 2011.
3. V. Singh, P.C. Pande& D.K. Jain. A Text Book of Botany, 4th edition, Rastogi Publication, 2008-2009.
4. N.S. Subrahmanyam, Modern Plant Taxonomy,1st edition Vikas Publishing House, 1997.
5. A Text Book of Botany, V. Singh, P.C. Pande& D.K. Jain, Rastogi Publication.
6. H. D. Kumar. Introductory Phycology, 2nd edition, Affiated East-west press Pvt Ltd, 1999.

Website Sources:

- http://www.brainkart.com/subject/Plant-Biology_229/
- http://www.plantcell.org/content/teaching-tools-plant-biology
- https://www.easybiologyclass.com/plant-physiology-free-lecture-notes-online-tutorials-lecture-notes-ppts-mcqs/

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BSB103T BIOCHEMISTRY AND METABOLISM

Objective(s): The objectives of this course:

- Is to impart knowledge to students about the chemical structures of carbohydrate, and their structural and metabolic role in cellular system.
- Will let the learner appreciate the importance of biochemical reaction in organisms for its survival.
- Will let the students understand the metabolic pathway at cellular level.

UNIT I: **(8 Sessions)**

Introduction: Background and scope of Biochemistry; properties of water, acids, bases and buffers; Covalent and non-covalent interactions in biological systems. Aqueous environment and living organism.

UNIT II: **(8 Sessions)**

Carbohydrates: Structure and Function: Structure and properties of Monosaccharides, Oligosaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

UNIT III: **(8 Sessions)**

Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.

UNIT IV: **(8 Sessions)**

Lipids: Structure and functions – Classification, structures, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids structure and properties of different types of phospholipids, sphingomyelins, glycolipids, cerebrosides, gangliosides, Prostaglandins cholesterol – its structure and biological properties, utilization of cholesterol.

UNIT V: **(8 Sessions)**

Metabolism: Glycolysis; Tricarboxylic acid cycle; Glycogenesis and glycogenolysis; Lipid biosynthesis and degradation-Beta oxidation

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the basics of biochemistry, properties of water, and biological interaction for skill development, employability and entrepreneurship development.

CO2: Learn the carbohydrates, their types, and their biological functions for skill development, employability and entrepreneurship development.

CO3: Understand the amino acids and proteins, their structure and function, purification and denaturation- renaturation for skill development, employability and entrepreneurship development.

CO4: Understand the lipids and their structure and functions for skill development, employability and entrepreneurship development.

CO5: Understand the lipid and carbohydrate metabolism for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1

wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	1	1	1	1	1	1
CO2	3	3	3	1	1	1	1	1	1	1
CO3	3	3	3	1	1	1	1	1	1	1
CO4	3	3	3	1	1	1	1	1	1	1
CO5	3	3	3	1	1	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1

Suggested Readings:

1. D. Voet, J. G. Voet, C. W. Pratt, Voet's Principles of Biochemistry, John Wiley & Sons, 2012.
2. D. L. Nelson, A. L. Lehninger, M. M. Cox, Lehninger Principles of Biochemistry, 8th Edn., W. H. Freeman, 2017.
3. J. M. Berg, J. L. Tymoczko, G. J. Gatto Jr.; L. Stryer, Stryer Biochemistry, 8th Edn, Freeman & Company, W. H., 2015.
4. V. W. Rodwell, D. Bender, K. M. Botham, P. J. Kennelly, P. A. Weil, Harper's Illustrated Biochemistry, 31st Edn., McGraw-Hill Education, 2018.

Website Sources:

- https://www.easybiologyclass.com/topic-biochemistry/
- https://www.chem.purdue.edu/courses/chm333/
- https://home.apu.edu/~jsimons/Bio101/biochem.htm
- https://ocw.mit.edu/courses/chemistry/5-36-biochemistry-laboratory-spring-2009/lecture-notes/

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BSB104T CHEMISTRY I

Objective(s): The objectives of this course:

- Familiarize students with modern concepts and tools in physical chemistry that are applied to many areas of chemical research.
- Make students gain an insight into the various concepts related to physical chemistry like types of reactions, dynamics of reactions, chemistry of solutions etc.
- Recognize the Modern techniques that can be imparted to analyze chemical systems.

UNIT I: (8 Sessions)

Introduction & Mathematical Concepts: Reversible and irreversible reactions, chemical equilibrium, catalysts, law of mass action, Le-Chatelier's principle, Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like Kx, e^x, X^n, sin x, log x; maxima and minima, partial differentiation and reciprocity relations, Integration of some useful/relevant functions.

UNIT II: (8 Sessions)

Solution: Concentration of solution; normality, equivalent weight, molarity, formality, molality, solutions of gases in liquids, mole fraction, colligative properties, abnormal molecular weights, Van't Hoff factor

UNIT III: (8 Sessions)

Acids & Bases: Ionization, strong and weak electrolytes, concept of acid and bases, dissociation of acid and base in water, strength of acids and bases, Ionic product of water, the pH scale.

UNIT IV: (8 Sessions)

Laws of Thermodynamics: First, second and Zeroth law of thermodynamics, entropy, enthalpy, Gibb's free energy. Order of reactions- first, second and zero order reactions.

UNIT V: (8 Sessions)

Colloidal & Electrochemistry: True solution, colloidal solution and suspension, types of colloidal systems, classification of colloids, properties of colloids, coagulation, protective colloids, electrolysis, electrochemical cells, electrode potentials, electrochemical series.

Course Outcomes:

At the end of the course students will be able to:
CO 1: Understand the Chemical equilibrium and its relationship on the basis of reversible and irreversible reactions for skill development and employability.
CO 2: Understand the ideal solution and debate the chemical potential in the ideal solution and interpret the colligative properties for skill development, employability and entrepreneurship development.
CO 3: Understand the concept of acid & base on the basis of different theories for skill development and employability.
CO 4: know about Chemical kinetics and how reaction rates are measured and represented in rate laws, and applications of chemical kinetics for skill development, employability and entrepreneurship development.

CO 5: Understand the idea of different electrochemical cells and colloidal systems for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	3	2	2	2	3	1
CO2	3	3	2	2	2	2	2	2	3	3
CO3	3	3	2	2	2	2	2	2	3	3
CO4	3	3	2	2	2	2	2	2	2	2
CO5	2	2	2	2	3	2	1	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	2
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. K. J. Laidler, Chemical Kinetics, Pearson Education Society, 1987
2. P. C. Rakshit, Physical Chemistry, Sarat Book House, 2014.
3. B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Company, 2008.
4. P. W. Atkins & J. dePaula, Physical Chemistry, 8th Edn W. H. Freeman Publishing Co., 2006.

Website Sources:

- https://www.askiitians.com/revision-notes/chemistry
- https://ocw.mit.edu/courses/chemistry/5-62-physical-chemistry
- http://www.colby.edu/chemistry/PChem/Lecture1.html
- https://www.internetchemistry.com/chemistry/physical_chemistry.htm

IFTM University, Moradabad
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TPSD101 PROFESSIONAL SKILL DEVELOPMENT-I

Objective(s):

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To increase understanding and recall of what is read and listen including facts and main idea.
- To enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resumes, bio-data, letters and applications of different kinds.
- To develop all the four skills of English language.

Unit I: (08 Session)

Basic Applied Grammar and Usage

The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. **Noun:** Kinds; Gender; Case; Number; Usage**. Pronouns:** Definition; Kinds; Usage. **Adjectives:** Kinds, Degrees of Comparison, Transformation of Degrees. **Determiners:** Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. **Articles:** Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. **Verbs:** Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage

Unit II: (08 Session)

Basic Applied Grammar Continued

Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. **Adverbs:** Kinds and Usage. **Prepositions:** Kinds and Usage. **Conjunctions:** Kinds; Usage. **Interjections:** Definition; Usage.

Unit III: (08 Sessions)

Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech

Unit IV: (08 Session)

Précis Writing: Techniques of Précis Writing; examples**. Paragraph Writing:** Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. **Reading Comprehension. Listening Comprehension.**

Unit V: (08 Sessions)

Writing of Resume, Bio-Data. **Writing of Letters and Applications:** Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment.

Course Outcomes:

The students completing this course will be able to:
CO1: Use grammar in their writing in English correctly for skill development.
CO2: Have in-depth knowledge of action words, preposition and conjunction and to express their strong feelings and emotion for skill development.
CO3: Use clauses and phrases, write a sentence using Present, Past and Future Tense and to interchange the Voice (Active and Passive) and Narration (Direct and Indirect) for skill development.
CO4: Write gist and paragraphs and to recall what is being read and listen including facts and main ideas for skill development.
CO5: Differentiate between Resume and Bio-data and to write letters for different reasons for skill development and employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	2	2	3	3	3
CO2	2	2	2	2	2	2	2	3	3	3
CO3	2	2	2	1	2	2	2	3	3	3
CO4	2	2	2	2	2	3	3	3	3	3
CO5	2	2	2	2	2	3	3	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	2	2
CO3	3	2	2
CO4	3	2	2
CO5	3	3	2

Suggested Readings:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
3. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources:

- www.wikipedia.org
- www.english grammar.org
- www.perfect-english-grammar.com
- www.sucesscds.net
- www.grammarly.com

IFTM University, Moradabad
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BSB101P ANIMAL SCIENCE LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipment and Accessories and Working	
5.	Study of prepared slides of *Euglena, Paramecium, Vorticella, Trypnosoma & Noctiluca*	Experiment 1
6.	Identification and study of invertebrate specimens of the following phylum Porifera, Coelentrata, Platyhelminthes, Annelida	Experiment 2
7.	Study of the L.S of spicules, T.S of Gemmule, Sycon, T.S & L.S of *Hydra*	Experiment 3
8.	Identification and study of invertebrate specimens of the following phylum Arthropoda, Mollusca, Echinodermata	Experiment 4
9.	Identification and study of vertebrate specimens of the following phylum Pisces, Amphibia	Experiment 5
10.	Identification and study of vertebrate specimens of the following phylum Reptilia, Aves, Mammal	Experiment 6
11.	Study of Histological slides: Tissue & Organ	Experiment 7
12.	Study of embryological slides: Development of chick embryo whole mounts	Experiment 8

IFTM University, Moradabad
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BSB102P PLANT SCIENCE LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipment and Accessories and Working	
5.	Identification and study of Cyanobacteria-*Nostoc*.	Experiment 1
6.	Identification and study of some algal forms: *Chlamydomonas, Volvox*	Experiment 2
7.	Identification and study of fungi-*Rhizopus, Agaricus*	Experiment 3
8.	Identification and study of lichen	Experiment 4
9.	Cut the T.S of given plant material (Bryophyta) and identify it with its morphological and anatomical features. (*Riccia, Marchantia*)	Experiment 5
10.	Cut the T. S of given plant material (Pteridophyta)and identify it on the basis of its anatomical features.(*Marselia, Selaginella*)	Experiment 6
11.	Cut the T.S of given plant material (Gymnosperms)and identify it on the basis of its anatomical features.(*Cycas / Pinus*)	Experiment 7
12.	Describe given plant in semi-botanical language and also give the floral structure and formulae of it	Experiment 8

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BSB103P BIOCHEMISTRY AND METABOLISM LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipment and Accessories and Working	
5.	To study of the properties of carbohydrates. Experiment: I A Molish Test Experiment: 1 B. Benedict's Test;	Experiment 1
6.	To estimate given amount of protein by Folin-Lowry method.	Experiment 2
7.	To estimate the protein content in the given sample by Biurret methods.	Experiment 3
8.	Qualitative test for the presence of fatty acid by titrametric methods.	Experiment 4
9.	Estimation of cholesterol by Liebermann-Buchard reaction.	Experiment 5
10.	Paper chromatography – Separation of amino acids and carbohydrates in a mixture	Experiment 6
11.	To detect the presence of amino acid from a given sample by Ninhydrin Test or Xanthoproteic acid Test.	Experiment 7
12.	To stain lignin of the plant section and observe under the microscope.	Experiment 8

IFTM University, Moradabad
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BFT201T PRINCIPLES OF FOOD PROCESSING

Objective(s): The objectives of this course:

- To make students learn fundamentals of food processing and the relationships between scientific principles and preparation techniques.
- It also provides an insight of manufacturing industries that transforms animal, plant, marine resources finished value-added food products.

UNIT I: (8 Sessions)

Introduction to food processing: Historical development and scope of food processing; Aims and objectives of preservation & processing of foods, Characteristics of low moisture, intermediate moisture and high moisture foods; Classification of food based on pH; Causes of quality deterioration and spoilage of food.

UNIT II: (8 Sessions)

Preservation of foods by low temperatures: Introduction to refrigeration and freezing, Definition, Principle of freezing; Freezing curve; Changes occur during freezing; Types of freezing; Consideration relating to storage of foods at chilling temperatures, changes during thawing and its effect on foods, Controlled and Modified atmosphere storage of foods.

UNIT III: (8 Sessions)

Preservation of foods by high temperatures: Basic concepts in thermal destruction of microorganisms D, Z, F values. Thermal resistance of the microorganisms; Thermal processing-cooking, blanching, pasteurization and sterilization of foods; General process of caning of foods, Spoilage in canned foods.

UNIT IV: (8 Sessions)

Preservation of foods by water removal: Principles, Technological aspects and application of evaporative concentration process; Freeze concentration, freeze drying and membrane process for food concentrations. Drying and dehydration of foods.

UNIT V: (8 Sessions)

Preservation of foods by non-thermal methods: Principles, Technological aspects and application of sugar and salt, antimicrobial agents, Non-ionizing and ionizing radiations, pulse electric field, Hurdle technology, high pressure processing, ohmic heating in preservation of foods.

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the objectives of preservation & processing of foods, causes of spoilage of foods and degree of the perishability of foods for skill development, employability and entrepreneurship development.

CO2: Learn about the concepts of refrigeration, freezing, controlled and modified storage of foods for skill development, employability and entrepreneurship development.

CO3: Understand the methods of preservation of foods by high temperature, thermal destruction of microorganisms, and General canning process of foods for skill development, employability and entrepreneurship development.

CO4: Understand the principle, technological aspects, and application of Dehydration and Drying, Evaporative Concentration, and Freeze-drying of foods for skill development and employability.
CO5: Understand the principle and application of various non-thermal preservation methods used in food industries for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	3	2	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	2
CO3	2	2	2	3	2	2	2	2	2	2
CO4	2	2	2	2	3	2	2	2	2	2
CO5	2	2	2	2	3	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Owen R. Fennema. Principles of food science. NewYork ; Basel : Dekker, 1975.
2. Potter, Norman N., Hotchkiss, Joseph H.Food Science. Fifth Edition, 2007.
3. V Kyzlink. Principles of food preservation. Amsterdam : Elsevier, 1990.
4. Shakuntala Manay N. foods facts and principles. New age International limited, Publishers: New Delhi: Third edition, 2010.
5. Dennis R. Heldman, Principles of Food Processing, 1997.

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://library.nitrkl.ac.in/
- ecoursesonline.iasri.res.in

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BFT202T FOOD MICROBIOLOGY

Objective: The main objective of this course:

- Is to introduce knowledge of food composition and food processing methods essential in the control of microbial growth and food contamination along with different microorganisms and their importance in food microbiology.

UNIT I: (8 Sessions)

Introduction: Historical development and scope of food microbiology. Morphology, general characteristics and classification of microorganisms.

UNIT II: (8 Sessions)

Microbial growth: Growth of microorganisms- physiological and nutritional need, growth curve; pure culture techniques and maintenance of culture; role of intrinsic and extrinsic parameters that affect the microbial growth in foods.

UNIT III: (8 Sessions)

Contamination, spoilage and preservation of food products: Principle underlying spoilage and preservation of foods. Contamination, spoilage and preservation- cereal products, sugar products, fruit and vegetable products, meat products, fish and sea foods, egg and poultry products, dairy products, beneficial micro-organism in food fermentation.

UNIT IV: (8 Sessions)

Food borne diseases: Bacterial food poisoning and infection-*Clostridium perferinges, Vibrios, E.coli, B.cereus, Y. enterocolitica, campylobacter, Listeria monocystogenes;* Non-bacterial poisonings, infections and intoxications.

UNIT V: (8 Sessions)

Food safety and quality control: Importance and principles of food hygiene and sanitation; basic principles of food plant sanitation; indicators of food safety and quality; microbiological criteria of foods; legislation for food safety- HACCP and ISO systems.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the historical development and role of microorganisms in food for skill development, employability and entrepreneurship development.
CO2: Understand the classification, growth, pure culture techniques, and control of microorganisms for skill development, employability and entrepreneurship development.
CO3: Gain knowledge about the contamination, spoilage, and preservation of different types of foods for skill development and employability.
CO4: Understand the beneficial microorganisms and their utilization in food fermentation. The student will learn about the concept of HACCP for skill development, employability and entrepreneurship development.
CO5: Predict the causative agent and pathogenesis of disease-causing by food borne pathogens and their toxins for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	2	2	2	2	2
CO2	2	2	3	2	2	3	2	2	2	2
CO3	2	2	3	3	3	3	2	2	2	2
CO4	2	3	3	3	3	3	3	3	3	2
CO5	2	3	3	2	3	2	3	3	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. Pelczar, Michael J., E. C. N. Chan, and Noel R. Krieg. *Microbiology*. Tata Mc- GrawHill, 1986.
2. James M. Jay, Martin J. Loessner, David A. Golden.Modern Food Microbiology (Food Science Text Series) 7th Edition.Springer, 1987.
3. William S.Frazier, Dennis C.Westhoff.Food Microbiology, Tata McGraw hill publications, 1988.
4. Fundamental Food Microbiology by Bibek Ray, Ph.D., Arun Bhunia, 2013
5. Food Microbiology: An Introduction (ASM Books) 4th Edition by Karl R. Matthews, Kalmia E. Kniel, Thomas J. Montville, 2017.

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- http://ecoursesonline.iasri.res.in/

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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BSB203T CHEMISTRY II

Objective(s): The objectives of this course:

- Impart knowledge of basic principles of organic chemistry, and it will also provide the important topics in Organic chemistry functional groups including (alkanes, cycloalkane compounds, phenols etc.
- Help students to gain experience to predict the functional group transformations, simple reaction mechanisms, and the synthesis of organic molecules by multi-step synthesis strategies.
- Help students to understand the reaction mechanism.

UNIT I: (8 Sessions)

Structure and Bonding: Hybridizations, Bond lengths and bond angles, bond energy: Localized and delocalized chemical bond, van-der Waals interactions, inclusion compounds, clatherates, charge transfer complex, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

UNIT II: (8 Sessions)

Types of Reagents and Reactions: Electrophiles and nucleophiles. Types of organic reactions. Energy consideration. Reactive intermediates-carbocations, carbanions, free radicals and carbenes. Methods of determination of reaction mechanism.

UNIT III: (8 Sessions)

Stereochemistry: Conformations with respect to ethane, butane and cyclohexane; Interconversion of Wedge Formula; Newman, Sawhorse and Fischer representations; Concept of chirality; Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism; D and L; cis - trans nomenclature; CIP Rules.

UNIT IV: (8 Sessions)

Alkanes and Cycloalkanes: IUPAC nomenclature, classification, isomerism in alkanes, sources, and methods of preparation (with special reference to Wurtz, Kolbe, Coreyhouse, reactions and decarboxylation of carboxylic acids. Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes**. Cycloalkanes:** Nomenclature, methods of preparations, chemical reactions. Bayer's strain theory and its limitations. ring strain in cyclopropane and cyclobutanes. Theory of stainless rings.

UNIT V: (8 Sessions)

Alcohols, Phenols and Ethers: Alcohols- Preparation of 1º, 2 º and 3 º alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters, Reactions- with sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. HNO_3). Oppeneauer Oxidation; Diols- Oxidation of diols; Pinacol-Pinacolone rearrangement.

Course Outcomes:

At the end of the course the students will be able to:
CO1: Understand the basic concepts of chemical structure and bonds, inclusion compounds, clatherates, charge transfer complex, resonance and hyperconjugation for skill development, employability and entrepreneurship development.
CO2: Describe the different types of reagents and reactions such as types of electrophiles and nucleophiles, different types of organic reactions and their mechanisms for skill development, and employability.
CO3: Explain the geometrical and optical isomerism; Conformations of molecules with respect to ethane, butane and cyclohexane; Interconversion of Wedge Formula; Newman, Sawhorse and Fischer representations for skill development and employability.
CO4: Understand the nomenclature, classification, isomerism, sources, and methods of preparation, physical properties and chemical reactions of alkanes and cycloalkanes for skill development, employability and entrepreneurship development.
CO5: Describe the chemical nature, properties, preparation and chemical reactions of alcohols, phenols and ethers for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	2	2	2	3	2	3	3
CO2	3	3	3	3	3	2	3	1	3	2
CO3	2	3	3	2	3	2	3	2	3	3
CO4	2	2	3	3	3	2	3	3	2	3
CO5	3	2	3	2	2	3	3	3	2	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	2
CO3	3	3	2
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. R. T. Morrison & R. N. Boyd, Organic Chemistry, 7th Edn, Prentice Hall, 2005.
2. A.I. Vogel, Vogel's Textbook of Practical Organic Chemistry, 5th Edn, Longman Publishers, 1998.
3. A. Bahl, Advanced Organic Chemistry, S Chand & Company Limited, 2010.

Website Sources:

- https://ncerthelp.com/
- https://ocw.mit.edu/courses/chemistry/
- https://www.clearniitmedical.com/
- https://www.cliffsnotes.com/study-guides/chemistry/

IFTM University, Moradabad
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BSB204T PLANT PHYSIOLOGY

Objective(s): The objectives of this course:

- Will primarily enable the student to learn about with the life processes of plants and how actually metabolic processes occur inside them.
- Is to make students aware and develops interest to work on plants having medicinal properties or plants producing secondary metabolites.

UNIT I: (8 Sessions)
Photosynthesis in plants: Role of photosynthesis pigments, PS II and PS I complex and mechanism of photosynthetic electron transport.

UNIT II: (8 Sessions) Vascular
Tissue: Role of xylem and phloem, Movement of water in plants in relation to water potential, pressure potential and metric potential, guttation, transpiration, physiology of stomatal opening and closing.

UNIT III: (8 Sessions)
Plant Hormones: Plant growth regulators, distribution and their metabolism, mechanism of action of plant growth regulators, role of major plant growth regulators in various plant developmental processes.

UNIT IV: (8 Sessions)
Photophosphorylation: Mechanism of carbon dioxide fixation in C3, C4 and CAM plants, Photorespiration.

UNIT V: (8 Sessions)
Photomorphogenesis: Role of phytochrome, cytochrome and phototropin, mechanism of photomorphogenesis photoperiodism, biological clock, vernalization. Dormancy: seed dormancy and bud dormancy, significance.

Course Outcomes:
At the end of the course students will able to:
CO1: Understand the importance of photosynthesis for plants for skill development, employability and entrepreneurship development.
CO2: Understand the water, solute and sugar transport processes in plants and different mechanisms in plants used for water & mineral transport for skill development, employability and entrepreneurship development.
CO3: Understand the plant hormones and their roles in plant development for skill development and employability.
CO4: Understand the light and dark reactions of photosynthesis and compare the dark reactions in plants for skill development and employability.
CO5: Understand the photochemical and biochemical characteristics of phytochrome for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1

wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	2	2	3	3	3
CO2	3	3	2	2	2	2	2	3	2	3
CO3	3	3	2	2	1	2	2	3	2	3
CO4	3	3	2	2	2	2	2	2	3	2
CO5	3	3	2	2	2	2	2	3	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	2
CO3	3	3	2
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. F. B. Salisbury, C. W. Ross. & V. G. Velázquez, Plant physiology, 4th Edn, Wadsworth Pub. Co., 1992.
2. T. Lincoln & Z. Eduardo, Plant Physiology, 5th Edn, Sinauer Associate Inc, 2010.
3. H. S. Srivastava, Plant Physiology Biochemistry and Biotechnology, 1st Edn,, Rastogi Publication, 2005.
4. S.C. Bhatle & M. A. Lal, Plant Physiology, Development and Metabolism, Springer Singapore, 2018.

Website Sources:

- https://www.wikipedia.org/
- https://www.ncbi.nlm.nih.gov/books
- http://www.plantphysiol.org/

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. (Biotechnology/ Food Technology) I Year (II Semester)

BSB205T ENVIRONMENTAL SCIENCE

Objective(s): The objectives of this course:

- Develop understanding of how science and the scientific method work to address environmental problems.
- Make the student become familiar with the Earth's major systems (ecosystems and biogeochemical cycles),
- Acknowledge how environment functions and how they are affected by human activity (population growth, air, water and soil pollution, ozone depletion, global warming, and solid waste disposal).
- Let students will learn about the interaction of human society (urban sprawl, energy use/generation, resource consumption and economics) with the Earth's systems.

UNIT I: (8 Sessions)

Environmental Sciences: Introduction, definition, Scope, Importance, Need for Public Awareness; Natural Resources: Renewable and non-renewable resources; Biogeochemical Cycles, Ecological Succession, Ecological pyramids.

UNIT II: (8 Sessions)

Concept of an Ecosystem: Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Food chains and food webs. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean).

UNIT III: (8 Sessions)

Environmental Pollution: Pollutants, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution; Solid waste management: Causes, effects and control measures of urban and industrial wastes.

UNIT IV: (8 Sessions)

Biodiversity: Biogeographical classification of India, Hot-spots of biodiversity, Biodiversity at global, national and local levels, Value of biodiversity- consumptive use, productive uses, social, ethical aesthetic and option values, Threats to biodiversity- habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: *In-situ* and *Ex-situ* conservation of biodiversity,

UNIT V: (8 Sessions)

Global Phenomenon & Their Management: Global warming, acid rains, depletion of ozone layer, population growth, population explosion-family welfare program and human rights, Biofertilizers, Biopesticides, vermicomposting.

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand about the introductory concept of environmental science, renewable and non-renewable resources, biogeochemical cycles, ecological succession and ecological pyramids for skill development and employability.

CO2: Learn about the concept of an ecosystem and structure & function of various ecosystem for skill development, employability and entrepreneurship development.

CO3: Learn about various types of environmental pollution and pollutants for skill development and employability.
CO4: Understand about the concept of biodiversity, its value and conservation for skill development, employability and entrepreneurship development.
CO5: Learn about the various global phenomenon and their management for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes. Please write 3,2,1 wherever required. (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	2	3	3	3	3
CO2	3	3	2	2	2	2	3	3	3	3
CO3	3	3	2	2	2	2	3	3	3	3
CO4	3	3	2	2	2	2	3	2	3	2
CO5	3	3	2	2	2	3	3	3	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	2
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	3	3	3

Suggested Reading:

1. S. K. Dhameja, Environmental Studies, S. K. Kataria & Sons, 2014.
2. J. Ingram, ,P. Ericksen ,D. LivermanFood Security and Global Environmental Change, Taylor & Francis, 2012.
3. S. S. Deswal, Environmental Engineering, Dhanpat Rai Publications, 2001.
4. S. Thakur, Environmental Biotechnology: Basic Concepts and Applications, I.K. International Publishing House Pvt. Limited, 2011.
5. D. D. Chiras, Environmental Science, 10th Eds., Jones & Bartlett Learning, 2014.

Website Sources:

- https://www.edx.org/course/subject/environmental-studies.
- https://online-learning.harvard.edu/subject/environmental-science
- https://www.coursera.org/browse/physical-science-andengineering/environmental-science-and-sustainability
- https://nptel.ac.in/course.html

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology I Year (II Semester)

BFT201P PRINCIPLES OF FOOD PROCESSING LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Orientation to working in a food Processing laboratory	Experiment 1
6.	To understand the concept of shelf life	Experiment 2
7.	To study blanching process	Experiment 3
8.	Identification of different types of packaging materials used in food industry	Experiment 4
9.	To perform the adulteration test for different foods (milk, coffee)	Experiment 5
10.	To study the concept of asepsis	Experiment 6
11.	Estimation of pH of different food samples	Experiment 7
12.	To study pasteurization and sterilization of foods	Experiment 8

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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BFT202P FOOD MICROBIOLOGY LAB

13.	Introduction of Laboratory Practices	
14.	Safety Measures	
15.	Do and Don't	
16.	About Equipments and Accessories: Principle and Working	
17.	To understand the basic microbiology laboratory practices and equipments	Experiment 1
18.	To clean and sterilize all glassware's.	Experiment 2
19.	To prepare and sterilize nutrient media.	Experiment 3
20.	To prepare bacterial smear.	Experiment 4
21.	Enumeration (counting) of bacterial colonies by plate count or serial dilution agar plate technique.	Experiment 5
22.	To perform gram's staining of Bacteria.	Experiment 6
23.	To prepare slant (slope) and stabs.	Experiment 7
24.	To streak agar petriplate using culture.	Experiment 8

IFTM University, Moradabad
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BSB203P CHEMISTRY II LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and don't	
4.	About Equipment's and Accessories: Principle and Working	
5.	To find out the strength in gms/liter of the given solution of sodium hydroxide with the help of standard oxalic acid solution	Experiment 1
6.	To determine the alkalinity in the given water sample by neutralization titration.	Experiment 2
7.	To determine the melting point of an organic compound containing C, H and O only.	Experiment 3
8.	To determine the melting point of an organic compound containing nitrogen.	Experiment 4
9.	To determine the melting point of an organic compound containing nitrogen and sulphur	Experiment 5
10.	To decolourise and crystallize the given organic compound using Charcoal	Experiment 6
11.	To purify the sample of benzoic acid using water as a solvent by recrystallization method.	Experiment 7

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (III Semester)

BFT301T FOOD AND NUTRITION

Objective: The main objective of this course:

- To utilize knowledge from foundational sciences as a basis for understanding the role of food and nutrients in health and disease.

UNIT I: (8 Sessions)

Introduction to Food and Nutrition: Basic terms used in study of food and nutrition; BMI and Nutritional Status; Understanding relationship between food, nutrition and health.

UNIT II: (8 Sessions)

Balanced Diet: Functions of food-physiological, psychological and social; Concept of Balanced Diet, Food Groups, Food Pyramid, Food Exchange List**;** Principles of Meal Planning; Factors affecting meal planning.

UNIT III: (8 Sessions)

Nutrients: Classification, digestion, absorption, functions, dietary sources, RDA, clinical manifestations of deficiency and excess of the following in brief-Energy**,** Carbohydrates, lipids and proteins**,** Fat soluble vitamins-A, D, E and K**,** Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C**;** Minerals – calcium, iron, iodine, fluorine and zinc.

UNIT IV: (8 Sessions)

Basics of Energy: Energy units - Kilocalories, Mega joules, determination of energy value of foods, using Bomb calorimeter, diagram of Bomb Calorimeter - gross calorific values, Physiological energy, value of foods, relation between oxygen used and calorific value

UNIT V: (8 Sessions)

Nutrition Improvement of Foods: Effect of processing on Nutritional quality of foods; Methods of enhancing the nutritional quality of foods- Enrichment and fortification.

Course Outcomes:

At the end of the course students will be able to:

CO1: Learn different terms in nutrition, and understand the relationship between nutrition and health for skill development, employability and entrepreneurship development.

CO2: Design balanced meal plans, and explain proper amounts of each food type to be consumed for skill development, employability and entrepreneurship development.

CO3: Understand and learn about various biomolecules, minerals, and nutrients, their source, digestion, absorption and toxicity for skill development, employability and entrepreneurship development.

CO4: Energy in terms of health, determinants of energy, and measurement of energy for skill development for employability.

CO5: Effect of processing on food, its quality, nutritional value and methods of food quality improvement – Enrichment and Fortification, their types and difference for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	2	3	3	2	3	2	2
CO2	3	2	3	3	3	3	2	3	2	2
CO3	3	2	3	3	3	3	2	3	2	2
CO4	3	3	2	2	2	2	2	3	3	3
CO5	2	3	2	2	2	2	2	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	3

Suggested readings:

1. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd.
2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
3. Sunetra Roday, Food Science Nutrition, Third Edition published in 2018.
4. Gopalan, C., (1990). NIN, ICMR. Nutritive Value of Indian Foods.
5. Wardlaw MG, Paul M Insel Mosby 1996). Perspectives in Nutrition, Third Edition.

Website sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://library.nitrkl.ac.in/
- ecoursesonline.iasri.res.in

IFTM University, Moradabad
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BSB302T ENZYMOLOGY

Objective(s): The objectives of the course:

- Provide an insight into the fundamentals of enzyme structure, function and kinetics of enzymes.
- Explain how enzymes are able to increase speed of a biochemical reaction in sense of thermodynamics, kinetics and molecular interactions also it deals with current applications and future potential of enzymes.
- This will be helpful in developing concept for fermentation technology and downstream processing.

UNIT I: (8 Sessions)

Enzymes as Catalysts: Overview, historical background; Enzyme characteristics and properties; Coenzyme, Cofactor, Apoenzyme, Holoenzyme, Prosthetic group, Enzyme nomenclature & classification; Enzyme Isolation, Purification and Characterization.

UNIT II: (8 Sessions)

Mechanism of Enzyme Kinetics: Kinetics of single substrate reactions (Michaelis- Menten equation); Enzyme inhibition (Competitive, Non- competitive, Mixed); Two or more than two substrate kinetics.

UNIT III: (8 Sessions)

Enzyme Immobilization: Overview, Types of enzyme immobilization viz adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding - examples; Advantages and disadvantages of different Immobilization techniques; Overview of applications of immobilized enzyme systems

UNIT IV: (8 Sessions)

Enzyme Regulation: Methods of enzyme regulation- covalent modification and zymogen activation, Allosteric regulation Partial Proteolysis; Disulphide reduction.

UNIT V: (8 Sessions)

Applications of Enzymes: Application of enzyme in industries- Food, Beverages, Detergent, Textile, Leather, Agricultural and pharmaceutical.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand enzyme nomenclature, classification, and purification techniques for skill development and employability.
CO2: Derive the kinetics expression of enzymatic reactions like Michaelis- Menten Equation for skill development and employability.
CO3: Understand the immobilization techniques and will learn methods and applications for skill development, employability and entrepreneurship development.
CO4: Identify the regulatory factors of enzymes for skill development, employability and entrepreneurship development.
CO5: Explore the application of enzymes in food, beverages, and agriculture industries for skill

development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	3	2	3	2	3	3	3
CO2	3	2	3	3	2	2	2	3	2	3
CO3	3	3	2	3	3	2	1	3	2	2
CO4	3	3	2	2	3	2	2	3	3	3
CO5	3	2	3	3	3	2	3	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	2
CO2	3	3	2
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Suggested Readings:

1. A. Fersht, Structure and Mechanism in Protein Science, World Scientific, 2017.
2. N. Price & L. Stevens, Fundamentals of Enymology, 2nd Edn., Oxford University Press, New York, NY.
3. T. Palmer, Understanding Enzymes, 2nd Edn., John Wiley & Sons, New York.
4. D. Voet & J. G. Voet, Biochemistry, John Wiley & Sons, New York, 2011.
5. G. Zubay, Biochemistry, 3rd Edn., Wm. C. Brown, Oxford, 1993.
6. J. M. Berg, J. L. Tymoczo & L. Stryer, Biochemistry, 7th Edn., W.H.Freeman, 2010.

Website Sources:

- https://www.omicsonline.org/scholarly/enzyme-technology-journals-articles-ppts-list.php
- https://www.britannica.com/science/enzyme
- https://www.sciencedirect.com/book/9780444641144/advances-in-enzyme-technology
- http://www.biologydiscussion.com/enzymes/enzyme-technology/enzyme-technology-application-and-commercial-production-of-enzymes/10185
- http://www.biologymad.com/studentswork/12%20-%20etnotes.pdf
- https://www.kth.se/dib/enzyme-technology-1.783173
- http://www1.lsbu.ac.uk/water/enztech/whither.html
- https://bmcbiotechnol.biomedcentral.com/articles/sections/protein-and-enzyme-technology
- http://www.odofin.com/enzyme%20technology.htm
- https://www.thesciencenotes.com/enzyme-technology/
- https://application.wiley-vch.de/books/sample/3527329897_c01.pdf

IFTM University, Moradabad
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BFT303T FOOD ENGINEERING

Objective(s): The objectives of this course:

- Is to introduce students with Food engineering which is a multidisciplinary subject which combines food sciences, microbiology, food processing and food technology.
- This applies engineering combined with the knowledge of product properties by developing processes and equipment to convert agricultural raw materials and ingredients into safe food for consumers.
- The main focus was on food preservation and stabilization, whereas trends now are on diversity, health, taste, and sustainable production.

UNIT I: (8 Sessions)

Introduction: Concept of Unit operation, Units and dimensions, Unit conversions, dimensional analysis, Principle and equipments used in food industry; Law of thermodynamics, Mass and Energy Balance. Design of food plant; important considerations for designing of food plants.

UNIT II: (8 Sessions)

Fluid flow in food processing: Liquid transport system, properties of liquids, Newton's law of viscosity, properties of Newtonian and non- Newtonian fluids, flow characteristics, Reynolds no, Bernoulli's equation, principle of flow measurement devices.

UNIT III: (8 Sessions)

Refrigeration and Freezing: Basic Concept of refrigeration and freezing, Classification and selection of a refrigerant, Description of a vapor compression Refrigeration, Types of freezers- plate, spiral, fluidized, cryogenic; Application of Frozen food storage in food processing industry.

UNIT IV: (8 Sessions)

Heat and Mass Transfer: Thermal Properties of Food, Modes of heat transfer- Conduction, Convection and Radiation; Fick's law of diffusion,
Heat transfer equipment- Heat exchangers.

UNIT V: (8 Sessions) Steam,

Evaporation and Dehydration: Generation of steam, Classification of boilers, Construction and functions of fire tube and water tube boilers, boiling point elevation, Type of evaporators and evaporation process; Basic Drying Process and types of driers; Determination of moisture content.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the basic principles of unit operation, thermodynamics, heat and mass transfer. Also, will be able to apply basic engineering principles to the design process and equipment for food processing for skill development, employability and entrepreneurship development.
CO2: Understand the basic concept of fluid flow and its application to the food processor for skill development, employability and entrepreneurship development.
CO3: Understand the basic concept of freezing, refrigeration and applications of frozen food storage in food processing industries for skill development, employability and entrepreneurship development.
CO4: Learn about the various heat transfer equipment and mode of heat transfer for skill development and employability.

CO5: Conceptualize boilers, dryers and evaporators for skill development and employability.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	2	2	2	2	3	2	1
CO2	2	2	3	2	2	3	2	3	3	2
CO3	2	3	3	3	2	3	2	3	3	2
CO4	2	2	3	2	2	2	2	3	3	2
CO5	2	2	3	2	2	2	2	2	3	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	2

Suggested Readings:

1. Fellow P. Food processing technology. VCH Ellis Horwood, 2009.
2. Rao DG. Fundamentals of food engineering. PHI Learning Private Ltd. 2010
3. Singh RP and Heldman DR. Introduction to food engineering. Academic press, 4th edition, 2009.
4. Rao C G Essentials of food process engineering. B S publications 2009
5. K.M. Sahay and KK Singh. Unit operations of agricultural processing, Second Edition, 2004.

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://www.ncbi.nlm.nih.gov/books
- http://ecoursesonline.iasri.res.in/
- https://nzifst.org.nz/resources/unitoperations/introduction2.htm
- https://library.nitrkl.ac.in/

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (III Semester)

BFT304T TECHNOLOGY OF CEREALS, PULSES AND OIL SEEDS

Objective: The main objective of this course:

- Is to enables the students to understand and acquaint with production trends, structure, composition, quality evaluation and processing technologies for product development and value addition of various cereals, pulses and oilseeds.

UNIT I: (8 Sessions) Wheat:
Types, structure of wheat grain, chemical composition; physicochemical properties; milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, technology of dough development.

UNIT II: (8 Sessions)
Rice: Chemical composition; grain structure; physicochemical properties, milling (mechanical & solvent extraction); parboiling, ageing of rice; utilization of by-products

UNIT III: (8 Sessions) Coarse
grains: Corn - Milling (wet and dry), cornflakes. Barley- Milling, Malting, Processing of beer. Oats – Milling (oatmeal, oat flour& oat flakes). Sorghum, Pearl Millet, finger millet – Milling.

UNIT IV: (8 Sessions)
Pulses: Composition of pulses; Milling of pulses-dry milling; Wet milling, Improved milling method; Pulse based food products; Anti nutritional factors of pulses.

UNIT V: (8 Sessions)
Oil seeds: Composition of oilseeds; Extraction of oil from -groundnut, sunflower, soybean and coconut; Oil refining process; Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fiber spinning.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the types, structure, chemical composition, physicochemical properties, and milling of wheat for skill development and employability.
CO2: Understand the composition, structure, physicochemical properties, and milling (mechanical & solvent extraction) of rice. Learn about the parboiling and ageing of rice for skill development, employability and entrepreneurship development.
CO3: Understand the milling process of different cereal grains like corn, oats, sorghum, millets, and barley for skill development and employability.
CO4: Gain knowledge on composition, milling, and Antinutritional factors of pulses for skill development, employability and entrepreneurship development.
CO5: Learn the composition and extraction of oil from -groundnut, sunflower, soybean, and coconut. Also, gain knowledge about the oil refining process and sources of protein for skill development and employability.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	3	3	2	2	2	2	2
CO2	2	2	3	3	3	3	3	2	2	2
CO3	3	3	3	3	2	3	3	2	2	2
CO4	2	2	3	3	2	3	3	2	2	2
CO5	2	2	3	3	2	3	3	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	2
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	3	3	2

Suggested Readings:

1. Kent, Technology of Cereal, 5th Ed. Pergamon Press, 2003
2. Marshall, Rice Science and Technology, Wadsworth Ed., Marcel Dekker, New York, 1994
3. Chakraverty, A.: Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford and IBH Publishing Co, Calcutta (1995).
4. KarelKulp and Joseph P Pante:Hand Book Of Cereal Science and Technology MercelDekkar USA (2000).
5. J. Smartt: Tropical Pulses Longman Group Ltd. London (1980).

Website Sources:

- http://www.egyankosh.ac.in/
- https://www.wikipedia.org/
- http://ecoursesonline.iasri.res.in/

IFTM University, Moradabad
Bachelor of Sciences (B.Sc.), Programme
B.Sc. (Biotechnology/ Food Technology) II Year (III Semester)

BSB305T MODERN ANALYTICAL TECHNIQUES

Objective(s): The objectives of this course:

- Let the student acquire basic concepts, principles, and techniques of modern analytical techniques.
- Empower students with an analytical mind set and the abilities to solve diverse analytical problems in an efficient and quantitative way
- Make student learn the principle behind the basic techniques like chromatography, electrophoresis and their application in diverse fields.

UNIT I: (8 Sessions)

Concept of Good Laboratory Practices: Parts of GLP, Good Manufacturing Practices, Quality assurance and Quality Control, Steps of Analysis, Basic Aspects of Qualitative and Quantitative Analysis. Accuracy and Precision.

UNIT II: (8 Sessions) Microscopy &Spectroscopy: Simple and Compound microscope; Overview of Electromagnetic spectrum; Beer-Lambert's Law: UV-Vis spectrophotometer, Colorimeter, Raman Effect, IR Spectroscopy- Their Instrumentation, Principle, Working and application

UNIT III: (8 Sessions)

Centrifugation: Theory and Principle of centrifugation, sedimentation, sedimentation rate, sedimentation coefficient. Use and design of different types of rotors, Types of centrifuges, Preparative and analytical centrifugation, Density gradient centrifugation (zonal and isopycnic), differential centrifugation.

UNIT IV: (8 Sessions)

Chromatography: Plate and Rate Theory, Principle of Chromatography, Chromatographic performance parameters, High performance liquid chromatography, adsorption chromatography, partition chromatography, Ion-exchange chromatography, molecular exclusion chromatography, affinity chromatography, normal and reverse phase chromatography.

UNIT V: (8 Sessions)

Electrophoresis: Theory of electrophoresis, General Principle, Native PAGE, SDS PAGE, Agarose gel electrophoresis, Iso-electric focusing, pulse gel electrophoresis, Capillary Electrophoresis.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the concept of GLP and GMP, quality assurance, quality control, and aspects related to their analysis for skill development, employability and entrepreneurship development.
CO2: Understand the EM spectrum and various spectroscopy- their principle and instrumentation for skill development and employability.
CO3: Learn all the related aspects of centrifugation and sedimentation for skill development and employability.
CO4: Learn the principle of chromatography and its various types for skill development and employability.
CO5: Understand the concept of electrophoresis and its types for skill development, employability and

entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	3	2	2	2	2	2	2
CO2	2	2	3	3	2	3	2	2	2	2
CO3	2	2	3	3	2	3	2	2	2	2
CO4	2	2	3	3	2	3	2	2	2	2
CO5	2	2	3	3	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. K. Wilson & J. Walker, Principles and Techniques of Biochemistry and Molecular Biology, 7th Edn., Cambridge University Press.
2. S. K. Sawhney & R. Singh, Introductory Practical Biochemistry, 2nd Edn., Alpha Science International, 2005
3. G. R. Chatwal & S. K. Anand, Instrumental Methods of Chemical Analysis, 5th Edn., Himalaya Publishing House, 2019.

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://library.nitrkl.ac.in/
- https://onlinecourses.swayam2.ac.in/

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. (Biotechnology/Food Technology) II Year (III Semester)

TEHU-301 DISASTER MANAGEMENT

Objective: The objective of this course is to provide students an understanding to the concepts and aspects of disaster and its relationship with development. To ensure awareness of Disaster Risk Reduction (DRR) approaches among students. To assist students, develop ability to respond to their environment with potential response to disaster.

UNIT I: **(12 Sessions)**

Introduction to Disasters

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks; Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.; Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc.; Differential impacts- in terms of caste, class, gender, age, location, disability; Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II: **(10 Sessions)**

Approaches To Disaster Risk Reduction

Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness; Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures; Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders

UNIT III: **(08 Sessions)**

Inter-Relationship between Disasters and Development

Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.; Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources; Role of international cooperation's in Disaster Management

UNIT IV: **(08 Sessions)**

Disaster Risk Management In India

Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management; Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation; Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V: **(07 Sessions)**

Disaster Management: Applications, Case Studies and Field Works

The project /fieldwork are meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below:

Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations.

Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs.

Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid. Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.
The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Course Outcome:

At the end of the course students will able to:
CO1: Ability to understand major types of disaster in Indian context for skill development
CO2: Understanding of approaches to reduce disaster risks for employability.
CO3: Capable of understanding relationship between development and disaster. Sustainable development for skill development
CO4: Understanding of when an event becomes disaster and the phases to handle the situation for employability
CO5: Ability to analyze how to handle a situation of disaster by taking case studies of events in past for skill development.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	3	2	3	2	2	2	2
CO2	2	2	3	2	2	2	2	2	3	2
CO3	3	2	2	2	2	2	3	2	2	2
CO4	2	2	2	3	2	2	2	2	2	2
CO5	2	2	2	2	3	2	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	2	2
CO2	2	3	2
CO3	3	2	2
CO4	2	3	2
CO5	3	2	2

Suggested Readings:

1. Satish Modh, Introduction to Disaster Management, Macmillan Publisher India Ltd
2. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
3. Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
4. Singhal J.P. “Disaster Management”, Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
5. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., . ISBN-10: 1259007367, ISBN-13: 978-1259007361]
6. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
7. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
8. Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.
9. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.

Website sources:

- https://www.physio-pedia.com/Disaster_Management
- http://www.ifrc.org/en/what-we-do/disaster-management
- http://www.wcpt.org/disaster-management/what-is-disaster-management
- en.wikipedia.org

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (III Semester)

BFT301P FOOD AND NUTRITION LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Identification of food sources for various nutrients using food composition tables.	Experiment 1
6.	Record diet of self using 24 hour dietary recall and its nutritional analysis.	Experiment 2
7.	Introduction to meal planning, concept of food exchange system	Experiment 3
8.	Planning of meals for adults of different activity levels for various income groups.	Experiment 4
9.	Planning of nutritious snacks for different age and income groups.	Experiment 5
10.	Preparation of nutritious snacks using various methods of cooking.	Experiment 6
11.	Assessment of weight and height of self and calculation of BMI	Experiment 7
12.	Evaluation of own diet and weight status	Experiment 8

IFTM University, Moradabad
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BSB302P ENZYMOLOGY LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Introduction to Enzymology Laboratory.	Experiment 1
6.	Extraction of enzyme from plant source.	Experiment 2
7.	To determine the effect of temperature on the rate of enzyme action.	Experiment 3
8.	To determine the effect of pH on the rate of enzyme action.	Experiment 4
9.	To determine the effect of substrate concentration on the rate of enzyme action.	Experiment 5
10.	To determine the effect of enzyme concentration on the rate of enzyme action.	Experiment 6
11.	Extraction of pure amylase enzyme and its mode of action on substrate (starch).	Experiment 7
12.	Immobilization of amylase enzyme.	Experiment 8

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B. Sc. Food Technology II Year (IV Semester)

BFT401T FOOD CHEMISTRY

Objective(s): The objectives of this course:

- Describes chemical composition, structure, biochemistry and quality of important foods: fruit, vegetables, meat/fish, bread, milk.
- Explores the quality degrading processes in foods, Food microbiology, food hygiene and food borne illness.

UNIT I: **(8 Sessions)**

Water: Definition, Composition of food, Definition of water in food, Structure of water and ice; Types of water, Interaction of water with solutes, Sorption phenomenon, Water activity and packaging, Water activity and spoilage.

UNIT II: **(8 Sessions)**

Lipids: Classification of lipids, Characteristics, Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Chemical properties-Reichert Meissel value, Polenske value, iodine value, peroxide value, saponification value; Effect of frying on fats, rancidity, lipolysis, flavor reversion.

UNIT III: **(8 Sessions)**

Proteins: Protein classification and structure, Nature of food proteins (plant and animal proteins), Properties of proteins (electrophoresis, sedimentation, amphoterism and denaturation), Functional properties of proteins eg. organoleptic, solubility, viscosity, binding gelation / texturization, emulsification, foaming.

UNIT IV: **(8 Sessions)**

Carbohydrates: Classification (mono, oligo and poly saccharides), Structure of important polysaccharides (starch, glycogen, cellulose, pectin, hemicellulose, gums), Chemical reactions of carbohydrates, Modified celluloses and starches.

UNIT V: **(8 Sessions)**

Vitamins: Structure, Importance and Stability, Water soluble vitamins, Fat soluble vitamins, Flavour: Definition and basictastes, Chemical structure and Flavour enhancers.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand about composition of food, water in food- it's types and interaction with food and water activity for skill development, employability and entrepreneurship development.
CO2: Learn about the lipids, its characteristics, physical and chemical properties, effects of frying for skill development and employability.
CO3: Understand about the protein (classification, structure, nature of food proteins) and various properties of protein for skill development, employability and entrepreneurship development.
CO4: Understand about the carbohydrates, structure of important polysaccharides, chemical reactions of carbohydrates and modified carbohydrates for skill development and employability.
CO5: Gain the knowledge about the structure, importance and different types of vitamins. One should also learn about flavour and flavour enhancers for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	2	2	1	2	3	2
CO2	3	2	3	3	3	2	2	3	3	2
CO3	3	2	3	3	3	3	2	3	3	2
CO4	3	2	2	2	2	2	2	2	3	2
CO5	3	2	2	2	2	1	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	2
CO3	3	3	3
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996
2. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002
3. Wong, Dominic WS, Food Enzymes, Chapman and Hall, New York, 1995
4. Potter,N.N.and Hotchkiss,J.H, Food Science, 5th Ed., Chapman & Hall,1995
5. DeMan, J.M., Principles of Food Chemistry, AVI, NewYork, 1980

Websites Sources:

- https://www.cdc.gov/foodsafety/
- https://libguides.reading.ac.uk/food/websites
- http://www.fao.org/home/en/

IFTM University, Moradabad
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BFT402T FOOD PRESERVATION TECHNOLOGY

Objective(s): The objectives of this course:

- To study the importance microorganisms in food preservation
- To introduce the basics of various food processing and preservation technologies.

UNIT I: (8 Sessions)

Food Microbiology: Principles of Food Preservation, microorganisms associated with foods- bacteria, yeast and mold, Importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, pH, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Classification of food based on pH, Food infection, food intoxication, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods.

UNIT II: (8 Sessions)

Food Preservation by Low temperature: Freezing and Refrigeration- Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.

UNIT III: (8 Sessions)

Food Preservation by high temperature: Thermal Processing- Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.

UNIT IV: (8 Sessions)

Food Preservation by Moisture control: Drying and Dehydration - Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry. **Evaporation** – Definition, factors affecting evaporation, names of evaporators used in food industry.

UNIT V: (8 Sessions)

Food Preservation by Irradiation: Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.

Course outcomes:

At the end of the course students will be able to:

CO1: Understand the principles of food preservation, classification of food and food associated microorganisms for skill development, employability and entrepreneurship development.

CO2: Understand about the food preservation techniques by low temperature for skill development, employability and entrepreneurship development.

CO3: Gain the knowledge about the various techniques for food preservation by high temperature for skill development and employability.

CO4: Learn about the methods of food preservation by moisture control for skill development, employability and entrepreneurship development.

CO5: Understand the concept of food preservation by irradiation and concept of cold sterilization for

skill development and employability.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	3	2	2	2	2	2	2
CO2	2	2	3	3	2	3	3	3	3	2
CO3	2	2	3	3	2	3	3	3	3	2
CO4	2	2	3	3	2	2	2	2	2	2
CO5	2	2	3	3	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	3	3	2

Suggested Readings:

1. B. Srilakshmi, Food science, New Age Publishers,2002
2. Meyer, Food Chemistry, New Age,2004
3. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency, 2013
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004

Websites Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://library.nitrkl.ac.in/

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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BFT403T PRINCIPLES OF FOOD PREPARATION

Objective: The main objective of this course:

- Is to impart the knowledge of fundamental and basic concepts of culinary techniques, cooking methods, heat transfer, sanitation, safety, nutritional value of various food products.

UNIT I: (8 Sessions) Methods of Cooking: Basic methods of cooking, Conduction, convection, radiation, Microwave cooking, cooking media- air, water, steam, fat. Introduction to cookery terms.

UNIT II: (8 Sessions) Cereals: Effect of heat on cereals, Bakery foods- Bread, Cakes, types of icings, pizza base, biscuits, cookies, rusk, and pastry. Roles of ingredients, faults and remedies, leavening agents, Methods of making dough; Breakfast cereals.

UNIT III: (8 Sessions) Pulses: Types of pulses, Ways of using pulses- cooking, soaking, germination, fermentation, Enhancement of nutritive value by these processes Fermented foods like Idli, dhokla, soy products.

UNIT IV: (8 Sessions) Vegetables and fruits: Quality, care in storage, Nutritive value of various types of fruits and vegetables, Effect of heat, acid and alkali on pigments, Effect of cooking on nutritive value of fruits and vegetables, Brief description of various fruits and vegetable products and their nutritional quality.

UNIT V: (8 Sessions) Milk and Beverages: Effect of heat on milk, Preparation of milk products and nutritional values of- Ghee, Butter, Rabri, khoa, chhanna, paneer, Ice cream- roles of ingredients, method of preparation, defects. Beverages: Tea, Coffee, Cola drinks- Types available, processing, associated health benefits and risks.

Course Outcomes:

At the end of the course students will be able to:
CO 1: Understand the fundamental and basic concepts of cooking techniques, heat transfer process, cooking media, and some general cookery terms for skill development and employability.
CO 2: Acquaint with knowledge on cereals and their processing aspects, utilization of different ingredients and their role in bakery, preparation of ready to eat breakfast cereals and instant cereal foods for skill development, employability and entrepreneurship development.
CO 3: Acquaint with the major pulses and their rudimentary processing, the nutritional value enhancement and the fermented foods prepared through pulses for skill development and employability.
CO 4: Learn processing of fruits & vegetables - different preservation techniques to improve the shelf life of seasonal fruits and nutritional content for skill development, employability and entrepreneurship development.
CO 5: Understand the properties of milk due to the effect of heat, Production of milk products and beverages, and their nutritional content for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	3	2	2	2	2
CO2	3	3	3	3	2	3	2	3	3	3
CO3	3	2	3	3	2	3	2	3	3	3
CO4	3	2	3	3	2	3	2	3	3	3
CO5	3	2	2	2	2	3	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	2
CO3	3	3	3
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Charley, H. Food Science, 2nd edition, 1982.
2. Ananda lakshmi, Basic Food Preparation, Lady Irwin College, 1989.
3. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford. 2007.
4. Swaminathan, M. Food Science, Chemistry and Experimental Foods, 2nd ed, 1987.
5. Manay NS & Shadakshasaswamy M, Food Facts and Principles, New Age International, 2004.

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- http://ecoursesonline.iasri.res.in/

IFTM University, Moradabad
Bachelor of Sciences (B.Sc.), Programme
B.Sc. (Biotechnology/Food Technology) II Year (IV Semester)

BSB404T INTRODUCTORY BIOSTATISTICS

Objective(s): The objectives of the course:

- To learn Biostatistics for designing data collection plans, analyze data appropriately and interpret and draw conclusions from those analyses.
- Is to help in learning advance statistical science and its application in problems of human health and disease.
- Is advancing statistics and analyzing data for research problems

UNIT I: (8 Sessions)

Introduction to Biostatistics: Definition, Statistical method biology measurement, Kinds of biological data, Function of statistics and limitation of statistics, Application of biostatistics, Role of biostatistics in modern research, Parametric and non-parametric methods (Tests).

UNIT II: (6 Sessions)

Collection of data: Presentation of data classification and tabulation, Type of representation (graphic-bar diagram, pie-diagram, Curves and basic concept of calculus), Sampling and sampling design.

UNIT III: (6 Sessions)

Measures of central tendencies: Mean, Median, Mode, Geometric mean, Measure of dispersion, Variability and changes, Deviation- Quartile deviation, Mean deviation, Standard deviation, Standard error, Coefficient of variations.

UNIT IV: (8 Sessions)

Different Test: Test of hypothesis, Test of significance, t-test, Chi-square test, F-test and ANOVA with numerical.

UNIT V: (12 Sessions)

Probability theory: Probability theory of random experiment and associated sample space, Events, Definition of probability, Algebra of events, Addition and multiplication theorems on probability (without proof), Probability distribution, Binomial distribution, Poisson distribution and Normal distribution and their applications in biostatistics.

Course Outcomes:

At the end of the course students will be able to:

CO1: Demonstrate knowledge of the properties of parametric, semi-parametric and non-parametric testing procedures in Biostatistics for skill development.
CO2: Remember restate the principal concepts about biostatistics and collect data relating to variable which will be examined for skill development.
CO3: Understand and interpret the concepts of descriptive statistics from these data for skill development.
CO4: Understand and be able to address ethical, regulatory and practical aspects of human subject's research including human subjects protections for skill development.
CO5: Be capable of self-directed learning of unfamiliar statistical methods and written and oral presentation of results/findings for skill development and employability.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	3	2	2	2	2	2
CO2	3	2	2	2	3	2	2	2	2	2
CO3	3	2	2	2	3	2	2	3	3	3
CO4	3	2	2	2	3	2	2	3	3	3
CO5	3	2	2	2	3	2	2	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	2	2
CO2	3	2	2
CO3	3	2	2
CO4	3	2	2
CO5	3	3	2

Suggested Readings:

1. George W and Willian G., Statistical Methods, IBH Publication
2. Zar J. Biostatistics, Prenticw Hall, London.
3. R. Rangaswami, A Text Book of Agricultural Statistics, New Age International Publication, New Delhi.
4. B. K. Mahajan: Methods in Biostatistics.
5. S.C. Gupta & V.K. Kapoor: Fundamentals of Applied Statistics: Sultan Chand & Sons, New Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

IFTM University, Moradabad
Bachelors of Science (B.Sc.), Program
B.Sc. Food Technology III Year (IV Semester)

BFT405T TECHNIQUES IN FOOD ANALYSIS

Objective: The main objective of this course:

- Is to help students gain knowledge about various procedures, techniques, instruments and national and international rules and regulations that are relevant in food industry.

UNIT I: (8 Sessions)

Sampling and Sampling Techniques: Statistical tests and Error Analysis: Accuracy, precision, classification of errors; minimization of errors; Sampling and sample treatment– different methods of sampling; factors involved in effective sampling.

UNIT II: (8 Sessions)

Composition analysis of food: Principles and analysis of- Moisture, total solids, Ash, Fat, Protein, Carbohydrate, Vitamin; Traditional method of mineral analysis.

UNIT III: (8 Sessions)

Spectrophotometer: Spectrophotometry: fundamental laws of photometry, Colorimetric analysis, fluorometric analysis, UV-Visible spectrophotometry.

UNIT IV: (8 Sessions)

Chromatography: Principle, classification, separation techniques (Elution, frontal and displacement analysis), Column chromatography, thin layer chromatography, paper chromatography, gas chromatography, HPLC.

UNIT V: (8 Sessions)

Food quality testing and evaluation: Sensory evaluation-introduction, panel screening, Sensory and instrumental analysis in quality control.

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the sampling techniques and the factors involved, error analysis, and minimization for skill development, employability and entrepreneurship development.

CO2: Understand the principle and analysis of compositional attributes of food for skill development, employability and entrepreneurship development.

CO3: Understand the fundamental principle and laws of spectrophotometry and its application in food analysis for skill development and employability.

CO4: Understand the basic principle and classification of chromatographic techniques and their application in food analysis for skill development and employability.

CO5: Understand the physiological and psychological basis for sensory evaluation and its methodologies to solve specific problems in food quality analysis for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Program Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	3	2	2	2	2	2	2
CO2	2	2	3	3	2	2	2	2	2	2
CO3	2	2	3	3	2	2	2	2	2	2
CO4	2	2	3	3	2	2	2	2	2	2
CO5	2	2	3	3	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	2
CO5	3	3	3

Suggested Readings:

1. Gaithersburg, AOAC International. Official methods of analysis of AOAC International. 17th ed., USA, Association of Analytical Communities, 2003.
2. Yolanda Picó, The Chemical Analysis of Foods, first ed., Acedemic Press, 2012.
3. M.L Leo, Handbook of Food Analysis, third ed., CRC Press, 2015.
4. G. Linden, Analytical Techniques for Foods and Agricultural Products, PCH, 1995.
5. S.S. Nielsen, Introduction to Chemical Analysis of Foods, 2002.
6. Y. Pomrenz, C.E. Meloan, Food Analysis-Theory and Practice, third ed., Springer, 2002.
7. S. Ranganna. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, Second ed., Tata-McGraw-Hill, 2001.

Website Sources:

- https://www.wikipedia.org/
- https://www.ncbi.nlm.nih.gov/books

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B. Sc. Food Technology II Year (IV Semester)

BFT401P FOOD CHEMISTRY LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Preparation of standard solution.	Experiment 1
6.	Estimation of moisture content in the given food samples by hot air oven.	Experiment 2
7.	To determine the casein content of a given milk samples	Experiment 3
8.	To determine the percent of free fatty acid and acid value of given fats and oils sample.	Experiment 4
9.	To determine the smoke point of given fats and oils sample.	Experiment 5
10.	Estimation of flour pigments with respect to carotenoids in the given samples.	Experiment 6
11.	Determination of inactivation of spoilage enzyme (Catalase, Peroxidase, Polyphenol oxidase) in a given food samples.	Experiment 7
12.	To determine the non-enzymatic browning in given food samples.	Experiment 8

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B. Sc. Food Technology II Year (IV Semester)

BFT402P FOOD PRESERVATION TECHNOLOGY LAB

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Preservation of food by high concentration of sugar	Experiment 1
6.	Preservation of food by using salt	Experiment 2
7.	Drying of fruit slices pineapple slices, apple slices in cabinet drier	Experiment 3
8.	Preservation of food by using acidulants i.e. pickling by acid, vinegar or acetic acid	Experiment 4
9.	Preservation of selected food items by Blanching	Experiment 5
10.	Preservation of food by using chemical preservatives	Experiment 6
11.	Demonstration of preserving foods under cold vs. freezing process	Experiment 7
12.	Preservation of food by heat treatment- pasteurization	Experiment 8

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
Fifth Semester
COURSE STRUCTURE

SYLLABUS
BFT-501 Techniques in Food Analysis

Unit I: Analysis of Food products: Introduction, Government regulations and recommendations, properties analysed, Sampling: methods and procedure *to develop skills.*

Unit II: Food safety, hazards and Risks. Microbiological consideration in food safety, chemical hazards associated with foods. Quality factors in food- appearance factors, textural factors, flavour factors and additional quality factors *to enhance skills for employability.*

Unit III: Instrumental Analysis: Spectrophotometry: fundamental laws of photometry, Colorimetric analysis, fluorimetric analysis, UV-Visible spectrophotometry *for effective development of employability skills.*

Unit IV: Chromatography: principle, classification, separation techniques (Elution, frontal and displacement analysis), Column chromatography, thin layer chromatography, paper chromatography, gas chromatography, HPLC *to develop employability and entrepreneurship.*

Unit V: Food adulteration and food safety. Sensory evaluation-introduction, panel screening, Sensory and instrumental analysis in quality control *for developing employability skills.*

Recommended Text/ Reference Books

1. Gaithersburg, AOAC International. Official methods of analysis of AOAC International. 17th ed., USA, Association of Analytical Communities, 2003.
2. Yolanda Picó, The Chemical Analysis of Foods, first ed., Acedemic Press, 2012.
3. M.L Leo, Handbook of Food Analysis, third ed., CRC Press, 2015.
4. G. Linden, Analytical Techniques for Foods and Agricultural Products, PCH, 1995.
5. S.S. Nielsen, Introduction to Chemical Analysis of Foods, 2002.
6. Y. Pomrenz, C.E. Meloan, Food Analysis-Theory and Practice, third ed., Springer, 2002.
7. S. Ranganna. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, Second ed., Tata-McGraw-Hill, 2001.

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the sampling techniques and the factors involved, error analysis, and minimization for skill development, employability and entrepreneurship development.

CO2: Understand the principle and analysis of compositional attributes of food for skill development, employability and entrepreneurship development.

CO3: Understand the fundamental principle and laws of spectrophotometry and its global application in food analysis for skill development and employability.

CO4: Understand the basic principle and classification of chromatographic techniques and their global application in food analysis for skill development and employability.

CO5: Understand the physiological and psychological basis for sensory evaluation and its methodologies to solve specific problems in food quality analysis for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes

Please write 3,2,1 wherever required

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	3	2	2	2	2	2	2
CO2	2	2	3	3	2	2	2	2	2	2
CO3	2	2	3	3	2	2	2	2	2	2
CO4	2	2	3	3	2	2	2	2	2	2
CO5	2	2	3	3	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	2
CO5	3	3	3

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-502 Food Industry By-Products & Waste Utilization

Unit I: Waste Related to the Food Industry: Food waste: status, definition and handling; classification and properties; assessment of the origin and the generated Mass of the most important types of Product-specific food waste; Content and ways of reuse of food wastes *for skill development.*

Unit II: Fundamentals and Applications of Anaerobic Digestion: for sustainable treatment of food industry wastewater; brewery and winery wastewater treatment: some focal points of design and operation application of UASBR for canning industry, Fixed bed loop reactor for alcohol industries *to develop skills for employability.*

Unit III: Utilization of By-Products and Waste from animal, meat, poultry and fish processing industries: Nutritive value of meat by-products, utilization of blood and blood plasma in food, medicinal and pharmaceutical uses of blood; utilization of gelatin from hide and skin, bones, glands and organs, poultry by-products and fish waste *for developing employability skills*.

Unit IV: Utilization of Plant By-Products: for the recovery of proteins, dietary fibers, antioxidants, and colorants; Utilization of sugarcane by-products: Uses of Bagasse, Molasses, Press mud, Trash, Tops and leaves *to develop skills for employability*.

Unit V: By-products of Dairy Industry and their utilization: skim milk and its by-products (casein, caseinates, milk protein hydrolysates) butter milk, whey and its by-products, ghee residue *for better employability.*

Recommended Text/ Reference Books

1. K. Kristbergsson, Utilization of By-Products and Treatment of Waste in the Food Industry, Springer Science Business Media, 2007.
2. V. Oreopoulou, W. Russ, Utilization of By-Products and Treatment of Waste in the Food Industry, 2007 ed., Springer, 2009.
3. H.W. Ockerman, L. Conly, Hansen Animal By-Product Processing & Utilization, first ed., CRC Press, 1999.
4. A.V. Delgado, C.de Armas Casanova Sugar Processing and By-products of the Sugar Industry, FAO Agriculture service bulletin, FAO, 2001.
5. C. Lim, D.J. Sessa, Nutrition and Utilization Technology in Aquaculture, Amer Oil Chemists Society, 1995.
6. Malik, E. Grohmann, Environmental Protection Strategies for Sustainable Development, 2012 ed., Springer.

Course Outcomes:

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

At the end of the course students will be able to:

CO1: Understand the definition, handling, classification, and properties of food waste; Types of product-specific food waste, and global ways to reuse food waste for skill development, employability and entrepreneurship development.

CO2: Understand the working and applications of UASB and fixed bed loop reactor used in the food industry for skill development, employability and entrepreneurship development.

CO3: Understand the utilization of by-products from animal, meat, poultry, and fish industries for skill development, employability and entrepreneurship development.

CO4: Identify and analyze the utilization of sugarcane by-products. Gain knowledge about the recovery of proteins, dietary fibres, and antioxidants for skill development and employability.

CO5: Understand the utilization of various dairy by-products like casein and ghee residue for skill development and employability

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	2	3	2	2	2
CO2	2	2	2	2	2	2	3	2	2	2
CO3	2	2	2	2	2	2	3	2	2	2
CO4	2	2	2	2	2	2	3	2	2	2
CO5	2	2	2	2	2	2	3	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-503 Food Safety and Microbial Standard

UNIT I: Microorganisms and Food Contamination: Emerging and Reemerging Food borne Pathogens, Microbiology Terms Applied to Food Safety, Methods for Identification of Bacterial Food borne Pathogens, Methods for Epidemiological Studies of Food borne Pathogens *for skill development.*

UNIT II: Clinical Presentations and Pathogenicity: Mechanisms of Bacterial Food borne Infections: Dietary Toxins: Naturally occurring in food Endogenous toxin, exogenous toxin. Microbial toxins; (i) Bacterial (ii) Mold. Intrinsic toxin produced during processing and storage. M as toxin – sources, conditions, causes and Elimination *for better employability*.

UNIT III: Safety of Major Food Products: Safety of Produce, Safety of Fruit, Nut, and Berry Products. Safety of Dairy Products, Safety of Meat Products, Safety of Fish and Seafood Products *to acquire knowledge for employability.*

UNIT IV: Risk Analysis, Interventions and Regulations: Food Risk Analysis, Sensory evaluation of food quality, Quality factor for consumer safety, Food Regulation in the India, Role of Different Regulatory Agencies of the world *for better employability*.

UNIT V: Food borne Diseases: Types – food borne infections, food borne intoxications and toxic infections, Origin, symptoms and prevention of some commonly occurring food borne diseases, Emerging pathogens of concern, Pesticide residues as toxin; i) chlorinated ii) Non – chlorinated. Non – Permitted food additives. Microbial standards of processed and preserved foods *to acquire knowledge for employability*.

Recommended Text/ Reference Books

1. O.A.Oyarzable, S. Backert, Microbial Food Safety: An Introduction, 2012 ed., Springer.
2. M.J. Pelczar, K. Chan, Microbiology, fifth ed., Tata McGRAW-Hill, 1998.
3. R E Hester , R M Harrison et al., Food Safety and Food Quality, first ed., Royal Society of Chemistry, 2001**.**
4. R.S. Igoe, Dictionary of Food and Ingredients, Fifth ed., Springer, 2011.
5. G.Tucker, Food Biodeterioration and Preservation, Second ed., Wiley-Blackwell, December 2016.
6. D. H. Watson, Food Chemical Safety, First ed., CRC Press, 2001.
7. B. Shivasankar, Food Processing and Preservation, PHI Learning Pvt. Ltd, 2004.

Course Outcomes:

CO1: Understand food safety and its microbiology for skill development, employability and entrepreneurship development.

CO2: Know major chemical and biochemical (enzymatic) reactions that influence food quality with emphasis on food industry applications globally for skill development, employability and entrepreneurship development.

CO3: Understand how the properties of different food components and interactions among these components modulate the specific quality attributes of food systems for skill development and employability.

CO4: Understand the principles that underlie the biochemical/enzymatic techniques used in food analysis for skill development and employability.

CO5: Gain knowledge and be able to use food regulations for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	2	2	2	2	2	2	2
CO2	2	2	3	2	2	3	3	3	3	3
CO3	2	2	3	2	2	3	3	3	3	3
CO4	2	2	3	2	2	3	3	3	3	3
CO5	2	2	3	2	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	2
CO5	3	3	3

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-504 Fat Rich and Traditional Dairy Products

Unit-I: Cream: Definition & Legal standards, Methods of separation, Efficiency of cream separation and factors affecting it; control of fat concentration in cream. Neutralization, standardization, pasteurization, and cooling of cream *for better employability*.

Unit-II: Butter: introduction to the butter-making process; batch and continuous methods. Technology of butter manufacture; over-run in butter; packaging and storage *for better employability*.

Unit-III: Khoa: Classification of types, standards methods of manufacture and preservation factors affecting yield of khoa. Physicochemical changes during manufacture and storage of khoa. Mechanization in manufacturing process of khoa *to acquire knowledge for entrepreneurship and employability*.

Unit-IV: Chhana: Product description, Standards method of manufacture, packaging and preservation. Paneer: Product description standards method of manufacture packaging and preservation. Physicochemical changes during manufacture and storage *to acquire knowledge for entrepreneurship and employability*.

Unit-V: Ghee: Methods of ghee making-batch and industrial processes, innovations in ghee production, procedure, packaging and preservation of ghee *to develop entrepreneurship*.

Recommended Text/ Reference Books

1. P.Walstra, DairyTechnology: Principles of Milk Properties and Processes, First ed., CRC Press, 1999.
2. P. Walstra, P. Walstra, J.T. M. Wouters, T.J. Geurts, Dairy Science and Technology, Second ed., CRC Press, 2005.
3. R.K. Robinson, Modern dairy Technology (vol.I and II), 1994 ed., Springer, 2012.
4. Rosenthal, Milk and Milk products, VCH Publications, 1991.
5. B. Shivasankar, Food Processing and Preservation, First ed., PHI Learning Pvt. Ltd, 2002.

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the different cream separation methods used in the dairy industry for skill development, employability and entrepreneurship development.

CO2: Understand the butter-making process and the key functions of the processing steps involved for skill development, employability and entrepreneurship development.

CO3: Understand the classification and global standard methods of manufacture of khoa for skill development and employability.

CO4: Identify the physicochemical changes during the manufacture and storage of paneer for skill development and employability.

CO5: Identify and analyze the production, packaging, and preservation of ghee for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	2	2	3	3	2
CO2	2	3	2	2	2	2	2	3	3	2
CO3	2	2	2	3	2	2	1	3	3	2
CO4	2	3	2	2	2	2	2	3	3	2
CO5	2	2	2	2	2	2	2	3	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	2
CO5	3	3	3

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-505 Food Packaging Technology

Unit-I: Introduction: Packaging developments – an historical perspective; Food supply and the protective role of packaging; The value of packaging to society; Definitions and basic functions of packaging; Packaging strategy, Packaging design and development, The packaging design and development framework, Packaging specifications and standards *to enhance skills for employability.*

Unit-II: Packaged product quality and shelf life: Factors affecting product quality and shelf life; Chemical/biochemical processes, Oxidation, Enzyme activity; Microbiological processes microbiological shelf life; Physical and physico-chemical processes; Migration from packaging to foods *for better employability*.

Unit-III: Logistical packaging for food marketing systems: Functions of logistical packaging; Logistics activity-specific and integration issues; Distribution performance testing; Packaging materials and systems *to generate entrepreneurship and employability.*

Unit-IV: Metal cans: Overview of market for metal cans; Container designs; Raw materials for can-making; Can-making processes (DRD) cans (DWI) cans; End-making processes; Coatings, film laminates and inks; Processing of food and drinks in metal packages; Shelf life of canned foods; Internal corrosion & External corrosion. **Packaging of food in glass containers:** Glass packaging; Attributes of food packaged in glass containers; Glass and glass container manufacture process *for better employability*.

Unit-V: Plastics in food packaging: Use of plastics in food packaging; Manufacture of plastics packaging; Types of plastic used in packaging, Polyethylene, (PP), (PET or PETE), (PEN), (PVC), (PS) (SB), (EVOH); Coating of plastic films – types and properties; Secondary conversion techniques; Printing and labelling of rigid plastic containers, Food contact and barrier properties. Active packaging; Modified atmosphere packaging, for better employability

Recommended Text/ Reference Books

1. G.A. Giles, Food Packaging Technology, Global Pack Management, GlaxoSmithKline, Blackwell publishers, CRC press.
2. F.A. Paine, H.Y. Paine, A Handbook of Food Packaging, Second ed., Springer, 1993.
3. R. Coles, D. McDowell, M.J. Kirwan, Food Packaging Technology, CRC Press.
4. A.Emblem, H. Emblem, Packaging Technology: Fundamentals, Materials and Processes, Woodhead Publishing Ltd, 2012.
5. B.S. Khakar, Food Science & technology, Daya Publishing House.

Course Outcomes:

At the end of the course students will be able to:

CO1: Impart the knowledge of various areas related to food processing and packaging for skill development, employability and entrepreneurship development.
CO2: Understand food composition and its physiochemical, nutritional, microbiological, and sensory aspects for skill development, employability and entrepreneurship development.
CO3: Learn the global importance of food safety, food quality, food laws, marketing, and food distribution system for skill development, employability and entrepreneurship development.
CO4: Evaluate different packaging materials (metals, cans, glass) based on various types of analysis in the laboratory for skill development and employability.
CO5: Understand packaging materials and effective packaging processes for skill development and employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	3	2	2	2	2	2	2
CO2	2	1	2	3	2	3	2	2	3	2
CO3	2	2	2	3	2	2	2	2	2	2
CO4	3	3	2	3	2	3	3	3	2	3
CO5	2	2	2	3	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-504 I Nutrition during lifecycle

Unit I: Basic physiologic changes in infancy, childhood, adolescence, adulthood, elderly, as well as other states such as pregnancy and lactation Introduction to Human Nutrition and Nutritional Terminology for skill development.

Unit II: Basic info on micro and macro nutrients metabolism, their role in human health, major dietary sources, common terminology, units and conversion, introduction to CFG and other references. Nutritional Assessment Application of ABCD tools with regard to various stages in life cycle, general factors affecting nutritional needs, basic info on some common nutritional deficiencies/toxicity in life cycle for enhancing skills for employability.

Unit III: Basic Nutrition During Pregnancy Review of major physiological changes during pregnancy, 3 trimesters, importance of BW gain and BMI, energy requirements, macro and micro nutrient requirements, some common pregnancy related problems and their effects on nutrient net intake. Basic Nutrition during lactation Review of milk production/ejection, factors affecting these process, human milk composition, major differences between cow's milk and human milk for develop skills for employability.

Unit IV: Basic Nutrition during Infancy Exclusive breastfeeding, formula feeding, nutrient needs, assessment of nutrient intake, introduction to solid food, some common problems, Review of growth and development in infancy, use of growth chart, benefits of breast feeding. Basic Nutrition during Childhood Growth and development, preschoolers and school-age periods, nutrient needs, nutritional assessment, differences between boys and girls, some common problems. Basic Nutrition during Adolescence Growth issues in boys and girls, factors affecting nutrient intakes, nutrient needs, basic info on eating disorders, impact of fast foods for enhancing skills for employability.

Unit V: Basic Nutrition during Adulthood Life style and nutrient needs, body weight management and energy intake, sex related differences in energy and nutrient needs. Basic Elderly Nutrition Basic info on decline in body organ function, problems with net intake (digestion, absorption, etc). problems with shopping, cocking, etc. Nutrient needs (Ca, Fe, energy, etc.). Nutritional Consideration of Disease States During the Life Cycle Nutritional consideration in some common diseases such as obesity, cardiovascular, cancer, etc. Research Data Discussing several studies pertaining to nutritional considerations in life cycle for enhancing skills for employability.

Recommended Text/ Reference Book:

1. Fundamentals of Foods, Nutrition and Diet Therapy by Sumati R. Mudambi ·
2. Applied Nutrition by R. Rajalakshmi, K. K. Sakhariah.
3. Nutrition for Health and Health Care by Eleanor Noss Whitney

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the basic physiologic changes in infancy, childhood, adolescence, adulthood, and elderly for skill development.

CO2: Gain knowledge about the basic info on micro and macro nutrients metabolism, their global role in human health for employability in industry.

CO3: Understand the basic nutrition during pregnancy review of major physiological changes during pregnancy for employability in industry.

CO4: Understand the basic nutrition during infancy exclusive breastfeeding, formula feeding, nutrient needs, assessment of nutrient intake, introduction to solid food, some common problems for employability in industry.

CO5: Understand the basic nutrition during adulthood life style and nutrient needs, body weight management and energy intake for employability in industry and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	2	2	2	2
CO2	2	2	3	3	2	2	1	3	2	2
CO3	3	2	3	3	3	2	2	2	3	3
CO4	2	3	3	3	3	3	3	2	2	3
CO5	3	3	2	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	1
CO2	3	**2**	**3**
CO3	2	2	2
CO4	2	**3**	2
CO5	3	**3**	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

SYLLABUS
BFT-504 II FOOD PLANT LAYOUT & DESIGN

UNIT I: Introduction to plant design, difference and considerations , General plant design procedure, Introduction to feasibility study and analysis for skill development .

UNIT II: Introduction to plant design, situations, difference and considerations ,General plant design procedure, Introduction to feasibility study and analysis. Food plant size, utilities and services- Ventilation, Illumination and fly control for employability in industry and skill development.

UNIT III: Food plant layout introduction, planning and experimentation :Plant layout ,Layout Design, Procedure, Experimentation in Pilot Plant, Symbols used for food plant design and layout for employability in industry and skill development.

UNIT IV: Food processing enterprise and engineering economics, evaluation methods, fruit juice processing plant, reduction unit, evaporation plant, drying plant, bake ovens and frying plant, thermal processing plant, refrigeration and air conditioning plant for employability in industry and skill development.

UNIT V: Process scheduling and operation , Process schedule, Plant operations, Building materials and construction for skill development

Recommended Text Books/References

1. Ahmad, T. Dairy Plant Engineering and Management, (Kitab Mahal, 2009)
2. Sheth, V. S. Facilities planning and materials handling; method and requirements, (Mercel Dekker, 1995)
3. Gomez, A. L. and Barbosa G. V. Food Plant Design, (CRC Press, 2003)
4. Biegler, L., Grossmann, I. E. and Westeberg, A. W. Systematic Methods of Chemical Engineering and Process Designs, (Prentice Hall of India, 1997)
5.. Turton, R., Bailie, R. C. and Whiting, W. B. Analysis, Synthesis and Design of Chemical Processes,(Prentice Hall of India, 2008)

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the plant design, difference and considerations for skill development.

CO2: Gain knowledge about the food plant size,global utilities and services- ventilation, illumination and fly control for employability in industry.

CO3:Understand the food plant layout introduction, planning and experimentation for employability in industry.

CO4: Understand the food processing enterprise and engineering economics,evaluation methods for employability in industry.

CO5: Understand the process scheduling and operation , process schedule, plant operations for employability in industry and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	2	2	2	2
CO2	2	2	3	3	2	2	1	3	2	2
CO3	3	2	3	3	3	2	2	2	3	3
CO4	2	3	3	3	3	3	3	2	2	3
CO5	3	3	2	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	1
CO2	3	**2**	**3**
CO3	2	2	2
CO4	2	**3**	2
CO5	3	**3**	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

SYLLABUS
BFT-504 III FOOD SUPPLY CHAIN MANAGEMENT

UNIT I: Introduction. Logistics and supply chain management - Scope, Significance and Drivers; Basic Model - Primary and Secondary Activities; Role and Challenges of Logistics and supply chain management in food industry. knowledge for better employability in industry and skill development

UNIT II: Demand Forecasting And Warehousing Demand and supply management, Forecasting techniques, Strategic planning for material sourcing, Outsourcing strategies, Warehouse strategies, Inventory models and control techniques knowledge for better employability in industry and skill development

UNIT III: Distribution And Transportation .Various sources of distribution channels, Distribution models, 3PL and 4PL, Distribution network planning, Modes of transportation, Design of transshipment, Containerization for better employability in industry and skill development

UNIT IV: Packaging And Information Technology ,Applications of Packaging in logistics, Types of packaging and packaging materials, Export & import packaging and labeling details, Reverse Supply Chain, Information Technology and the Supply Chain (ERP, Bar-coding, RFID, GPS, E-Procurement). knowledge for better employability in industry and skill development

UNIT V: Global Lscm And Performance Analysis, Export and import procedure and Documentation, Customer relationship management in LSCM, Performance metrics in Supply Chain, Challenges in SCM for better employability in industry and skill development

Recommended Text Books/References:

1. D K Agarwal, Logistics and supply chain management, Macmillan Publishers India Ltd. (2003), Eighth Impressions, 2010.
2. Sunil Chopra and Peter Meindi, Supply chain management Pearson Education publishers, 2010.
3. David Taylor and David Brunt, Manufacturing Operations and Supply chain Management, Vikas Thomson Learning publishers, 2009.
4. Amit Sinha and Herbert Kotzab, Supply Chain Management, Tata McGraw Hill, 2011.
5. Surendra M. Gupta, Reverse Supply Chains: Issues and Analysis, CRC Press, 2013.

Course Outcomes:

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At the end of the course students will be able to:

CO1: Understand the logistics and supply chain management - scope, significance and drivers for skill development.

CO2: Gain knowledge about the demand forecasting and warehousing demand and supply management for employability in industry for better employability in industry and skill development

CO3: Understand the global distribution and transportation, various sources of distribution channels, distribution models for employability in industry.

CO4: Understand the packaging and information technology , global applications of packaging in logistics, types of packaging and packaging materials for employability in industry.

CO5: Understand the global lscm and performance analysis, export and import procedure and documentation for employability in industry and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	2	2	2	2
CO2	2	2	3	3	2	2	1	3	2	2
CO3	3	2	3	3	3	2	2	2	3	3
CO4	2	3	3	3	3	3	3	2	2	3
CO5	3	3	2	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	1
CO2	3	**2**	**3**
CO3	2	2	2
CO4	2	**3**	2
CO5	3	**3**	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-505 I Food Physics

UNIT I: Units and measurement: Measurement in science, fundamental quantities and units, derived units, systems of units (CGS, FPS, MKS and SI: Base units, SI prefixes), concept of dimension, dimensional formulae's (velocity, acceleration, area, volume, force, density, momentum, work, pressure and co-efficient of viscosity), conversion of units from one unit to another to inculcate skill, provide employability & entrepreneurial skills.

UNIT II: Rheological Properties, Rheology-definition-various types of materials-Hook's law-classic ideal material. Stress-strain-density relationship. Rheological models-Maxwell model, Kelvin model, Four elements Burger's model for skill development and employability.

Unit III: Textural Properties Texture of food materials-subjective and objective methods-Imitiative and Empirical tests . Texture Profile Analysis. Interpretation of results for skill development and employability

Unit IV: Electrical properties resistance capacitance uses Dielectric loss factor method of determination. A.C. conductivity and dielectric constant determination O meter. Effect of moisture content on electrical properties energy absorption from high frequency electric field for skill development and employability.

Unit V: Composition of raw materials and processed foods in chemical-physical terms, chemical and physical changes in food from harvesting to consumption, chemical composition and physical properties in relation to the foods quality through use of modern analytical methods for understanding for entrepreneurial skill.

Recommended Text Books/References:

1. Mohesenin.N.N. Thermal properties of Food and Agricultural Materials. Gordon and Beach Science Publishers. NewYork 1980.
2. Rao. M.A. and S.S.H. Rizvi (Eds) Engineering Properties of Foods . Marcel Dekker Inc. New York 1986

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the unit measurements and conversion of units from one form to another in food science for skill development and employability.

CO2: Understand about the global food flow and viscoelastic behaviors in food on the basis of different properties such as density, heat capacity and thermal conductivity.

CO3: Understand the different tests and instruments used for the texture analysis of food and measure various force-related properties to inculcate skill, provide employability.

CO4: Understand the effect of moisture content on electrical properties energy absorption from high frequency electric field and Food Codex for skill development.

CO5: Understand the concept of the composition of raw materials used in processed foods and changes in chemical composition and physical properties to improve the food quality for employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	2	2	1	2	2	2	2	2
CO2	2	2	3	3	2	2	2	3	2	2
CO3	3	2	3	3	3	2	2	2	3	3
CO4	2	3	3	3	3	3	3	2	2	3
CO5	3	3	2	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	2	2
CO2	2	2	**2**
CO3	2	2	2
CO4	3	3	2
CO5	3	3	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-505 II JUICE PROCESS TECHNOLOGY

Unit I: Introduction and History of growth. Type of beverages: fruit & vegetable juices, fermented and non-fermented beverages, synthetic beverages, carbonated and non-carbonated beverages. Tea, Coffee and Cocoa: Production, composition, processing and preparation for skill development.

Unit II: Fruit and Vegetable Beverages: Juice extraction, clarification, preservation, packaging, concentration and drying. Various beverages from fruit juices, their preparation and preservation for skill development.

Unit III: Non carbonated and carbonated synthetic beverages: Ingredients, source of carbon dioxide, chemical and physical properties of carbon dioxide, carbonating process, packaging of carbonating beverages for skill development.

Unit IV: Alcoholic Beverages: Non-Distilled Beverages : Beer and Wine, Distilled Beverages :Vodka, Rum, Gin, Whisky, Arack, Toddy, Brandy for enhancing skills for employability.

Unit V: Water for beverages: Types of water required for beverages, treatment of water. Additives for beverages: Natural and synthetic sweeteners and colours, acids, emulsifiers, preservatives, flavours and flavour enhancers. Quality control of beverage: Quality standards for beverages, chemical, microbial and sensory evaluation, product shelf life for enhancing skills for employability.

Recommended Text/ Reference Book:

1. Foods: Facts and Principles : N. Shankuntala Manny and M. Shadaksharaswamy.
2. Processing Fruits: Science and Technology, Second Edition by Diane M. Barrett.
3. Beverages : Processing and Technology by Deepak Mudgil.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand all about the composition, processing and preparation of beverages for skill development.
CO2: Understand the various types of beverages from fruit juices, their preparation and preservation for skill development.
CO3: Understand the non carbonated and carbonated synthetic beverages, Ingredients, processing and packaging for skill development.
CO4: Understand the alcoholic Beverages for enhancing skills for employability.
CO5: Understand about water for beverages, Additives for beverages and global Quality standards for beverages for better employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required

IFTM UNIVERSITY, MORADABAD
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(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	2	2	1	2	2	2	2	2
CO2	2	2	2	3	2	2	2	3	2	2
CO3	3	2	2	3	2	2	2	2	3	3
CO4	2	3	3	3	3	3	3	2	2	3
CO5	3	3	2	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	**2**	**3**	2
CO2	3	**2**	**3**
CO3	**3**	2	2
CO4	2	**3**	2
CO5	**2**	**2**	3

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)
SYLLABUS
BFT-505 III FISH AND MARINE PRODUCTS TECHNOLOGY

UNIT I: General and systematic classification of fishes. Classification based on degrees of movement, zones inhabited and manner of reproduction for skill development.

UNIT II: Economically important groups of fishes: general and brief account of elasmobronchs, clupeoids, salmonoids, scombroids, gadoids, heterosomata, sciaenids, carangids, trichiurids, catfish, crustaceans and mollusks. knowledge for better employability in industry.

UNIT III: Natural populations or stocks as biological entities: factors limiting abundance of stocks. Criteria for distinguishing units or multi-stock species. Idea of unit stock- its relevance to tropical marine fish. Population dynamics: recruitment, growth and mortality. Length-weight relationship. Condition factor knowledge for better employability in industry.

UNIT IV: General account of life history of Indian fishes: oil sardines, Indian shad, mackerel, Bombay duck and Malabar sole. General account of : food and feeding habits of fishes; reproduction and spawning and fish eggs and larvae. Age determination of fishes. knowledge for better employability in industry.

UNIT V: General account of movement and migration in fishes: eels, salmon, Indian shad. General account of Marking and Tagging of fishes. knowledge for better employability in industry.

Recommended Text Books/References

1. Cushing D-Fisheries biology, Wisconsin U. Press
2. Cushing DH -Marine ecology &Fisheries ,Cambridge U. Press
3. Jhingran VG- Fish and fisheries of India,Hindusthan
4. Nelson JS- Fishes of the world ,John Wiley
5. Royce WF-Introduction to fishery sciences,Academic Press

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand the classification based movement for Fishes and manner of reproduction for skill development.
CO2: Understand the general and brief account of about economically important groups of fishes for better employability in industry.

CO3: Understand the natural populations and global criteria for distinguishing units or multi-stock species for better employability in industry

CO4: Understand the general account of life history of Indian fishes and reproduction and spawning and fish eggs and larvae for better employability in industry.

CO5: Understand the movement and migration in fishes and knowledge for better employability in industry.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	2	2	2	2
CO2	2	2	3	3	2	2	2	3	2	2
CO3	3	2	3	3	3	2	2	2	3	3
CO4	2	3	3	3	3	3	3	2	2	3
CO5	3	3	2	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	1
CO2	3	**2**	**3**
CO3	2	2	2
CO4	2	**3**	2
CO5	3	**3**	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

SYLLABUS
BFT-601 Food Fermentation Technology

Unit I: Microbes in food fermentation: maintenance and strain development, Media-composition, Types of Raw Material, Inoculums development for industrial fermentations, benefits of fermented food *to generate employability.*

Unit II: Microbial Production of enzymes in food industries-amylase lipase, protease, pectinase, lactase and cellulase *to enhance skills for employability and entrepreneurship.*

Unit III: Dairy and non-Dairy product: Production of cheese, yoghurt, soya sauce, butter milk, bread, fermented fish & pickle.

Unit IV: Alcoholic Beverages: Beer & Wines, Distilled alcoholic product (sprit)- whisky, Brandy, rum, vodka, gin Champagne, Industrial process for wine production *to enhance skills for employability*.

Unit V: Production of organic acids (vinegar, lactic acid), production of Baker's Yeast, Single cell protein (SCP).

Recommended Textbooks/References

1. P.F. Stanbury, A. Whitaker, S.J. Hall, Principles of Fermentation Technology, Third revised ed., Butterworth-Heinemann Ltd, 2016.
2. J.E. Bailey, F. David, Biochemical Engineering fundamentals, Second ed., 2010.
3. A.H. Patel, Industrial Microbiology. MacMillan Publishers. 2015.

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the culture media, important cultures and inoculum transfer method for skill development, employability and entrepreneurship development.

CO2: Understand the microbial production of various enzymes such as lipase, amylase, protease, pectinase, lactase, and cellulase for skill development, employability and entrepreneurship development.

CO3: Understand the design of fermentor and different processes and control system for skill development, employability and entrepreneurship development

CO4: Understand the global industrial production process of various alcoholic beverages and distilled alcoholic products for skill development and employability.
CO5: Understand the distillation process, types of alcoholic beverages for skill development and employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	3	2	2	2	2	2	2	2
CO2	3	2	3	2	2	3	3	3	3	3
CO3	2	3	3	3		3	3	3	3	3
CO4	3	2	3	2	2	2	2	2	2	2
CO5	2	2	3	2	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	2

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

SYLLABUS
BFT- 602 Food Chemistry II

UNIT I: Minerals: Macro, micro and trace elements, distribution in body and Metabolic role of minerals, sources, bioavailability, requirement and deficiency disorders; Factors affecting enhancing/inhibiting absorption of Calcium, Phosphorus, Iron, Iodine. Toxic metals for skill development, employability and entrepreneurship development.

UNIT II: Natural Food Pigments: Introduction and classification; Food pigments (chlorophyll, carotenoids, anthocyanins and flavonoids, beet pigments, caramel) for skill development and employability.

UNIT III: Browning Reactions in Food: Enzymatic browning; Non – Enzymatic browning- Maillard reaction,Caramelization reaction, Ascorbic acid oxidation for skill development and employability.

UNIT IV: Enzymes: Introduction; classification; General characteristics; Enzymes in food processing; Industrial Uses of Enzymes; Immobilized enzymes for skill development.

UNIT V: Physico-chemical and nutritional changes occurring during food processing treatments: Drying and dehydration; Irradiation; Freezing; Canning for skill development.

Recommended Text books/References

1. deMan, M. John, Principles of Food Chemistry ,Third ed., Springer, 1999.
2. Desrosier, W. Norman, Desrosier, N. James,The technology of food preservation , Fourth ed., Westport, Conn, AVI Pub. Co, 1977.
3. Fennema, R. Owen, Food Chemistry, Third ed., Marcell Dekker, New York, 1996.
4. Fuller, Gordon W, New Product Development from Concept to Marketplace, CRC Press, 2004.
5. J. Robert, O.E. Whitehurst, Enzymes in Food Technology, Second ed., 2002.

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand distribution,role and bioavalability of macro, micro and trace elements for skill development, employability and entrepreneurship development.

CO2: Learn about the natural food pigments its global characteristics, physical and chemical properties for skill development and employability.

CO3: Understand about the protein amd mechanism of browning for skill development, employability and entrepreneurship development.
CO4: Understand about the enzymes, characteristics, properties and industrial uses for skill development and employability.
CO5: Expalin the physico-chemical and nutritional changes due to food processing for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	2	2	1	2	3	2
CO2	3	2	3	3	3	2	2	3	3	2
CO3	3	2	3	3	3	3	2	3	3	2
CO4	3	2	2	2	2	2	2	2	3	2
CO5	3	2	2	2	2	1	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	2
CO3	3	3	3
CO4	3	3	2
CO5	3	3	3

IFTM UNIVERSITY, MORADABAD
B.Sc. (FOOD TECHNOLOGY)

SYLLABUS
BFT- 603 Technology of Meat, Poultry & Eggs

UNIT I: Introduction: Livestock and poultry population in India; Development of meat and poultry industry in India and its need in nation's economy; Glossary of live market terms for animals and birds; Meat quality: Effects of feed, breed and environment on production of meat animals and their quality; Meat Quality-color, flavor, texture, Water-Holding Capacity (WHC), Emulsification capacity of meat for developing skills..

UNIT II: Slaughter process: Slaughter, inspection and grading, Antemortem examination of meat animals, slaughter of buffalo, sheep/ goat, poultry,pig A Generic HACCP model, dressing of carcasses, post-mortem examination of meat to enhance employability skills.

UNIT III: Preservation of meat: Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, and RTE meat products, meat curing. Sausages- processing, types and defects *to generate skills for employability.*

UNIT IV: Egg Industry and Egg Production Practices: The egg industry, its techniques of working, General management, structure, composition and nutritive value of egg and its products *for skill enhancement.*

UNIT V: Preservation of eggs: Refrigeration and freezing, thermal processing, dehydration, coating; Quality identification of shell eggs: Factors affecting egg quality and measures of egg quality *to enhance employability skills*.

Recommended Textbooks/References

1. Lawrie R A, Lawrie's Meat Science, 5thEd, Woodhead Publisher, England, 1998
2. Parkhurst & Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997
3. Pearson &Gillet Processed Meats,3 Ed, CBS Publication, New Delhi, 1997
4. ShaiBarbut,Poultry Products Processing,CRC Press 2005
5. Stadelman WJ, Owen J Cotterill Egg Science and Technology, 4th Ed. CBS Publication New Delhi, 2002

Course Outcomes:

At the end of the course students will be able to:

CO1: Understand the need and importance of the livestock, egg and poultry industry. They will get knowledge about meat quality parameters and what are the factors that affect it for skill development, employability and entrepreneurship development.
CO2: Acquire in-depth knowledge of the slaughter process of buffalo, sheep/goat, poultry, and pig, the global importance of antemortem and postmortem inspection, HACCP for slaughter Process for skill development, employability and entrepreneurship development.
CO3: Acquire detailed knowledge about the various preservation techniques for meat for skill development, employability and entrepreneurship development.
CO4: Understand the egg industry, its techniques of working, general management, structure, composition and nutritive value of egg and its products for skill development and employability.
CO5: Gain knowledge about various preservation techniques for eggs. Also understand the factors affecting egg quality and measures of egg quality globally for skill development and employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	3	2	2	2	3	2	2
CO2	2	2	2	3	2	2	2	3	2	2
CO3	2	2	2	3	2	2	2	3	2	2
CO4	2	2	2	3	2	2	2	3	2	2
CO5	2	2	2	3	2	2	2	3	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	2

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SYLLABUS
BFT-604 Project Management and Entrepreneurship

Unit -I Concept of Entrepreneurship: Definition of Entrepreneurship given by various economists - the ideal definition –The conceptual model of Entrepreneurship given by John Kao. Views given by Schumpeter Walker & Drucker on Entrepreneurship *for skill enhancement.*

Unit – II Small Business: Definition of Small Business - Composition of Small Business -Economic Contribution of Small Business. Strategic Planning for Small Business -Steps in Strategic Planning -Develop a clear Mission Statement -Assess Organisation Strengths - Conduct a thorough Market Segment Analysis -Analyse Competitors - Create Company Goals -Formulate Strategic Options and Select appropriate Strategies *for entrepreneurship and employability.*

Unit III Introduction: Project - definition, features, types, infrastructure creation-a special type of projects, significance of infrastructure in economic development, bottlenecks in the infrastructure creation, Project Identification: Idea generation, Project screening, Feasibility study. The advantages and disadvantages of starting your business –The advantages and disadvantages of buying all existing *to enhance skills for employability.*

Unit IV Arrangement of funds : Traditional sources of financing – Equity shares, preference shares, Debentures/bonds, loan from financial institutions- Loan syndication and consortium finance; Alternative sources of financing- Foreign Issue, FDI & FII, ECB, Private equity, Securitization, BOT projects, PPP, Venture capital / Incubation fund, Franchising etc; Role played by various Financial Institutions like IDBl, ICICI and IFCI for better knowledge *to enhance entrepreneurship and employability.*

Unit V: Special Role played by SIDBI and Commercial Banks – Approval of term loan applications by Commercial Banks – How to decide about a suitable agency for assistance Role played by SFCR and NSIC; Project Implementation: Project contracts – Principles, practical aspects of contacts, legal aspects of project management, global tender, Negotiation for projects, Project insurance, Human resource management, network analysis *for entrepreneurship and employability*.

Recommended Textbooks/References

1. Scarborough and Zimmerer, Effective Small Business Management, Seventh ed., Pearson, 2002.
2. Pickle and Abrahamson, Small Business Management, Fifth ed., John Wiley & Sons, 1990.
3. J. Kao, Creativity & Entrepreneurship.
4. Gupta and Srinivasan, Entrepreneurial Development, 2015 ed., Sultan Chand & Sons, 2015.
5. V. Desai, Dynamics of Entrepreneurial Development & Management, Fifth ed., Himalaya Publishing House, 2012.
6. P. Chandra, Projects planning analysis selection implementation & review, Eighth ed., McGraw Hill Education India Private Limited, 2014.

Course Outcomes:

At the end of the course students will be able to:

CO1: Describe Entrepreneurship and examine the role of an entrepreneur in economic development for skill development, employability and entrepreneurship development.

CO2: Learn about the key principles behind small businesses. Also, will be able to do strategic planning for small businesses and assess the organizational strength for skill development, employability and entrepreneurship development.

CO3: Analyze the global concept of Project planning, scheduling, and Execution. Will also have clarity about project organization and feasibility analysis for skill development, employability and entrepreneurship development.

CO4: Learn about the different traditional and alternative sources for the arrangement of funds. Also, know about the role played by various institutions for skill development, employability and entrepreneurship development.

CO5: Understand the role played by commercial banks and other institutions in the approval of loans. Also, learn about the concept of project implementation for skill development, employability and entrepreneurship development.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	2	2	2	2	2	3	2	2
CO2	2	3	2	2	2	2	2	3	2	2
CO3	2	3	2	2	2	2	2	3	2	2
CO4	2	3	2	2	2	2	2	3	2	2
CO5	2	3	2	2	2	2	2	3	2	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

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SYLLABUS
BFT-605 Food Quality Management

UNIT I: Food Quality: Introduction to food quality management – Definition, quality concepts, quality, quality perception, quality attributes, safety, health, sensory, shelf life, convenience, extrinsic attributes, factors affecting food behavior. Quality in the Agri-food production chain-Techno- managerial approach, food quality relationship and food quality management functions for skill development and employability

UNIT II: Food contamination: Contamination in Food- : Physical, chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, radionucleides, solvent residues, chemicals) Natural toxins; Contaminants formed during processing – nitrosamines, acrylamide etc. natural food contaminants and contaminants form packaging materials for skill development, employability and entrepreneurship development.

UNIT III: Food Additives: Chemical, technological and toxicological aspects; Risk assessment studies- Safety and quality evaluation of additives and contaminants, Antioxidants - Introduction, mechanism of action, natural and synthetic anti-oxidants, technological aspect of antioxidants; Sweeteners- Introduction, importance, classification- natural and artificial, chemistry, technology and toxicology, consideration for choosing sweetening agents; Colors- Introduction, importance, classification- natural, artificial, and natural identical, FD&C Dyes and Lakes. for color for skill development, employability and entrepreneurship development.

UNIT IV: Food Laws, standards and regulations: History, National and International laws & Regulations: FSSAI, USFDA, EU, Codex alimantarious, ISO Series and HACCP for skill development.

UNIT V: World Trade Organization (Sanitary and Phyto 68Sanitary agreement, Technical Barriers in Trade), -Standards of Identity, Standards of Quality,Standards of fill of the container for skill development and employability.

Recommended Textbooks/References

1. Pie P.A. Luning, W.J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen, 2002.
2. Brannen et al., Food Additives, Second ed., T & F India, 2016.
3. H.J Heinz, D.A. Shapton, Principles and Practices for the safe processing of Foods, Butterworth-Heinemann, 2002.
4. DeMan, Principles of Food Chemistry, 3rd ed., Springer, 2007.
5. ternel A, Luning, Willem J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen,2009.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand why there is a need for food quality management and what parameters are generally analyzed. Understand why and how the government controls the quality of food for skill development, employability and entrepreneurship development.
CO2: Understand the food contamination in terms of physical, chemical, and biological parameters for skill development, employability and entrepreneurship development for skill development, employability and entrepreneurship development.
CO3: Understand the chemical, technological and toxicological aspects of different types of food additives in food preservation for skill development, employability and entrepreneurship development.
CO4: Learn the basic principles and application of processing techniques in foods like microwave processing, cryogenic freezing, ultra-filtration, supercritical fluid extraction, flavour encapsulation, and nanotechnology for skill development and employability
CO5: Understand National and International Food Laws, global Standards, and Regulations for skill development and employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	2	3	2	2	3
CO2	2	2	2	2	2	2	3	2	2	3
CO3	2	2	2	2	2	2	3	2	2	3
CO4	2	2	2	2	2	2	3	2	2	3
CO5	2	2	2	2	2	2	3	2	2	3

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	2

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SYLLABUS
BFT 604 I CANE SUGAR TECHNOLOGY

UNIT I: Introduction to sugar – Etymology, History (accent time & middle age)Modern History .Chemistry of sugar,Constituents of sugar,Natural polymers of sugars,Flammability of sugar.Types of sugar, Monosacchirides – Glucose, Fructose, Disacchirides - Succrose, maltose, Lactose. Sources of sugar,Sugar beet, sugarcane. Refining of sugars ,Sugar production countries. Forms of sugar and its use Consumption Health effects of sugar- Blood glucose level - Obesity and Diabeties - Cardivascular disease- Alzheimer's disease - Tooth decays - Addiction forming - Hyper activity- Measurement to inculcate skill, provide employability & entrepreneurial skills .

UNIT II: Carbohydrates: Introduction and Classification of Carbohydrates with suitable examples. Reactions of Monosaccharide such as a) Mutarotation b) Alkaline degradation c) Rearrangements d) Acidic degradation e) Polymetrisation f) Caramelisation for entrepreneurship development.

Unit III: Di & Polysaccharides : Structures and properties of sucrose, Malstose, Lactose, Starch & Cellulose (chain structures) for entrepreneurship development.

Unit IV: Organic acids &Polyphenols : Organic acids & their effects on the processing of sugar house products. • Polyphenols : Occurrence, classification & their effects on processing of sugar house products Organic acids & Polyphenols in cane juice for skill development and employability.

Unit V: Physical & Chemical properties of sugar : Chemical properties of sucrose :– sucrose molecule, crystalline sucrose, amorphous sucrose, aqueous sucrose. Solution (solubility, density, viscosity, surface tension, boiling point, freezing point, rotation of polarized light) • Physical properties of sucrose :– Structure of the sucrose molecule, sucrose derivatives, decomposition of sucrose. Physical properties of reducing sugar :– Physical properties of dextrose solution (solubility, density, refractive index, optical rotation) Physical properties of invert sugar (solubility, refractive index, optical rotation) for understanding for entrepreneurial skill.

Recommended Text Books/References

1 Organic & Sugar Chemistry Organic Chemistry: Hendrickson, cram, Hammond
2 Organic Chemistry : Morrison & Boyd
3 Organic Chemistry : Volume I & II I.L.Finar
4 Text book of organic chemistry :P.L.Soni
5 Advanced organic chemistry : Reactions, Mechanism & Structure Jerry march .

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand about suagrs, its types and disorders globally for skill development.
CO2: Understand about carbohydrates and its classification for skill development, employability and entrepreneurship development.
CO3: Understand about di and polysaccharides for skill development.
CO4: Understand about organic acids and poly phenols for skill development.
CO5: Understand about physical and chemical properties of sugars for employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	3	2	3	2
CO2	3	2	2	3	2	2	3	3	2	2
CO3	2	2	2	3	3	2	3	2	2	3
CO4	2	3	3	3	3	3	3	2	3	3
CO5	1	3	3	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	3
CO2	3	**2**	3
CO3	2	2	2
CO4	2	**3**	2
CO5	3	**3**	3

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SYLLABUS
BFT-604 II Food Borne Infection & Intoxicants

Unit I: Foodborne Disease: Epidemiology and Disease Burden, Introduction, Types of Food Borne Illness: Food intoxication, Food infection, Food toxi-infection for skill enhancement.

Unit II: Milk Borne Infections: Salmonella poisoning, Bacillary dysentery (Shigellosis), Streptococcal infection for better employability skills.

Unit III: Milk Borne Intoxications: Staphylococcal poisoning, Botulism, *E.coli* poisoning, Cholera, Fungal intoxications for effective development of employability skills.

Unit IV: Strategies for Prevention & control of food- borne infections**,** Microbial Food Safety Risk Assessment to acquire knowledge for better employability skills.

Unit V: Recent trends and advancements in the field of food toxicology, Food Safety Post-processing: Transportation, Supermarkets, and Restaurants to enhance skills for entrepreneurship development and employability

Recommended Text/ Reference Book:

1. Foodborne Infection & Intoxications by Glenn J. Morris
2. Foodborne Diseases by Alexandru Mihai Grumezescu, Alina Maria Holban
3. Handbook of Foodborne Diseases by Dongyou Liu

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand about food born diseases for skill development.
CO2: Understand about milk born infections for skill development, employability and entrepreneurship development.
CO3: Understand about milk born intoxications for skill development.
CO4: Understand about global strategies for prevention and control of food born diseases skill development.
CO5: Understand about Recent trends and advancements in the field of food toxicology for employability.

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Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	3	2	3	2
CO2	3	2	2	3	2	2	3	3	2	2
CO3	3	2	2	3	3	2	3	2	2	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	**2**	**3**	3
CO2	3	**2**	3
CO3	2	2	2
CO4	**3**	**3**	2
CO5	3	**3**	3

IFTM UNIVERSITY, MORADABAD
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SYLLABUS
BFT-604 III CLINICAL NUTRITION

UNIT I: BASIC HUMAN PHYSIOLOGY- Animal cell: structure & function, Tissue- their types and functions , Digestive system: structure, function, glands and hormones. Digestion of Carbohydrates, Proteins, fats, vitamins & minerals etc. Disorders of gastrointestinal tract. knowledge for better employability in industry

UNIT II: METABOLISM IN BRIEF- Biological cycles- Glycolysis, Kreb's cycle, Gluconeogenesis, ETP chain, Deamination, Transamination knowledge for better employability in industry

UNIT III: NUTRITION IN PREGNANCY – physiological changes of pregnancy – nutritional requirements – food selection – complications of pregnancy knowledge for better employability in industry

UNIT IV: DISEASES IN INFANTS- Types and classification of diseases in new infants. Their identification, treatment, food recommendations. knowledge for better employability in industry

UNIT V: NUTRITION DURING ADOLESCENCE: growth & nutrient needs – food choices – eating habits – factors influencing., common diseases, food selection .knowledge for better employability in industry

Recommended Text Books/References :

1- B. Srilakshmi- Dietetics, 7th ed
2- Ghosh, S.: The Feeding and Care of Infants arid Young Children, VHAI. 6th Ed. Delhi.
3- Indian Council of Medical Research : Nutrient Requirements and Recommended Dietary Allowance for Indians, New Delhi
4- Textbook of Nutrition-Ravinder Chadha & Pulkit Mathur, Orient Blackswan Pvt. Ltd. Telangana
5- Sohi D. A Comprehensive Textbook of Nutrition & Therapeutic Diets, New Delhi: Jaypee Brothers Medical Publishers

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand about basic human physiology for skill development.
CO2: Understand about human metabolism for skill development, employability and entrepreneurship development.
CO3: Understand about nutrition in pregnancy for skill development.

CO4: Understand about global diseases in infants for skill development.
CO5: Understand about nutrition during adolescence for employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	3	2	3	2
CO2	3	2	2	3	2	2	3	3	2	2
CO3	2	2	2	3	3	2	3	2	2	3
CO4	2	3	3	3	3	3	3	2	3	3
CO5	1	3	3	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	3
CO2	3	**2**	3
CO3	2	2	2
CO4	2	**3**	2
CO5	3	**3**	3

IFTM UNIVERSITY, MORADABAD
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SYLLABUS
BFT-605 I FOOD LAWS AND QUALITY ASSURANCE

UNIT I: Concept meaning and exposure, estimation, toxicological requirements and risk assessment: Food quality, food safety, food adulteration, food hazards. Natural toxins. knowledge for better employability in industry.

UNIT II: Food laws and regulations: National and international food laws, Governing bodies knowledge for better employability in industry.

UNIT III: Safety assessment and Safety evaluation: Food contaminants and pesticide residues, heat treatments and related processing techniques knowledge for better employability in industry.

UNIT IV: Principles of quality control. 1) Quality management systems in India; Sampling procedures and plans. 2) Food Safety organizations dealing with inspection, traceability and Labeling issues, International food standards. **HACCP**: Define, Principles, Uses, How HACCP assists the food industry. knowledge for better employability in industry.

UNIT V:Quality assurance, Total Quality Management: GMP/GHP, GLP, GAP, Sanitary and hygienic practices, Quality manuals, documentation and audits, Indian & International quality systems and standards like ISO and Food Codex, Export import policy and export documentation, Laboratory quality procedures and assessment of laboratory performance, Applications in different food industries. knowledge for better employability in industry and skill development

Recommended Text Books/References

1. Food Safety and standards Act 2006, Rules 2011, Regulations, 2011, 10th Edition, ILBCO India, Indian Law Book Company, 2013.
2. Early, R. (1995): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
3. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
4. Pomeraz, Y. and MeLoari, C.E. (1996): Food Analyasis: Theory and Practice, CBS publishers and Distributor, New Delhi
5. Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organisation, Geneva.

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand about food hazard and natural toxins for skill development.
CO2: Understand about food laws and regulations for skill development, employability and entrepreneurship development.
CO3: Understand about global safety assessment and safety evaluations for skill development.
CO4: Understand about principles of quality control for skill development.
CO5: Understand about quality assurance and total quality management for employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	3	2	3	2
CO2	3	2	2	3	2	2	3	3	2	2
CO3	2	2	2	3	3	2	3	2	2	3
CO4	2	3	3	3	3	3	3	2	3	3
CO5	1	3	3	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	3
CO2	3	**2**	3
CO3	2	2	2
CO4	2	**3**	2
CO5	3	**3**	3

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SYLLABUS
BFT-605 II GRAIN STORAGE

UNIT I: Principles and practices of storage – storage losses and their estimation, factors affecting grain quality; Primary and secondary insect pests, rodents and microorganisms of stored food grains and their control knowledge for better employability in industry

UNIT II: Flow characteristics of granular materials; Functional requirements of storage structures; Traditional storage structures in India and their improvements; Design of silos, bins and godowns – RCC and steel structures; Aeration system for various storage structures; grain handling equipment - their design and operational features for better employability in industry

UNIT III: Management and maintenance of grain storage; Code of practices for safe storage of food grains; Fumigation and controlled atmosphere storage of food grains; Analysis of residual pesticides and insecticides; Integrated pest management of stored grain knowledge for better employability in industry

UNIT IV: Improved storage methods for grain-modern storage structures-infestation-temperature and moisture changes in storage structures-CAP storage-CA storage of grains and perishables construction operation and maintenance of CA storage facilities knowledge for better employability in industry

UNIT V: Functions of Packaging Materials: Introduction – packaging strategies for various environment – functions of package – packaging materials – cushioning materials – bio degradable packaging materials – shrink and stretch packaging materials for skill development.

Recommended Text Books/References:

1.Himangshu Barman. 2008, Post Harvest Food grain storage. Agrobios (India), Jodhpur.
2.Chakaraverty, A. 2000. 3rd edition. Post harvest technology of cereals, pulses and oil seeds. Oxford and IBH publishing and Co.Pvt.Ltd. New Delhi
3.D K Agarwal, Logistics and supply chain management, Macmillan Publishers India Ltd. (2003), Eighth Impressions, 2010.
4. Sunil Chopra and Peter Meindi, Supply chain management Pearson Education publishers, 2010.

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Course Outcomes:

At the end of the course students will be able to:
CO1: Understand about principles and grain storage practices for skill development.
CO2: Understand about flow characteristics of granular material and their design for skill development, employability and entrepreneurship development.
CO3: Understand about management and maintenance of grain storage for skill development.
CO4: Understand about improved grain storage methods. for skill development.
CO5: Understand about functions of packaging materials globally for employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	3	2	3	2	3	2
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	2
CO3	2	2	2	3	2	2	3	2	2	3
CO4	2	3	3	3	3	3	3	2	3	3
CO5	1	3	3	2	3	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	**3**	**3**	3
CO2	**3**	**2**	3
CO3	2	2	2
CO4	**3**	**3**	2
CO5	**3**	**3**	3

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SYLLABUS
BFT-605 III FLAVOUR CHEMISTRY AND TECHNOLOGY

UNIT I: Classification of flavours according to characteristic group present, Resources of raw materials used in flavor chemicals, Chemistry of flavours, raw materials, Unit processes involved, different reagents used, Selection of process for industry for employability in industry and skill development.

Unit II: Important chemical reactions involved in converting raw material into flavour chemicals, Synthetic methods for various functional groups –Alcohols for flavour applications, their Classification and synthesis; Aldehydes for flavour applications, their Classification and synthesis**;** Esters, Ketones, ethers used in flavour industry and their synthesis Lactones, Amines, Phenols, Nitro compounds used in flavour applications and their synthesis for employability in industry and skill development.

Unit III: Biogenesis of flavours in fruits and vegetables, reaction flavours, off flavours. Flavour enhancers / chemicals, Systematic approach to understanding flavour formation during food processing, food matrix, interaction of added flavours for employability in industry and skill development.

Unit IV: Flavour enhancers, modifiers, precursors, suppressors, major chemicals and raw materials, solvents. Forms of flavour and the manufacturing processes involved all types of flavours. Aroma recovery during processing for employability and entrepreneurship.

Unit V: Legal aspects (natural flavours and natural flavouring substances, nature identical flavouring substances, artificial flavouring substances), and the FSSA act, Selection and application of flavours in foods and beverages for employability in industry and skill development.

Recommended Text Books/References

1- Perfume and flavor materials of natural origin – Arctander
2- Common fragrance and flavor materials – Bauer
3- Chemistry and technology of flavor fragrances – D. J. Rowe
4- Aroma Science – S. P. Gimelli
5-Fragrance Chemistry – E. T. Theimer
6- Perfumery and Flavoring synthetics – Bedaukian

Course Outcomes:

At the end of the course students will be able to:
CO1: Understand about classification of flavours for skill development.
CO2: Understand about important chemical reactions involved in converting raw material into flavor chemicals for skill development, employability and entrepreneurship development.
CO3: Understand about biogenesis of flavours in fruits and vegetables for skill development.
CO4: Understand about flavour enhancers and modifiers for skill development.
CO5: Understand about legal global aspects related to flavours for employability.

Mapping Course Outcomes leading for the achievement of Programme Outcomes
Please write 3,2,1 wherever required
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	2	3	2	3	2
CO2	3	2	2	3	2	2	3	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3
CO4	2	3	3	3	3	3	3	2	3	3
CO5	1	3	3	2	2	3	2	2	3	2

CO-Curriculum Enrichment Mapping (Please write 3,2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	**Employability**	**Entrepreneurship Development**
CO1	3	**3**	3
CO2	3	**2**	3
CO3	3	2	2
CO4	3	**3**	2
CO5	2	**3**	3