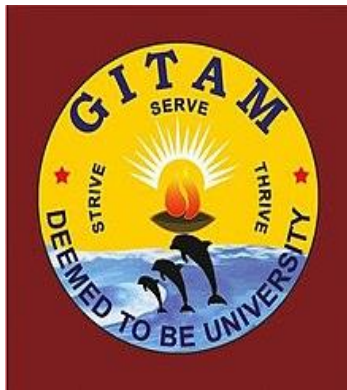


**GANDHI INSTITUTE OF TECHNOLOGY AND
MANAGEMENT
(GITAM)
(Deemed to be University, Estd. u/s 3 of UGC Act 1956)**

VISA KHAPATNAM *HYDERABAD *BENGALURU

Accredited by NAAC with 'A+' Grade



REGULATIONS AND SYLLABUS

**Bachelor of Science (HONOURS)
in
FOOD TECHNOLOGY
(W.e.f. 2018-19 admitted batch)**

Website: www.gitam.edu

B.Sc. (Hons.) FOOD TECHNOLOGY REGULATIONS

(W.e.f. 2018-19 admitted batch)

1.0 ADMISSIONS

Admissions into B.Sc. (Hons.) Food Technology program of GITAM (Deemed to be University) are governed by GITAM (Deemed to be University) admission regulations.

2.0 ELIGIBILITY CRITERIA

- 2.1 A pass in Intermediate or +2 with Physics, Chemistry, and Mathematics or Biology with a minimum aggregate of 50% marks or any other equivalent Examination approved by GITAM (Deemed to be University).
- 2.2 Admissions into B.Sc. (Hons.) FOOD TECHNOLOGY will be based on the marks obtained in intermediate or equivalent examination and the rule of reservation, wherever applicable.

3.0 CHOICE BASED CREDIT SYSTEM

Choice based credit system (CBCS) is introduced with effect from the admitted batch of 2015-16 based on UGC guidelines in order to promote:

- Student centered learning
- Cafeteria approach
- Inter-disciplinary learning.

Learning goals/objectives and outcomes are specified leading to what a student should be able to do at the end of the program.

4.0 STRUCTURE OF THE PROGRAMME

- 4.1 The program consists of:
 - (i) Ability enhancement compulsory core courses (AECC)
 - (ii) Core Courses (compulsory) (CC)
 - (iii) Discipline specific electives (DSE)
 - (iv) Generic electives (GE)
 - (v) Skill enhancement courses (SEC) are of general nature either related or unrelated to the discipline.
 - (vi) Practical Proficiency Courses (PPC): Laboratory work
- 4.2 Each course is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week.
- 4.3 In general, credits are assigned to the courses based on the following contact hours per week per semester.
 - One credit for each lecture / tutorial hour.
 - Two credits for three hours of Practicals.
- 4.4 The curriculum of six semesters B.Sc. (Hons.) FOOD TECHNOLOGY program is designed to have a total of 140 credits for the award of B.Sc. (Hons.) FOOD TECHNOLOGY degree.

5.0 MEDIUM OF INSTRUCTION:

The medium of instruction (including examinations and project reports) shall be English.

6.0 REGISTRATION

Every student has to register himself/herself for each semester individually at the time specified by the Institute / University.

7.0 ATTENDANCE REQUIREMENTS

7.1 A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend the end - semester examination and he/she will not be allowed to register for subsequent semester of study. He /She have to repeat the semester along with his / her juniors.

7.2 However, the Vice Chancellor on the recommendation of the Principal/ Director of the University College / Institute may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine medical grounds and on payment of prescribed fee.

8.0 EVALUATION

8.1 The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks).

8.2 A student has to secure an aggregate of 40% in the course in the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

8.3 Practical/ Viva voce/ Seminar etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks, and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 1.

Table 1: Assessment Procedure

S. No.	Component of assessment	Marks Allotted	Type of Assessment	Scheme of Examination
1	Theory	40	Continuous evaluation	(i) Two mid semester examinations shall be conducted for 15 marks each. (ii) 5 marks are allocated for quiz. (iii) 5marks are allocated for assignments.
		60	Semester-end examination	The semester-end examination shall be for a maximum of 60 marks.
	Total	100		
2	Practicals	40	Continuous evaluation	Forty (40) marks for continuous evaluation is distributed among the components: regularity, preparation for the practical, performance, submission of records and oral presentations in the laboratory. Weightage for each component shall be announced at the beginning of the Semester.
		60	Continuous evaluation	Sixty (60) marks for two tests of 30 marks each (one at the mid-term and the other towards the end of the Semester) conducted by the concerned lab Teacher and another faculty member of the department who is not connected to the lab, as appointed by the HoD.
	Total	100		

9.0 REAPPEARANCE

9.1 A student who has secured 'F' grade in a Theory course shall have to reappear at the subsequent semester end examinations held for that course.

9.1.1 A student who has secured 'F' grade in a Practical course shall have to attend Special Instruction Classes held during summer.

9.1.2 A student who has secured 'F' Grade in Project work / Industrial Training etc. shall have to improve his/her report and reappear for Viva – voce at the time of Special Examination to be conducted in the summer vacation.

10.0 SPECIAL EXAMINATION

A student who has completed his/her period of study and still has "F" grade in a maximum of four Theory courses is eligible to appear for Special Examination normally held during summer vacation.

11.0 BETTERMENT OF GRADES

A student who has secured only a Pass or Second class and desires to improve his/her Class can appear for Betterment Examinations only in Theory courses of any Semester of his/her choice, conducted in Summer Vacation along with the Special Examinations. Betterment of Grades is permitted 'only once' immediately after completion of the program of study.

12.0 GRADING SYSTEM

- 12.1 Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table-2.

Table 2: Grades & Grade Points

Sl.No.	Grade	Grade Points	Absolute Marks
1	O (outstanding)	10	90 and above
2	A+ (Excellent)	9	80 to 89
3	A (Very Good)	8	70 to 79
4	B+ (Good)	7	60 to 69
5	B (Above Average)	6	50 to 59
6	C (Average)	5	45 to 49
7	P (Pass)	4	40 to 44
8	F (Fail)	0	Less than 40
9	Ab. (Absent)	0	-

- 12.2 “A student who earns a minimum of four grade points (P Grade) in a Course is declared to have successfully completed the course, subject to securing an average GPA (average of all GPAs in all the semesters) of 5 at the end of the Program to declare pass in the program”.
- “Candidates who could not secure an average GPA of 5 at the end of the program shall be permitted to reappear for a course(s) of their choice to secure the same’.

13.0 GRADE POINT AVERAGE

- 13.1 A Grade Point Average (GPA) for the semester/trimester will be calculated according to the formula:

$$\text{GPA} = \frac{\Sigma [C \times G]}{\Sigma C}$$

Where

C = number of credits for the course,
G = grade points obtained by the student in the course.

- 13.2 To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student’s performance in all the courses taken, in all the semesters up to the particular point of time.
- 13.3 CGPA required for classification of class after the successful completion of the program is shown in Table 3.

Table 3: CGPA required for award of Class

Distinction	$\geq 8.0^*$
First Class	≥ 7.0
Second Class	≥ 6.0
Pass	≥ 5.0

* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester in **first attempt**.

14.1 ELIGIBILITY FOR AWARD OF THE B.Sc. DEGREE

14.1 Duration of the program: A student is ordinarily expected to complete B.Sc. program in six semesters of three years. However a student may complete the program in not more than five years including study period.

14.2 However the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

14.3 A student shall be eligible for award of the B.Sc. Degree if he / she fulfills all the following conditions.

- a) Registered and successfully completed all the courses and projects.
- b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
- c) Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and
- d) No disciplinary action is pending against him / her.

14.4 The degree shall be awarded after approval by the Academic Council

15.0 Discretionary Power:

Notwithstanding anything contained in the above sections, the Vice Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

Course Structure (Food Technology-Major)
Details of courses under B.Sc. (Honours)

COURSE	*CREDITS
I. Core Course Theory (14 Papers)	14×4= 56
Core Course Practical (14 Papers)	14×2=28
II. Elective Course (8 Papers)	
A.1. Discipline Specific Elective (4 Papers)	4×4=16
A.2. Discipline Specific Elective Practical (4 Papers)	4×2=8
B.1. Generic Elective/ Interdisciplinary (4 Papers)	4×4=16
B.2. Generic Elective Practical (4 Papers)	4×2=8
C. Skill Enhancement Elective Course (2 Papers)	2×2=4
III. Ability Enhancement Courses	
Ability Enhancement Compulsory (2 Papers of 2 credit each) English Communication Skills Environmental Science	2×2=4
Total credit	140

STRUCTURE OF B.Sc. (HONS.) FOOD TECHNOLOGY PROGRAM

SEMESTER-I

Course Code	Category	Title	Periods / week	Credits	Scheme of Evaluation		
					CE	SE	Total Marks
SFC 101	AECC	English Communication Skills	3	2	40	60	100
SFT 101	CC	Fundamentals of Food Technology	4	4	40	60	100
SFT 103	CC	Principles of Food Science	4	4	40	60	100
SFT 141 / 143	GE	Generic Elective-1	4	4	40	60	100
SFT 121	PPC	Fundamentals of Food Technology Practical	3	2	100	--	100
SFT 123	PPC	Principles of Food Science Practical	3	2	100	--	100
SFT 125 / 127	PPC	Generic Elective-1 Practical	3	2	100	--	100
Total			24	20			

SEMESTER-II

Course Code	Category	Title	Periods / week	Credits	Scheme of Evaluation		
					CE	SE	Total Marks
SFC 102	AECC	Environmental Science	3	2	40	60	100
SFT 102	CC	Technology of Food Preservation	4	4	40	60	100
SFT 104	CC	Food Processing Technology	4	4	40	60	100
SFT 142 / 144	GE	Generic Elective-2	4	4	40	60	100
SFT 122	PPC	Technology of Food Preservation Practical	3	2	100	--	100
SFT 124	PPC	Food Processing Technology Practical	3	2	100	--	100
SFT 126 / 128	PPC	Generic Elective-2 Practical	3	2	100	--	100
Total			24	20			

SEMESTER-III

Course Code	Category	Title	Periods / week	Credits	Scheme of Evaluation		
					CE	SE	Total Marks
SFT 201	CC	Food and Nutrition	4	4	40	60	100
SFT 203	CC	Technology of Fruits, Vegetables and Plantation Crops	4	4	40	60	100
SFT 205	CC	Technology of Dairy and Sea Food	4	4	40	60	100
SFT 241 / 243	GE	Generic Elective-3	4	4	40	60	100
SSE 283 / 293	SEC	Skill Enhancement Course-1	3	2	40	60	100
SFT 221	PPC	Food and Nutrition Practical	3	2	100	--	100
SFT 223	PPC	Technology of Fruits, Vegetables and Plantation Crops Practical	3	2	100	--	100
SFT 225	PPC	Technology of Dairy and Sea Food Practical	3	2	100	--	100
SFT 227 / 229	PPC	Generic Elective-3 Practical	3	2	100	--	100
Total			31	26			

SEMESTER-IV

Course Code	Category	Title	Periods/ week	Credits	Scheme of Evaluation		
					CE	SE	Total Marks
SFT 202	CC	Technology of Cereals, Pulses and Oilseeds	4	4	40	60	100
SFT 204	CC	Food Microbiology	4	4	40	60	100
SFT 206	CC	Technology of Meat, Poultry and Egg	4	4	40	60	100
SFT 242 / 244	GE	Generic Elective-4	4	4	40	60	100
SSE 288 / 290	SEC	Skill Enhancement Course-2	3	2	40	60	100
SFT 222	PPC	Technology of Cereals, Pulses and Oilseeds Practical	3	2	100	--	100
SFT 224	PPC	Food Microbiology Practical	3	2	100	--	100
SFT 226	PPC	Technology of Meat, Poultry and Egg Practical	3	2	100	--	100
SFT 228 / 230	PPC	Generic Elective-4 Practical	3	2	100	--	100
Total			31	26			

SEMESTER-V

Course Code	Category	Title	Periods / week	Credits	Scheme of Evaluation		
					CE	SE	Total Marks
SFT 301	CC	Food Engineering	4	4	40	60	100
SFT 303	CC	Food Chemistry-I	4	4	40	60	100
SFT 341 / 343 / 345	DSE	Discipline Specific Elective-1	4	4	40	60	100
SFT 341 / 343 / 345	DSE	Discipline Specific Elective-2	4	4	40	60	100
SFT 321	PPC	Food Engineering Practical	3	2	100	--	100
SFT 323	PPC	Food Chemistry-I Practical	3	2	100	--	100
SFT 325 / 327 / 329	PPC	Discipline Specific Elective-1 Practical	3	2	100	--	100
SFT 325 / 327 / 329	PPC	Discipline Specific Elective-2 Practical	3	2	100	--	100
Total			28	24			

SEMESTER-VI

Course Code	Category	Title	Periods / week	Credits	Scheme of Evaluation		
					CE	SE	Total Marks
SFT 302	CC	Food Chemistry-II	4	4	40	60	100
SFT 304	CC	Food Quality and Sensory Evaluation	4	4	40	60	100
SFT 342 / 344 / 346	DSE	Discipline Specific Elective-3	4	4	40	60	100
SFT 342 / 344 / 346	DSE	Discipline Specific Elective-4	4	4	40	60	100
SFT 322	PPC	Food Chemistry-II Practical	3	2	100	--	100
SFT 324	PPC	Food Quality and Sensory Evaluation Practical	3	2	100	--	100
SFT 326 / 328 / 330	PPC	Discipline Specific Elective-3 Practical	3	2	100	--	100
SFT 326 / 328 / 330	PPC	Discipline Specific elective-4 Practical	3	2	100	--	100
Total			28	24			

GENERIC ELECTIVES (GE)

GE-1 (One paper and corresponding lab to be selected)

SFT 141	Introductory Microbiology
SFT 143	Microbes in sustainable agriculture and development
SFT 125	Introductory Microbiology Practical
SFT 127	Microbes in sustainable agriculture and development Practical

GE-2 (One paper and corresponding lab to be selected)

SFT 142	Microbial Metabolism
SFT 144	Beverage technology
SFT 126	Microbial Metabolism Practical
SFT 128	Beverage technology Practical

GE-3 (One paper and corresponding lab to be selected)

SFT 241	Microbial Genetics and Molecular Biology
SFT 243	Technology of Spices
SFT 227	Microbial Genetics and Molecular Biology Practical
SFT 229	Technology of Spices Practical

GE-4 (One paper and corresponding lab to be selected)

SFT 242	Genetic Engineering and Biotechnology
SFT 244	Bioethics and Biosafety
SFT 228	Genetic Engineering and Biotechnology Practical
SFT 230	Bioethics and Biosafety Practical

DISCIPLINE SPECIFIC ELECTIVES (DSE)

DSE-1 & 2 (Two papers and corresponding labs to be selected)

SFT 341	Food Packaging
SFT 343	Fermentation Technology
SFT 345	Clinical Nutrition
SFT 325	Food Packaging Practical
SFT 327	Fermentation Technology Practical
SFT 329	Clinical Nutrition Practical

DSE-3 & 4 (Two papers and corresponding labs to be selected)

SFT 342	Instrumentation for Food Analysis
SFT 344	Food Safety and Hygiene
SFT 346	Bakery and Confectionary technology
SFT 326	Instrumentation for Food Analysis Practical
SFT 328	Food Safety and Hygiene Practical
SFT 330	Bakery and Confectionary technology Practical

SKILL ENHANCEMENT ELECTIVES (SEC)

SEC-1 (One paper to be selected)

SSE 283	Functional foods and nutraceuticals
SSE 293	Mathematics for Life Sciences

SEC-2 (One paper to be selected)

SSE 288	Entrepreneurship development
SSE 290	Probability and Statistics

Type of Course	No. of courses		Credits	
	Theory	Lab/Tutorial	Theory	Lab/Tutorial
Ability Enhancement Compulsory Courses	02	--	04	--
Core courses	14	14	56	28
Discipline Specific Electives	04	04	16	08
Generic Electives	04	04	16	08
Skill enhancement Courses	02	--	04	--
TOTAL	26	22	96	44

TOTAL CREDITS: 140 (Theory: 96 and Lab: 44)

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFC 101: ENGLISH COMMUNICATION SKILLS (THEORY) (AECC)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 marks

Unit I

Textual Lessons 1 & 2, Synonyms & Antonyms, One word substitutes, Words often confused, Phrasal Verbs

Unit II

Textual Lesson – 3 Foreign Phrases, Tenses, Concord

Unit III

Textual Lesson – 4 Error Analysis, Single Sentence Definition, Paragraph Writing

Unit IV

Textual Lesson – 5 Essay Writing, Dialogue Writing, Reading Comprehension

Unit V

Textual Lesson – 6 Note Making, Precis Writing

Recommended Readings:

1. Part – 1 (Communicate Units 1 to 6 only) of Creative English for Communication, N.Krishna Swamy & T. Sriraman.Macmillan India Ltd (2005 version)
2. Current English for Colleges., N. Krishna Swamy & T. Sri Raman. Macmillan. Examine your English Margaret Maison,Macmillan.

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 101: FUNDAMENTALS OF FOOD TECHNOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction-historical evolution of food processing technology. Cereals and millets-Structure and composition, properties and nutritional attributes of rice, wheat, maize, barley, millet and oats, malting, gelatinization of starch, types of browning- Maillard & caramelization, rice- parboiling of rice- advantages and disadvantages.

Unit II

Pulses- Structure and composition of pulses, toxic constituents in pulses, processing of pulses-soaking, germination, decortications, cooking and fermentation. Fats and Oils-classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, and hydrogenation. Rancidity –Types- hydrolytic and oxidative rancidity and its prevention.

Unit III

Fruits and Vegetables-Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre. Post-harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

Unit IV

Compositional, Nutritional and Technological aspects of Animal foods. Flesh Foods-Meat - Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat. Fish - Classification of fish (fresh water and marine), aquaculture , composition of fish, characteristics of fresh fish, spoilage of fish-microbiological, physiological, biochemical.

Unit V

Poultry - Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers. Milk and Milk Products- Definition of milk, chemical composition of milk, its constituents, processing of milk, pasteurization, homogenization. An overview of types of market milk and milk products.

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 121: FUNDAMENTALS OF FOOD TECHNOLOGY (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Study different types of browning reactions: enzymatic and non-enzymatic.
2. To study gelatinization behavior of various starches
3. To study the concept of gluten formation of various flours.
4. To study malting and germination.
5. To study dextrinization in foods.
6. Identification of pigments in fruits and vegetables and influence of pH on them.
7. Quality inspection of animal foods.

Recommended Readings:

1. Bawa. A.S, O.P Chauhan et al. Food Science. New India Publishing agency, 2013
2. Roday, S. Food Science, Oxford publication, 2011.
3. B. Srilakshmi, Food science, New Age Publishers, 2002
4. Meyer, Food Chemistry, New Age, 2004
5. De Sukumar., Outlines of Dairy Technology, Oxford University Press, 2007

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 103: PRINCIPLES OF FOOD SCIENCE (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Characteristics, sols, gels, pectin gels, colloidal sols, stabilization of colloidal system, emulsions, properties of emulsions, formation of emulsion, emulsifying agent, food foams, formation stability and destruction of foam, application of colloidal chemistry to food preparation.

Unit II

Objectives, type of food panels, characteristics of panel member, layout of sensory evaluation laboratory, sensitivity tests, threshold value, paired comparison test, duo- trio test, triangle test, hedonic scale, chemical dimension of basic tastes, Amoore's classification of odorous compounds. Sherman and Szczniak classification of food texture. Food as a substrate for microorganism, factors affecting growth of microbes: pH, water activity, O-R potential, nutrient contents, inhibitory substance and biological structure.

Unit III

Principles and applications, Hurdle effect in fermented foods, shelf stable products, intermediate moisture foods, application of hurdle technology. Minimal processing of foods with thermal methods and non-thermal methods-safety criteria in minimally processed foods-Minimal processing in practice-fruits and vegetables-seafood-effect on quality-Future developments.

Unit IV

Principles, equipment and processing, effect on food. Waste water, hardness of water, break point chlorination, physical and chemical of impurities, BOD, COD, waste water treatment, milk plant sanitation, CIP system, sanitizers used in food industry.

Unit V

Objectives of packaging, flexible packaging, properties of the following packaging materials-low density polyethylene, high density polyethylene, polypropylene, polyvinyl chloride, polyvinylidene chloride, ethylene vinyl alcohol, polystyrene, polyethylene terephthalate, nylon, ethylene vinyl acetate, ethylene acrylic acid, ethylene methacrylic acid, ionomers.

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 123: PRINCIPLES OF FOOD SCIENCE (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Estimation of reducing sugar by Fehling's procedure
2. Estimation of salt content in brine
3. Estimation of salt content in butter
4. Preparation of brix solution and checking by hand refractometer
5. Application of colloidal chemistry to food preparation
6. Demonstration of the Soxhlet method for determination of fat content
7. Determination of acidity of water
8. Determination of alkalinity/ hardness of water
9. Demonstration of the Kjeldahl's method for estimation of protein content

Recommended Readings:

1. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press,2003
2. De S, Outlines of Dairy Technology, Oxford Publishers,1980
3. Deman JM, Principles of Food Chemistry, 2nd ed. Van Nostrand Reinhold, NY1990
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi,2004
5. Jenkins WA and Harrington JP, Packaging Foods with Plastics, Technomic Publishing Company Inc., USA,1991
6. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New AgeInternational (P) Ltd. Publishers, New Delhi, 1987
7. Meyer LH, Food Chemistry, CBS Publication, New Delhi,1987
8. Potter NH, Food Science, CBS Publication, New Delhi,1998
9. Ramaswamy H and MarcottM,Food Processing Principles and Applications CRC Press, 2006
10. Ranganna S, Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2nd ed.
11. TMH Education Pvt. Ltd,1986

**B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFC 102: ENVIRONMENTAL SCIENCE (AECC)**

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 marks

Unit I

The Multidisciplinary nature of environmental studies–Definition, Scope and Importance, Need for Public awareness. Natural Resources: Classification – Renewable and Non Renewable Resources. Renewable Resources: Forest, Water and Energy Resources Non Renewable Resources: Mineral, Food and Land resources (Uses, reasons for over-utilization and effects)

Unit II

Eco-system: Structure of an Ecosystem, Producers, consumers and de-composers. Structure of Terrestrial Ecosystems (Forest ecosystem, Grassland ecosystem and Desert ecosystem) and Aquatic Ecosystems (Pond ecosystem and ocean ecosystem). Function of an ecosystem -food chains, food web and ecological pyramids - energy flow in the ecosystem. Environmental Pollution: Causes, effects and control measures of Air, Water, soil pollution, Thermal pollution and nuclear hazards. Municipal solid waste management.

Unit III

Environmental problems: Global Environmental Problems, Green house effect, Ozone layer depletion, acid rains and Climate change. National Environmental Problems: Deforestation – Causes and Effects, Environmental Problems associated with dams. Mining and Environmental effects.

Unit IV

Social Issues and the Environment: Environmental ethics, Issues and possible solutions. Waste land reclamation, Consumerism and waste products. Environmental Legislation: Environment Protection Act, Air Act, Water Act, Wildlife Protection act and Forest conservation act.

Unit V

Human Population and the Environment: Population growth, variation among nations, Population explosion-Family welfare programme. Environment and human health. Human rights, Value education, HIV/AIDS, Women and Child welfare, Role of information technology in environment and human health.

Recommended Readings:

1. Text Book of Environmental studies for Undergraduate courses by Bharucha Erach Published by V.G.C
2. Environmental Science: A Global Concern by William P. Cunningham and Baraba Woodworth Saigo.
3. A text book of Environmental Science by P.C.Joshi
4. A text book of Environmental Science by Arvind Kumar
5. A text book of Environmental Science by S.C.Santra
6. Ecology & Environment by P.D.Sharma

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 102: TECHNOLOGY OF FOOD PRESERVATION (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit 1

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, definition of shelf life, perishable foods, semi perishable foods, and shelf stable foods.

Unit II

Thermal Processing- Classification of thermal treatments, Mode of action, Commercial heat preservation, methods: Sterilization, commercial sterilization, Pasteurization and blanching-objectives, types. Pros and cons of high temperature preservation.

Unit III

Freezing and Refrigeration: Introduction to cool storage, refrigeration, and freezing, principle of freezing, freezing curve, changes occurring during freezing, types of freezing- slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.

Unit IV

Drying and Dehydration - Definition, drying as a means of preservation, heat and mass transfer, factors affecting rate of drying, normal drying curve, types of driers used in the food industry. Evaporation – Definition, factors affecting evaporation, names of evaporators used in food industry.

Unit V

Irradiation - Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, application and benefits of irradiation processing in food industry. Quality and safety of irradiated foods

B.Sc. (H) FOOD TECHNOLOGYII SEMESTER
SFT 122: TECHNOLOGY OF FOOD PRESERVATION (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Methods of Sampling.
2. Concept of shelf life of different foods
3. To study the concept of Asepsis and sterilization
4. Determination of pH of different foods using pH meter.
5. Study quality characteristics of foods preserved by drying/dehydration/freezing.
6. To perform pasteurization of fluids using different methods.
7. To perform blanching of different plant foods.

Recommended Readings:

1. Text Book on Food Storage and Preservation (2004) by Vijayakhader.
2. Food Science (2002) by B. Srilakshmi.
3. Food Processing and Preservation (2010) by B.SivaShakar.
4. Food Processing and Preservation (2007) by G. Subbalakshmi
5. Food preservation and processing (2007) by ManoranjanKalia

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 104: FOOD PROCESSING TECHNOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I.

Food processing operations - Refrigeration and Freezing -Requirements of refrigerated storage - controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing, Freezing methods -direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing.

Unit II

Thermal Processing of Foods - Classification of thermal processes, Principles of thermal processing, commercial canning operations, Aseptic Processing, UHT. Irradiation and microwave heating-Principles, Dosage, Applications of Irradiation, Mechanism of microwave heating and applications.

Unit III

Material handling-Elementary concept of material handling in food industry, equipment and functioning of belt conveyor, screw conveyor, bucket elevator and pneumatic conveyor.
Separation processes - Principles and methods of: distillation, extraction, washing, filtration, sedimentation, sieving and centrifugation

Unit IV

Technology of colloids in food - Characteristics, sols, gels, pectin gels, colloidal sols, stabilization of colloidal system, syneresis, emulsions, properties of emulsions, formation of emulsion, emulsifying agents, food foams, formation stability and destruction of foam, application of colloidal chemistry to food preparation.

Unit V

Food Additives - Introduction, need of food additives in food processing and preservation, Characteristics and classification of food additives, Chemical, technological and toxicological aspects. Contamination in Food- Physical, chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, radionuclides, solvent residues, chemicals) Natural toxins. Food Laws and Regulations- Codex, HACCP, ISO, FSSAI (2018), BIS.

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 124: FOOD PROCESSING TECHNOLOGY (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Canning of foods
2. Preservation of food by the process of freezing
3. Drying of food using Tray dryer/other dryers.
4. Estimation of Chemical Oxygen Demand (Demonstration)
5. Preparation of brix solution and checking by hand refractometer 6 Analysis of water
6. Minimal Processing of food
7. Application of colloidal chemistry in food preparation

Recommended Readings:

1. Potter NH,1998, Food Science, CBS Publication, New Delhi
2. Ramaswamy H and Marcotte M,2009, Food Processing Principles and Applications CRC Press
3. Deman JM,2007, Principles of Food Chemistry, 3rd Ed.Springer
4. Manay NS and Shadaksharaswamy M, 1987, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 201: FOOD AND NUTRITION (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Functions of food-physiological, psychological and social, Concept of Balanced Diet, Food Groups-major nutrients, Food Pyramid, guidelines for good health. Food exchange list, basal metabolism, factors affecting BMR

Unit II

Basic terms in study of food and nutrition- BMI, Nutritional Status, malnutrition, recommended daily allowances(RDA). Factors affecting RDA, uses of RDA. Relationship between food, nutrition and health.

Unit III

Meal planning-Factors affecting meal planning for different groups of people. Methods of cooking- Dry, moist, frying and microwave cooking, Advantages, disadvantages and effect on foods. Nutritional labeling- Importance, global trends, codex guidelines, nutritional labelling in India, FSSAI guidelines.

Unit IV

Classification, digestion, functions, dietary sources, Recommended Dietary Allowances, clinical manifestations of deficiency and excess and factors affecting absorption- Energy, lipids carbohydrates and proteins

Unit V

Classification, digestion, functions, dietary sources, RDA, clinical manifestations of deficiency and excess and factors affecting absorption: Fat soluble vitamins-A, D, E and K. Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C. Minerals – calcium, iron, iodine, fluorine, copper and zinc

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 221: FOOD AND NUTRITION (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 marks
Sessionals: 40 marks

1. Identification of food sources for various nutrients using food composition tables.
2. Record diet of self-using 24 hour dietary recall and its nutritional analysis.
3. Introduction to meal planning, concept of food exchange system.
4. Estimation of BMI and other nutritional status parameters.
5. Planning meals for adults of different activity levels for various income groups.
6. Survey of locally available foods and identifying the key nutrients
7. Estimation of BMI and other nutritional status parameters.
8. Formulation of weaning foods
9. Planning and preparation of diets for aged people

Recommended Readings:

1. Dietetics (2007) by B. Srilakshmi.
2. ICMR (2010). Nutrient Requirements and Recommended Dietary Allowances for Indians
3. Text Book of Human Nutrition (2010) by Bamji
4. Essentials of Human Nutrition (2007) by A.S.Truswell.
5. Nutrition & Dietetics 3rd edition Subhangini Joshi
6. Oxford Handbook of Nutrition and Dietetics (2012) Joan Webster
7. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd
8. IFCT (2017) Indian Food Composition Tables

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 203: TECHNOLOGY OF FRUITS, VEGETABLES AND
PLANTATION CROPS (THEORY)

Hours per week: 4

Credits: 4

End Examination: 60 Marks

Sessionals: 40 Marks

Unit I

Introduction: Importance of fruits and vegetables, history and need of preservation, reasons of spoilage, method of preservation (short & long term). Canning and bottling of fruits and vegetables: Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods.

Unit II

Fruit beverages: Introduction, Processing of fruit juices, preservation of fruit juices, processing of squashes, cordials, nectars, concentrates and powder. Jams, jellies and marmalades: Jam: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation, Processing & technology, defects in jelly, Marmalade: Types, processing & technology, defects.

Unit III

Pickles, chutneys and sauces: processing, types, causes of spoilage pickling. Tomato products: Selection of tomatoes, pulping & processing of tomato juice, tomato puree, paste, ketchup, sauce and soup.

Unit IV

Dehydration of foods and vegetables: Sun drying & mechanical dehydration, process variation for fruits and vegetables, packing and storage.

Unit V

Spices: Processing and properties of major and minor spices, essential oils & oleoresins, adulteration. Tea, coffee and cocoa: Processing and properties of tea leaves, coffee cherries, cocoa beans variety and products.

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 223: TECHNOLOGY OF FRUITS, VEGETABLES AND
PLANTATION CROPS (PRACTICAL)

Hours per week: 3

Credits: 2

End Examination: 60 Marks

Sessionals: 40 Marks

1. Estimation of total soluble solids (TSS).
2. Estimation of pH and acidity of products.
3. Estimation of brix: acidity ratio
4. Estimation of ascorbic acid and effect of heat treatment on it.
5. To study the steps of can making process.
6. Preparation and evaluation of pectin products.
7. Adulteration of spices.
8. Dehydration of fruits and vegetables.
9. Rehydration of fruits and vegetables.

Recommended Readings:

1. Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & vegetables, ICAR, NewDelhi
2. W B Crusess.2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India
3. Manay, S. &Shadaksharaswami, M.2004. Foods: Facts and Principles, New Age Publishers
4. Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products, Tata Mc Graw-Hill publishing company limited, Second edition.
5. Srivastava, R.P. and Kumar, S. 2006 . Fruits and Vegetables Preservation- Principles and Practices. 3rd Ed. International Book DistributingCo.

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 205: TECHNOLOGY OF DAIRY AND SEA FOOD (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction: Status of fishery industry in India. Chilling and Freezing of fish: Relationship between chilling and storage life, MAP, general aspects of freezing, freezing systems (air blast freezing, plate or contact freezing spray or immersion freezing, freezing on board, onshore processing, changes in quality in chilled and frozen storage, thawing.

Unit II

Fish Curing and Smoking: Drying and salting of fish, water activity and shelf-life , salting process, salting methods (brining, pickling, kench curing, gaspe curing), Preservation by smoking, smoke production , smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, examples of smoked and dried products.

Unit III

Canning of fish: Principles, classification, storage of canned fish, pre-process operations, post process operations, cannery operations for specific canned products.(Tuna, Mackerel, Sardine). Fishery by-products: Surimi- Introduction, processing, comparison of surimi and fish mince products. Fish protein concentrates (FPC), fish protein extracts (FPE), fish protein hydrolysis (FPH), Fermented fish: Flowchart of Indigenous products- Fish sauce and Paste

Unit IV

Milk: Physical properties of milk, Composition of milk – Lactose, milk fat, protein and enzymes, Market milk industry and milk products: Systems of collection of milk Reception, Platform testing, Various stages of processing- Filtration, Clarification, Homogenization, Pasteurization. Receiving and storage of milk.

Unit V

Milk products–Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, ice-cream, condensed milk, milk powder, channa, paneer, cheese (cheddar).Dairy plant sanitization: Objectives, cleaning, washing-bottle and can, tankers, silos-detergents and sanitizers.

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 225: TECHNOLOGY OF DAIRY AND SEA FOOD (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. To perform platform tests in milk (Acidity, COB, MBRT, specific gravity, SNF)
2. To estimate milk protein by Folin method.
3. To estimate milk fat by Gerber method.
4. Preparation of flavored milk/. Pasteurization of milk
5. To prepare casein and calculate its yield.
6. Quality evaluation offish/prawn.
7. Identification of different varieties of fish.
8. Subjective evaluation of Fresh Fish.
9. Cut out examination of canned fish (Sardine, Mackerel, Tuna)
10. Fish product formulation/canning.

Recommended Readings:

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford. 2007.
2. Hall GM, Fish Processing Technology, VCH Publishers Inc., NY,1992
3. Sen DP, Advances in Fish Processing Technology, Allied Publishers Pvt. Limited 2005
4. Shahidi F and Botta JR, Seafoods: Chemistry, Processing, Technology and Quality, Blackie Academic & Professional, London, 1994
5. Webb and Johnson, Fundamentals of Dairy Chemistry, 3rd ed., CBS Publishers, New Delhi 1988

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 202: TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Milling technology: Wheat-Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, Products and By-products. Rice – Physicochemical properties, milling (mechanical & solvent extraction), parboiling, ageing of rice, utilization of byproducts. Corn–Milling (wet & dry), cornflakes, corn flour. Barley- Milling (pearl barley, barley flakes & flour) Oats–Milling (oatmeal, oat flour & oat flakes) Sorghum and millets – Traditional & commercial milling (dry & wet)

Unit II

Pulse technology: Processing- Soaking, Germination, Decortication, Cooking and Fermentation. Changes during germination, Milling- decutilating and splitting (dry and wet milling). Antinutritional factors, Factors affecting cooking time.

Unit III

Legume technology: Classification of legumes, chemical composition and nutritional value. Methods of dehulling-. Home, cottage and commercial scale. Modern techniques of dehulling. Milling of legumes: Dal milling principles, methods, equipments and effect on quality. Principle products, fermented products of legumes.

Unit IV

Technology of Oil seeds: Sources, Composition, Processing of oil seeds – Soya bean, coconut. Hydrogenation. Refining of fats & oils, bleaching, de-odourising, hydroxylation, Protein isolates, Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fibre spinning

Unit V

Alcoholic beverages: classification- wine, beer, spirit, liqueurs, cocktails. Production- fermentation and distillation. Storage. Bar layout- physical layout of bar, Bar stock- alcohol & non alcohol beverages, Bar equipments

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 222: TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Physical characteristics of Wheat.
2. Estimation of Gluten Content of flour.
3. Estimation of Pelenske Value of flour.
4. Estimation of Potassium Bromate in flour.
5. Fermenting power of yeast.
6. Physical Characteristics of Rice and paddy.
7. Cooking characteristics of rice.
8. Determination of sedimentation power of flour
9. Identification of different varieties of millets and cereals

Recommended Readings:

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

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 204: FOOD MICROBIOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Food microbiology- definition and importance, Microbial growth in food- intrinsic and extrinsic factors affecting the growth of microorganisms in food, bacterial growth curve. Beneficial role of microorganisms in food. Probiotics, prebiotics and synbiotics.

Unit II

Microorganisms associated with food- Bacteria, molds, yeast, virus- General characteristics, structure, morphological characteristics, growth and cultural characteristics. Endospore - structure and significance in food microbiology

Unit III

Microbial food spoilage - sources of microorganisms in foods, spoilage of different food groups- milk and dairy products, meat, poultry and sea foods, cereal and cereal products, fruits and vegetables and canned products

Unit IV

Sterilization methods-physical and chemical. Pure culture techniques, methods of isolation. Enumeration of Microorganisms- qualitative and quantitative. Control of Microorganisms in Foods- Principle and methods. Preservation and maintenance of microbial cultures.

UNIT V

Food infection and food intoxication. Food and water borne diseases by – *Salmonella*, *E. coli*, *Clostridium*, *Listeria*, *Shigella*, *Bacillus*, *Campylobacter*, *Vibrio*. Trends in Food Microbiology-rapid methods of detection, recent Advances

**B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 224: FOOD MICROBIOLOGY (PRACTICAL)**

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Introduction to the Basic Microbiology Laboratory Practices and equipment
2. Functioning and use of compound microscope
3. Cleaning and sterilization of glassware
4. Preparation and sterilization of nutrient broth
5. Cultivation and sub-culturing of microbes
6. Preparation of slant, stab and plates using nutrient agar
7. Morphological study of bacteria and fungi using permanent slides
8. Simple staining
9. Gram's staining
10. Standard Plate Count Method
11. Introduction of culture procuring and depositing centers, ATCC, DSMZ, and IMTECH

Recommended Readings:

1. Food Microbiology (4th edition) by W. C Frazier.
2. Modern Food Microbiology (7th edition) by J.M. Jay .
3. Food Microbiology (2006) by M.R. Adams.
4. Basic Food Microbiology (2004) by G.J. Banwart.
5. Food Microbiology (2007) by K.Vijaya Ramesh.
6. Fundamentals of Food Microbiology (5th Edition) by B. Ray and A. Bhunia.

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 206: TECHNOLOGY OF MEAT, POULTRY AND EGG (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction: Livestock and poultry population in India, Development of meat and poultry industry in India and its need in nation's economy, Glossary of live market terms for animals and birds.

Unit II

Meat quality: Effects of feed, breed and environment on production of meat animals and their quality. Meat Quality-color, flavor, texture, Water-Holding Capacity (WHC), Emulsification capacity of meat

Unit III

Slaughter process: Slaughter, inspection and grading, Antemortem examination of meat animals, slaughter of buffalo, sheep/ goat, poultry, pig. A generic HACCP model, dressing of carcasses, post-mortem examination of meat.

Unit IV

Preservation of meat: Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, and RTE meat products, meat curing. Sausages-processing, types and defects. By-products: Importance, classification and uses, Manufacture of Natural casings

Unit V

Egg Industry: The egg industry, its techniques of working, General management, structure, composition and nutritive value of egg and its products. Preservation of eggs: Refrigeration and freezing, thermal processing, dehydration, coating. Quality identification of shell eggs- Factors affecting egg quality and measures of egg quality.

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 226: TECHNOLOGY OF MEAT, POULTRY AND EGG (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Estimation of moisture content of meat
2. Cutout analysis of canned meats/retort pouches
3. Estimation of protein content of meat
4. Analysis of frozen meat/meat emulsion products
5. To study shelf-life of eggs by different methods of preservation
6. Evaluation of eggs for quality parameters (market eggs, branded eggs)
7. To perform freezing of yolk/albumen
8. Meat/Egg product formulation

Recommended Readings:

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

B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 301: FOOD ENGINEERING (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Concept of unit operation, units and dimensions, unit conversions, dimensional analysis, mass and energy balance, related numericals. Important considerations for designing of food plants, types of layout. Principle and equipments used in food industry.

Unit II

Liquid transport systems, properties of liquids, Newton's law of viscosity, principle of capillary tube and rotational viscometer, properties of Non-Newtonian fluids, flow characteristics, Reynolds number, Bernoulli's equation, concept of flow measurement devices, related basic numericals.

Unit III

Concept and selection of a refrigerant, description of a refrigeration cycle, pressure enthalpy charts and tables, mathematical expressions useful in analysis of vapour compression refrigeration cycle, numericals based on VCR system, Freon 12 and R-717, superheating and sub cooling, freezing time calculation using Plank's Equation, frozen food storage, related basic numericals

Unit IV

Systems for heating and cooling food products, thermal properties of food, modes of heat transfer, application of steady state heat transfer-estimation of conductive, convective, overall heat transfer coefficient and design of tubular heat exchanger. Related basic numericals, Fick's law of diffusion, membrane separation systems-electrodialysis system, reverse osmosis, membrane System, and ultrafiltration membrane system, membrane devices used for RO and UF: plate and frame, tubular, spiral wound and hollow fiber devices.

Unit V

Properties of dry air, properties of water vapour, properties of air vapour mixture, psychrometric chart, related basic numericals, generation of steam, construction and functions of fire tube and water tube boilers, thermodynamics of phase change, steam tables, boiling point elevation, types of evaporations, design of single effect evaporators, basic drying process, moisture content on wet basis and dry basis, dehydration systems, dehydration system design, related basic numericals

**B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 321: FOOD ENGINEERING (PRACTICAL)**

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Plant layout design
2. Determination of drying characteristics
3. Determination of viscosity of Newtonian and non Newtonian fluids
4. Study of effect of temperature on viscosity
5. Screen analysis of food sample
6. Study of evaporation process
7. Freezing time calculation
8. Psychrometrics- use and application.

Recommended Readings:

1. Rao DG. 2010. Fundamentals of food engineering. PHI learning private ltd.
2. Singh RP and Heldman DR. 1993, 2003, 2009. Introduction to food engineering. Academic press 2nd, 3rd, and 4th edition.
3. Rao C G 2006 Essentials of food process engineering. B S publications
4. Fellow P. 1988 Food processing technology

B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 303: FOOD CHEMISTRY – I (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction to Food Chemistry – Definition, Composition of food. Water - Definition of water in food, Structure of water and ice, Types of water, Sorption phenomenon, Water activity and packaging, Water activity and shelf-life

Unit II

Lipids - Classification of lipids, Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Chemical properties-reichert-meissel value, polenske value, iodine value, peroxide value, saponification value. Effect of frying on fats, Changes in fats and oils- rancidity, lipolysis, flavor reversion, Auto-oxidation and its prevention, Technology of edible fats and oils- Refining, Hydrogenation and Interesterification, Fat Mimetics

Unit III

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

Unit IV

Carbohydrates – Classification (mono, oligo and poly saccharides), Structure of important polysaccharides (starch, glycogen, cellulose, pectin, hemicellulose, gums), Chemical reactions of carbohydrates –oxidation, reduction , with acid & alkali, Modified celluloses and starches, resistant starch.

Unit V

Vitamins – Structure, Importance and Stability of Water soluble vitamins & Fat soluble vitamins
Flavour - Definition and basic tastes, Chemical structure and taste, Description of food flavours, Flavour enhancers

B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 323: FOOD CHEMISTRY – I (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Preparation of primary and secondary solutions
2. Estimation of moisture content
3. Determination of gelatinization temperature range (GTR) of different starches and effect of additives on GTR.
4. Determination of refractive index and specific gravity of fats and oils.
5. Determination of smoke point and percent fat absorption for different fat and oils.
6. Determination of percent free fatty acids
7. Estimation of saponification value
8. Estimation of reducing and non-reducing sugars using potassium ferricyanide method.

Recommended Readings:

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

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 302: FOOD CHEMISTRY – II (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Minerals - Major and minor minerals calcium, phosphorus, Sulphur, magnesium, sodium, potassium, chlorine; minor minerals - iron, Fluorine, zinc, copper, iodine, chromium, cobalt, Metal uptake in canned foods, Toxic metals.

Unit II

Natural Food Pigments- Introduction and classification Food pigments (chlorophyll, carotenoids, anthocyanins and flavonoids, beet pigments, caramel). Browning Reactions In Food - Enzymatic browning, Non - Enzymatic browning, Maillard reaction, Caramelization reaction, Ascorbic acid oxidation

Unit III

Enzymes - Introduction, classification, General characteristics, Enzymes in food processing, Industrial Uses of Enzymes, Immobilized enzymes

Unit IV

Physico-chemical and nutritional changes occurring during food processing treatments -Drying and dehydration, Irradiation, Freezing, Canning

Unit V

New product development – Definition, Importance, Need of product development, Steps of product development- Product development tools, Reasons for failure.

**B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 322: FOOD CHEMISTRY – II (PRACTICAL)**

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Estimation of total ash
2. Estimation of minerals-demo
3. Determination of thermal inactivation time of enzymes in fruits and vegetables.
4. Estimation of iodine value
5. Estimation of peroxide value
6. Determination of carotenoids w.r.t flour pigments.
7. Extend of non-enzymatic browning by extraction methods.
8. Introduction of the concept of new product development

Recommended Readings:

1. DeMan, John M., Principles of Food Chemistry ,3rd Ed., Springer 1999
2. Desrosier, Norman W. and Desrosier.,JamesN.,The technology of food preservation , 4th Ed.,Westport, Conn. : AVI Pub. Co., 1977.
3. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996
4. Fuller, Gordon W, New Product Development From Concept to Marketplace, CRC Press, 2004.
5. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 304: FOOD QUALITY AND SENSORY EVALUATION (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction to quality attributes of food - Appearance, flavour, textural factors and additional quality factors.

Unit II

Gustation- Introduction and importance of gustation, Structure and physiology of taste organs-tongue, papillae, taste buds, salivary glands. Mechanism of taste perception, Chemical dimensions of basic tastes- sweet, salt, sour, bitter and umami, Factors affecting taste quality, reaction time, taste modification, absolute and recognition threshold, Taste measurement-Electronic Tongue, Taste abnormalities

Unit III

Olfaction - Introduction, definition and importance of odour and flavor, Anatomy of nose, physiology of odour perception, Mechanism of odour perception, Theories of odour classification, chemical specificity of odour. Odour measurement techniques – historical perspective and emphasis on recent techniques- e- nose etc. Olfactory abnormalities

Unit IV

Colour - Introduction and importance of colour, Dimensions of colour and attributes of colour; gloss etc. Perception of colour. Colour Measurement: Munsell colour system, CIE colour system, Hunter colour system. Colour abnormalities

Unit V

Texture - Introduction, definition and importance of texture, Phases of oral processing, Texture perception, receptors involved in texture perception, Rheology of foods, Texture classification, Texture measurement – basic rheological models, forces involved in texture measurement and recent advances in texture evaluation. Application of texture measurement in cereals, fruits and vegetables, dairy, meat and meat products

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 324: FOOD QUALITY AND SENSORY EVALUATION (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Training of sensory panel.
2. To perform sensitivity tests for four basic tastes
3. To perform analytical and affective tests of sensory evaluation.
4. Recognition tests for various food flavors.
5. Sensory evaluation of milk and milk products.
6. Flavor defects in milk
7. Extraction of pigments from various fruits and vegetables and study the effect of temperature and pH
8. Texture evaluation of various food samples- cookies/ biscuits/ snack foods
9. Textural measurement of various food products using Texture Analyzer
10. Measurement of colour by using Tintometer/ Hunter Colour Lab etc.
11. Concept of electronic tongue and nose.

Recommended Readings:

1. Rao E. S. (2013). Food Quality Evaluation. Variety Books.
2. Pomeranz Y and Meloan CE (2002). Food Analysis – Theory and Practice, CBS Publishers and Distributors, New Delhi.
3. deMan J. (2007). Principles of Food Chemistry, 3rd ed., Springer.
4. Meilgard (1999). Sensory Evaluation Techniques, 3rd ed. CRC Press LLC, 1999.
5. Amerine, Pangborn & Roessler (1965). Principles of Sensory Evaluation of food, Academic Press, London.

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 141: INTRODUCTORY MICROBIOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Development of microbiology, Spontaneous generation theory. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Beijerinck, Winogradsky, Edward Jenner, Ivanowski. Germ theory of disease, golden era of microbiology.

Unit II

Classification: Whittaker's and Carl Woese's three kingdom classification systems and introduction to Bergey's manual. Prokaryotic and eukaryotic cell organization. Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (bacteria, algae, fungi and protozoa).

Unit III

Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope. Control of microorganisms-sterilization, disinfection, antisepsis, and sanitization.

Unit IV

Medical microbiology and immunology: List of important human diseases and their causative agents of various human systems. Definitions of immunity (active/passive), primary and secondary immune response, antigen, antibody and their types

Unit V

Environmental microbiology: Microbial interactions—mutualism, commensalism, antagonism, and parasitism. Microorganisms used as biopesticides, biofertilizers, biodegradation, and bioremediation. Fermentation- types, primary and secondary metabolites, fermenter design, and important industrial products.

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 125: INTRODUCTORY MICROBIOLOGY (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Microbiology Laboratory Management and Biosafety.
2. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology laboratory
3. Preparation of culture media for bacterial cultivation
4. Sterilization of medium using Autoclave and assessment for sterility
5. Sterilization of glassware using Hot Air Oven and assessment for sterility
6. Sterilization of heat sensitive material by filtration and assessment for sterility
7. Demonstration of presence of microflora in the environment by exposing nutrient agar plates to air.
8. Study of different shapes of bacteria using permanent slides
9. Study of Rhizopus, Penicillium, Aspergillus using permanent mounts
10. Study of Spirogyra and Chlamydomonas using permanent Mounts
11. Study of the following protozoans using permanent mounts/photographs: Amoeba, Entamoeba, Paramecium and Plasmodium

Recommended Readings:

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
5. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T.Brown Publishers.
6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 143: MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT
(THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Soil Microbiology - Soil as Microbial habitat, Soil profile and properties, Soil formation, Diversity and distribution of microorganisms in soil. Soil organic matter - Mineralization of cellulose, hemicelluloses, lignocelluloses, lignin and humus

Unit II

Microbial activity in soil and green house gases- Carbondioxide, methane, nitous oxide, nitric oxide – production and control

Unit III

Microbial Control of soil borne plant pathogens- Biocontrol mechanisms and ways, Microorganisms used as biocontrol agents against Microbial plant pathogens, Insects, Weeds

Unit IV

Biofertilization, Phytostimulation, Bioinsecticides, Plant growth limiting compounds, biofertilizers – symbiotic (Bradyrhizobium, Rhizobium, Frankia), Non Symbiotic (Azospirillum, Azotobacter, Mycorrhizae, MHBs, Phosphate solubilizers, algae), Novel combination of microbes as biofertilizers, PGPRs

Unit V

Secondary Agriculture Biotechnology- Biotech feed, Silage, Biomanure, biogas, biofuels – advantages and processing parameters. GM crops -Advantages, social and environmental aspects, Bt crops, golden rice, transgenic animals. GEAC.

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 127: MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT
(PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Study soil profile
2. Study microflora of different types of soils
3. Rhizobium as soil inoculants characteristics and field application
4. Azotobacter as soil inoculants characteristics and field applications
5. Design and functioning of a biogas plant
6. Isolation of cellulose degrading organisms

Recommended Readings:

1. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego,
2. Singh RS. (1998). Plant Diseases Management. 7th edition. Oxford & IBH, New Delhi.
3. Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press,
4. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
5. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
6. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA
7. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
8. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
9. Altman A (1998). Agriculture Biotechnology, 1st edition, Marcel decker Inc.
10. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
11. Reddy, S.M. et. al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
12. Saleem F and Shakoori AR (2012) Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG.

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 142: MICROBIAL METABOLISM (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Microbial Growth and Effect of Environment on Microbial Growth -Definitions of growth, Batch culture, Continuous culture, generation time and specific growth rate Temperature and temperature ranges of growth pH and pH ranges of growth Effect of solute and water activity on growth Effect of oxygen concentration on growth Nutritional categories of microorganisms

Unit II

Nutrient uptake and Transport - Passive and facilitated diffusion Primary and secondary active transport, concept of uni-port, symport and anti-port, Group translocation Iron uptake.
Nitrogen Metabolism - an overview - Introduction to biological nitrogen fixation Ammonia assimilation Assimilatory nitrate reduction.

Unit III

Chemoheterotrophic Metabolism - Aerobic Respiration - Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway TCA cycle Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial ETC, electron transport phosphorylation, uncouplers and inhibitors.

Unit IV

Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation - Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate/nitrite and nitrate/ammonia respiration; fermentative nitrate reduction) Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways

Unit V

Chemolithotrophic and Phototrophic Metabolism- Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction). Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria and cyanobacteria.

B.Sc. (H) FOOD TECHNOLOGY I SEMESTER
SFT 126: MICROBIAL METABOLISM (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Study and plot the growth curve of *E. coli* by turbidimetric and standard plate count methods.
2. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data
3. Effect of temperature on growth of *E. coli*
4. Effect of pH on growth of *E. coli*
5. Demonstration of alcoholic fermentation
6. Demonstration of the thermal death time and decimal reduction time of *E. coli*.

Recommended Readings:

1. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc.
2. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons
3. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India
4. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag
5. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 144: BEVERAGE TECHNOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Beverages: Functions, classification, nutritive value, health benefits, Role of water in beverages, Laboratory standards of water, water treatments in food industry – distillation, reverse osmosis, membrane filtration, deionization, ozonation, irradiation, activated charcoal, chemical treatment, technology and chemical constituents of bottled water

Unit II

Fruit based beverages– fruit juice, fruit drink, cordials, fruit nectars, squash, concentrates, fruit punch, carbonated fruit beverages. Processing of Fruit based beverages. Carbonated non – alcoholic soft drinks- ingredients and manufacturing.

Unit III

Alcoholic beverages: Starter cultures, Role of yeast, beer- raw materials, technology of brewing, Wine-technology of wine making, types of wine. Distilled spirits- whisky, rum, gin and brandy. Traditional alcoholic beverages: toddy, *chang*, *kaomak*, *takju*, *feni* and *madhuka*.

Unit IV

Coffee: bean processing, blending, roasting, grinding, brewing. Caffeine – effect on health. Decaffeinated coffee: methods of decaffeination, Instant coffee processing. Tea- types of tea, chemical constituents, harvesting, processing and packaging. Instant tea processing.

Unit V

Role of sweeteners, types of sweeteners-Sucrose, invert sugar, High fructose corn syrup, high glucose corn syrup, honey. Artificial sweeteners- types, effect on health, Food adjuncts- types, sources, fortified beverages, Packaging, labeling and storage considerations of beverages,

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 128: BEVERAGE TECHNOLOGY (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Processing of fruit juices – Mango, pineapple
2. Preparation of fruit cordials- lemon and orange
3. Preparation of concentrates- Grape and tomato
4. Preparation of coffee by different methods and comparing
5. Preparation of appetizers - tomato and corn soup
6. Visit to local beverage industry
7. Study on locally available traditional alcoholic beverages

Recommended Readings:

1. Text book of Food Science and Technology (2001) by Vijayakhader
2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
3. Chemistry and Technology of Soft Drinks and Fruit Juices (2nd Edition) by P. R. Ashurst.
4. Beverages: technology, chemistry and microbiology (1994) by A. Varnam, J.M. Sutherland
5. Food and Beverage Packaging Technology,(2011)Richard Coles
6. Functional and Speciality Beverage Technology (2009) by P Paquin

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 241: MICROBIAL GENETICS AND MOLECULAR BIOLOGY
(THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Structures of DNA and RNA / Genetic Material - DNA structure, Salient features of double helix, Types of DNA, denaturation and renaturation, topoisomerases; Organization of DNA Prokaryotes, Viruses, Eukaryotes. RNA Structure

Unit II

Replication of DNA - Bidirectional and unidirectional replication, semi- conservative, semi-discontinuous replication Mechanism of DNA replication: Enzymes and proteins involved in DNA replication –DNA polymerases, DNA ligase, primase, telomerase – for replication of linear ends.

Unit III

Transcription - Transcription: Definition, promoter - concept and strength of promoter. Transcriptional Machinery and Mechanism of transcription. Translation - Genetic code, Translational machinery, charging of tRNA, aminoacyl tRNA synthetases, Mechanisms of initiation, elongation and termination of polypeptides.

Unit IV

Regulation of gene Expression - Principles of transcriptional regulation, regulation at initiation with examples from lac and trp operons. Mutations - Mutations and mutagenesis: Definition and types of Mutations; Physical and chemical mutagens; Uses of mutations, DNA repair mechanisms.

Unit V

Mechanisms of Genetic Exchange - Transformation - Discovery, mechanism of natural competence Conjugation - Discovery, mechanism, Hfr and F' strains Transduction - Generalized transduction, specialized transduction. Plasmids and Transposable Elements. Property and function of plasmids, Types of plasmids. Prokaryotic transposable elements – Insertion Sequences, composite and non-composite transposons, Replicative and Non replicative transposition, Uses of transposons and transposition.

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SFT 227: MICROBIAL GENETICS AND MOLECULAR BIOLOGY (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Study of different types of DNA and RNA using micrographs and model / schematic representations
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Estimation of salmon sperm / calf thymus DNA using colorimeter (diphenylamine reagent) or UV spectrophotometer (A₂₆₀ measurement)
4. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
5. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).
6. Study the effect of chemical (HNO₂) and physical (UV) mutagens on bacterial cells.
7. Study survival curve of bacteria after exposure to ultraviolet (UV) light
8. Demonstration of Bacterial Transformation and calculation of transformation efficiency.

Recommended Readings:

1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication
2. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco
3. De Robertis EDP and De Robertis EMF (2006) Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia
4. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
5. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.
6. Krebs J, Goldstein E, Kilpatrick S (2013). Lewin's Essential Genes, 3rd Ed., Jones and Bartlett Learning
7. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India
8. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings
9. Maloy SR, Cronan JE and Friefelder D (2004) Microbial Genetics 2nd EDITION., Jones and Barlett Publishers
10. Russell PJ. (2009). i Genetics- A Molecular Approach. 3rd Ed, Benjamin Cummings

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 243: TECHNOLOGY OF SPICES (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Spices - Definition, Composition, classification. Spice production in India, role of spices in cookery, spice processing technology. Post processing treatment- steam sterilization, irradiation, chemical fumigation. Nutritive value of spices. Application in food systems

Unit II

Major spices –pepper, cardamom, chillies, ginger, turmeric composition, production, processing, uses, health benefits, active spice constituents. Minor spices –Asafoetida, ajwain, aniseed, bay leaves, caraway cinnamon, clove, coriander, cumin, fenugreek, garlic, nutmeg, mace, kokam, saffron- uses and active spice constituents.

Unit III

Value added products of different spices. Benefits of value added products. Primary and secondary functions of spices. Role of biotechnology in improvement of spice crops. Adulteration of spices. Economic uses of spices.

Unit IV

Technology of manufacturing spice extractives - oleoresins and oils, advantages and applications of spice extractives. Spice contaminants- harmful effects, preventive measures, decontamination techniques, sterilization of spices. Spoilage of spices-factors affecting spice spoilage, Preservation of spices.

Unit V

Packaging and storage of spices- packaging requirements, types and characteristics of packaging materials, labeling considerations of spice and spice products, storage stability. Quality control of spices, spice specific tests. Storage requirements of spice and spice products. Spice board of India.

B.Sc. (H) FOOD TECHNOLOGY II SEMESTER
SFT 229: TECHNOLOGY OF SPICES (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Testing for adulterants in spices
2. Processing of some spices
3. Extraction of various spices
4. Investigating the antimicrobial activity of various spices
5. Visit to commercial crop production and research centers
6. Value addition of spices

Recommended Readings:

1. Handbook of Herbs and Spices (2006) Volume 3 by K. V. Peter
2. Chemistry of Spices (2008) by V. A. Parthasarathy
3. Handbook on Spices & Condiments (Cultivation, Processing and Extraction) 2010 by H. Panda
4. The Complete Book on Spices & Condiments (2006) 2nd edition by NIIR Board
5. Cultivation of Spice Crops (2005) by Azhar Ali Farooqi

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 242: GENETIC ENGINEERING AND BIOTECHNOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction to genetic engineering and biotechnology, restriction modification systems: mode of action, applications of type II restriction enzymes in genetic engineering, DNA modifying enzymes and their applications: DNA polymerases. terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases cloning: use of linkers and adaptors, transformation of DNA electroporation, methods of dna, rna and protein analysis

Unit II

Vectors: Cloning Vectors: Definition and Properties Plasmid vectors: pBR and pUC series Bacteriophage lambda and M13 based vectors Cosmids, BACs, YACs Expression vectors: E.coli lac and T7 promoter-based vectors, yeast YIp, YE_p and YC_p vectors, Baculovirus based vectors, mammalian SV40-based expression vectors

Unit III

DNA Amplification and DNA sequencing: Basics of PCR, RT-PCR, Real-Time PCR Genomic and cDNA libraries: Preparation and uses, Genome sequencing Sanger's method of DNA Sequencing: traditional and automated sequencing

Unit IV

Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viralmediated delivery, Agrobacterium - mediated delivery Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hGH, antisense molecules. Bt transgenic - cotton, brinjal, flava savo tomato, Gene therapy, recombinant vaccine, protein engineering

Unit V

Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions. Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 228: GENETIC ENGINEERING AND BIOTECHNOLOGY
(PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Isolation of Plasmid DNA from E.coli
2. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis
3. Ligation of DNA fragments
4. Interpretation of sequencing gel electropherograms
5. Designing of primers for DNA amplification
6. Amplification of DNA by PCR
7. Demonstration of Southern blotting

Recommended Readings:

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
4. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press
5. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 244: BIOETHICS AND BIOSAFETY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions. Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

Unit II

Entrepreneurship: Selection of a product, line, design and development processes, economics on material and energy requirement, stock the product and release the same for making etc. The basic regulations of excise: Demand for a given product, feasibility of its production under given constraints of raw material, energy input, financial situations export potential etc.

Unit III

Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

Unit IV

Biosafety– Introduction to biosafety and health hazards concerning biotechnology. Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

Unit V

Forensic science: e.g. solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods of DNA finger printing.

Health: e.g. development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics, monoclonal in E.coli, human genome project.

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 230: BIOETHICS AND BIOSAFETY (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Proxy filing of Indian Product patent
2. Proxy filing of Indian Process patent
3. Planning of establishing a hypothetical biotechnology industry in India
4. A case study on clinical trials of drugs in India with emphasis on ethical issues.
5. Case study on women health ethics.
6. Case study on medical errors and negligence.
7. Tracking plagiarism (Demo).

Recommended Readings:

1. Kaplan JM Patterns of Entrepreneurship.
2. Gupta CB, Khanka SS. Entrepreneurship and Small Business Management, Sultan Chand & Sons.
3. Entrepreneurship: New Venture Creation : David H. Holt
4. Patterns of Entrepreneurship : Jack M. Kaplan
5. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka, Sultan Chand & Sons.
6. Sateesh MK (2010) Bioethics and Biosafety, I. K. International Pvt Ltd.
7. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers

B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 341: FOOD PACKAGING (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Packaging functions and Requirements, printing of packages. Barcodes and other marking, Labeling Laws. Paper and paper-based materials, corrugated fiber board (CFB). Plastics, formation- molding, types of plastics, biodegradable plastics, edible packaging, environmental concerns.

Unit II

Metal packaging- Metals: Tinfoil, tinning process, components of tinfoil, tin free can (TFC) types of can, metallic films, lacquers Glass: Composition, Properties, Methods of bottle making, and types of closures.

Unit III

Package design for fresh horticultural produce and animal foods, dry and moisture sensitive foods, frozen foods, fats and oils, thermally processed foods and beverages.

Unit IV

Testing Procedures for Packaging Materials- thickness, tensile strength, puncture resistance, bursting strength, seal strength, water vapor permeability, CO₂ permeability, oxygen permeability, grease resistance, Testing Procedures for Packaged Foods - Compatibility and shelf life studies, evaluation of transport worthiness of filled packages. Food Packaging Laws and Regulations.

Unit V

Bottling machines, Cartoning systems, Seal and Shrink packaging machine; Form, Fill and Sealing machine (FFS). Vacuum, Controlled and Modified atmosphere packaging systems; Aseptic packaging systems; Retort packaging, Active and Intelligent packaging systems.

**B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 325: FOOD PACKAGING (PRACTICAL)**

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Testing of physical/mechanical properties of food packaging material.
2. Testing of thermal shock resistance of glass.
3. Gas/Vacuum packaging of foods and shelf life studies.
4. Determination of Water Vapor Transmission rate of Packaging Material.
5. Edible packaging of Food Samples.
6. Study of Sorption Isotherm for Food Package Design.
7. Packaged food cut-out analysis.
8. To study the operation of FFS machine.

Recommended Readings:

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

B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 343: FERMENTATION TECHNOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction to fermentation processes, microorganisms used in food fermentation. Isolation, primary and secondary screening methods. Preservation and strain improvement methods

Unit II

Design of fermentor, types of fermentors: maintenance of aseptic conditions, instrumentation control, physical and chemical environment sensors, control of various physical parameters; fermentation economics.

Unit III

Industrial media formulation; substrates for fermentation – carbon and nitrogen sources; antifoams; sterilization; inoculums development, Types of fermentations- batch, continuous, dual or multiple fermentations. Solid state, surface, submerged fermentations, scale up.

Unit IV

Industrial production: Industrial production of enzymes, proteolytic enzymes, pectinases, amylases, organic acids – acetic acid, lactic and citric acid. Production of vitamins (Vitamin B2, Vitamin B12), Baker's yeast, yoghurt.

Unit V

Immobilization technology. Downstream processing- solid-liquid separation, Release of intracellular products, concentration, recovery and purification. Computer applications in fermentation technology.

B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 327: FERMENTATION TECHNOLOGY (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Design of fermentor
2. Screening for amylase production.
3. Screening for organic acid production by crowded plate technique
4. Screening of antibiotic producing microorganisms.
5. Isolation of yeasts from grapes.
6. Production of Wine
7. Production and estimation of Ethanol

Recommended Readings:

1. Industrial Microbiology (1984) by A.H. Patel.
2. Prescott and Dunn's Industrial Microbiology (2004) by G. Reed.
3. Solid State Fermentation in Biotechnology (2009) by Ashok Pandey.
4. Industrial Microbiology (2002) by Waites.
5. Biotechnology: A Text Book of Industrial Microbiology (1991) by Cruger and Cruger.
6. Principles of Fermentation Technology (2008) by Stanbury.
7. Microbial Technology: Microbial Processes (2009) by H. J. Peppler.

B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 345: CLINICAL NUTRITION (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Therapeutic diet-Principles of diet therapy. Factors to be considered during meal planning. Therapeutic modification of normal diet, assessment of patient needs, special feeding methods-tube feeding, parenteral feeding. Nutrition counseling, Risk factors of different nutritional and metabolic disorders.

Unit II

Dietary management- Diabetes mellitus – etiology, prevalence, risk factors, symptoms, classification, diagnosis, complications, insulin. Obesity- etiology, types, theories, assessment, risk factors, complications, dietary and non- dietary treatment. Underweight- etiology, dietary modifications.

Unit III

Anatomy and functions of gastro intestinal tract, common gastro intestinal disorders – dyspepsia, diarrhoea, peptic ulcers, constipation- etiology symptoms and dietary treatment. Structure and functions of liver. Liver disorders - hepatitis, cirrhosis and hepatic coma- etiology, symptoms, diagnosis and dietary management

Unit IV

cardiovascular system components, Anatomy and functions of heart, cardiovascular diseases: etiology, prevalence, modifiable and non-modifiable risk factors, symptoms, diagnosis, medications, Dietary management in atherosclerosis, hypertension, myocardial infarction.

Unit V

Anatomy and functions of kidneys- symptoms, etiology, diagnosis Dietary management of kidney and urinary tract: Nephritis, renal calculi. Etiology, symptoms and dietary management – Anaemia, Inborn errors of metabolism- phenylketonuria, galactosemia, Lactose intolerance.

**B.Sc. (H) FOOD TECHNOLOGY V SEMESTER
SFT 329: CLINICAL NUTRITION (PRACTICAL)**

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Formulating diet for preschool going children (2-5 years).
2. Planning high protein diets
3. Planning low fat and low caloric diets.
4. Planning and preparation of high fibre diets.
5. Planning diet for diabetic mellitus
6. Planning diet for cardio vascular disease
7. Planning diet for anemia
8. Formulation of antioxidant rich foods

Recommended Readings:

1. Dietetics (2007) by B. Srilakshmi.
2. Nutrition and Diet Therapy (2005) by S.R.Williams.
3. Text Book of Human Nutrition (2010) by Bamji
4. Essentials of Human Nutrition (2007) by A.S.Truswell.
5. Advancing Dietetics and Clinical Nutrition (2011) by A. Payne and H.M.Barker.

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 342: INSTRUMENTATION FOR FOOD ANALYSIS (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Principles and applications of chromatographic techniques: paper chromatography, thin layer chromatography, gel filtration, ion-exchange chromatography, affinity chromatography, gas chromatography, high performance liquid chromatography, fast protein liquid chromatography.

Unit II

Principles and concepts of electrophoretic techniques: native polyacrylamide gel electrophoresis (PAGE), sodium dodecyl sulphate-PAGE, agarose gel electrophoresis, capillary electrophoresis, isoelectric focusing and two dimensional, pulse field and diagonal electrophoresis.

Unit III

Principles and applications of UV-visible, infrared, fluorescence spectroscopy, AAS, ESR, NMR. Principles and applications of preparative and analytical ultracentrifuges.

Unit IV

FTIR, XRF, Differential Scanning Calorimetry, XRD, SEM, TEM, water activity meter, textural analyzer, biosensors, nitrogen analyzers

Unit V

Detection and measurement of radioactivity. Radioactive and non-radioactive tracer techniques and their applications in the field of biological sciences. Principles of electrochemical techniques –operation and applications of pH, oxygen, ion-selective and gas sensing electrodes.

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 326: INSTRUMENTATION FOR FOOD ANALYSIS (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Separation and identification of sugars using paper chromatography
2. Separation and identification of sugars using thin layer chromatography
3. Separation and identification of amino acids using paper chromatography
4. Estimation of DNA concentration by Diphenylamine method
5. Estimation of RNA concentration by Orcinol method
6. Separation of proteins by SDS-PAGE

Recommended Readings:

1. Principles and Techniques of Biochemistry and Molecular Biology (7th edition) by K. Wilson and J. Walker.
2. A Biologists guide to Principles and Techniques of Practical Biochemistry (3rd edition) by B.D. Williams.
3. Biophysical Chemistry: Principles and Techniques (2010) by Upadhyay, Upadhyay and Nath.

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SFT 344: FOOD SAFETY AND HYGEINE (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Introduction to Food Safety – Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods, Food Hazards of Physical and Chemical Origin – Introduction, Physical Hazards with common examples, Chemical Hazards (naturally occurring ,environmental and intentionally, added), Packaging material as a threat, Impact on health, Control measures

Unit II

Food Hazards of Biological Origin – Introduction, Indicator Organisms, Food borne pathogens: bacteria, viruses and eukaryotes, Seafood and Shell fish poisoning, Mycotoxins. Management of hazards – Need, Control of parameters, Temperature control, Food storage

Unit III

Hygiene and Sanitation in Food Service Establishments – Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste Disposal, Pest and Rodent Control, Personnel Hygiene

Unit IV

Food Safety Management Tools - Basic concept, Prerequisites- GHPs ,GMPs, HACCP, ISO series, TQM - concept and need for quality, components of TQM, Kaizen, Risk Analysis, Accreditation and Auditing

Unit V

Microbiological criteria - Microbiological standards and limits (for processed food, water), Sampling, Basic steps in detection of food borne pathogens, Water Analysis Food laws and Standards - Indian Food Regulatory Regime, Global Scenario, Recent concerns - New and Emerging Pathogens, Genetically modified foods\Transgenics, Organic foods, Newer approaches to food safety.

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 328: FOOD SAFETY AND HYGEINE (PRACTICAL)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

1. Preparation of different types of media (complex, differential and selective)
2. Enumeration of aerial microflora using PDA
3. Identification of Molds by lactophenol blue staining
4. Negative Staining
5. Microbiological Examination of food
6. Bacteriological Analysis of Water by MPN method
7. Assessment of surface sanitation by swab and rinse method
8. Assessment of personal hygiene

Recommended Readings:

1. Lawley, R., Curtis L. and Davis,J. The Food Safety Hazard Guidebook , RSC publishing, 2004
2. De Vries. Food Safety and Toxicity, CRC, New York, 1997
3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985
4. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, Oxford, 2000Forsythe,S.J.The Microbiology of Safe Food , second edition, Willey- Blackwell,U.K.,2010
5. Mortimore S.and Wallace C.HACCP,A practical approach, Chapman and Hill,London,1995
6. Blackburn CDW and Mc Clure P.J.Food borne pathogens. Hazards, risk analysis & control.CRC Press, Washington,U.S.A, 2005.

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 346: BAKERY AND CONFECTIONARY TECHNOLOGY (THEORY)

Hours per week: 4
Credits: 4

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Bakery industry: Current status, growth rate, and economic importance. Product types, nutritional quality and safety of products, pertinent standards & regulations. Bread, buns and pizza base: Ingredients & processes for breads, buns, pizza base, equipments used, product quality characteristics, faults and corrective measures. Cakes: Ingredients & processes for cakes, Equipments used, product quality characteristics, faults and corrective measures. Different types of icings.

Unit II

Biscuits, cookies & crackers: Ingredients & processes, Equipments used, product quality characteristics, faults and corrective measures. Modified bakery products: Modification of bakery products for people with special nutritional requirements e.g. High fibre, low sugar, low fat, gluten free bakery products. Breakfast cereals, macaroni products and malt: Production and quality of breakfast cereals, macaroni products and malt.

Unit III

Chocolate processing - Different steps involved in chocolate processing - Ingredients, mixing, refining. General technical aspects of Industrial sugar confectionery, composition effects, changes, change of state.

Unit IV

Boiled sweets - classification - Ingredients used in the preparation - Caramel, toffee and fudge – Processing. Processing of liquorice paste, cream paste and aerated confectionery products - Ingredients- their function - Ingredients and Processing. Tablets, Lozenges, Sugar pan ni ng tablets, Granulated confectionery, medicated confectionery - Ingredients and Processing.

Unit V

Chewing gums, fondants, Marzipan - Ingredients & Processing. Crystallized confectionery - Processing - Ingredients and their functions. Quality and standards/regulations to be followed in the confectionery Industry and packaging requirements

B.Sc. (H) FOOD TECHNOLOGY VI SEMESTER
SFT 330: BAKERY AND CONFECTIONARY TECHNOLOGY (PRACTICAL)

Hours per week: 3

End Examination: 60 Marks

Credits: 2

Sessionals: 40 Marks

1. Preparation of sponge cake with icing and assessment of its quality.
2. Preparation of biscuits and assessment of quality
3. Determine the effect of heat on sugar solution and perform the thread and cold water test.
4. To study the process of inversion, melting and caramelization in sucrose.
5. Preparation of *Shakarpara* and *Chhana murki*.
6. Preparation of bread and assessment of its quality

Recommended Readings:

1. Basic Baking 5th Ed. Dubey, S.C. (2007). Chanakya Mudrak Pvt. Ltd.
2. Industrial Chocolate Manufacture. Beckett S.T. (2009), Blackwell Publishing Ltd.
3. Chocolate, Cocoa and Confectionary, Minifie B.W. (1999). Aspen Publication.
4. Text book of Food Science and Technology. Vijaya khader.. ICAR
5. Bakery Technology and Engineering. Samuel A. Matz (1999)., PAN-TECH International Incorporated.

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SSE 283: FUNCTIONAL FOODS AND NUTRACEUTICALS

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Functional foods and Nutraceuticals -Definitions, sources, Health benefits, bioactive components of functional foods. Development of functional foods, challenges and safety considerations, Future trends of functional foods. Dietary supplements and fortified foods- need, health benefits adverse effects

Unit II

Functional foods of animal origin: Dairy products, sea foods, egg, Functional foods of plant origin: fruits, vegetables, nuts, spices, cereals, beverages. Probiotics, prebiotics and synbiotics as functional foods, Effects of probiotics on health.

Unit III

Types of functional foods: whole foods, enriched foods, enhanced foods, fortified foods, modified foods. Market of functional foods, Challenges for Functional food delivery, Factors affecting consumer interest.

Unit IV

Diet and disease relationship – nutrition and health claims, Food component – approved health claims, labeling considerations for functional ingredients, Permissible and impermissible functional claims, Role of biotechnology in the development of functional foods.

Unit V

Nutraceutical compounds – Phytochemicals, phytosterols and other bioactive compounds, peptides and proteins, carbohydrates, prebiotics, probiotics and synbiotics, lipids, vitamins and minerals; their sources and role in promoting human health.

Recommended Readings:

1. Text Book of Human Nutrition (2010) by Bamji
2. Handbook of Nutraceuticals and Functional Foods, Second Edition Robert E C Wildman
3. Functional Foods and Nutraceuticals 2012 Rotimi E. Aluko
4. Functional Foods: Principles and Technology (2009) Mingro Guo CRC
5. Functional Foods: Designer Foods, Pharmafoods, Nutraceuticals I. Goldberg

B.Sc. (H) FOOD TECHNOLOGY III SEMESTER
SSE 293: MATHEMATICS FOR LIFE SCIENCES (THEORY)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Trigonometry: Measurement of angles, Trigonometric ratios, Trigonometric identities, Trigonometric ratios of compound angles

Unit II

Trigonometry: Trigonometric ratios of multiple and Sub-multiple angles, Transformations, Inverse trigonometric functions (Definitions only), Hyperbolic Functions (Definitions only)

Unit III

Limits and Continuity: Limit of a function, Standard Limits, Indeterminate forms, Continuity of a function

Unit IV

Differentiation: Derivability of a function, Derivatives from first principles, Derivatives of trigonometric functions, Product rule, Quotient rule, Derivative of Inverse function and Inverse trigonometric functions, Derivative of Hyperbolic and Inverse Hyperbolic functions, Derivatives of functions defined by means of a parameter, Differentiation of a function with respect to another function, Implicit differentiation, Logarithmic differentiation, Transformation

Unit V

Integration: Definition, Methods of integration- Integration by substitution, Integration by parts,

Integration of rational function of the form $\frac{1}{ax^2 + bx + c}$

Recommended Readings:

1. “New Intermediate Mathematics Volume I for Junior Intermediate” by V. Venkateswara Rao, N. Krishna Murthy, B.V.S.S. Sarma; S. Chand & Company Ltd.
2. “New Intermediate Mathematics Volume II for Senior Intermediate” by V. Venkateswara Rao, N. Krishna Murthy, B.V.S.S. Sarma ; S.Chand & Company Ltd.

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SSE 288: ENTREPRENEURSHIP DEVELOPMENT

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Meaning, Need and Importance of Entrepreneurship, Promotion of entrepreneurship, Factors influencing entrepreneurship, Features of a successful Entrepreneurship.

Unit II

Forms of Business Organization, Project Identification, Selection of the product, Project formulation, Assessment of project feasibility.

Unit III

Importance of finance / loans and repayments, Characteristics of Business finance, Fixed capital management: Sources of fixed capital, working capital its sources and how to move for loans, Inventory direct and indirect raw materials and its management. Funding agencies-MSME. Export council of India.

Unit IV

Meaning and Importance, Marketing-mix, product management – Product line, Product mix, stages of product life cycle, marketing Research and Importance of survey, Physical Distribution and Stock Management.

Unit V

Meaning of International business, Selection of a product, Selection of a market for international business, Export financing, Institutional support for exports.

Recommended Readings:

1. Holt DH. Entrepreneurship: New Venture Creation.
2. Kaplan JM Patterns of Entrepreneurship.
3. Gupta CB, Khanka SS. Entrepreneurship and Small Business Management
4. Vasant Desai (2012) Fundamentals of Entrepreneurship and Small Business Management,
5. Vasant Desai (2011) The Dynamics of Entrepreneurial Development and Management,
6. D. David and S Erickson (1987) Principles of Agri Business Management

B.Sc. (H) FOOD TECHNOLOGY IV SEMESTER
SSE 290: PROBABILITY AND STATISTICS (THEORY)

Hours per week: 3
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

Unit I

Statistics: collection of data, classification of data, graphical representation of data, measures of central tendency-mean, median and mode; measures of dispersion-range, mean deviation, standard deviation and variance

Unit II

Probability: Definition, Addition theorem, Multiplication theorem, Conditional probability, Bayes's theorem (definitions only, no proofs). Theoretical distributions: Random variables, Mean and variance, Binomial distribution, Poisson distribution, Normal distribution (simple problems on the above topics).

Unit III

Correlation and regression, rank correlation, curve fitting, method of least squares- fitting of other curves straight line, parabola, $y = ax^b$, $y = ae^{bx}$

Unit IV

Sampling: objectives of sampling, sampling distribution, testing of hypothesis, null hypothesis, level of significance, Test of significance for large samples, comparison of large samples. Test of significance of means of two large samples.

Unit V

Sampling of variables – small samples, students 't' distribution, properties of t-distribution. Significance test of sample mean, significance test of difference between sample means. Chi –square test – properties of Chi square distribution – 'F' distribution, ANOVA (one way classification)

Recommended Readings:

1. Engineering Maths by Dr. B. S. Grewal, Khanna Publications
2. Engineering Mathematics by B. V. Ramana, Third Edition, Tata Mc.Graw Hill
3. S. C. Gupta and V. K. Kapoor, S. Chand and Company Ltd.
4. Fundamentals of Biostatistics, Khan and Khanum UKAAZ Publications.