

# SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

## BHAI JAITA SUBHARTI ENGINEERING COLLEGE

### ORDINANCE No. V (2A) RELATING TO

### BACHELOR OF TECHNOLOGY (B.Tech.) PROGRAMME

(Effective from the Session – 2019-20)

#### General

1. This ordinance may be called “**Ordinance Relating to Bachelor of Technology(B.Tech)**” Programme.
2. It shall come enforced with immediate effect from session 2019-20.
3. This supersedes the previous Ordinance relating to Bachelor of Technology (B.Tech) Programme ordinance no. [V (2A)].
4. The degree “Bachelor of Technology” acronym as B.Tech shall be of four years (eight semesters) in the branches of Engineering prevalent in the institute at a point of time based on Choice Based Credit System (CBCS) as per AICTE guidelines.

#### CHAPTER – 1

##### 1.1 Introduction

Bhai Jaita Subharti Engineering College is a constituent Institute of Swami Vivekanand Subharti University, Meerut has been established in 2019 with the vision we make every decision to support the career and personal development of our learners. Our curriculum, teaching and services demonstrate that we value the diverse profiles of our learners. The University boasts of highly qualified, dedicated and competent faculty from all walks of life, world class infrastructure, fully equipped Laboratories with latest state-of-the-art equipment and a huge library with recent knowledge resources including e-resources. Swami Vivekanand Subharti University providing a safe and healthy working environment for teaching and non-teaching employees, students, and visitors etc.

## **1.2 Vision**

To become a dynamic, demand driven, quality conscious, efficient and innovative institute capable of becoming active partner in the techno-economic growth of the Nation and to provide world class technological education and research inputs to the society.

## **1.3 Mission**

Strive to create centre of excellence in specialized areas of technology and enable its academic beneficiaries to become competent professionals capable of providing sustainable solutions to challenging problems of the society and industry.

## **1.4 Programme Educational Objectives (PEOs):**

The Programme Educational Objectives of B.Tech. programmes are:

**PEO1.** To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms

**PEO2.** To prepare graduates who will contribute to society as broadly educated, expressive, ethical and responsible citizens with proven expertise

**PEO3.** To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills

**PEO4.** To prepare graduates who will thrive to pursue life-long learning to fulfill their goals

## **1.5 Programme Outcomes (POs):**

Engineering programmes are designed to prepare graduates to attain the following program outcomes:

**PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11. Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **CHAPTER-2**

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### **Eligibility for Admission**

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- 2.1** (i) An applicant is eligible for admission in the 1 Year of the B.Tech. programme provided that, he/she should be at least 17 years on 31 December of the year of admission. The upper age limit for taking admission in Under Graduate programme will be 30 years.

An applicant should have passed intermediate examination or an equivalent examination from any recognized board/university with Physics, Mathematics as compulsory subjects, Chemistry/Bio-technology/Computer Science/Biology as one of the optional subjects.

The admission shall be considered purely on the basis of merit in the University entrance test and counseling conducted by the university. The applicant who have 45 % of marks (40 % for SC/ST) [as per AICTE norms\*] or more in the above mentioned three subjects and not less than 45 % marks (40 % for SC/ST) in the optional subjects will be considered for direct admission against seats, which might not have been filled up through the examination and counseling.

The applicant who has obtained a two/three year Engineering Diploma with Minimum (45 %) aggregate marks from a recognized Institute/University will be considered eligible for direct admission in the second year of the B.Tech programmes.

The applicant having a three year B.Sc. degree with Mathematics with a minimum of 40 % marks in aggregate from a recognized university will be considered eligible for direct admission in the second year of the B.Tech programmes. Provided that the students belonging to B.Sc. Stream, shall clear the subjects Engineering Graphics/Engineering Drawing and Engineering Mechanics of the First Year Engineering Programme along with the Second year subjects.

Provided that the students belonging to B.Sc. Stream shall be considered only after filling the supernumerary seats in this category with students belonging to the Diploma Stream.

**2.2** The B.Tech. programme is available in the following discipline:

- (i) Food Technology
- (ii) Artificial Intelligence and Machine Learning

**2.3** Selected candidates shall be allocated a discipline from those listed in clause 2.2 on the basis of merit, choice and counseling.

**2.4** Request for change in discipline may be considered on the basis of merit in the entrance examination provided that the seat remains vacant after the last date for admission in B.Tech. programme.

**2.5** After 2<sup>nd</sup> Semester, a student can apply for change of branch which shall be considered on the following grounds:

1. Availabilities of seats in branch as per sanctioned intake by AICTE.

(ii) The students should have passed 1<sup>st</sup> and 2<sup>nd</sup> Semester examination without any carry over paper.

1. The branch from which the students will be shifted must not fall below 75 % of its sanctioned intake.

**2.6** The change of discipline shall be allowed only once during the programme.

## **CHAPTER-3**

### **Teaching Course**

- 3.1** The programme will be of four years duration, divided in to eight semesters.
- 3.2** The duration of the B. Tech. programme for the candidates admitted in semester I will be four academic years (eight semesters).
- 3.3** The duration of the B. Tech. programme for the candidates admitted in semester III (lateral entry) will be three academic years (six semesters).
- 3.4** Annual academic calendar shall be published by the University.
- 3.5** There shall be normally 14 weeks of teaching in every semester.
- 3.6** Study & evaluation scheme is enclosed as an Annexure A1-A7.

## CHAPTER-4

### Curriculum/Structure

**4.1** The programme shall be spread over four academic years, spread over eight semesters comprising actual teaching for a minimum of 90 days in each semester.

**4.2** The programme focuses on the following aspects:

- Competency
- Entrepreneurship
- Skill Enhancement
- Value Added Courses
- Extracurricular activities

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

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising Professional/Program Core Courses (PCC), Professional/Program Elective Courses (PEC), Engineering Science Courses (ESC), Basic Sciences Courses (BSC), Humanities and Social Sciences including Management Courses (HSMC) Mandatory Courses (MC) and Open Elective Courses (OEC). The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and **computation of the Cumulative Grade Point Average (CGPA) based on student's performance** in examinations, the UGC has formulated the guidelines to be followed.

#### **4.3.1 Structure of Undergraduate programs**

The four year B. Tech. programme compromise of courses divided in seven distinct areas, namely: Professional/Program Core Courses (PCC), Professional/Program Elective Courses (PEC), Engineering Science Courses (ESC), Basic Sciences Courses (BSC), Humanities and Social Sciences including Management Courses (HSMC) Mandatory Courses (MC) and Open Elective Courses (OEC). All the courses offered in first year B. Tech. programs are

categorized as „Common Courses” for all the academic programs. Credits assigned and curricular components of the B. Tech. curriculum are given in Annexure A1-A7.

### **Professional/Program Core Courses (PCC)**

The departmental core consists of courses considered essential for a chosen Engineering/Science discipline including, Engineering design, Seminar, Industrial Training and Project (PROJ).

### **Professional/Program Elective Courses (PEC)**

The students are required to complete a specific number of elective courses. Every department offers a wide variety of elective courses to students providing them opportunity to discover their academic interest and enhancing their engagement in learning process.

### **Open Elective Courses (OEC)**

The Open Electives courses are offered by different academic departments to the students of all disciplines. A wide range of elective courses is available with each branch. When a student opts elective courses offered in his/her program it will be termed as OE.

### **Humanities and Social Sciences including Management Courses (HSMC)**

The Humanities, Social Sciences and Management Courses consist of courses considered essential for a B.Tech. program to inculcate the essence of technical writing, communication skills, economics and analysis, management and professional ethics & human values.

### **Basic Sciences Courses (BSC)**

The Applied Sciences and Mathematics Courses consist of courses considered essential for a B.Tech. program to build the foundation for learning of engineering core courses.

### **Engineering Science Courses (ESC)**

The students are required to complete a minimum number of Allied engineering courses (majority of them taught as common courses) offered by engineering departments other than his/her parent department. These courses expose the student with wide spectrum knowledge of allied engineering domain connected to the main engineering stream of the course of study of the students of concerned departments.

### **Mandatory Courses (MC)**

The mandatory courses considered essential for a B.Tech. programme to inculcate the essence of Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Knowledge Tradition etc. 4.4

### **Induction Program**

Three weeks duration Induction program for students to be offered right at the start of the first year. These activities are listed under following 7 heads:

- 1 Physical and Health
- 2 Culture
- 3 Literature and Media
- 4 Social Service
- 5 Self development
- 6 Nature and Environment
- 7 Innovation

4.5 The academic calendar shall be as follows:-

<b>I , III , V, VII Semester (Odd)</b>	Session - 1st Aug. to 30th Nov Exam - 1st Dec. to 20th Dec.
<b>II, IV, VI, VIII Semester (Even)</b>	Session - 1st Jan. to 10th May Exam - 1st May to 20th May

## CHAPTER-5

### Attendance

- 5.1** The students are expected to attend all the classes and should not have less than 75 % attendance in theory as well as in practical classes, wherever held, to become eligible to appear for the university examination. Short fall in attendance can, however be condoned in deserving cases to the extent of 10 % by the Principal. If the short fall is more than 10 % but not more than 15 %, the Principal may recommend deserving cases to the Vice Chancellor for condo-nation. The order of the Vice Chancellor in this regard shall be final.

## CHAPTER-6

### Examination

All Courses offered by SITE will have an evaluation system within two components as:

1. Continuous Comprehensive Assessment (CCA) accounting for 30% of the final grade that a student gets in a course, and
2. End-Semester Examination (ESE) accounting for the remaining 70% of the final grade that the student gets in a course.

**A student will have to pass both the components i.e. CCA and ESE separately to become eligible to be declared successful in a course.**

### **6.1 Continuous Comprehensive Assessment (CCA)**

#### **Award of Sessional Marks:**

Sessional marks for theory subjects and practicals and shall be awarded as per the breakup of sessional marks given below:-

#### **Theory Subjects :**

- (a) Class test will comprise two mid-term test of equal weightage. **-20 Marks**
- (b) Marks for regular class attendance **- 10 Marks**

#### **2. Practical :**

(a) Two—mid-term viva-voce test of equal weightage. - **5 Marks**

1. Teacher's assessment (including 5 marks for regular attendance) based on lab record attendance - **10 Marks**

**5.** Make-up test may be held for those students who fail to appear in any one of the mid-term class test due to genuine unavoidable reasons, provided prior permission was consented from the Principal.

**6.** A maximum of 10 marks in each subject shall be awarded for attending classes (theory/practical) as per the following norms:

1. 85 % or more attendance	10 Marks
2. 80 % or more but less than 85 % attendance	10 Marks
3. 75 % or more but less than 80 % attendance	09 Marks
4. 70 % or more but less than 75 % attendance	08 Marks
5. 65 % or more but less than 70 % attendance	07 Marks
6. 60 % or more but less than 65 % attendance	06 Marks
7. 51 % or more but less than 60 % attendance	05 Marks
8. 50 % attendance	04 Marks
9. Less than 50 % attendance	01 Marks
	0 Marks

## 6.2 Award of General Proficiency Marks:

The marks in General Proficiency shall be awarded on the following basis:-

- (i) Co-curricular & Extra-curricular activities (games, sports, cultural and literary activities etc.) **50%**
- (ii) Discipline inside and outside the college campus (including 10 marks for regular attendance) **50%**

6.3 The marks for seminar, industrial training and educational tour shall be awarded on the following basis:

- (i) Write-up/Report 50%
- (ii) Presentation 50%

## 6.4 END SEMESTER EXAMINATION (ESE)

The remaining 70% of the final grade of the student in a course will be assessed on the basis of an end semester examination (ESE) that will be for three hours duration and will cover the entire syllabus of the course. The question papers for the ESE will be got set by the Controller of Examinations (COE) of the Swami Vivekanand Subharti University (SVSU) by a selected faculty panel.

6.5 The entire programme has to completed within a maximum of seven years from the date of original admission in the programme by those students who are admitted in the first year and within six years by those admitted directly in the Second Year, [Vide clause 2.1 (iv, v)]

## CHAPTER-7

### Paper Setting

7.1 The work of setting the end semester examination papers and evaluation of scripts and conduct of the end semester practical examination shall be assigned to the course teachers as well as to outsiders, ordinarily in the ratio of 50:50 for internal and external valuation respectively.

### Results

7.2 The result shall be prepared at the end of each academic year of the programme by aggregating the marks obtained in the theory and practical examinations in all the semesters of the programme till date.

- (a) The minimum passing marks in each theory subject (including sessional marks) shall be 40% and 50% in aggregate. The minimum pass marks in a project/ Practical subject (including sessional marks if any), Seminars, Industrial Training and Educational Tour, Viva-Voce etc. shall be 50%.
- (b) If a student obtained 40% marks in at least 50% of the papers (ignoring fractions) including project report, he/she will be provisionally promoted to the next year with carryover papers and will have to appear & obtain pass marks in carryover papers along with the subsequent regular examinations for the relevant semester.
- (c) If a candidate fails in only one head/subject and having passed in all other head/subject of the given examination of the year than his/her deficiency of maximum five (05) marks may be fulfilled by grace marks after fulfilling the conditions given below:

7.3 If a candidate fails in only one head/subject and having passed in all other heads/subjects of the given examination of a **semester\*/year**, then his/her deficiency of marks may be fulfilled by grace marks under the following conditions:-

- (i) Grace marks is not a matter of right of the student but is the discretion of the University.
- (ii) Provided that the candidate has appeared in the main examination of the concerned programme and falls short of pass marks by not more than five (05) marks in theory paper only. Benefit of above mentioned shall not be given to the candidate who had appeared in supplementary/special examination/carry over examination.
- (iii) Further, benefit of grace marks may be given only to the candidate who will pass the entire concerned examination of the **semester\*/year** after awarding the grace marks and not for the purpose of promoting the student to next year with back papers or for improvement of division or percentage.

- (iv) If in a head/subject of an examination passing in Theory, Practical or sessional exams separately is mandatory, then the benefit of grace marks shall be given only in Theory examination of the University examination.
- (v) The award of grace marks permissible shall be on the basis of 1 grace mark for every 05 marks secured by an examinee over and above the minimum passing aggregate marks of all subjects of the year.

**7.4** Awarding of Grace Marks shall be done as given below:-

Aggregate Marks Obtained over & above minimum passing marks	Permissible Grace Marks
1-5	1
6-10	2
11-15	3
16-20	4
21-25	5

Total number of Grace Marks given to the student will be marked with astrick (\*) at the bottom of the mark sheet.

\* Grace Mark in semester examination will be considered hereinafter.

A student not covered by clause 7.2 (a) to (c) above shall have the following options to complete his/her programme -

- (i) He/ she may take admission on payment of full annual programme fee and repeat the entire year of study. He /She shall be treated as a regular student. Or
- (ii) He /She may pay only University exam fee for the End Semester Examination and appear in the End Semester University exams directly. He /She shall not be allowed to attend classes and the Sessional marks obtained earlier shall be retained. Or

(iii) He /She may pay half of the annual programme fee and attend classes. The sessional marks obtained by him/her earlier shall be retained. There will not be any requirement of minimum attendance for appearing in the University examination

7.5 A student will not be promoted to the next academic year if the carryover papers are more than 50% at one point of time.

### **Evaluation under Grading Assessment**

7.6 The minimum Grade/ Grade Point required to pass each paper in a semester examination under CBCS shall be Grade D/ Grade Point 4 in each theory paper/ Practical/Project (wherever applicable) in External Examination and Internal Assessment separately.

### **Calculation Criteria**

7.7 To implement the following grading system, the colleges/campuses shall use the following UGC recommended 10 point grading system:

<b>Marks (%)</b>	<b>Letter Grades</b>	<b>Grade Points (G)</b>
85-100	A++ (Outstanding)	10
75 to < 85	A+ (Excellent)	9
70 to <75	A (Very Good)	8
65 to <70	B+ (Good)	7
60 to <65	B (Above Average)	6
50 to <60	C (Average)	5
40 to <50	D (Pass)	4
0 to <40	F (Fail)	0
	AB (Absent)	0

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

$$(S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i},$$

where  $C_i$  is the number of credits of the  $i^{\text{th}}$  programme and  $G_i$  is the grade point scored by the student in the  $i^{\text{th}}$  programme.

$$\text{CGPA} = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where  $S_i$  is the SGPA of the  $i^{\text{th}}$  semester and  $C_i$  is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts

## CHAPTER-8

### **Power to Modify**

- 8.1** In the event of any emergent situation, if any deviation is considered necessary, the Vice-Chancellor is authorized to modify the ordinance. Subjected to subsequent ratification by the executive council.

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**SWAMI VIVEKANAND  
SUBHARTI UNIVERSITY, MEERUT**



**EVALUATION SCHEME**

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**B.TECH.**

**(FOOD TECHNOLOGY)**

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**W.E.F. SESSION 2019-20 & 2021-22**

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**BHAI JAITA SUBHARTI ENGINEERING COLLEGE**  
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**  
**STUDY & EVALUATION SCHEME**  
**B.Tech 1<sup>st</sup> Year/1<sup>st</sup> Semester (Common to all branches)**  
**For Academic Session 2019-20**

SEMESTER I														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BAS-101/ BAS-102	Physics/ Chemistry	BSC-1 /BSC-2	3	1	0	20	10	30	-	70	-	100	4
2	BAS-103	Mathematics I	BSC-3	3	1	0	20	10	30	-	70	-	100	4
3	BEEE-101/ BCSE-101	Electrical Engg./ Programming For Problem Solving	ESC-1 / ESC-2	3	1	0	20	10	30	-	70	-	100	4
4	BME-151/ BME-152	Engineering Graphics & Design/ Workshop Practices	ESC-3/ ESC-4	2	0	4	-	-	-	15	-	35	50	3
5	BAS-151/ BAS-152	Physics Lab/ Chemistry Lab	BSC-1/ BSC-2	0	0	3	-	-	-	15	-	35	50	1.5
6	BEEE-151/ BCSE-151	Electrical Engineering Lab/ Programming for Problem Solving Lab	ESC-1/ ESC-2	0	0	2	-	-	-	15	-	35	50	1
Total													450	17.5

**B.Tech. 1<sup>st</sup> Year/2<sup>nd</sup> Semester (Common to all branches)**  
**For academic Session 2019-20**

SEMESTER II														
S No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BAS-201/ BAS-202	Physics/ Chemistry	BSC-1 /BSC-2	3	1	0	20	10	30	-	70	-	100	4
2	BAS-203	Mathematics II	BSC-4	3	1	0	20	10	30	-	70	-	100	4
3	BEEE-201/ BCSE-201	Electrical Engg./Programming For Problem Solving	ESC-1 / ESC-2	3	1	0	20	10	30	-	70	-	100	4
4	BME-251 / BME-252	Engineering Graphics & Design/ Workshop Practices	ESC-3 /ESC-4	2	0	4	-	-	-	15	-	35	50	3
5	BHU-201	Professional English	HSMC-1	2	0	0	20	10	30	-	70	-	100	2
6	BAS-251/ BAS-252	Physics Lab/ Chemistry Lab	BSC-1 /BSC-2	0	0	3	-	-	-	15	-	35	50	1.5
7	BEEE-251/ BCSE-251	Electrical Engineering Lab/ Programming for Problem Solving Lab	ESC-1 /ESC-2	0	0	2	-	-	-	15	-	35	50	1
8	BHU-251	English Lab	HSMC-1	0	0	2	-	-	-	15	-	35	50	1
Total													600	20.5

**BHAI JAITA SUBHARTI ENGINEERING COLLEGE**  
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**  
**STUDY & EVALUATION SCHEME**  
**B.Tech.2<sup>nd</sup> Year/3<sup>rd</sup> Semester (FOOD TECHNOLOGY)**  
**w.e.f academic Session 2019-20**

SEMESTER III														
S.No	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BFD-301	Composition Quality & Safety of Foods	PCC-1	3	1	0	20	10	30	-	70	-	100	4
2	BFD-302	Food Microbiology	PCC-2	3	0	0	20	10	30	-	70	-	100	3
3	BFD-303	Fluid Flow and Solid Handling	PCC-3	3	1	0	20	10	30	-	70	-	100	4
4	BFD-304	Process Calculation	PCC-4	3	1	0	20	10	30	-	70	-	100	4
5	BME-301	Engineering Mechanics	ESC-1	3	1	0	20	10	30	-	70	-	100	4
6	BFD-351	Composition Quality & Safety of Foods Lab	PCC-5	0	0	2	-	-	-	15	-	35	50	1
7	BFD-352	Food Microbiology Lab	PCC-6	0	0	2	-	-	-	15	-	35	50	1
8	BMC-301- BMC-305	Mandatory Course-1	MC-1	2	0	0	20	10	30	-	70	-	100	0
<b>TOTAL</b>													<b>700</b>	<b>21</b>

**B.Tech2<sup>nd</sup> Year/4<sup>th</sup> Semester (FOOD TECHNOLOGY)**  
**w.e.f academic Session 2019-20**

SEMESTER IV														
S.No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BFD-401	Principle of Heat & Mass Transfer	PCC-7	3	0	0	20	10	30	-	70	-	100	3
2	BFD-402	Food Chemistry & Nutrition	PCC-8	3	0	0	20	10	30	-	70	-	100	3
3	BFD-403	Food Biotechnology	PCC-9	3	0	0	20	10	30	-	70	-	100	3
4	BFD-404	Storage of Foods Products	PCC-10	2	1	0	20	10	30	-	70	-	100	3
5	BAS-401	Mathematics-III (Probability and Statistics)	ESC-2	3	1	0	20	10	30	-	70	-	100	4
6	BAS-404	Biology	ESC-3	2	1	0	20	10	30	-	70	-	100	3
7	BFD-451	Principle of Heat & Mass Transfer Lab	PCC-11	0	0	2	-	-	-	15	-	35	50	1
8	BFD-452	Food Chemistry Lab	PCC-12	0	0	2	-	-	-	15	-	35	50	1
9	BFD-453	Food Biotechnology Lab	PCC-13	0	0	2	-	-	-	15	-	35	50	1
10	BMC-401- BMC-405	Mandatory Course-2	MC-2	2	0	0	20	10	30	-	70	-	100	0
<b>TOTAL</b>													<b>850</b>	<b>22</b>

**List of Mandatory Courses (non-credit)**

BMC-301/BMC-401/BMC-501: Constitution of India

BMC-302/BMC-402/BMC-502: Universal Human Values -1 :- Syllabus will prepare as per scheduled

BMC-303/BMC-403/BMC-503: Environment Science

BMC-304/BMC-404/BMC-504: Essence of Indian Knowledge Tradition:-:- Syllabus will prepare as per scheduled

BMC-305/BMC-405/BMC-505: Learning an art form (during Induction Program):-:- Syllabus will prepare as per scheduled

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**STUDY & EVALUATION SCHEME**  
**B.Tech.3<sup>rd</sup> Year/5<sup>th</sup> Semester (FOOD TECHNOLOGY)**  
**w.e.f academic Session 2019-20**

SEMESTER V														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BFD-501	Food Quality-Analysis & Assurance	PCC-14	3	1	0	20	10	30	-	70	-	100	4
2	BFD-502	Processing of Fruits and Vegetables	PCC-15	3	0	0	20	10	30	-	70	-	100	3
3	BFD-503	Processing of Milk & Milk Products	PCC-16	3	0	0	20	10	30	-	70	-	100	3
4	BFD-511- BFD-513	Professional Elective Course -1	PEC-1	3	0	0	20	10	30	-	70	-	100	3
5	BFD-001- BFD-003	Open Elective Course -1	OEC-1	3	0	0	20	10	30	-	70	-	100	3
6	BFD-551	Food Quality-Analysis & Assurance Lab	PCC-17	0	0	2	-	-	-	15	-	35	50	1
7	BFD-552	Processing of Fruits and Vegetables Lab	PCC-18	0	0	2	-	-	-	15	-	35	50	1
8	BFD-553	Processing of Milk & Milk Products Lab	PCC-19	0	0	2	-	-	-	15	-	35	50	1
9	BHU-501 to 532	Slot for HSMC Course	HSMC-2	3	0	0	20	10	30	-	70	-	100	3
<b>TOTAL</b>													<b>750</b>	<b>22</b>

**B.Tech.3<sup>rd</sup> Year/6<sup>th</sup> Semester (FOOD TECHNOLOGY)**  
**w.e.f academic Session 2019-20**

SEMESTER VI														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BFD-601	Food Engineering	PCC-20	3	1	0	20	10	30	-	70	-	100	4
2	BFD-611- BFD-613	Professional Elective Course -2	PEC-2	3	0	0	20	10	30	-	70	-	100	3
3	BFD-621- BFD-623	Professional Elective Course -3	PEC-3	3	0	0	20	10	30	-	70	-	100	3
4	BFD-004- BFD-006	Open Elective Course -2	OEC-2	3	0	0	20	10	30	-	70	-	100	3
5	BFD-651	Food Engineering Lab	PCC-21	0	0	2	-	-	-	15	-	35	50	1
6	BFD-652	Advance Food Technology Lab-I	PCC-22	0	0	2	-	-	-	15	-	35	50	1
7	BFD-653	Processing of Cereals Pulses & Oilseeds Lab	PCC-23	0	0	2	-	-	-	15	-	35	50	1
8	BHU-601 to 632	Slot for HSMC Course	HSMC-3	3	0	0	20	10	30	-	70	-	100	3
<b>TOTAL</b>													<b>650</b>	<b>19</b>
9		Summer Internship		During Summer Vacations / Non-credit (4-6 Week)										

**BHAI JAITA SUBHARTI ENGINEERING COLLEGE**  
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**  
**STUDY & EVALUATION SCHEME**  
**B.Tech.4<sup>th</sup>Year/7<sup>th</sup> Semester (FOOD TECHNOLOGY)**  
**w.e.f academic Session 2019-20**

<b>SEMESTER VII</b>														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BFD-711- BFD-713	Professional Elective Course -4	PEC-4	3	0	0	20	10	30	-	70	-	100	3
2	BFD-721- BFD-723	Professional Elective Course -5	PEC-5	3	0	0	20	10	30	-	70	-	100	3
3	BFD-007- BFD-009	Open Elective Course -3	OEC-3	3	0	0	20	10	30	-	70	-	100	3
4	BFD-010- BFD-012	Open Elective Course -4	OEC-4	3	0	0	20	10	30	-	70	-	100	3
5	BFD-752	Project Stage-I	PROJ	0	0	6	-	-	-	50	-	100	150	3
6	BFD-751	Summer Internship	PROJ	0	0	2	-	-	-	50	-	-	50	1
7	BHU-701 to 732	Slot for HSMC	HSMC-4	3	0	0	20	10	30	-	70	-	100	3
<b>TOTAL</b>												<b>700</b>	<b>19</b>	

**B.Tech.4<sup>th</sup>Year/8<sup>th</sup> Semester (FOOD TECHNOLOGY)**  
**w.e.f academic Session 2019-20**

<b>SEMESTER VIII</b>														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BFD-811- BFD-813	Professional Elective Course -6	PEC-6	3	1	0	20	10	30	-	70	-	100	4
2	BFD-013- BFD-015	Open Elective Course-5	OEC-5	3	0	0	20	10	30	-	70	-	100	3
3	BFD-016- BFD-018	Open Elective Course -6	OEC-6	3	0	0	20	10	30	-	70	-	100	3
4	BFD-851	Project Stage-II	PROJ	0	0	16	-	-	-	100	-	200	300	8
<b>TOTAL</b>												<b>600</b>	<b>18</b>	

**B.Tech. (FOOD TECHNOLOGY) TOTAL CREDITS – 159**  
**COURSE TYPE NOMENCLATURE**

<b>Course Code</b>	<b>Definitions</b>
BSC	BASIC SCIENCE COURSES
ESC	ENGINEERING SCIENCE COURSES
HSMC	HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES
PCC	PROFESSIONAL CORE COURSES
PEC	PROFESSIONAL ELECTIVE COURSE
OEC	OPEN ELECTIVE COURSE
MC	MANDATORY COURSES
PROJ	PROJECT
CCA	CONTINUATION COMPREHENSIVE ASSESSMENT
ESE	END SEMESTER EXAMINATION
L	LECTURE
T	TUTORIAL
P	PRACTICAL
CT	CLASS TEST
AT	ATTENDANCE
PS	PRACTICAL SESSIONAL
TE	THEORY EXAM
PE	PRACTICAL EXAM

**PROGRAMME CORE ELECTIVE COURSES (PCC)**  
**[FOOD TECHNOLOGY]**

<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>
01	BFD-301	COMPOSITION QUALITY & SAFETY OF FOODS
02	BFD-302	FOOD MICROBIOLOGY
03	BFD-303	FLUID FLOW AND SOLID HANDLING
04	BFD-304	PROCESS CALCULATION
05	BFD-351	COMPOSITION QUALITY & SAFETY OF FOODS LAB
06	BFD-352	FOOD MICROBIOLOGY LAB
07	BFD-401	PRINCIPLE OF HEAT & MASS TRANSFER
08	BFD-402	FOOD CHEMISTRY & NUTRITION
09	BFD-403	FOOD BIOTECHNOLOGY
10	BFD-404	STORAGE OF FOODS PRODUCTS
11	BFD-451	PRINCIPLE OF HEAT & MASS TRANSFER LAB
12	BFD-452	FOOD CHEMISTRY LAB
13	BFD-453	FOOD BIOTECHNOLOGY LAB
14	BFD-501	FOOD QUALITY-ANALYSIS & ASSURANCE
15	BFD-502	PROCESSING OF FRUITS AND VEGETABLES
16	BFD-503	PROCESSING OF MILK & MILK PRODUCTS
17	BFD-551	FOOD QUALITY-ANALYSIS & ASSURANCE LAB
18	BFD-552	PROCESSING OF FRUITS AND VEGETABLES LAB
19	BFD-553	PROCESSING OF MILK & MILK PRODUCTS LAB

20	BFD-601	FOOD ENGINEERING
21	BFD-651	FOOD ENGINEERING LAB
22	BFD-652	ADVANCE FOOD TECHNOLOGY LAB-I
23	BFD-653	PROCESSING OF CEREALS PULSES & OILSEEDS LAB

**PROFESSIONAL ELECTIVE COURSES (PE)  
(FOOD TECHNOLOGY DEPARTMENT)**

S No	Course Code No	Course Title
		<b>PROGRAMME ELECTIVE 01</b>
01	BFD-511	FOOD BIOCHEMISTRY
02	BFD-512	FOOD PROCESSING AND PRESERVATION
03	BFD-513	ENGINEERING PROPERTIES OF FOOD MATERIALS
		<b>PROGRAMME ELECTIVE 02</b>
04	BFD-611	PROCESSING OF CEREALS, PULSES AND OILSEEDS
05	BFD-612	PROCESSING OF MEAT, FISH & POULTRY PRODUCTS
06	BFD-613	FRUITS, VEGETABLES & PLANTATION PRODUCTS
		<b>PROGRAMME ELECTIVE 03</b>
07	BFD-621	FOOD ADITIVIES
08	BFD-622	PACKAGING OF FOOD PRODUCTS
09	BFD-623	PRINCIPLE OF HUMAN NUTRITION
		<b>PROGRAMME ELECTIVE 04</b>
10	BFD-711	CROP PROCESS ENGINEERING
11	BFD-712	FOOD BEVERAGES
12	BFD-713	TRADITIONAL & FERMENTED FOODS
		<b>PROGRAMME ELECTIVE 05</b>
13	BFD-721	DRYING PROCESSING
14	BFD-722	FOOD PROCESS ENGINEERING
15	BFD-723	FOOD ADULTERATION
		<b>PROGRAMME ELECTIVE 06</b>
16	BFD-811	FOOD PRESERVATION TECHNOLOGY
17	BFD-812	FOOD HYGIENE AND PLANT SANITATION
18	BFD-813	QUALITY ANALYSIS

**OPEN ELECTIVE COURSES (OE)**  
**[FOOD TECHNOLOGY]**

<b>S. No</b>	<b>Code No.</b>	<b>Subjects</b>
		<b>Open Elective 01</b>
01	BFD-001	INTRODUCTION TO BIOTECHNOLOGY
02	BFD-002	INTRODUCTION TO FOOD TECHNOLOGY
03	BFD-003	FOOD PROCESSING & WASTE MANAGEMENT
		<b>Open Elective 02</b>
04	BFD-004	RHEOLOGICAL & SENSORY ASSESSMENT
05	BFD-005	FOOD PROCESS PLANT DESIGN AND LAYOUT
06	BFD-006	FOOD PRODUCTS & PROCESS DEVELOPMENT
		<b>Open Elective 03</b>
07	BFD-007	BAKERY PROCESS TECHNOLOGY
08	BFD-008	ENGINEERED, TEXTURISED & FABRICATED FOODS
09	BFD-009	TRANSPORT PROCESS IN FOOD ENGINEERING
		<b>Open Elective 04</b>
10	BFD-010	UNIT OPERATION IN FOOD PROCESSING
11	BFD-011	POST HARVEST TECHNOLOGY
12	BFD-012	FOOD FERMENTATION TECHNOLOGY
		<b>Open Elective 05</b>
13	BFD-013	FOOD SAFETY AND REGULATION
14	BFD-014	FAT & OIL TECHNOLOGY
15	BFD-015	ENZYME PROCESSING IN FOOD PRODUCTS
		<b>Open Elective 06</b>
16	BFD-016	NANO FOOD TECHNOLOGY
17	BFD-017	SPECIALITY FOODS
18	BFD-018	ENZYME TECHNOLOGY

**HUMANITIES, SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)**

S.No	Subject Code	Subject Name
1	BHU-501/BHU-601/BHU-701	Humanities, Social Science including Management Courses
2	BHU-502/BHU-602/BHU-702	Foundational Course in Humanities (Development of Societies/Philosophy)
3	BHU-503/BHU-603/BHU-703	Education, Technology and Society
4	BHU-504/BHU-604/BHU-704	History of Science and Technology in India
5	BHU-505/BHU-605/BHU-705	Nyaya Logic Epistemology
6	BHU-506/BHU-606/BHU-706	Political and Economic Thought for a Humane Society
7	BHU-507/BHU-607/BHU-707	State, Nation Building and Politics in India
8	BHU-508/BHU-608/BHU-708	Psychological Process
9	BHU-509/BHU-609/BHU-709	Positive Psychology
10	BHU-510/BHU-610/BHU-710	Application of Psychology
11	BHU-511/BHU-611/BHU-711	Sociology, Society and Culture
12	BHU-512/BHU-612/BHU-712	Epochal Shift
13	BHU-513/BHU-613/BHU-713	Values and Ethics
14	BHU-514/BHU-614/BHU-714	Ethics and Holistic Life
15	BHU-515/BHU-615/BHU-715	Folk and Vernacular Expressive Tradition and Popular Culture
16	BHU-516/BHU-616/BHU-716	Universal Human Conduct
17	BHU-517/BHU-617/BHU-717	Gender Culture and Development
18	BHU-518/BHU-618/BHU-718	Introduction to Women's and Gender Studies
19	BHU-519/BHU-619/BHU-719	Advance Course in Peace Research
20	BHU-520/BHU-620/BHU-720	Contemporary India in Globalized Era: Challenges of Democracy and Development
21	BHU-521/BHU-621/BHU-721	Making Indian Culture: Epistemic Traditions, Literature and Performative Arts
22	BHU-522/BHU-622/BHU-722	Universal Human Values 2: Understanding Harmony
23	BHU-523/BHU-623/BHU-723	Human Relations at Work
24	BHU-524/BHU-624/BHU-724	Sanskrit Bhasa
25	BHU-525/BHU-625/BHU-725	Language and Communication
26	BHU-526/BHU-626/BHU-726	Language and Linguistics
27	BHU-527/BHU-627/BHU-727	Understanding Society and Culture through Literature
28	BHU-528/BHU-628/BHU-728	Fundamentals of Linguistics
29	BHU-529/BHU-629/BHU-729	Elements of Literature
30	BHU-530/BHU-630/BHU-730	Humanities and Multiple Dimensions of Ecology
31	BHU-531/BHU-631/BHU-731	Film Appreciation
32	BHU-532/BHU-632/BHU-732	Law and Engineering

- Syllabus will prepare as per scheduled

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-301***
2. Subject Name: **Composition, Quality & Safety of Foods**
3. Contact Hours:       L: 3       T: 1       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 4

**Objectives:** This is an introductory course which gives the necessary details and information to get acquainted with the properties, composition, quality and safety of foods.

**Unit 01:- Composition**

Chemical constituents of foods: Desirable and Potentially undesirable food constituents and their importance. Recommended Dietary Allowances (RDA). Basal metabolic rate and dietary requirements of different age groups. Composition of foods – General and specific for different foods of plant and animal origin.

**Unit 02:- Carbohydrates**

Classes, Nomenclature and structure. Dietary utilization and disturbances. Lipids: Definition, Classification and structure: Fatty acids composition of natural lipids of plants and animal origin, Essential fatty acids. Role and use of natural lipids and tailor made fats in foods.

**Unit 03:- Protein**

Physico-chemical properties of amino acids, peptides and proteins, structure - function relationship of proteins, Essential Amino acids. Nutritional attributes of food and their implications

**Unit 04:- Quality**

Basic concepts. Nutritional and sensory attributes and their assessments, causes of undesirable changes leading to quality deterioration in foods and their implications. Determination of probable cause(s) of observed quality change in foods.

**Unit 05:- Safety**

Operational sense of food safety, Potential Food derived health hazards- Microbial contamination. Pesticide residues, Environmental Contamination. Risk and risk assessment. HACCP. Adulteration in Foods. Testing food for its safety.

**Course Outcome:-**

To provide guiding principles and tools for the development of the whole person recognizing that the individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions.

**Text books:**

1. Fennema OR. 1996. Food Chemistry. Marcel Dekker.
2. Meyer LH. 1987. Food Chemistry. CBS Publishers.
3. Krammer A & Twigg BA. 1973. *Quality Control in Food Industry*. Vol. I, II. AVI Publ.
4. Macrae R, Roloson R & Sadlu MJ. 1994. *Encyclopedia of Food Science & Technology & Nutrition*. Vol. XVI. Academic Press.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-302***
2. Subject Name: ***Food Microbiology***
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objectives:-** To make the student to understand the causes of food spoilage and predict the micro-organism that can spoil a given food, when prepared, processed and stored under given condition and take corrective measures to control the spoilage and pathogenic micro-organism in food.

**Unit 01:- Microorganism**

General characteristics of microorganism: Classification, morphology, physiology, growth, nutrition and reproduction; Pure culture techniques and maintenance of cultures, control of microorganisms.

**Unit 02:- Characteristics**

Incidence of microorganism in foods, Sources of contamination. Principles underlying spoilage of foods. Physical and Chemical methods to control microorganisms. Food poisoning and food borne infections, Microbial toxins, Indicator organisms.

**Unit 03:- Contaminated Products**

Contamination, spoilage and preservation of cereal products, sugar products, fruit and vegetable products, Bakery Products, Microbiological standard of foods.

**Unit 04:- Contamination**

Contamination, spoilage and preservation of Meat products, Fish and Sea foods, Egg and Poultry products, Milk and Milk products and other foods. Microbiological limits.

**Unit 05:- Safety**

Food plant sanitation, inspection and control, personnel hygiene, Microbes in food fermentation, putrefaction, Lipolysis; Antagonism and Synergism in microorganisms. Rapid methods in detection of microorganisms. Standard plate count; Yeast and mould count

**Course Outcome:-**

Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival. Describe the characteristics of food borne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification. Explain why microbiological quality control programmes are necessary in food production.

**Text books:**

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. Food Microbiology. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. Essentials of Food Microbiology. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. Modern Food Microbiology. 7th Ed. Springer.
5. Ray B. 2004. Fundamentals of Food Microbiology. 3rd Ed. CRC.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-303***
2. Subject Name: ***Fluid Flow and Solid Handling***
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objectives:-**

The objective of this course is to introduce the basic concepts of stress and strain caused by applied forces and to create a confidence in analysing simple structural components.

**Unit 01:- Handling**

Solids and their handling properties of solids, screening, industrial screening equipment. Determination of particle size, screen analysis, Size reduction of solids, stages of reduction, operating variables, intermediate and fine size reduction, power requirement and mechanism. Power driven machines: Crushers, grinders, and conveyors.

**Unit 02:- Filtration**

Filtration: Theory, continuous and batch equipment. Flow of solids through fluids, classification and sedimentation.

**Unit 03:- Fluid Flow**

Fluid flow: Properties of fluids. Fluid statics: Euler's equation, Hydrostatic Law and Pressure Measurement. Transport of fluids, energy relationships, pipe fittings, minor losses in pipe flow filtration: Theory, continuous and batch equipment. Flow of solids through fluids, classification and sedimentation.

**Unit 04:- Flow Measurement**

Flow measurements: Orifice meter. Nozzle and venturi meters, rotameter and pitot tube.

**Unit 05:- Pump**

Pumping and compressing: reciprocating pumps, rotary pumps, centrifugal pumps and blowers. Introduction to fluidization.

**Course Outcome:-**

Develop the skills in arranging and handling different measuring instruments

**Text books:**

1. McCabe Smith: Unit Operations in Chemical Engineering, McGraw Hill.
2. Fox, R.A. & McDonald, A.T. "Introduction to Fluid Mechanics, 5th ed: John Wiley (1998).
3. Kumar D S "Fluid Mechanics", S.K, Katria and Sons, Delhi (1998.).
4. Rajput R.K."Text book of Fluid Mechanics", S.Chand and Co., New Delhi, (1998).
5. Gupta, Vijay and SK Gupta," Fluid Mechanics and its Applications"Wiley Eastern, NewDelhi.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-304**
2. Subject Name: **Process Calculations**
3. Contact Hours:       L: 3       T: 1       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 4

**Objectives:-**

To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

**Unit 01:- Dimensions & Calculations**

Units their dimensions and conversions, Mass and volume relations, law of thermodynamic, thermal treatment. Sterilisation. Blanching. Drying time calculation. Wet basis moisture content calculation, dry basis moisture calculation. Freeze drying, heat exchanger.

**Unit 02:- Humidity & Temperature**

Humidity and saturation, Relative Humidity and percent saturation, Dew point, Dry and Wet bulb temperatures, Use of humidity charts for engineering calculations.

**Unit 03:- Engineering Properties**

Engineering properties of agricultural materials: physical properties, shape and size, density, specific gravity, drag coefficient, frictional properties and angle of repose. Mechanical properties, thermal properties.

**Unit 04:- Energy Balance**

Rheological properties, heat transfer, conduction, convection, radiation, black body, white body, grey body, thermal radiation, emission, sensible heat, latent heat

**Course Outcome:-**

Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

**Text books:**

1. Himmelblau, D.M."Basic Principles & Calculations in Chemical Engineering", 6th ed. Prentice Hall (1996).
2. Felder & Rousseau, R.W. "Elementary Principles of Chemical Processes ", 3rd edition. John Wiley.
3. Bhatt. B.I. and Vora S.M. "Stoichiometry" 2nd edition, Tata McGraw Hill (1984) Reference Books.
4. Hougan D. A., Watson K.M. & Ragatz R. A. "Chemical Process Principles" Asia Publishing House.
5. Luben W.L. and Wenzel, L.A. "Chemical Process Analysis Mass and Energy Balance" Prentice Hall.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BME-301**
2. Subject Name: **Engineering Mechanics**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objectives:-**

To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

**Unit 01:- Force Systems:**

Basic concepts: Definitions, Basic assumptions, Scalar & Vector Quantities, Free, Forced and fixed vectors. Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces Moment of a force, Vector representation, Moment for coplanar Force system, Varignon's theorem Couple, Vector representation, Resolution of a force into a force and a couple. Force Systems: Coplanar Concurrent Force system and Coplanar Non Concurrent force systems, Resultant of coplanar force system Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem.

**Friction:** Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of Friction.

**Unit 02:- Basic Structural Analysis:**

Plane Truss, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss, Method of joints, Method of section, Zero force members. Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

**Unit 03:- Centroid and Moment of Inertia:**

Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of Composite bodies. Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas. Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies..

**Unit 04:- Kinematics of Rigid Body:**

Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity.

**Kinetics of Rigid Body:** Introduction, Force, Mass and Acceleration, Newton's law of motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion. Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy, Linear Impulse and Momentum, Conservation of linear momentum.

**Unit 05:- Mechanics of Deformable Solids:**

**Simple stress and strain:** Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

**Bending of Beams:** theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. Theory of Torsion, Torque and twist, Shear stress due to torsion circular sections.

**Course Outcome:-**

Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

**Text books:**

1. Himmelblau, D.M."Basic Principles & Calculations in Chemical Engineering", 6th ed. Prentice Hall (1996).
2. Felder & Rousseau, R.W. "Elementary Principles of Chemical Processes ", 3rd edition. John Wiley.
3. Bhatt. B.I. and Vora S.M. "Stoichiometry" 2nd edition, Tata McGraw Hill (1984) Reference Books.
4. Hougan D. A., Watson K.M. & Ragatz R. A. "Chemical Process Principles" Asia Publishing House.
5. Luben W.L. and Wenzel, L.A. "Chemical Process Analysis Mass and Energy Balance" Prentice Hall.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BMC-303**
2. Subject Name: **Environment Science**
3. Contact Hours:       L: 3       T: 1       P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**1 Nature of Environment**

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

**2 Impact of Human Activity on Environment**

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics.

**3 Environmental Changes and Human Health**

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming, acid rain, ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards.

**4 Environmental Protection through Assessment and Education**

Indicators and Impact Assessment – Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring.

**5 Environmental Protection– Role of individuals, organizations and government in pollution control Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education.**

**Text Book:**

1. Environmental Studies, J Krishnawamy, R J Ranjit Daniels, Wiley India.

**Reference Books:**

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press.
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications.
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007.
8. Textbook of Environment Ecology , Singh, Acme Learning.
9. Perspective in Environmental Studies, Kaushik, New Age International.
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: ***BFD-351***
2. Lab Name: ***Composition, Quality & Safety of Food Lab***
3. Contact Hours:      L: 0      T: 1      P: 3
4. Examination Duration (Hrs.): Practical    02
5. Credits: 2

**Objectives:**

This is an introductory course which gives the necessary details and information to get acquainted with the properties, composition, quality and safety of foods.

**Experiment 01:-**

Sampling requirements, procedures and methods

**Experiment 02:-**

Determination of moisture content of foods by oven drying and distillation methods.

**Experiment 03:-**

Determination of Total and Acid insoluble ash content in foods.

**Experiment 04:-**

Determination of Crude fat content by solvent extraction methods in foods.

**Experiment 05:-**

Determination of crude Protein by Kjeldhal Lowry methods.

**Experiment 06:-**

Determination of reducing and total sugar content in foods.

**Experiment 07:-**

Determination of crude Fibre content in foods.

**Experiment 08:-**

Determination of specific vitamin content of food such as ascorbic acid, carotenes etc.

**Outcomes**

- The students will have knowledge about different processing and preservation methods and principles involved.
- Students will get acquainted with analytical methods used for quality Transfer
- control analysis of raw material and processed food commodities.
- The students will have learnt about composition and processing of various cereals, pulses and oilseeds.

**Text books:**

1. Banawart GJ. 1989. *Basic Food Microbiology*. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. *Food Microbiology*. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. *Essentials of Food Microbiology*. Arnold Heinemann.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **BFD-352**
2. Lab Name: **Food Microbiology Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

**Objectives:-**

To enable the students to understand the basic concepts of food microbiology are involved in the analyses.

**Experiment 01:-**

Microscope its parts and utility in identification and differentiation of various microorganism as bacteria, yeast and mold.

**Experiment 02:-**

Determination of effect of temperature on enzyme activity.

**Experiment 03:-**

Determination of effect of pH on enzyme activity.

**Experiment 04:-**

Estimation of enzymatic browning in a food.

**Experiment 05:-**

Estimation of enhancement in an enzyme activity during ripening of a fruit.

**Experiment 06:-**

Preparation and sterilization of media and glass ware for microbial counts.

**Experiment 07:-**

Detection/ estimation of catalase and peroxidase activity in vegetable.

**Experiment 08:-**

Application of enzymes: Amylase in hydrolysis of starch. Invertase in hydrolysis of sucrose. Protease in hydrolysis of protein Lipase in hydrolysis of fat. Cellulase and hemicellulase for dehulling of a grain, etc.

**Course Outcome:-**

- Explain the significance and activities of microorganisms in food.
- Describe the characteristics of food borne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification.
- Explain why microbiological quality control programmes are necessary in food production.
- Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.

**Text books:**

1. An introduction to practical biochemistry by D.T.Plummer, III Ed. Tata McGraw Hill Publishing Co. New Delhi.
2. Principles of Enzymology for Food Science by J.R.Whitaker, Marcel Dekker Inc.
3. Methods in Enzymology by S.P.Colwick and N.O. Kaplan, Academic Press.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-401***
2. Subject Name: ***Principal of Heat & Mass Transfer***
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objectives:-**

Students will understand the basic concepts of conduction, convection and radiation heat transfer and Students will understand how to formulate and be able to solve one and two dimensional conduction heat transfer problems. Solution techniques will include both closed form and numerical methods. Convection effects will be included as boundary conditions.

**Unit 01:- Introduction**

Introduction, Conduction: Basic concepts of conduction in solids, liquids and gases, One and two dimensional heat conduction. Critical and optimum insulation thickness. Introduction to unsteady state heat transfer.

**Unit 02:- Heat Transfer**

Basic laws of heat transfer by radiation, black body and gray body concepts, solar radiations, combined heat transfer coefficients by convection and radiation. Heat Transfer Equipments: Double pipe, Shell & tube and Plate type heat exchanger, Evaporator, Condenser.

**Unit 03:- Drying Foods**

Drying: Batch and freeze drying, rotary driers. Surface vs diffusion controlled operations. Principles of convection, Equations of forced and free convection, Heat flow due to conduction & convection

**Unit 04:- Heat & Energy**

Solid-gas equilibrium, Different modes of drying operation, Types of batch and continuous dryer Definitions of moisture contents, Rate of batch drying, Time of drying, Mechanism of batch drying, Continuous drying.

**Unit 05:- Analytical Methods**

Classification of crystallizers, Equilibrium yield of crystallization, Heat and mass transfer rates in crystallization, Theories of crystallization, Factors governing nucleation and crystal growth rates, controlled growth of crystal.

**Course Outcome:-**

- Basic heat transfer mechanisms (conduction, convection and radiation).
- Heat transfer by conduction in solids for steady-state and transient conditions.
- Heat transfer by convection in closed conduits and on external surfaces.
- Heat transfer by thermal radiation.

**Text books:**

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. Food Microbiology. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. Essentials of Food Microbiology. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. Modern Food Microbiology. 7th Ed. Springer.
5. Ray B. 2004. Fundamentals of Food Microbiology. 3rd Ed. CRC.

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-402**
2. Subject Name: **Food Chemistry & Nutrition**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objectives:-** The main objectives of the Nutrition Science and Food Chemistry Nutrition are to provide a link to scientific information on diet and health for farmers, consumers, and scientists and to train future generations of students and scientists in the nutrition sciences.

**Unit 01:- Food Structures**

(a) Water in Foods: Structure. Properties, Interactions, Water activity, Sorption Isotherms and food stability.

(b) Carbohydrates: Functions, Reactions and properties of simple and complex carbohydrate, Browning reactions, Selection of Natural or Modified carbohydrates for incorporation into processed food.

**Unit 02:- Lipids**

Lipids: Consistency of commercial fats, Lipolysis, Auto oxidation, Thermal Decomposition and effect of ionizing radiation, Refining of oils, Modification of oils and fats, Role of food lipids in flavor, Nutritional aspects of natural and modified fats.

**Unit 03:- Proteins**

Proteins: Chemical reactions and interactions of amino acids and proteins, De-naturation and its implications, Functional properties of food proteins, Modification of food proteins in processing and storage and its implications. Nutritive value of food proteins.

**Unit 04:- Vitamins**

Vitamins, Minerals, Pigments and Flavours: Chemistry and stability of water and fat soluble vitamins, Chemical properties of minerals and their bioavailability, Enrichment and Fortification. Natural pigments in foods and their retention in processed foods. Flavoring constituents in foods, Development of process and reaction flavour volatiles.

**Unit 05:- Food Groups**

Food groups and their typical composition; essential nutrients- sources, functions, deficiency diseases; requirements and recommended dietary allowances. Malnutrition, Protein quality evaluation, Calorific value of foods.

**Course Outcome:-**

- Study that how to destroy the harm full enzymes
- How to protect the food from various enzymatic reactions
- Use of various type of vitamins in various human disease.
- Role of essential nutrients in human body.

**Text Books:**

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. DeMan JM. 1976. Principles of Food Chemistry. AVI Publications.
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-403***
2. Subject Name: ***Food Biotechnology***
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objectives:** Lectures cover basic properties, characteristics, structures and functions of living cells (microbial) and enzymes; metabolic pathways and how these are harnessed, manipulated and applied through natural selection, genetic engineering, optimized reactor and environmental designs and controls to increase productivity.

**Unit 01: Nomenclature**

Nomenclature, Classification and specificity of enzymes and cofactors, Enzyme Kinetics: Factors affecting the rate of enzyme catalyzed reaction, regulation and control of enzyme action.

**Unit 02: Metabolic Pathways**

Metabolic Pathways: Carbohydrates, proteins and fats; catabolism and anabolism

**Unit 03: Digestion**

Digestion, Absorption, Assimilation and Transport of nutrients in human beings.

**Unit 04: Food Purification**

Downstream processing: separation of particles, disintegration of cells, extraction, concentration, purification, drying. Process development. Mechanism of enzyme action: use of enzymes in solution. Use of immobilized enzymes. Water quality.

**Unit 05: Food Enzymes**

Application of enzymes in food processing: Endogenous enzymes and their role in modification of foods, enzyme added to foods during processing sources, conversions and specific applications.

**Course Outcome**

The course discusses the microbiological and technological principles of industrial application of microorganisms and enzymes in food production and processing systems to provide useful products and services.

**Text Books:**

1. A.L. Lehninger Principle of Biochemistry.
2. Lubert Stryen Biochemistry.
3. Fennema OR. 1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. S.A. Joshi Nutrition and Dietetics.
6. J.H. Weil General Biochemistry.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-404***
2. Subject Name: ***Storage of Food Products***
3. Contact Hours: L: 2 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objective:-**

Food is stored by almost every human society and by many animals. Storing of food has several main purposes: Storage of harvested and processed plant and animal food products for distribution to consumers.

**Unit 01:-Unit Operation**

Performance characteristics of different unit operations such as precleaning, grading, conveying, elevating, drying, treating, blending, packaging and storage, seed treater, weighing and bagging machines, their operation and maintenance, installation and determination of their capacity, seed quality maintenance during processing, plant design and layout, economy and safety consideration in plant design.

**Unit 02:- Drying Method**

Seed drying principles and methods, theory of seed drying, introduction to different types of heated air dryers, significance of moisture equilibrium, method of maintaining safe seed moisture, thumb rule and its relevance.

**Unit 03:- Storage Structure**

Importance of scientific seed storage, types of storage structures to reduce temperature and humidity; management and operation/cleanliness of seed stores, packaging-principles, practices, materials and hermetic packaging.

**Unit 04:- Packaging Equipment**

Packaging equipments: Food packages, bags, types of pouches, wrappers, carton and other traditional package; Retortable pouches; Shelf life of packaged foodstuff.

**Unit 05:- Packaging Materials**

Food containers: Rigid containers, glass, wooden boxes, crates, plywood and wire bound boxes, corrugated and fibre board boxes, textile and paper sacks, corrosion of containers (tin plate); Flexible packaging materials and their properties; Aluminium as packaging material; Evaluation of packaging material and package performance.

**Course Outcome:-**

Preserving pantry food, such as spices or dry ingredients like rice and flour, for eventual use in cooking. Increase the shelf life of the products. Protect food from Insect, Peat and Rodents.

**Text Books:**

1. Crosby NT. 1981. *Food Packaging Materials*. Applied Science Publ.
2. Mahadeviah M &Gowramma RV. 1996. *Food Packaging Materials*. Tata McGraw Hill.
3. Palling SJ. (Ed). 1980. *Developments in Food Packaging*. Applied Science Publ.
4. Sacharow S &Grittin RC. 1980. *Principles of Food Packaging*. AVI Publ.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BAS- 401***
2. Subject Name: ***Mathematics III***
3. Contact Hours: L: 3      T: 1      P: 0
4. Credits: 4

**Objective:**

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to understand the method of solving algebraic, transcendental equations and determine the approximate value of the derivative & definite integral for a given data using numerical techniques.

**Unit 01:- Basic Probability**

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality

**Unit 02:- Continuous Probability Distributions**

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

**Unit 03:- Bivariate Distribution**

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

**Unit 04:- Basic Statistics**

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

**Unit 05:- Applied Statistics**

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations

**Unit 06:- Small samples**

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes

**Course Outcome:-**

Students will demonstrate the ability to think critically, research, and reason. (Ethical Leadership), engage in activities directly benefitting the broader community. (Community Engagement), an understanding of the common body of knowledge in

mathematics, ability to apply analytical and theoretical skills to model and solve mathematical problems and the ability to analyze data and draw appropriate statistical conclusions.

**Text/Reference Books:**

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
3. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
4. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
5. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
6. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
7. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

**1. Course Code: BAS-404**

2. Subject Name: ***Biology***
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Course Outcomes:** After studying the course, the student will be able to:

- Describe how biological observations of 18<sup>th</sup> Century that lead to major discoveries.
- Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
- Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
- Classify enzymes and identify DNA as a genetic material.
- Apply thermodynamic principles to biological systems.

**Unit-I Diversity of Living Organisms**

What is living? Biodiversity: classification Five kingdom classification; Salient features and classification of Monera, Protista and Fungi into major groups: Lichens, Viruses and Viroids. Salient features and classification of plants into major groups, Salient features and classification of animals.

**Unit-II Structural Organization in Animals and Plants**

Plants Morphology and modifications: Internal Morphology of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit and seed. Animal tissues; Morphology, anatomy and functions of different systems.

**Unit-III Cell: Structure and Function**

Cell theory and cell as the basic unit of life: Structure of prokaryotic and eukaryotic cells; Plant cell and animal cell. Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, nucleic acids; Enzymes- types, properties, enzyme action. Cell Division.

**Unit-IV Plant Physiology and genetics**

Mendel's law, movement of water, gases and nutrients; cell to cell transport. Essential minerals, macro- and micronutrients and their role; deficiency symptoms. Nitrogen metabolism, Photosynthesis and respiration in plants. Plant-Growth and Development.

**Unit-V Human Physiology**

Digestion and Absorption: Alimentary canal and digestive glands, role of digestive enzymes and gastrointestinal hormones. Respiratory system in humans; mechanism of breathing and its regulation in humans. Body Fluids and Circulation: composition of blood, blood groups, coagulation of blood. Modes of excretion and Locomotion and Movement.

**Text / References:**

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
2. .E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.

3. .D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.
4. .G. S. Stent and R. Calendar, "Molecular Genetics", Freeman and company, 1978.
5. L. M. Prescott, J. P. Harley and C. A. Klein, "Microbiology", McGraw Hill Higher Education, 2005.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: ***BFD-451***
2. Lab Name: ***Principal of Heat & Mass Transfer Lab***
3. Contact Hours: L: 0 T: 1 P: 3
4. Examination Duration (Hrs.): Practical 02
5. Credits: 2

**Objectives:-**

To enable the students to understand the basic concepts of principle of heat and mass transfer are involved in the analyses.

**Experiment 01:-**

To find the thermal conductivity of metallic rod at different temperature and draw the temperature profile for steady and unsteady state conduction..

**Experiment 02:-**

To find out the thermal conductivity of insulating powder.

**Experiment 03:-**

To find the thermal conductivity of liquid / gases.

**Experiment 04:-**

To find the emissivity of grey plate with respect to black plate.

**Experiment 05:-**

To study the critical heat flux behaviour of a liquid.

**Experiment 06:-**

Determination of separation through membrane

**Experiment 07:-**

Determination of liquid extraction

**Experiment 08:-**

Determination of liquid solid extractions

**Course Outcome:-**

Students will understand the basic concepts of conduction, convection and radiation heat transfer and Students will understand how to formulate and be able to solve one and two dimensional conduction heat transfer problems. Solution techniques will include both closed form and numerical methods. Convection effects will be included as boundary conditions.

**Text books:**

1. Holman, J.P.: "Heat Transfer" 9 th ed. McGraw Hill (1989).
2. Treybal, R "Mass Transfer Operations", 3rd ed. New York: McGraw-Hill, (1980).
3. McCabe Smith: Unit Operations in Chemical Engineering, McGraw Hill
4. Foust A. S. et.al., "Principles of Unit Operations" John Wiley (1980).

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: ***BFD-452***
2. Lab Name: ***Food Chemistry Lab***
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

**Objectives:-**

To enable the students to understand the basic concepts of food chemistry of different food products are involved in the analyses.

**Experiment 01:-**

Analysis of water for potable and food purposes.

**Experiment 02:-**

Moisture content in foods in relation to their stability.

**Experiment 03:-**

Non-enzymatic browning reactions and its determinations.

**Experiment 04:-**

Determination of free fatty acid content in fats and oils..

**Experiment 05:-**

Determination of heat stability of vitamin C.

**Experiment 06:-**

Study of some reactions of proteins.

**Experiment 07:-**

Study of some processing changes in proteins.

**Experiment 08:-**

Study of some functional properties of proteins.

**Course Outcome:-**

Students will understand safety, transfer and measurement of chemicals, filtration, solution preparation, mass percent determination, titrations, redox reactions, enthalpy of reactions, spectrochemical analysis, gas stoichiometry and Operating pH meters, spectrophotometers, analytical balances, and other common laboratory equipment applications in an undergraduate laboratory.

**Text Books:**

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. DeMan JM. 1976. Principles of Food Chemistry. AVI Publications.
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: ***BFD-453***
2. Lab Name: ***Food Biotechnology Lab***
3. Contact Hours:       L: 0       T: 0       P: 2
4. Examination Duration (Hrs.): Practical   02
5. Credits: 1

**Objectives:-**

To enable the students to understand the basic concepts of biotechnology are involved in the analyses.

**Experiment 01:-**

Study of laboratory equipments used in plant tissue culture lab.

**Experiment 02:-**

Preparation of stock solution.

**Experiment 03:-**

Preparation of growth media.

**Experiment 04:-**

Explants selection, treatment and inoculation.

**Experiment 05:-**

Study of Total dissolved and suspended solid in waste water.

**Experiment 06:-**

Study of acidity of waste water.

**Experiment 07:-**

Study of hardness of waste water.

**Experiment 08:-**

Study of microbial production from different selective strains.

**Course Outcome:-**

The course discusses the microbiological and technological principles of industrial application of microorganisms and enzymes in food production and processing systems to provide useful products and services.

**Text Books:**

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. DeMan JM. 1976. Principles of Food Chemistry. AVI Publications.
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-501***
2. Subject Name: ***Food Quality- Analysis & Assurance***
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objective:**

The objective of this course is to review the basic principles of the analytical procedures commonly used to analyze foods and to discuss their application to specific food laws, Standards and specifications.

**Unit 01:- Food Quality**

Ways of describing of Food Quality, Quality control and Quality Assurance functions. Total Quality Control (TQC) and the role of management/ TQM. Statistical quality control.

**Unit 02:- Sensory Evaluation**

Instrumental measurements of sensory attribute of foods: Appearance, colour, volume, density and specific gravity, Rheological and textural characteristics. Texture profile analysis. Correlation between instrumental and Sensory analysis of food quality attributes.

**Unit 03:- Food Protein**

Nutritional Quality of foods and its assessments: Food proteins (Digestibility, Biological value, NPU, PER), Modifications of foods constituents due to processing and storage and their nutritional implications.

**Unit 04:- Food Specifications**

Food standards and Specifications: Compulsory and voluntary trade and Company standards. Consumer, company, In-process and finished product specifications.

**Unit 05:- Food Standards**

Quality costs, Analysis and Interpretation of sensory scores. Application of sensory evaluation in Quality Management of foods. Relevant Food laws: PFA, FPO, SWMA, MPO, AgMark, and BIS Standards.

**Course Outcome:-**

Students will demonstrate the ability to think food quality, sensory evaluation, food protein, specifications and food standards.

**Text books:**

1. J.M.DeMan Rheology and Texture in Food Quality
2. Y.Pomeranz Food Analysis : Theory and practice IS: 6273 (Part-1& Part-2)
3. M.A. Amerine Principles of Sensory Analysis of Food

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: ***BFD-502***
2. Subject Name: ***Processing of Fruits and Vegetables***
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objective:**

Processing of fruits and vegetables is very important to produce products for direct consumption and as food ingredients. During processing, the main objectives are to preserve the color, flavor, texture, and nutrition while prolonging the shelf life of perishable fruits and vegetables.

**Unit 01:- Post harvest technology**

Importance of post harvest technology of fruits and vegetables, structure, cellular components, composition and nutritive value of fruits and vegetables, fruit ripening, spoilage of fruits and vegetables. relationship between moisture content (wet basis and dry basis)

**Unit 02:- Unit Operation**

Harvesting and washing, pre-cooling, preservation of fruits and vegetables, blanching, commercial canning of fruits and vegetables, minimal processing of fruits and vegetables. Ohmic heating. Pulse electric field.

**Unit 03:- Storage and Packaging**

Cold storage of fruits and vegetables, controlled atmosphere packaging of fruits and vegetables, gas composition, quality of storage. Cold plasma technology

**Unit 04:- Drying**

Dehydration of fruits and vegetables, methods, osmotic dehydration, foam mat drying, freeze drying, microwave heating, applications, radiation preservation of fruits and vegetables, irradiation sources.

**Unit 05:- Processing**

Intermediate moisture foods, ohmic heating principle, high pressure processing of fruits and vegetables, applications, sensory evaluation of fruit and vegetable products, packaging technology for fruits and vegetables, general principles of quality standards and control, FPO, quality attributes.

**Course Outcome:-**

Be familiar with and understand the harvesting and storage methods used for fruit and vegetables and understand the physiological changes occurring to fruit and vegetables during harvesting and storage.

**Text books:**

1. Cruess WV. 2000. *Commercial Fruit and Vegetable Products*. Agrobios.
2. Mircea Enachescu Danthy. 1997. *Fruit and Vegetable Processing*. International Book Publ.
3. Srivastava RP and Sanjeev Kumar. 1994. *Fruit and Vegetable Preservation. Principles and Practices*. International Book Distr.
4. Sumanbhatti and Uma Varma. 1995. *Fruit and Vegetable Processing*. CBS.
5. Thompson A. K. 1996. *Post Harvest Technology of Fruits and Vegetables*. Blackwell.
6. Verma LR and Joshi VK. 2000. *Post Harvest Technology of Fruits and Vegetables*. Vols. I- II. Indus Publ.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-503**
2. Subject Name: **Processing of Milk & Milk Products**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

### **Objective**

To carry out activities for promoting production, procurement, processing and marketing of milk & milk products for economic development of the rural farming community.

#### **Unit 01:- Milk Constituents**

Fluid Milk: Composition of milk and factor affecting it. Physico-chemical characteristics of milk and milk constituents. Production and collection, cooling and transportation of milk. Packaging storage and distribution of pasteurized milk.

#### **Unit 02:- Types of Milk**

Whole, Standardized, Toned, Double toned and skim milk. Test for milk quality and Adulteration. UHT processed milk, flavoured, Sterilized milk. Cleaning and sanitization of dairy equipments. Definition, Classification, Composition and physico-chemical properties of cream. Production processes and quality control.

#### **Unit 03:- Milk Products**

Butter: Definition, Classification, Composition and methods of manufacture, Packaging and storage. Butter oil/Ghee. Ice cream: Definition, Classification and Composition, Constituents and their role. Preparation of mixes and freezing of Ice cream, Overrun, Judging, Grading, and defects of Ice cream.

#### **Unit 04:- Evaporation and Condensation**

Evaporated and Condensed milk: Method of manufacture, Packaging and storage. Defects, Causes, and prevention. Roller and Spray Drying of milk solids. Instantization. Flow ability, Dustiness, Reconstituability, Dispersability, Wet ability, Sink ability and appearance of milk powders.

#### **Unit 05:- By-Products**

By-products of dairy industry and their effective utilization. Manufacture of casein, Whey protein, Lactose from milk and their use in formulated foods. Quality Control tests in Dairy industry.

#### **Course Outcome:-**

Be familiar with and understand the formation of milk and its components, explains the formation of milk, the sensory and physical properties of milk and also explain the dairy processing technologies viz. Pasteurization, Sterilization and UHT Methods

#### **Text books:**

1. C.F.T.R.I. Mysore Manuals on Rice and its Processing
2. N.N.Potter Food Science
3. S.A.Matz Cereal Technology

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: ***BFD-551***
2. Lab Name: ***Food Quality- Analysis & Assurance Lab***
3. Contact Hours:       L: 0       T: 0       P: 2
4. Examination Duration (Hrs.): Practical   02
5. Credits: 2

**Objectives:-**

To enable the students to understand the basic concepts of food quality and analysis of food products are involved in the analyses.

**Experiment 01:-**

Evaluation of quality of Dairy Products: Over run and fat content in Ice-cream, Specific gravity of Milks etc.

**Experiment 02:-**

Determination of the salt (NaCl) in meat processing.

**Experiment 03:-**

Determination of lycopene content in food samples.

**Experiment 04:-**

Determination of protein in food samples.

**Experiment 05:-**

Assessment of quality of Fruit & Vegetable Products: Tomato Products, Jam, Jelly, Marmalades, Squashes & Cordials, Canned Products.

**Experiment 06:-**

To study and determination the concept of moisture content.

**Experiment 07:-**

To determination the Estimation of Ash Content.

**Experiment 08:-**

Demonstration of the impact of salt, sodium phosphate and salt & phosphate on water holding capacity (WHC) in raw meat.

**Course Outcome:-**

To acquaint the students with various dairy engineering operations such as homogenization, pasteurization, thermal processing, evaporation, freezing and drying of milk and understand the principles and methods of Quality Control and Assurance in milk, sensory evaluation and HACCP in different food processing.

**Text Books:**

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. Fennema OR.1996. Food Chemistry. Marcel Dekker.
3. Meyer LH. 1987. Food Chemistry. CBS Publishers.
4. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: ***BFD-552***
2. Lab Name: ***Processing of Fruit & Vegetables Lab***
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1
6. Instruction: Minimum five experiments from the followings.

**Objectives:-**

To enable the students to understand the basic concepts of Processing of Fruit & Vegetables products are involved in the analyses.

**Experiment 01:-**

Determination of size, shape, density of fruits and vegetables.

**Experiment 02:-**

Determination of density, area-volume-mass relationship of fruits and vegetables.

**Experiment 03:-**

Determination of sugar-acid ratio of fruits.

**Experiment 04:-**

Determination of grader and packaging methods.

**Experiment 05:-**

Assessment of quality of Fruit & Vegetable Products: Tomato Products, Jam, Jelly, Marmalades, Squashes & Cordials, Canned Products.

**Experiment 06:-**

Experiments on drying of fruits and vegetables.

**Experiment 07:-**

Determination of controlled atmosphere storage and quality evaluation.

**Course Outcome:-**

To acquaint the students with drying of food materials, traditional and modern storage structures, unit operation of processing the fruits and vegetables, post harvest losses of different fruits and vegetables during different unit operations and increase the self life of the value added food products.

**Text Books:**

1. BIS Specifications Morris B. Jacobs, The Chemical Analysis of Foods & Food Products
2. S. Ranganna Hand Book of Analysis and Quality Control for Fruit & Vegetable Products
3. Official Method of Analysis of AOAC

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **BFD-553**
2. Lab Name: **Processing of Milk & Milk Products Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1
6. Instruction: Minimum five experiments from the followings.

**Objectives:-**

To enable the students to understand the basic concepts of Processing of Milk & Milk Products Lab are involved in the analyses.

**Experiment 01:-**

Determination of the composition of milk and its properties (fat content, total solids, specific gravity, acidity, pH, viscosity etc.).

**Experiment 02:-**

Study of plate heat exchanger and tubular heat exchanger.

**Experiment 03:-**

HTST pasteurization of milk.

**Experiment 04:-**

Spray drying of milk.

**Experiment 05:-**

Design of food processing plant and preparation of layout

**Experiment 06:-**

Study of drum dryer

**Experiment 07:-**

Quality control of the different milk and milk products

**Experiment 08:-**

Study of microbial quality of milk and milk products.

**Course Outcome:-**

To acquaint the students with drying of milk, storage, unit operation of processing the milk and milk products and increase the self life of the value added food products.

**Text Books:**

1. BIS Specifications Morris B. Jacobs, The Chemical Analysis of Foods & Food Products
2. S. Ranganna Hand Book of Analysis and Quality Control for Fruit & Vegetable Products
3. Official Method of Analysis of AOAC

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-601**
2. Subject Name: *Food Engineering*
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objective**

Propose and conduct research on non thermal food processing methods, to improve and acquire processed foods with fresh-like quality. Extend the shelf life of foods. Assess the potential energy savings and favorable economics associated with combining non thermal processing methods with current commercial food preservation systems.

**Unit-I:-Role Preservation in food processing industries**

Preservation of foods – physical and chemical methods-microbiological aspects thermo bacteriology, process calculation and selection.

**Unit-II:-Study on different method of preservation and its importance**

Low temperature preservation - cooling and cold storage – freeze concentration and membrane separation process - hurdle technology - principles and applications - food irradiation - advantages and applications.

**Unit-III:-Importance of heat and its application in food processing industries**

Application of heat energy and ultrasound - inactivation of microorganisms and enzymes -electrical resistance heating of food - heat generation, ohmic heater, heating models.

**Unit- IV:-Extrusion Technology and its importance in food industry**

Extrusion: Theory, equipments, applications. Distillation and leaching: Phase equilibria, multistage calculations, equipments, solvent extraction. Extrusion cooking - recent developments, methods, design criteria of extruders.

**Unit-V:-Introduction of microwave processing and its role in food industry**

Microwave processing - interaction with food materials- microwave equipment - hydrostatic pressure treatment of food - equipment, processing and effect on microorganisms

**Out Come**

Understand and explain the importance of transport processes and unit operations in food processing as demonstrated both conceptually and practical in Laboratory. Use the principles of food preservation including effects of low and high temperatures and heat penetration to evaluate adequacy of thermal processing.

**Text books:**

1. Brennan JG, Butters JR, Cowell ND & Lilly AEI. 1990. *Food Engineering Operations*. Elsevier.
2. Coulson JM & Richardson JF. 1999. *Chemical Engineering*. VolS. II, IV. The Pergamon Press.
3. Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
4. Fellows P. 1988. *Food Processing Technology: Principle and Practice*. VCH Publ.
5. Geankoplis J Christie. 1999. *Transport Process and Unit Operations*. Allyn& Bacon.
6. Henderson S & Perry SM. 1976. *Agricultural Process Engineering*. 5th Ed. AVI Publ.
7. McCabe WL & Smith JC. 1999. *Unit Operations of Chemical Engineering*. McGraw Hill.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. **Subject Code: BFD-611**
2. **Subject Name: Processing of Cereals, Pulses & Oilseeds**
3. **Contact Hours: L: 3 T: 1 P: 0**
4. **Examination Duration (Hrs.): Theory 03**
5. **Credits: 4**

**Objectives:**

This course will impart knowledge to the students on cereal and millet processing. By the end of the course, the students will be able to understand traditional and improved methods of cereal processing and to develop good expertise on the technical aspects of preparation of cereal and millet based products.

**Unit-I:-Composition and Structure**

Composition, Structure and Processing characteristic of Cereal grains, Legumes and oilseeds, Post harvest, Post processing practices for their safe storage. Parboiling and Milling of paddy, Quality characteristics, curing and aging of rice, processed rice products.

**Unit-II:- Wheat milling**

Wheat and its quality characteristics for milling into flour and semolina, Flour milling, Turbo grinding and air classification, Flour grades and their suitability for baking purposes, Assessment of flour quality and characteristics, Milling of Durum wheat, Macaroni products.

**Unit-III:-Dal mill and its by products**

Dal mills, handling and storage of by-products and their utilization. Storage of milled products, Expeller and solvent extraction processing, assessment of processed product quality.

**Unit -IV:- Legume Processing**

Milling of legume-pulses by traditional and improved processes. Pearling of Millets.

**Unit -V:- Oil Seeds Processing**

Processing of oil seeds for direct use and consumption, Oil and protein products. Processing of extracted oil refining, hydrogenation, interestrification. Processing of deoiled cake into protein concentrates and isolates, Textured protein, Functional protein preparations. Peanut butter, Margarine and Spread.

**Out Come:**

Able to gain knowledge in different processing of plantation crops, spices and tuber crops and also its value added products. Able to acquire a confident to get placement in any kind of cereals and spices industry with minimum post harvest losses and maximum benefit to the industry. To develop an awareness of various processing procedure and processed cereal products.

**Text books:**

1. Asiedu JJ.1990. *Processing Tropical Crops*. ELBS/MacMillan.
2. Chakraverty A. 1995. *Post-harvest Technology of Cereals, Pulses and Oilseeds*. Oxford & IBH.
3. Morris Lieberman. 1983. *Post-harvest Physiology and Crop Preservation*. Plenum Press.
4. Pandey PH. 1994. *Principles of Agricultural Processing*. Kalyani.
5. Pillaiyar P. 1988. *Rice - Post Production Manual*. Wiley Eastern.
6. Sahay KM & Singh KK. 1994. *Unit Operations in Agricultural Processing*. Vikas Publ. House.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-612**
2. Subject Name: **Processing of Meat Fish and Poultry Products**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

Gain knowledge on the methods of grading meat. Study on different techniques available to slaughter animal. Quality control and standardization of meat, fish and poultry. Processing and preservation of egg and fish.

**Unit-1:-Introduction and Kind of Meat and Poultry Products**

Meat and poultry products: Introduction, kinds of meat animals and poultry birds, classification of meat, composition of meat.

**Unit-II:-Study of Different Methods for Preservation of Poultry**

Preservation of poultry: different methods, stuffed products, frozen products, poultry concentrates and flavours, synthetic poultry flavour.

**Unit-III:-Study of Different Methods for Preservation of meat products**

Different preservation methods of meat: Smoking, curing and freezing, chilling of meat and different methods of chilling, freezing of meat and different methods, packaging of meat and meat products, quality control.

**Unit-IV:-Study of nutritional Quality and Preservation methods of Fish Products**

Fish: Nutritional quality of fish and fish products, fillet and steaks, different preservation techniques, chilling, freezing, drying, canning, curing and smoking, quality control in fish processing.

**Unit-V:-Classification and Composition of Egg**

Classification, composition and nutritive value of eggs: Grading of eggs, different quality parameters of eggs, Haugh unit, processing of egg, yolk processing, egg breaking mechanisms, freezing of egg, pasteurization, different dehydration methods, quality control and specification of egg products.

**Outcomes:**

After completing this course students will get to know about the nutritional profile of meat, poultry, fish and egg. Increase the shelf life of the products..

**Text Book:**

1. Chooksey MK & Basu S. 2003. *Practical Manual on Fish Processing and Quality Control*. CIFE, Kochi.
2. Chooksey MK. 2003. *Fish Processing and Product Development*. CIFE, Kochi.
3. Hall GM. 1997. *Fish Processing Technology*. Blabie Academic & Professional.
4. Lawrie RS. 1985. *Developments in Meat Sciences*. Vol. III. Applied Science Publ.
5. Mead GC. 1989. *Processing of Poultry*. Elsevier.

**1. Subject Code: BFD-613**

2. Subject Name: Fruits Vegetables and Plantation of the Products

3. Contact Hours: L: 3 T: 0 P: 0

4. Examination Duration (Hrs.): Theory 03

5. Credits: 3

**Objectives:**

The production of fruits and vegetables is highly located in favored situations of soil and climate. A crucial problem faced in the case of fruits and vegetables is that of the huge enormous losses that occur on account of spoilage.

**Unit-I:- Structure Composition and Nutritional Aspect of Fruits and Vegetables**

Structural, Compositional and Nutritional aspects of fruits and vegetables. Physiological development: Growth, Maturation, Ripening and Senescence. Post harvest handling including controlled and modified storage. Techniques of processing and preservation of fruits and vegetables by refrigeration and freezing, canning and bottling, drying and dehydration.

**Unit-II:- Technology for Manufacture of Processed Food Products**

Technology of fruits and vegetable products: Juices and pulps, Concentrates and powders, Squashes and cordials. Beverage: Still and carbonated. James, Jellies and Marmalades. Preserves, candies and crystallized fruits. Tomato products: Puree, Paste, Ketchup, Sauce and soup. Chutneys, pickles and other products.

**Unit-III:- Spices: Composition, structure and methods of Preservation**

Spices: Composition, Structure and characteristics. Preservation and processing of major and minor spices of India; whole spice, Spice powder, Paste and extracts, Spice oils and oleoresins. Composition, Structure, characteristics & processing of cashew nut and other dry fruits.

**Unit-IV:- Composition, Production and Processing of Tea Leaves and Coffee**

Composition, Production and processing of Tea leaves: Black tea, Green tea and Oolong tea. Instant tea. Production and processing of coffee cherries by wet and dry methods to obtain coffee beans, grinding, storage and preparation of brew, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee.

**Unit-V:- Production, processing and chemical composition of cocoa beans.**

Production, processing and chemical composition of cocoa beans. Cocoa Processes: Cleaning, roasting, alkalization, cracking and fanning, Nib grinding for cocoa liquor, cocoa butter and cocoa powder. Manufacturing process for chocolate: Ingredients, Mixing, Refining, Conching, Tempering, Moulding etc. to obtain chocolate slabs, chocolate bars. Enrobed and other confectionary products.

**Outcomes:**

Students would have learnt different post harvest handling methods of fruits and vegetables.

The students will have knowledge about different processing and preservation methods and principles involved. The students will gain information about various food constituents, and changes that occur in them during food processing.

**Text Book**

1. G. Lal, G.S. Siddappa and G.L. Tondan Preservation of fruits & vegetables.
2. B. Shrilakshimi Food Science.
3. Bernard. W. Minifie Chocolate, Cocoa and Confectionary: Science and Technology.
4. R.H.H. Wills et.al. An introduction to the Post-harvest physiology and handling of fruits and vegetables.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-621**
2. Subject Name: *Food Additives*
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objective:**

Maintain or Improve Safety and Freshness. To Improve or maintain nutritional value, taste, texture and appearance.

**Unit-I:-Introduction and classification of food additive**

Definitions of Food Additives, Classification and Functions, Legitimate uses of Additives in foods, Intentional & Non Intentional additives, Indirect food additives; Difference between Additives & Adulterants, Food uses and functions in formulations; Toxicological evaluation of food additives.

**Unit-II:-Functions of Food Additive**

Uses & functions of: Acid, Base, Buffer systems, Salts and Chelating/Sequestering agents, Masticatory substances. Low calorie and non nutritive sweeteners, Polyols.

**Unit-III:-Classes of Food Additive**

Anti microbial agents / Class I and Class II preservatives as per PFA Act. Tracers and other additives.

**Unit-IV:-Colouring and Flavouring Agents**

Colorants, Flavoring agents and related substances, Clarifying agents. Gases and Propellants. Tracers and other additives.

**Unit-V:-Emulsifiers and Anti-caking agents**

Antioxidants, Emulsifying and stabilizing agents, Anti-caking agents, Thickeners, Firming agents. Flour bleaching agents and Bread improvers.

**Course outcomes:**

Food additives contribute to the overall quality, safety, nutritive value, appeal, convenience, and economy of foods. Explain what a food additive is and how it can protect the quality of food. Learning how to lead a healthier lifestyle. Describe the fundamentals in food toxicology and the important characteristics of common contaminants in food. Discuss the toxicology of different types of food contaminants.

**Text books:**

1. Branen AL, Davidson PM & Salminen S. 2001. Food Additives. 2nd Ed. Marcel Dekker.
2. George AB. 1996. Encyclopedia of Food and Color Additives. Vol. III. CRC Press.
3. George AB. 2004. Fenaroli's Handbook of Flavor Ingredients. 5th Ed. CRC Press.
4. Morton ID & Macleod AJ .1990. Food Flavours. Part A, BC. Elsevier.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. **Subject Code: BFD-622**
2. Subject Name: Packaging of Food Products
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

For most food products, the main objective of food packaging is to ensure the safety of the product and preserve it in good condition for the anticipated shelf life. The package should also minimize product losses (waste) throughout the food handling and distribution chain.

**Unit-I:- Introduction and type of Packaging**

Introduction of packaging: Types of Package, functions and design. Principle in the development of protective packaging. Deteriorative changes in foodstuff and packaging methods of prevention.

**Unit-II:- Study on Different Packaging material**

Cellulosic and Polymeric packaging materials and forms: Food grade polymeric packaging materials, rigid plastic packages. Films: Oriented, Co-extruded, Laminates and Metallised; Cellophane, Olefins, Polyamides, Polyesters, PVC, PVDC, PVA, Inomers, Copolymers, Polycarbonates, Phenoxy, Acrylic and Polyurethane. Their mechanical sealing and barrier properties.

**Unit-III:-Different Packaging Standard and Regulations**

Package standards and regulation; Shrink packaging; Aseptic packaging, CAP and MAP, Active packaging; Biodegradable packaging.

**Unit-IV:- Role of packaging in Food Industry**

Methods to extend shelf life; Packaging of perishables and processed foods; Special problems in packaging of food stuff. Package printing, Packaging Laws and Regulations, Evaluation of food packaging materials and package performance.

**Unit-V:- Characteristics and packaging required of the food products**

Food product characteristics and package requirement, Selection of materials, Forms, Machinery and methods for fresh produce (Fruits, Vegetables, Egg, Meat and Fish), Edible oils and Fats, Spice and spice products, Processed products (Fruit & Vegetable, Cereal & Pulse, Dairy, Confectionary & Snacks, Meat & Marine products).

**Course outcomes:**

Consumers demand products that fit into their lifestyles and the packaging industry has had to respond to this. Correct packaging prevents any wastage (such as leakage or deterioration) which may occur during transportation and distribution. It is strongly recommended that prior to filling, glass containers are heat sterilized.

**Text Books:**

1. Crosby NT. 1981. *Food Packaging Materials*. Applied Science Publ.
2. Mahadeviah M & Gowramma RV. 1996. *Food Packaging Materials*. Tata McGraw Hill.
3. Palling SJ. (Ed). 1980. *Developments in Food Packaging*. Applied Science Publ.
4. Sacharow S & Grittin RC. 1980. *Principles of Food Packaging*. AVI Publ.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

**1. Subject Code: BFD-623**

**2. Subject Name: Principle of Human Nutrition**

**3. Contact Hours: L: 3 T: 0 P: 0**

**4. Examination Duration (Hrs.): Theory 03**

**5. Credits: 3**

**Objectives:**

Introduce students to the principle of human nutrition, Provide information on the relationship between nutrition and processed foods; and Expose students to the various methods of nutritional evaluations in human and animals.

**Unit-I:-Introduction and Concepts of Nutrition**

Concepts and content of nutrition: Nutrition agencies, Nutrition of community, Nutritional policies and their implementation, Metabolic functions of nutrients. Water and energy balance. Basal metabolism- BMR, Body surface area and factors affecting BMR.

**Unit-II:-Energy Metabolism and method for requirement estimation of energy**

Energy metabolism- Basal and resting metabolism – influencing factors, methods to determine energy requirements & expenditure, thermo genesis, adaptation to altered energy intake. Regulation of food intake. Basis for computation of nutrient requirements, latest concepts in dietary recommendations, RDA – ICMR and WHO their uses & limitations.

**Unit-III:-Vitamins: Classifications, Functions and source and Diseases**

Functions, types, classification, diseases, food sources and other benefits of vitamins, minerals, carbohydrates, proteins, fats and water. Effect of excess and deficiency.

**Unit-IV:- Balance Diet for the human according to age Group**

Classification of balanced diet, Preparation of balanced diet for various groups, Diets and disorders. Recommended dietary allowances: For various age group, According to physiological status, Athletic and sports man, Geriatric persons.

**Unit-V:- Nutrition and its requirement for the Growth of Human Body**

Growth and development, nutritional requirements, feeding pattern, compositional differences between human milk and milk substitute and their suitability for infant feeding. Weaning practices, weaning and supplementary foods.

**Course Outcomes:**

Describe the role and function of macronutrients and micronutrients, nutrient deficiencies and nutrient toxicity and Identify food groups, their type and nutrient contribution and their distinguishing nutrients

**Text Books:**

1. Guthrie Helen (1986) Introductory Nutrition. Times Mirror/ Mosby College Publishing.
2. Mudambi, S.R., Rajgopal, M.V.(1990) Fundamentals of Foods and Nutrition, New Age International Pvt. Ltd.
3. Nutrient Requirements and Recommended Dietary Allowances for Indians- I.C.M.R. Publication 1999.
4. Banarsidas B. (1995): Park & Park- Textbook of Preventive and Social Medicine, Jabalpur.
5. Robnsson, and Lawler. (1986) Normal and Therapeutic Nutrition. Mac Millan Pub.Co.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-004**
2. Subject Name: **Rheological and Sensory Assessment**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

Objectively define and quantify categories of texture-modified food by conducting rheological measurements and sensory analyses. A further objective was to facilitate the communication and recommendations of appropriate food textures for patients with dysphasia.

**Unit-I:-Mechanical and Rheological Properties**

Mechanical properties of foods. Mechanical models to visualize behaviour of foods. Basic and applied rheological considerations and their application to foods

**Unit-II:-Study on texture classification and characteristics of food material**

Texture classification, relation of food texture with structure and rheology. Principles and practices of objective texture measurements, viscosity measurements.

**Unit-III:-Function of Emulsifier in relation to food texture**

Rheology of chocolate, Textural characteristics of food emulsions, Functions of emulsifiers in relation to food texture, Sensory measurement of food texture and texture profile.

**Unit-IV:-Textural properties of various fruits, vegetables and dairy products**

Texture Properties of fruits and vegetables, Dough, Pasta, Dairy Products, meat product fat and fat products and their instrumental managements

**Unit-V:-Sensory Characteristics of the food products**

Sensory methods of texture and viscosity measurements and their correlation.

**Course outcomes:**

Describe the principles and application of instrumental analytical techniques. Determine when a specific analytical technique is required. Perform fundamental lab skills including solution preparation, dilution and pH adjustment. Perform instrumental techniques used in the evaluation of foods

**Text Books:**

1. Bourne MC. 2002. *Food Texture and Viscosity: Concept and Measurement*. Academic Press.
2. Deman JM. *et al.* 1976. *Rheology and Texture in Food Quality*. AVI Publ.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. **Subject Code: BFD-006**
2. Subject Name: *Food Products and Process Development*
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 3

**Objectives:**

Understand the basics of innovation in food industry and apply the stage-gate process to product development, Interpret a brief specifying the requirements for a product, Undertake a survey of similar products that are already in the marketplace, and identify the key product attributes, develop a sensory and/or instrumental profile that can be applied during product development trials.

**Unit-I:-Innovation and product development concept**

Innovation and product development concept. Generation of ideas. Desk Research. Screening/appraisal of initial ideas.

**Unit-II:-Developing Planning and processing of the food products**

Detailed study of product, process and market, Planning and developmental activities and evaluating them.

**Unit-III:-Prototype Product and Its testing**

Development of prototype product and its testing for acceptance.

**Unit-IV:-Planning for production testing and trial**

Development of process and planning for production trials. Planning the test market. Actual production trials and test marketing. Evaluation of test results.

**Unit-V:-Launching of the product and Advertising of the product**

Launching of the product. Advertising and marketing plans. Suggestions for improving success.

**Course Outcomes:**

Develop an awareness of methods used in the development and testing New Food Products; including the characterisation of sensory attributes and determination of consumer preferences. Apply the new product development theories and manage a food product development project. Reflect on the interactions of ingredients and processes used in the development of New Food Products with potential hazards that could compromise safety or quality attribute.

**Text Book:**

1. Leniger HA & Beverloo WA. 1975. *Food Process Engineering*. D. Reidel Publishing Co.
2. Rao MA & Rizvi SSH.. 1986. *Engineering Properties of Foods*. Marcel Dekker.
3. Ronald Jowitt. 1984. *Extrusion Cooking Technology*. Elsevier.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **BFD-651**
2. Lab Name: **Food Engineering Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

**Objectives:**

This is a introductory course which gives the necessary details and information to get acquainted with the properties and determination of solving problems on single and multiple effect evaporator, distillation, crystallisation, extraction, leaching for safety of foods.

**Experiment-I**

Determination of solving problems on single and multiple effect evaporator, distillation, crystallisation, extraction, leaching.

**Experiment-II**

Determination of membrane separation and mixing.

**Experiment-III**

Preparation and quality testing of extruded foods.

**Experiment-IV**

Preparation and quality testing of different vegetable based instant soups, hard boiled candy/ tutti-fruity etc.

**Experiment-V**

Determination of reverse osmosis and ultra filtration - design of plate and packed tower.

**Experiment-VI**

Preparation and quality testing of food products from tropical fruits as sapota, karonda, ber, anola, mjamun etc.

**Experiment-VII**

Preparation and quality testing of instant mixes based on cereal & pulses like Halwa mix, Dosa mix, Idli mix etc.

**Experiment-VIII**

Preparation and quality testing of egg powder.

**Experiment-IX**

Analysis of milk, ghee and Egg quality.

**Unit-X**

Visit to related industry

**Out Come**

Understand and explain the importance of transport processes and unit operations in food processing as demonstrated both conceptually and practical in Laboratory. Use the principles of food preservation including effects of low and high temperatures and heat penetration to evaluate adequacy of thermal processing.

**Text books:**

1. Brennan JG, Butters JR, Cowell ND & Lilly AEI. 1990. *Food Engineering Operations*. Elsevier.
2. Coulson JM & Richardson JF. 1999. *Chemical Engineering*. VolS. II, IV. The Pergamon Press.
3. Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
4. Fellows P. 1988. *Food Processing Technology: Principle and Practice*. VCH Publ.
5. Geankopolis J Christie. 1999. *Transport Process and Unit Operations*. Allyn& Bacon.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE

DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **BFD-652**
2. Lab Name: **Advance Food Technology Lab –I**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

**Objectives:-**

To enable the students to understand the basic concepts involved in the analyses.

**Experiment-I**

Processing and analysis method of digital pH meter for pH content

**Experiment-II**

Processing and analysis method of Acidity

**Experiment-III**

Processing and analysis method of TSS

**Experiment-IV**

Processing and analysis method of Vitamin-C

**Experiment - V**

Processing and analysis method of Protein

**Experiment-VI**

Processing and analysis method of Microbial Growth

**Experiment-VI**

Processing and analysis method of Ash Content

**Experiment-VII**

Processing and analysis method of Color measurement

**Outcomes**

Explain the advance significance and activities of food in industry. Describe the characteristics of food nutrients and methods for their isolation, detection and identification. Explain quality control programmes are necessary in food production. Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.

**Text books:**

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Srivastava RP & Sanjeev Kumar. 1994. Fruit and Vegetable Preservation. Principles and Practices. International Book Distr.
3. Sumanbhatti & Uma Varma. 1995. Fruit and Vegetable Processing. CBS.
4. Thompson AK. 1996. Post Harvest Technology of Fruits and Vegetables. Blackwell.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **BFD-653**
2. Lab Name: **Processing of Cereals Pulses & Oilseeds Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

**Objectives:**

To testing and quality evaluation of different processed products

**Experiment-I**

Preparation and quality testing of cookies, Cakes (Egg/ Egg less).

**Experiment-II**

Preparation and quality testing of RTS/RTC foods.

**Experiment-III**

Preparation and quality testing of cereals products (sweet buns, pizza base etc.).

**Experiment-IV**

Preparation and quality testing of pulses products (bread, biscuits etc.)

**Experiment-V**

Preparation and quality testing of oil seed products (Nan khatai etc.)

**Experiment-VI**

Determination of oil extraction methods.

**Experiment-VII**

Determination of cereals, pulses based RTC/RTE food products.

**Outcomes**

After completion of the laboratory work student can determine the various parameters of processed products.

**Text books:**

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Srivastava RP & Sanjeev Kumar. 1994. Fruit and Vegetable Preservation. Principles and Practices. International Book Distr.
3. Sumanbhatti & Uma Varma. 1995. Fruit and Vegetable Processing. CBS.
4. Thompson AK. 1996. Post Harvest Technology of Fruits and Vegetables. Blackwell.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. **Subject Code: BFD-711**
2. Subject Name: ***Crop Process Engineering***
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

### **Objectives**

Be able to apply new technology, design, plan, control and manage food process engineering system, be able to differentiate and select efficient technology in the development of agro industry processing to achieve profitable and environmentally safe outcome.

### **Unit: I:- Introduction**

Introduction to food process engineering

### **Unit: II:- Basic principle of material and energy balance**

Material and energy balances: Basic principles, total mass balance and component mass balance, Material balance calculations involved in dilution, concentration and dehydration, Heat balance calculations.

### **Unit: III:- Fluid flow and its application**

Fluid flow theory and applications: Fluid statics and fluid dynamics, mass and energy balances in fluid flow, Newtonian and non-Newtonian fluids, streamline and turbulent flow, Fluid flow applications measurement of pressure and velocity.

### **Unit: IV:- Heat transfer in food processing**

Heat transfer in food processing, thermal properties of foods, modes of heat transfer, conductive heat transfer in a rectangular slab, tubular pipe, and multilayered systems, Natural and forced convection, estimation of convective heat transfer coefficient in forced and natural convection, estimation of overall heat transfer coefficient, heat exchangers- Plate, tubular, scraped surface, and steam infusion heat exchangers.

### **Unit: V:- Study on Psychrometric properties**

Psychometrics: Properties of dry-air : composition of air, specific volume of air, specific heat of dry air, enthalpy of dry air, dry bulb temperature.

### **Course out comes:**

To enumerate the unit and dimension of various physical quantities, to describe the type and properties of fluid flow, to appraise the performance of processing unit, to validate the energy balance involve in food processing operation.

### **Text books:**

1. K.M. Sahay and K.K. Singh (2001). Unit operation of Agriculture Processing.
2. Food Process Engineering Lab manual, "Department of Food Process Engineering", SRM University.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject code: **BFD-712**
2. Subject Name: *Food Beverages*
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

Food and Beverage Server Resume Objective Sample. A Food Server is tasked with serving patrons in a restaurant or other eating establishment. Specific job duties frequently include greeting customers, taking orders, serving food and beverages, and generally ensuring that customer needs are accommodated.

**Unit-I:-Introduction and classification of beverage**

Introduction: classification, production and consumption of beverages. Alcoholic beverages: Concept of fermentation for production of beer, wine and distilled beverages including their Packaging and maturation. Non-alcoholic beverages: carbonated and noncarbonated.

**Unit- II:-Study the Water treatment and quality**

Water treatment and quality. Specification for beverage water. Alkalinity reduction, filtration of water, water softening. Raw materials, equipment, quality control and legislation of beverage products.

**Unit- III:-Natural and synthetic colorants used in soft drinks**

Natural and synthetic colorants used in soft drinks. Acidulants, clouding and flavouring agents for soft drink. Carbon dioxide and carbonation for soft drinks. Equipments and machineries used in soft drink. Packaging aspects in soft drink.

**Unit- IV:-Study on Quality control of soft drink**

Quality control in soft drink –Chemical and sensory and microbiological quality. Sweeteners used in soft drink and their properties, non-nutritive sweeteners.

**Unit -V:-Study on processing of Tea, Coffee and Cocoa**

Tea, coffee and cocoa – processing, grading and quality. Miscellaneous beverages: coconut water, sweet toddy, sugar cane juice, coconut milk, flavoured syrups.

**Out Come:**

Provide quality food and beverage planning, preparation, and presentation for a food service operation, apply the principles of food and beverage cost control to assist in making decisions at an operational level and to contribute to the achievement of financial plans, contribute to food planning, preparation, and presentation for a food service operation, demonstrate application of food safety principles in the food production environment

**Text books:**

1. Levenspiel, O., Chemical Reaction Engineering, Willey Eastern Ltd.
2. Smith & Vanness, Thermodynamics for Chemical Engineers, MGH.
3. Food Science by Potter.
4. Principles of Food Science Vol. I by Fennema, Karrel.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-713**
2. Subject Name: **Traditional and fermented food**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To survey and enlist the traditional fermented foods of Himachal Pradesh and study their method of preparation. To isolate the microbial flora from inoculum used in the preparation of bhatooru, seera and siddu. To study the microbial profile during fermentation. To characterize the fermentation involved in the production of bhatooru, seera and siddu. To study the biochemical characteristics of fermented foods.

**Unit- I:- Indian traditional sweets**

Indian traditional sweet, savory and snack food products: Sweetmeats, Namkins, Papads, Idli and Dosa.

**Unit-II:-Study on Maintenance of different microorganism and mushroom processing**

Preparation and Maintenance of Bacterial, Yeast and Mold cultures for food fermentations. Lactic acid bacteria-activities and health-promoting effects. Mushrooms: Cultivation and preservation.

**Unit-III:-Study on fermented dairy products**

Fermented Dairy Products: Cheeses, Curd and Yoghurt, Butter milk and the fermented milks. Spoilages and defects of fermented dairy products and their control. Fermented meat and fish products.

**Unit -IV:-Study on production of alcoholic fermented beverage**

Fermentative Production of Beer, Wines, Cider and Vinegar. Fermented Vegetables (Pickles).

**Unit -V:-Study on production of Production of Baker's Yeast and food enzymes**

Production of Baker's Yeast, Microbial Proteins and fats, Food enzymes, and Food additives. Oriental fermented foods.

**Outcomes:**

One of the important outcomes of food fermentation is the food which use I production of traditional sweets, fermented dairy products, fermented ear, wine, pickle etc.

**Book References**

1. K.H. Steinkrus Handbook of Indigenous Fermented Foods.
2. Sukumar De Outlines of Dairy Technology.
3. Prescott & Dunn Industrial Microbiology L.E.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-721**
2. Subject Name: **Drying Processing**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To impart knowledge of different drying methods in food processing which use food processing viz. Sun drying, solar drying, freeze drying, osmotic drying, to study the different dryer viz. Tray dryer, cabinet dryer, tunnel dryer, spray dryer, and fluidized bed dryer and to study that how to determine the moisture content, the drying rate period and falling rate period.

**Unit-I:-Drying and its importance in food processing industry**

Drying definition, Moisture removal and its need, Dehydration of food, Evaporation of water below its boiling point, Utilities of drying, Theoretical aspects of drying, Thermal properties related to drying of foods.

**Unit- II:- Moisture content and its methods**

Moisture content measurement, representation and determination, Equilibrium moisture content (EMC), its determination, methods, models and importance, and importance, Moisture sorption curves, Hysteresis phenomenon.

**Unit- III:-Drying process and methods**

Drying process and methods, Drying rate periods – constant and falling rate periods and their calculation, Heat and mass transfer coefficient calculations, Capillary and diffusion theory, Thin layer and deep bed drying, Dryer performance indices – overall thermal efficiency, specific energy consumption, coefficient of performance.

**Unit- IV:-Classification and Criteria for dryer selection.**

Classification and selection, Quality criteria for dryer selection.

**Unit- V:-Importance of dryers in food processing**

Basic construction and application of the following dryers – Grain dryers, Tray dryers, Vacuum dryers, Spray dryers, Fluidized bed dryers, Freeze dryers, Flash Dryers, Super-heated steam drying, Solar energy based dryers, Osmotic Dehydration, Drum dryer.

**Unit -VI:-Study the different characteristics of food material**

Physical, Chemical and Microbiological characteristics of dehydrated foods, re-hydration ratio, size and density, shelf-life, water activity, Microbial stability of selected foods.

**Course Out Comes:**

Understand moisture content, moisture removal and its requirement, Understand moisture content measurement and thermal properties related to drying, to select suitable dryer meeting requirement, to develop functional design of dryers, to judge quality of dried product.

**Text books:**

1. Unit operation of agriculture processing- K.M. Sahay and K.K. Singh.
2. Unit operations of chemical engineering by McCabe and Smith. McGraw-Hill

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-722**
2. Subject Name: ***Food Process Engineering***
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 3

**Objectives:**

To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

**Unit I:- Preservation methods in food industry**

Process time calculations; Sterilizers and accessories used in canning industries; Engineering aspects of pasteurizer; homogenizer, evaporators (basic principle and single-effect evaporator) and concentrators used in food industries; Seaming machine.

**Unit-II:- Freezing and their type**

Construction of cold storage; Different types of freezers including plate contact freezer, air blast freezer, cryogenic freezing and refrigerated vans.

**Unit- III:- Various type of dryer**

Various types of driers (basic principle and drying time) – Tray drier, roller drier, spray drier, fluidized bed drier, freeze drier and solar drier.

**Unit- IV: Heat Exchanger and Extruders**

Heat exchangers (including paraflow HEs); Extruders – Basic principles and types, Difference between single- and twin-screw extruders; Kneader; Oil expeller

**Course Outcome:**

Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

**Book:**

1. The Fundamentals of Food Engineering; Charm SE; 1963, AVI Pub.
2. Bakery Technology & Engineering; Matz SA; 1960, AVI Pub.
3. Dictionary of Food Science & Technology, Blackwell Publishing
4. Engineering Properties of Foods; Rao MA & Rizvi SSH; 1986, Marcel Dekker Inc.
5. Fundamentals of Food Process Engineering; Toledo RT; 2nd ed, 2000, CBS Publishers.
6. Food process engineering, D.R.Heldman and R.P.Singh

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: - **BFD-723**
2. Subject Name: **Food Adulteration**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To protect the public from poisonous and harmful foods, to prevent the sale of substandard food, to protect the interest of the consumer by eliminating fraudulent practices.

**Unit-I:- Introduction and classification of food adulteration**

Food adulteration, identification, - classification and controls and effect of the food adulterates on human health.

**Unit II:- Methods for evaluation of food adulterant**

Nature of adulterants, methods of evaluation of food adulterants and toxic constituents. significance of Adulterants and their poisoning

**Unit III:-PFA Act and its importance in food industry**

Prevention Food Adulteration act and their role in food industry

**Unit-IV:- Adulteration and its detection in oils and fats**

Adulteration and its detection in oils and fats. Rancidity, auto oxidation and anti-oxidants. Detection of common food adulterants in (theoretical aspects) Spices ii. Grains iii. Coffee iv. Tea v. Food colours vii. Milk.

**Unit-V:-Current scenario and types of adulteration**

Current scenario, types of adulteration, food adulteration and food safety, drug adulteration, Petroleum adulteration method of detection and analyses of adulterated samples.

**Course outcomes:**

The significance of adulterants and their poisoning, understand the problems of food adulteration, How to protect the human health from different adulterants, forensic importance of food and cosmetic adulterants.

**Text books:**

1. Dr. Jagmohan Negi. Edition. 2004. Food & Beverage Laws - Food Safety and Hygiene. Media :Hard Back. ISBN : 9788182040007.

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-007**
2. Subject Name: **Bakery Process Technology**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

**Objectives:**

Establish and maintain high standards of sanitation, exhibit a strong foundation of baking methodology, exhibit nutritional awareness and implement food-for-life principles, plan production of product and purchase, cost, and price product for profit, exhibit a solid foundation of techniques for food preparation, presentation, and service, including competence in baking and pastry production, line work, and basic grade.

**Unit-I:- Wheat flour and its processing**

Wheat flour and wheat flour treatments – Grade of flour, constituents of flour – ageing of flour – Tests for flour quality. Yeast: Characteristics, Preparation, Handling & Storage, Adequacy for use in bakery industry. Ingredients, Technology and quality parameters for baked products: Bread, Biscuits and cakes

**Unit II:- Bakery equipments**

Bakery equipment and machinery .Different types of Mixers, kneaders and cutters. Different types of ovens. Packaging machinery for bread and biscuits. 8. Quality control in bakery industry. Quality control of raw materials. Quality control of finished products. Quality control of packaging materials

**Unit III:- Technology and methods of bread making**

Technology of bread making, different methods. Process steps and their significance. Characteristics of good bread. Defects in bread their causes and remedies.

**Unit IV:- Technology of Cakes Manufacture**

Technology of Cakes Manufacture. Different cake making processes. Sugar batter method, Flour batter method, Modified sugar batter method Whipping method, Blending method etc. Process steps and their significance. Importance of baking time and temperature. Recipe balancing Defects in cakes, their causes and remedies.

**Unit V:- Study on technology of Cakes Manufacture**

Biscuits definition and types. Fermented dough biscuits. Cookies, types of cookies and their manufacture cream biscuits, process steps and their significance, defects in biscuits their causes and remedies.

**Out Come:**

At the end of this module, the student will be able to: Understand the importance and role of various ingredients used in bakery and confectionary products, Understand the different methods of bread & cake making and their formulations, Understand the different types of biscuits, cookies and their methods of manufacturing, Understand the process of cocoa processing and chocolate manufacturing, Understand the different types of sugar confectionary production..

**Text books:**

1. Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
2. Bakery Technology & Engineering; Matz SA; 1960; AVI Pub.
3. Up to-date Bread Making; Fance WJ &Wrogg BH; 1968, Maclasen& Sons Ltd.
4. Modern Cereal Chemistry; Kent-Jones DW & Amos AJ; 1967, Food Trade Press

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-008**
2. Subject Name: **Engineered, Textured and Fabricated of Foods**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

Study of the extrusion process and type of extruder, physical changes during extrusion, study of fabrication of different type of beverage and puffed products and also study the different bakery products

**Unit-I:- Type of extruder and their processing**

Extruders. Single Screw & Multiple Screw Extruders. Extrusion process. Extrusion cooking. Physical & Chemical Changes during Extrusion Process.

**Unit -II:- Textural studies of paneer and different puffed products.**

Textured vegetable protein products. Puffing Gun, Puffed Products. Meat Analogues., Imitation Paneer

**Unit -III:- Beverages and Bakery Products**

Fabricated RTS Beverages, Bakery Products, Margarine, Peanut Butter, Imitation Milks Designer Lipids etc.

**Unit-IV:- Weaning Foods/ Baby Foods**

Weaning Foods/ Baby Foods. Therapeutic Foods . Geriatric Foods.

**Unit-V:-Fermented Foods**

Technology and manufacture of Macaroni, Pasta, Noodles, Vermicelli etc.

**Outcomes:**

To learn that how to operate the extruder machine and analysis of different extruded products.

**Text books:**

1. Zeki Berk, Food Process Engineering and Technology, Academic Press
2. Shubhangini A. Joshi Nutrition and Dietetics, Tata McGraw-Hill Education, 2010
3. S.A.Matz, Cereal Technology, CBS Publishers.

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-009**
2. Subject Name: **Transportation Process in Food Engineering**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To impart knowledge on principles of momentum, heat and mass transfer and its application in food processing, fundamental understanding of the laws of mass and energy balance, molecular diffusion and their application to food engineering; practical problems related to convective heat transfer process and its applications in food processing.

**Unit-I:-Heat and Mass Transfer**

Introduction to food engineering and transport phenomena: transport of mass, transport of heat, and transport of momentum: applications in the food industry. Units and dimensions in the international system of measurement. Material and energy balances.

**Unit-II:- Transport of momentum**

Viscosity concept for Newtonian and non-Newtonian foods.

**Unit-III:- Fluid dynamics**

Fluid Statics and dynamics, laminar flow and turbulent flow, Bernoulli equation, continuous and localised friction losses, dimensioning of fluid-dynamic circuits, operating equipment calculation.

**Unit-IV:-Mode of heat transfer**

Heat transfer: introduction to transfer mechanisms: conduction, convection, irradiation. Evaluation of transfer coefficients through rectangular and cylindrical walls.

**Unit-V:-**

**Heat exchangers and its classification**

Heat exchangers: classification and mechanical aspects, project equations, technical specifications.

**Unit-VI:-Unit operations of agriculture processing**

General aspects: definition of unit operation, plant and process, planning and design, review on economics, plant services, mass and energy balances.

**Outcomes:**

Understanding of transport processes, ability to do heat, mass and momentum transfer analysis, ability to analyze industrial problems along with appropriate boundary conditions, ability to develop steady and time dependent solutions along with their limitations.

**Text Books:**

1. K.J. VALENTAS-E. ROTSTEIN-R.P. SINGH, *Handbook of Food Engineering Practice*, CRC Press, New York, 1997.
2. W.L. MCCABE-J.C. SMITH-P. HARRIOT, *Unit Operations of Chemical Engineering*, McGraw-Hill, New York, 1993.
3. A. IBARZ-G.V. BARBOSA, *Unit Operations in Food Engineering*, CRC Press, 2003
4. D.R. HELDMAN-R.W. HARTEL, *Principles of Food Processing*, Int. Thomson Publishing, New York, 1997.

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-010**
2. Subject Name: **Unit Operations in Food Process Engineering**
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 3

### **Objectives**

To impart knowledge of different unit operations of food industries like size reduction, evaporation, drying, fluid flow and food freezing, to introduce the concept of material and energy balance as applied to food engineering systems.

### **Unit-I:-Basic engineering mathematics**

Review of basic engineering mathematics; units and dimensions; mass and energy balance. Principles of Fluid Flow - Introduction to stress strain behaviour in materials; properties of fluid viscosity; capillary tube viscometer; power law equation for pseudo plastic; Newtonian and dilatants fluids; flow in pipes-friction, laminar and turbulent flow equations, considerations in pumping fluid.

### **Unit- II:-Milling operations**

Size Reduction-Principles, types of equipments, applications and energy laws, Screening of solids, size measurement and analysis, standard sieves, membrane separation processes.

### **Unit- III:- Freezing**

Food freezing - Properties of frozen foods; freezing point depression, general introduction to enthalpy change during freezing, Plank's equation for predicting freezing time; food freezing equipment such as air blast freezers; plate freezers and immersion freezers.

### **Unit- IV:-Psychrometry chart principle and application in drying**

Psychrometry - Principles, air properties; application in drying of foods. Food dehydration Basic principles of dehydration; constant rate and falling rate periods of dehydration; equilibrium moisture content; fixed bed dehydration; drum dehydration, and fluidized bed drying; spray drying of liquid foods, different types of dryer and their specific applications in food processing sector.

### **Outcomes:**

Study o the different drying operation and dryers ad difference in the drying ad drying and dehydration, study the size reduction, principle of size reduction, membrane processing unit Membrane Separation Processes, freezing and different Methods of freezing viz air last freezing, immersion freezing etc. plank equation. Changes in the products during freezing.

### **Text books:**

1. Unit operation of agriculture processing- K.M.Sahay and K.K. singh.

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-011**
2. Subject Name: **Post Harvest Technology**
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 3

**Objective:**

To acquaint with different methods of food preservation, different groups of micro-organisms associated with food, sensory quality parameters, and methods of sensory evaluation of foods.

**Unit-I:- Preserved food products**

Composition of food and nutritive value of horticultural and arable crops. Methods of preservation, Contamination and spoilage of foods, spoilage of fresh fruits, vegetables, cereals and other crops, spoilage of various processed products, canned foods, dehydrated and frozen foods, pickles, chutneys and cereal products, intrinsic and extrinsic parameters that affect microbial growth and their control measures.

**Unit-II:-Microorganism**

Classification of microorganisms and their sources in food, various types of fermentation and their utilization, microbial examination of foods. Food borne diseases and poisoning.

**Unit-III:-FoodHygiene**

Food safety and quality, importance of hygiene and sanitation.

**Unit-IV:- Role of microorganisms**

Importance of micro organisms in industrial fermentation process and production of various by-products, production of vinegar, Fermented beverages, bread and traditional food products.

**Outcomes:**

Discover new ideas through group discussions, experiments, case study analysis and interactive learning. Improve the quality and safety of the food products and protect from spoilage by microorganisms.

**Text books**

1. Frazier, J. and Westhoff, D.C. 1988. *Food Microbiology*. 4th Ed. McGraw Hill.
2. Jay, J.M., Loessner, M.J. and Golden, D.A. 2005. *Modern Food Microbiology*. 7<sup>th</sup> Ed. Springer.
- Steinkraus, K.S. 1996. *Handbook of Indigenous Fermented Foods*. Marcel Dekker.
3. James, M.J., Loessner, M.J. and David, A. 2005. *Modern Food Microbiology*. 7th Ed.

Golden Food Science Text Studies

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-012**
2. Subject Name: **Food Fermentation Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To understand the principles of food fermentation technology, to study the types of starters used in Food Industry, to study the production of various fermented food.

**Unit: I:- Introduction of formation**

Food Fermentation Technologies.

**Unit: II:- Bio fermented – its design and operation**

Study of a Bio fermented – its design and operation, down Stream Processing and Product recovery.

**Unit: III:- Starter cultures**

Starter cultures.

**Unit: IV:- Baker's Yeast**

Production of Baker's Yeast

**Unit: V:- Fermented food and its by products**

Development of a fermented food/drink utilizing plant products /animal products or by products as substrate

**Outcomes:**

Enhance the understanding of white wine making process, enhance sensory evaluation skills, gained experience in cellar safety procedure.

**Text Books**

1. Food Microbiology. 2nd Edition By Adams M & Moss, M. 2008. RSC Publishing.
2. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2 by Joshi V. K. & Pandey, A., Sanjanya Books 1999.
3. Essentials of Food Microbiology. Edited by John Garbutt. Arnold International Students Edition. 1997

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-811**
2. Subject Name: **Food Preservation Technology**
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives**

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

**Unit-1:-Principles of Food Preservation**

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 microorganisms. Classification of food based on pH, Food infection, food intoxication, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods.

**Unit-II:-Freezing**

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:- Thermal Processing**

Thermal Processing- Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.

**Unit-IV:- Drying and Dehydration**

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.

**Unit-V:-Ionizing radiations and its processing in food industry**

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.

**Outcomes:**

*To impart knowledge on the causes of food spoilage and methods of processing and preserving food. To identify & select processing equipment and preservation methods appropriate for specific foods. To describe the effects of preservation methods on the quality of food.*

**Test books:**

1. Fruits and vegetable – **Principle ad Practices: R.P. Srivastava and Sanjeev kumar**
2. Food Science by N.N.Potter
3. Food Processing Technology Principles & Practices by P J Fellows

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-812**
2. Subject Name: **Food Hygiene and Plant Sanitation**
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 3

**Objectives:**

Demonstrate in knowledge of sanitation regulations and standards, Explain the various issues of contamination and food borne illness disease, be able to apply sensory evaluation techniques to the study of food, to gain the ability to think critically about problems and issues in food processing, Gain an understanding of food hygiene, sanitation, and safety during food processing unit operations, Prevent food spoilage, i.e. changes that make food unfit for consumption due to microbial or chemical contamination.

**Unit-I:- Role of Hygiene in food industry**

Definitions general hygiene, health. Hygiene as an academic discipline in our country and the world. Legislation in the field of hygiene and health. Public health in national and EU state health policy, the role of chemistry and food.

**Unit-II:- Chemical and biological factors**

Chemical Biological factors of Hygiene Interior: comfort, discomfort, risk to health.

**Unit-III**

**Hygiene and its effect on human health**

Hygiene of foodstuffs. Personal hygiene and health status of workers.

**Unit-IV:- Principles and methods of sanitations**

Principles for sanitation in industrial sectors. Methods industrial cleaning: Cleaning - out-of - Place (COP), Cleaning -in - Place (CIP), Central Cleaning System ( CCS ).

**Unit-V:-Disinfection: Methods and means. Sterilization -In -Place ( SIP )**

Disinfection: Methods and means. Sterilization -In -Place (SIP). Pest Control: Methods and means. Insect, Rodent, Birds: Methods and means. Checking hygiene of production. Methods, equipment: direct, indirect.

**Outcomes:**

Clearly understand food hygiene & safety standards required for licensed food premises to recognize the fundamentals of food hygiene management, especially for cleaning, sanitization as well as pest control operations in food processing and manufacturing industry, appreciate the major features of HACCP, demonstrate practical proficiency in developing a HACCP plan.

**Text Books:**

1. Principles of Food Sanitation by Marriott and Norman, G.
2. Hygiene and Sanitation in Food Industry by S. Roday, TMH
3. Guide to Improve Food Hygiene by Gaston and Tiffney, TMH

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-813**
2. Subject Name: **Quality Analysis**
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 3

**Objectives:**

To increase the self life of the products, developing a theoretical and practical understanding of the method used to analyses of food, to identified different problem associated with food contamination due to microorganism., to ensure high and consistent quality of food in the food industry.

**Unit-I:- Terminologies of quality analysis**

Introduction: Quality terminology; Quality Control; Quality Assurance; Quality Management; Sensory Analysis; Statistical Process Control; Good Manufacturing Practice-Good Hygiene Practice Principles of food analysis; analysis of moisture and ash; analysis of fats; determination of protein.

**Unit-II:- Importance of (TQC) and TQM in food industries**

Total Quality Control (TQC) and the role of management/ TQM.. Statistical quality control. Quality costs., Analysis and Interpretation of sensory scores. Application of sensory evaluation in Quality Management of foods.

**Unit-III:- Analysis of food product**

Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials. In process quality control and finished products quality control of the food products.

**Unit-IV:-Sampling and Hazards of food material**

Sampling objectives and guidelines and methods. Hazards– Microbial, Physical, Chemical. Ensuring safe Food.

**Outcomes:**

The course provides the necessary information and methodology to: understand the concepts of quality systems and their requirements; be able to analyze related case studies.

**Text Books:**

1. Linden. G. 1996. Analytical techniques for food and agriculture products.
2. **Ranganna.s.** 2001. Hand book of analysis and quality control of fruits and vegetable products, 2<sup>nd</sup> ed. Tata mc graw hill publication.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-013**
2. Subject Name: **Food Safety and Regulation**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

The objective of the food safety is to make available safe, pure, wholesome and nutritious food and protect the food from poisoning, contamination from microorganism.

**Unit-I:- Food Safety & Hygiene**

Importance of Food Safety, Food Hygiene, Food Poisoning, High risk food, Low risk food, Ready to eat foods, Danger Zone, Basic requirements for bacterial growth, Food contaminants. Physical, Chemical, Biological and Allergens; Personal hygiene.

**Unit-II:- Food Safety and Quality Management**

GHP, GMP, SOP, HACCP, ISO 22000, ISO 9001, Codex Alimentations Commission (Codex), FAO

**Unit-III:- Food Plant Sanitation**

Structural requirements, SSOP, CIP, Chlorination, Detergents, Disinfectants and Sanitizers.

**Unit-IV:-Food Laws & Regulations**

Food Safety and Standards Act, FDA, Evolution in Food laws and regulations- PFA, FPO, AGMARK, BIS, ISI.

**Unit-V:-Food Adulteration**

Common Food adulterants and their tests: Milk, Vegetable oil, Spices, Tea, Pulses, Sugar, Honey.

**Outcomes:**

After completion the course student learn how to protect the food from microorganism and how to increase the self life of the product without spoilage. Students also learn that what is role of different laws of food safety.

**Text books:**

1. Hand book of Hygiene Control in the Food Industry (Second Edition), 2016.

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-014**
2. Subject Name: ***Fat and Oil Technology***
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To provide the basics of the critical parameters involved in the extraction, refining, bleaching, deodorization of fats and oils and their modifications (blending, interesterification, emulsification, vocation, fractionation and genetic manipulation) into functional shortenings and the subsequent handling and the preservation of their quality. To provide knowledge and understanding of the changes and reactions of fats and oils in the food system influencing the stability of the finished food. To provide the updated knowledge on the nutritional and health benefits of fats and oils focusing on the myths and realities of the ingredients.

**Unit-I:-Sources of Fat**

Fat consumption-nutritive value- chemical composition of fat and oil- types of fatty acid - sources of fat- Physical, thermal and chemical properties of fat and oil. Pretreatment and storage of oil seeds.

**Unit-II:-Industrial Production of Oil**

Production of oil-extraction of oil - cold pressing and hot pressing, solvent extraction, rendering-removal and recovery of solvent from miscella-removal and recovery of solvent from extracted residue-refining of oil-neutralization- degumming - bleaching - alkali refining-deodorization.

**Unit-III:- Edible oil Production**

Winterization of oil, hydrogenization of oil, generation and storage of hydrogen- production and regeneration of catalysts-filtration of hardened oil-production of palm oil –rice bran oil, soybean oil.

**Unit-IV:- Processing of Animal Fats**

Animal fats-sources-nutritive value- industrial application-Lards-tallow-physical nature- production and storage, production of margarine, partial sterilization- emulsification-chilling-kneading and cooling-Incorporation of salt and colouring agents.

**UNIT-V:- Product made From Fat And Oil**

Changes during storage of oil seeds-rancidity-causes-atmospheric oxidation and enzyme action-free fatty acids-Non edible oil-Castor oil-Linseed oil-vegetable waxes-production-industrial application of fats and oil-soap-candle –paints and varnishe.

**Outcomes:**

Impart knowledge on isolation and purification of fats and oils. Impart knowledge and skills in fat and oil products development. Impart skills in quality assurance, assessment and measurement of physical and chemical changes occurring in fat and oil products

**Text Book:**

1. Kirschentiuer, H.G, “Fats and Oils”, Reinhold Publishing Corporation, New York 1944.
2. Weiss, T.J, “Food oils and their Uses”. The AVI Publishing Company, Inc., Westport, Connecticut 1970.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-015**
2. Subject Name: **Enzyme processing in Food Products**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To insure that learners have acquired the facts, concepts and principles necessary to understand various techniques of enzyme production and purification and fermentation process, to discuss the current advancement of enzyme and fermentation technology applications in industry.

**Unit-I:- Introduction of Enzymes**

Enzymes: Introduction, classification, properties, characterization, enzyme kinetics, enzyme concentration, substrate concentration, environment and enzyme immobilization, enzyme in food in industry: commercialization of enzyme processes, alternative methods to use the enzymes, type of reaction.

**Unit-II:- Role of enzymes in food industry**

Enzymes in milk production, enzyme in milk preservation: lactose, hydrolysis, use of enzyme for determine the milk quality, enzyme in chesses manufacturing: endogenous microbial enzymes, exogenous enzymes, coagulant technology, enzymes in chesses preservation.

**Unit-III:- Role of enzymes in beverage industry**

Enzymes in beverage, application of enzymes in tea and cocoa processing, application of enzymes in alcoholic beverages as beer, whisky, wine and ciders. Role of the enzymes in fruit juice production, factors affecting the enzymatic activity. Enzymatic clarification of apple and guava juices, factors affecting the clarity of fruit juices.

**Unit-IV:-Enzymes in baking industry**

Enzymes in baking industry: Introduction, Enzymes for baking industry, , Use of the proteinases, lipases and pentose's in baking industry.

**Unit-V:-Enzymes in the processing of fats and oils**

Enzymes in the processing of fats and oils: specificity, stability and application of lipases and related enzymes.

**Outcomes:**

Display the instructive and comprehensive current knowledge of enzyme technology and fermentation, explain the enzyme mechanisms and kinetics, production and recovery, Categorize enzymes, including the ones produced through the recombinant method.

**Text books:**

1. Flickinger MC & Drew SW. 1999. Encyclopedia of Bioprocess Technology. A Wiley- Inter Science Publicationn.
2. **Kruger JE. et al. 1987.** Enzymes and their Role in Cereal Technology. American Association of Cereal Chemists Inc.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-016**
2. Subject Name: **Nano Food Technology**
3. Contact Hours:       L: 3       T: 0       P: 0
4. Examination Duration (Hrs.): Theory   03
5. Credits: 3

### **Course Objectives**

Provide sound fundamental and applied understanding of the development, use, and analysis of nanotechnologies for application in food processing, Introduce students to regulatory, industrial, and economic aspects surrounding the use of nanotechnology in food systems, the developments in nanotechnology will have an impact on food science and the design of the next generation's food systems, Prepare students for exposure to engineered nanotechnologies for use in food processing.

### **Unit-1:-Nanotechnology and its composition**

Introduction of Food Nanotechnology, Nano composites for Packaging Applications.

### **Unit-II:-Study different Nano scale properties of foods**

Nano scale physicochemical properties of foods.

### **Unit-III:-Applications and analysis of nanotechnologies for food**

Applications, manufacture, and analysis of nanotechnologies for food processing and preservation.

### **Unit-IV:-Characterization of Engineered Nano materials**

Unique Issues for Characterization of Engineered Nano materials for Food Applications -Safety Assessment of Oral- Exposure Engineered Nano materials for Food Application.

### **Unit-V:-Importance of packaging material**

Crop improvement - Reasons to Package Food Products - Physical Properties of Packaging Materials - Strength - Barrier Properties Light Absorption – Structuring of Interior Surfaces - Antimicrobial Functionality - Visual Indicators

### **Course outcomes**

Understand Nanotechnology in Agriculture, Nanotechnology in Food industry, Identify and describe significant physico-chemical properties of engineered food nanotechnologies, incorporating understanding of appropriate methods of analysis and impact of manipulation of these properties on stability and functionality, Compare and contrast differing engineered nanotechnologies within an application grouping (e.g., food antimicrobial encapsulation technologies) with regards to strengths and weaknesses, identifying key strengths/weaknesses as related to food industry concerns relevant to that grouping.

### **Text books:**

1. Flickinger MC & Drew SW. 1999. Encyclopedia of Bioprocess Technology. A Wiley- Inter Science Publication.
2. Food Microbiology. 2nd Edition By Adams M & Moss, M. 2008. RSC Publishing.
3. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2 by Joshi V. K. & Pandey, A., Sanjanya Books 1999.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-017**
2. Subject Name: **Specialty Foods**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives**

The basic objectives of the report are to define, segment, and project the global market size for specialty food ingredients on the basis of type of ingredient, application, and region, other objectives are analyzing the opportunities in the market for stakeholders, providing a competitive landscape of market trends, and analyzing the macro and micro indicators of this market to provide factor analysis and to project the size of the market and its submarkets, in terms of value and volume.

**Unit-I:-Infant, baby foods, Adolescent and their functions**

Infant and baby foods, Adolescent / Teenage foods, Geriatric foods, Foods for pregnant ladies and nursing mothers. Functional foods and Probiotics.

**Unit-II:-Role of food diet in human body**

Foods / Diets in metabolic disorders and disturbances.

**UNIT-III:-Recommended food for human body**

Foods and Diets recommended and restricted in Gastrointestinal disorders; Fever and Infection; Liver, gallbladder and pancreatic disturbances.

**Unit-IV:-Food diet recommended and restricted in blood circulation.**

Foods and Diets recommended and restricted in blood, circulatory and Cardiac diseases; urinary and Musculoskeletal diseases. Allergies.

**Unit-V:-Beneficial Effects of Spices and different food constituents**

Beneficial Effects of Spices, gamma-linolenic acid, Spirulina, antioxidants and other food constituents. New Developments.

**Outcomes:**

Apply scientific thinking in the analysis, synthesis and evaluation of knowledge within the discipline of food science, nutritional sciences or dietetics. Effectively communicate discipline-specific information in written and oral forms to scientific audiences. Effectively interact within scientific teams.

**Text books:**

1. TadenszKudra& Majumdar AS. 2002. *Advanced Drying Technologies*. Marcel Dekker.
2. Wallace B Van Arsdel& Michael J Copley. 1963. *Food Dehydration*. AVI Publ.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **BFD-018**
2. Subject Name: **Enzyme Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Objectives:**

To insure that learners have acquired the facts, concepts and principles necessary to understand various techniques of enzyme production and purification and fermentation process, to discuss the current advancement of enzyme and fermentation technology applications in industry

**Unit-I:- Introduction to Enzymes**

Introduce the various aspects of enzyme production, purification, use in industry, and basics of fermentation technology. Enzyme technology covers the definition, classification, characteristics, extracellular enzyme, sources, the various techniques of enzyme production and purification, application of enzyme in industry; introduction to immobilized enzymes and cells as well as their advantages and disadvantages.

Enzyme activity- chemical nature of enzymes. Protein nature of enzymes Coenzymes and Cofactors- Prosthetic group, coenzymes involved in different metabolic pathways. Classification of coenzymes. Isozymes, Abzymes, Synzyme.

**Unit-II:- Enzyme Catalysis and Inhibition**

Lock and key, Induced fit and Transition state Hypotheses. Mechanism of enzyme catalysis- Acid-base catalysis, covalent catalysis, Metal ion catalysis, Proximity and orientation effects etc. Mechanism of Serine proteases-Chymotrypsin, Lysozyme, Carboxypeptidase A and Ribonuclease., Proenzymes (Zymogens).

**Unit-III:- Enzyme Regulation**

Feedback Regulation, Allosteric Regulation, Reversible Covalent Modification and Proteolytic Activation. Organisation of enzymes in the cell. Enzymes in the cell, localization, compartmentation of metabolic pathways, enzymes in membranes, concentrations. Mechanisms of enzyme degradation, lysosomal and nonlysosomal pathways, examples.

**Unit-IV:- Enzyme Kinetics**

Factors affecting the enzyme activity- Concentration, pH and temperature. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten Equation, Km, Vmax, L.B Plot, Turnover number, Kcat. Kinetics of Enzyme Inhibition. Kinetics Allosteric enzymes.

**Outcomes:**

Display the instructive and comprehensive current knowledge of enzyme technology and fermentation, explain the enzyme mechanisms and kinetics, production and recovery, Categorize enzymes, including the ones produced through the recombinant method.

**Text Books:**

1. Fundamentals of Enzymology : Nicholas Price & Lewis Stevens
2. Enzymes : Biochemistry, Biotechnology and Clinical Chemistry- Trevor Palmer.
3. Buchholz, K., Kasche, V. and Bornscheuer, U.T. (2005) *Biocatalysts and Enzyme Technology*. John Wiley & Sons: UK.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE  
DEPARTMENT OF FOOD TECHNOLOGY

1. **Course Code: BMC-301/401/501**
2. Subject Name: Constitution of India
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

**Course Objectives:**

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

Unit No.	Particulars	Contact Hours
1	<b>History of Making of the Constitution: Indian</b> History, Drafting Committee ( Composition & Working), Preamble, The Union and its territory, Citizenship	4
2	<b>Contours of Constitutional Rights &amp; Duties:</b> Fundamental Rights-Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties	4
3	<b>Organs of Governance:</b> Parliament-Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Vice president, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions	4
4	<b>State Legislation:</b> Function and formation of state legislative, legislative council, Power of chief minister, union state relationship <b>Local Administration:</b> District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, Panchayati raj: Introduction, Block level: introduction, Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4
5	<b>Commission:</b> Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women. Role and Functioning of Comptroller & Auditor general of India	4

**Course Outcomes:**

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

**References:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

