



Jayoti Vidyapeeth Women's University Jaipur (Rajasthan)

**Faculty of Education & Methodology
Department of Food and Biotechnology**

Curriculum as per NEP 2020

**CURRICULUM FRAMEWORK FOR
FOUR-YEAR UNDER GRADUATE PROGRAM IN FOOD AND BIOTECHNOLOGY
(B.TECH FBT WITH 04 YEARS DURATION)**

**Program Name: B.TECH FBT
Duration: 04 YEARS**

LEVEL 6

**With Effect from
Academic Session 2023-2024**



National Educational Policy 2020:

The approval of the National Education Policy (NEP) by the Ministry of Human Resource Development, Government of India has been well deliberated the NEP is designed to contemplate the current skill requirements. The Indian education system with its earlier policies on education has greatly led to creation of fragmented system of education. However, bringing the whole system into one large umbrella remains a key issue. The current NEP has attempted to cure the same by getting rid of standalone institutions and institutions of affiliated nature and proposed formation and up gradation of institutions to offer multidisciplinary education. Multidisciplinary education system with inbuilt flexibility for both undergraduate as well as post graduate and research level is a key highlight of the NEP. It focuses on promoting and building vocational skills/skill enhancement courses, right from the school level, which can ease the burden on the employment opportunities and supply of proficient/talented workforce. As the experts rightly put it as the syllabi which academia develops should be student centric rather than teacher centric, which used to be so far. As already the Union Cabinet has approved the NEP 2020, it aims to pave way for transformational reforms in higher education systems in the country. This policy will replace the 34- year-old National Policy on Education (NPE), 1986.

Vision of the National Education Policy 2020

- An education system that contributes to an equitable and vibrant knowledge society, by providing high-quality education to all.
- Develops a deep sense of respect towards the fundamental rights, duties and Constitutional values, bonding with one's country, and a conscious awareness of one's role and responsibilities in a changing world.
- Instills skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen.

This National Education Policy 2020 is the first education policy of the 21st century and aims to address the many growing developmental aspirations of our country. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirations & goals of 21st century education, including SDG4, while building upon India's traditions and value systems. NEP aims for India to have an education system by 2040 that is second to none, with equitable access to the highest-quality education for all learners regardless of social or economic background and seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030." The whole of the NEP policy is a medication to cure the shortcomings in the education system for the last 35 to 36 years. The failure or success of the NEP will rely completely on the implementation and its acceptance by the stakeholders. For which we need to join hands in strengthening the system.



EXECUTIVE SUMMARY

Higher Education is a vital contributor for Economic Development of the nation. It plays a major role in improving human well-being and developing Indian Economy, since it serve as a center for developing ideas and innovations. The Sustainable Development Goal 4 (SDGs4) also advocates the quality of education, which seeks to “ensure inclusive and equitable quality education and promotes lifelong learning opportunities for all” by 2030 for Inclusive Economic Development. **Jayoti Vidyapeeth Women’s University, Jaipur** proposed an idea of developing a Curriculum Framework based on New Education Policy guidelines for both Undergraduate and Postgraduate programs across the faculty disciplines Department of Food and Biotechnology has adopted the Curriculum Framework for Four-Year under Graduate Program in Food and Biotechnology , B.TECH FBT given by the NEP Curriculum .



Need for Curriculum Development

As per the National Education Policy initiatives, it is intended to formulate Curriculum to eliminate the disparities among the students studying in different Universities/Institutes. In addition to above the Members of the Committee also identified the need for the Development of Curriculum framework for Commerce Education:

1. **Indian Business Environment:** Due to LPG of Indian Economy, industry has undergone a lot of changes, growing MSME sector and Khadi & Village Industries, Non-profit and Social Enterprises, Emerging Entrepreneurship, State and Central Government initiatives, there are lot of opportunities for young people, the Curriculum helps the students to explore and utilize the opportunities created by the present business environment.
2. **Credit Disparities:** The Choice Based Credit System is not introduced in true sense as well there is credit disparity from one University to another/One Institute to another. To remove this credit disparities, which was burdening the students, Curriculum Framework is developed, which helps the BOS of the Universities/Institutes to develop their own Scheme of Teaching and Evaluation as per the Curriculum Credit Framework.
3. **Program Learning Outcomes (PLOs) and Sustainable Development Goals (SDGs):** In the New Curriculum, the courses would be mapped to identify their contribution towards PLOs and SDGs, which in turn help Universities/Institutes in their Accreditation and Ranking.
4. **Skill Development Courses:** The focus of existing Master Programs in Commerce is less on skill development. The New Curriculum has given more emphasis for the skill development by considering the need of the Fourth Industrial Revolution components namely Automation, Digital platforms, AI, Block Chain Technology, IOT, Spread Sheet, Analytics etc., which enables the students to acquire the specialized skills and applied competencies in the field of Commerce and Business.
5. **Discipline Specific Electives:** The existing Programs in Commerce in many Universities/Institutes have limited number of Discipline Specific Electives and these are almost like core courses, hence wider choice of elective courses are proposed to introduce in the New Curriculum Framework.
6. **Multidisciplinary Courses:** New Curriculum helps the students to choose the courses of their choice from other streams/across faculty. Therefore, students will be capable of making a positive contribution to Commerce, Trade and Industry in the national and global context by drawing the knowledge from the different disciplines, which is socially desirable.



Outcomes of the Program

In addition to Conventional Time-Tested Lecture Method, the Members of the Curriculum Development suggest the following approaches:

Program Outcome:

At the end of the Bachelor of Technology in Food and Biotechnology (B. Tech. FBT) Program, graduates will be able to

- P01-** Graduates of the course will have strong background in the interface of modern biology and advanced food technology and be able to use these tools in industry and/or institutes wherever necessary.
- P02-** Graduates of the course will function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in food and Biotech industries.
- P03-** Graduates will identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of natural sciences and engineering sciences.
- P04-** Graduates of the course will design solutions with appropriate consideration for public health and safety and environmental considerations.
- P05-** Graduate will able to generate, select, and relate suitable techniques, assets, and current engineering and IT tools counting prophecy and modelling to compound engineering activities related to Food and Biotechnology.



Guidelines for Continuous Assessment and Semester End Examination

The Members of the BOS Committee deliberated on the framework of Continuous Assessment as well Semester End Examination for the courses. The CA and End Term Examination will carry 30% and 70% weight age each, to enable the course to be evaluated for a total of 100 marks, irrespective of its credits. The evaluation system of the course is comprehensive & continuous during the entire period of the Semester. For a course, the CA and End Term Examination will be on the following parameters:

Sr.No.	Parameters for the Evaluation	Marks
1.	Internal Assessment	15 Marks
2.	Continuous Assessment	15 Marks
2.	Semester End Examinations	70 Marks
	Total	100Marks

Continuous Assessment: The CA will carry a maximum of 15% weight age (15 marks) of total marks of a course.

- i. Individual Assignments
 - ii. Seminars/Class Room Presentations/ Quizzes
 - iii. Group Discussions /Class Discussion/ Group Assignments
 - iv. Case studies/Case lets
 - v. Participatory & Industry-Integrated Learning/ Filed visits
 - vi. Practical activities / Problem Solving Exercises
 - vii. Participation in Seminars/ Academic Events/Symposia, etc.
 - viii. Mini Projects/Capstone Projects
 - ix. Any other academic activity
- b. Internal Assessment Tests :The test will carry a maximum of 15% weightage (15 marks) of total marks of a course, under this component,

(Internal Test followed by Continuous Assessment has to be conducted in a semester for 30 marks each and the same is to be scaled down to 30 marks. Standard format is given below.



Template for Internal Assessment Test

Internal Assessment Test Bachelor of Technology (B.TECH FBT)

Course Code:
Duration: 1 Hour

Name of the Course:
Total Marks: 30

SECTION-A

I. Answer any two of the following questions. Questions are asked on Remembering.
(4 x 2= 8)

- 1.
- 2.
- 3.

SECTION- B

II. Answer any two of the following questions. Questions are asked on Understanding and Applying.
(2 x5= 10)

- 4.
- 5.
- 6.

SECTION- C

III. Answer any one of the following questions. Questions are asked on analyzing and evaluating.
(1*12=12)

- 7.
 - 8.
-

II. Semester End Examination:

The Semester End Examination for all the courses for which students who get registered during the semester shall be conducted. End Term Examination of the course shall be conducted after fulfilling the minimum attendance requirement as per the University norms. **Jayoti Vidyapeeth Women's University** BOS Committee for B.TECH FBT has suggested the following Framework for End-Examination.



Proposed Model Question Paper for Semester End Examination
Semester B.TECH FBT. Examination, Month/Year
(New Syllabus 2023-24)

Paper: _____

Time: 3 Hours

Max. Marks: 70

SECTION-A

1. Answer any Six of the following questions. Each Question Carries 2 Marks

(6x 3= 18)

- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.

SECTION- B

Answer any four of the following questions. Each question carries 4 marks

(4 x4= 16)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

SECTION- C

Answer any three of the following questions. Each question carries 12 marks

(3x12=36)

- 7.
- 8.
- 9.
- 10.
- 11.



Learning Outcome Based Curriculum Framework

Program Specific Outcome:

PS01: The student will be able to apply facts of food and biotechnology with detailed command of Food Technology and Biotechnology disciplines which facilitate them to comprehend the budding techniques and complex food and Biotech engineering conceptions.

PS02: Students will have capability to obtain expertise in solving engineering troubles associated to current food and biotechnology area/industries along with focus on the significance of food safety and sanitation of healthy processed food and Biotechnological approaches.

PS03: Students will have capacity to work in the field of Food technology and Biotechnology in private or government organizations and research sectors to design or process food products and biotechnology tools as per the requirements and qualifications.



Intended Learning Outcomes

After successful completion of this program B. Tech. FBT; learner will have acquired knowledge from basic concepts to advanced Technologies in Food and Biotechnology. Student will be able to handle and perform all the techniques and instrumentation part related to Food and Biotechnology. Students will also be skilled to handle research based problems as they will be experienced with Research based projects and Dissertation. Students will be able to work as an individual in multidisciplinary units of food and Biotech industries upon successfully completing their studies. Students will also be focused in higher studies based on Research and Development as this program develops student as innovative researcher too.

i. Generic Skills

Graduates of the degree will have the capacity to

- Work individually and collaboratively in team with productivity for Food and Biotechnology.
- Use basic research and statistical tools of analysis independently.
- Apply significant and diagnostic skills and research methods to identification, evaluation and innovative findings of research problems related Food and Biotechnology.
- Engage confidently in self-directed study and research.
- Communicate ideas effectively in research/ industry of Food and Biotechnology.
- Operate effectively in multicultural and diverse environments.
- Be proficient in the use of appropriate information and communication technologies.
- Critically evaluate new ideas, research findings and methodologies in Food and Biotechnology field.
- Recognize and understand the ethical responsibilities of individuals and organizations in society and capable of resolving ethical issues.

ii. Graduate Attributes

Bachelor of Technology in Food and Biotechnology (B. TECH. FBT) graduates will have the following attributes and skills

(A) Academically admirable

- (1) Analysis and evaluation of evidence in the Food and Biotechnology disciplines in support of solution to problems in Food and Biotechnology Field.
- (2) Strategic and critical thinking in relation to Food and Biotechnology business issues.

(B) Research related Skills



- (3) The retrieval of information from variety of Research areas in Food and Biotechnology.
- (4) Problem solving nature development through the application of appropriate and relevant theories, principles and Methodologies.
- (5) Skilled in All techniques and Processing methods related to Food and Biotechnology through Practical exposure, Minor projects and Dissertation.

C) Familiar to cultural diversity

- (6) Aware of Cultural difference and able to account for these in developing solutions to Food and Biotechnology related problems.

D) Vigorous global citizens

- (7) Effective communicators on matters related to Food and Biotechnology.
- (8) Participants in Conference, Workshops on national and international level with their relative topics of Food and Biotechnology.

E) Leaders in communities

- (9) Effective decision makers in their corporate/ Research Field through meaningful and impactful community engagement practices.
- (10) Ethical and collegial in professional practice.



PROGRAM STRUCTURE

Teaching & Evaluation for B. Tech. FBT with Food and Biotechnology as Core subject

B. Tech. FBT										
S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	End Term	CA	Total Marks	Credits
						(L + T + P)				
1	6	I	UF-BT-018	Fundamentals of Biotechnology	Major	(3+0+0)	70	30	100	3
2	6	I	UF-BT-019	Fundamentals of Biotechnology Labs	Major	(0+0+2)	35	15	50	2
3	6	I	UF-BT-101	Introduction to food technology	Major	(3+0+0)	70	30	100	3
4	6	I	UF-BT-105	Biomolecules	Minor	(2+0+0)	70	30	100	2
5	6	I	UF-BT-104	Biomolecules Lab	Minor	(0+0+2)	35	15	50	2
6	6	I	UF-BT-102	Basics of Biosciences	Minor	(2+0+0)	70	30	100	2
7	6	I	UF-BT-103	Basics of Biosciences Lab	Minor	(0+0+2)	35	15	50	2
8	6	I	UF-BT-020	Fundamentals Of Chemistry	Multi Disciplinary Course	(2+0+0)	70	30	100	2
9	6	I	UF-BT-021	Fundamentals Of Chemistry Lab	Multi Disciplinary Course	(0+0+2)	35	15	50	2
10	6	I	SEC-001	Hands on Training Courses on-Fruits and Vegetable dehydration techniques	Skill Enhancement courses (SEC)	(1+0+2)	70	30	100	3
Sub Total						13+0+10	530	240	800	23



S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	End Term	CA	Total Marks	Credits
						(L + T + P)				
1	6	II	UF-BT-120	Fundamentals of microbiology	Major	(2+0+0)	70	30	100	2
2	6	II	UF-BT-123	Fundamentals of microbiology Lab	Major	(0+0+2)	35	15	50	2
3	6	II	UF-BT-126	Unit operations in Food Industry	Major	(2+0+0)	70	30	100	2
4	6	II	UF-BT-127	Unit operations in Food Industry Lab	Major	(0+0+2)	35	15	50	2
5	6	II	UF-BT-122	Fundamentals of Food Science & Technology	Major	(3+0+0)	70	30	100	3
6	6	II	UF-BT-121	Fundamentals of Food Science & Technology Lab	Major	(0+0+2)	35	15	50	2
7	6	II	UF-BT-117	Cell biology	Minor	(3+0+0)	70	30	100	3
8	6	II	UF-BT-118	Cell biology Lab	Minor	(0+0+2)	35	15	50	2
9	6	II	SEC-002	Hands on Training Courses-Quality Analysis of Food Products	Skill Enhancement courses (SEC)	(1+0+2)	70	30	100	3
10	6	II	UMC-001	Women Rights & Law	UMC	2+0+0	GRADE BASED			2
11	6	II	UMC-005	Gow Gyan Science	UMC	2+0+0				2
12	6	II	UMC-007	Community Development Activities	CDA	2+0+0				2
13	6	II	ECA-001	Extra curriculum activities	ECA	2+0+0				2
14	6	II	UF-BT-033	Industrial Visit	Skill Enhancement courses (SEC)					-
Sub Total						19+0+10	490	210	700	29

Students exiting the programme after securing 40 credits will be awarded UG Certificate in the relevant Discipline /Subject provided they secure 4 credits in work based vocational courses offered during internship in addition to 6 credits from skill-based courses earned during first and second semester.



S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	6	III	UF-BT-046	Molecular Biology	Major	(2+0+0)	70	30	100	2
2	6	III	UF-BT-047	Molecular Biology Lab	Major	(0+0+2)	35	15	50	2
3	6	III	UF-BT-044	Metabolism and Bioenergetics	Major	(2+0+0)	70	30	100	2
4	6	III	UF-BT-045	Metabolism and Bioenergetics Lab	Major	(0+0+2)	35	15	50	2
5	6	III	UF-BT-050	Technology of Milk & Milk Products	Major	(2+0+0)	70	30	100	2
6	6	III	UF-BT-051	Technology of Milk & Milk Products Lab	Major	(0+0+2)	35	15	50	2
7	6	III	UF-BT-048	Principles of Food Preservation	Major	(2+0+0)	70	30	100	2
8	6	III	UF-BT-049	Principles of Food Preservation Lab	Major	(0+0+2)	35	15	50	2
9	6	III	UF-BT-041	Food Microbiology & Safety	Major	(2+0+0)	70	30	100	2
10	6	III	UF-BT-042	Food Microbiology & Safety Lab	Major	(0+0+2)	35	15	50	2
11	6	III	UF-BT-039	Biostatistics	Minor	(1+0+0)	70	30	100	1
12	6	III	UF-BT-040	Biostatistics Lab	Minor	(0+0+2)	35	15	50	2
13	6	III	UF-BT-037	Basic Enzymology	Minor	(2+0+0)	70	30	100	2
14	6	III	UF-BT-038	Basic Enzymology Lab	Minor	(0+0+2)	35	15	50	2
15	6	III	SEC-004	Hands on Training Courses- Plant Tissue Culture Techniques	Skill Enhance ment courses (SEC)	(1+0+2)	70	30	100	3
						14+0+16	805	345	1150	30



S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	6	IV	UF-BT-062	Recombinant DNA technology	Major	(2+0+0)	70	30	100	2
2	6	IV	UF-BT-063	Recombinant DNA technology Lab	Major	(0+0+2)	35	15	50	2
3	6	IV	UF-BT-060	Principles of Immunology	Major	(2+0+0)	70	30	100	2
4		IV	UF-BT-061	Principles of Immunology Lab	Major	(0+0+2)	35	15	50	2
5	6	IV	UF-BT-151	Waste management of Food Industries	Major	(3+0+0)	70	30	100	3
6	6	IV	UF-BT-146	Fruits and Vegetable Processing Technology	Major	(2+0+0)	70	30	100	2
7	6	IV	UF-BT-147	Fruits and Vegetable Processing Technology lab	Major	(0+0+2)	35	15	50	2
8	6	IV	UF-BT-052	Environmental Biotechnology	Minor	(2+0+0)	70	30	100	2
9	6	IV	UF-BT-053	Environmental Biotechnology Lab	Minor	(0+0+2)	35	15	50	2
10	6	IV	UF-BT-057	Medical Biotechnology	Minor	(2+0+0)	70	30	100	2
11	6	IV	UF-BT-058	Medical Biotechnology Lab	Minor	(0+0+2)	35	15	50	2
12	6	IV	UF-BT-150	Minor Project	Minor	(0+0+4)	50	-	50	4
13	6	IV	UF-BT-148	Industrial Visit	Skill Enhancement courses (SEC)	-				
14	6	IV	UMC-002	Military Science & Civil Defense	UMC	2+0+0	GRADE BASED			2
15	6	IV	VAD-003	Environmental Studies & Disaster Management	UMC	2+1+1				4
16	6	IV	VAD-001	Cyber Security	UMC	3+0+0				3
17	6	IV	UMC-007	Community Development Activities	CDA	2+0+0				2
18	6	IV	ECA-001	Extra curriculum activities	ECA	2+0+0				2
Sub Total						24+1+15	645	165	900	40
<p>Students exiting the program after securing 80 credits will be awarded UG Diploma in the relevant Discipline /Subject provided they secure additional 4 credit in skill based vocational courses offered during first year or second year summer term.</p>										



S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	6	V	UF-BT-069	Enzyme technology	Major	(2+0+0)	70	30	100	2
2	6	V	UF-BT-070	Enzyme technology Lab	Major	(0+0+2)	35	15	50	2
3	6	V	UF-BT-077	Plant biotechnology	Major	(2+0+0)	70	30	100	2
4	6	V	UF-BT-078	Plant biotechnology Lab	Major	(0+0+2)	35	15	50	2
5	6	V	UF-BT-154	Cereal, Pulse & oilseed Technology	Major	(2+0+0)	70	30	100	2
6	6	V	UF-BT-155	Cereal, Pulse & oilseed Technology Lab	Major	(0+0+2)	35	15	50	2
7	6	V	UF-BT-065	Basic Food Engineering	Major	(2+0+0)	70	30	100	2
8	6	V	UF-BT-066	Basic Food Engineering Lab	Major	(0+0+2)	35	15	50	2
9	6	V	UF-BT-161	Modern Baking & Confectionary Technology	Major	(2+0+0)	70	30	100	2
10	6	V	UF-BT-162	Modern Baking & Confectionary Technology Lab	Major	(0+0+2)	35	15	50	2
11	6	V	UF-BT-073	Food Storage and Transport	Minor	(2+0+0)	70	30	100	2
12	6	V	UF-BT-072	Food Laws, Standards & Regulations	Minor	(2+0+0)	70	30	100	2
13	6	V	UF-BT-071	Fermentation Technology	Minor	(2+0+0)	70	30	100	2
14	6	V	UF-BT-074	Industrial Training (60 Days, after IV Sem, during Summer vacation)	Internship	-	100	-	100	4
Sub Total						16+0+10	835	315	1150	30



S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	6	VI	UF-BT-062	Applied Recombinant DNA technology	Major	(2+0+0)	70	30	100	2
2	6	VI	UF-BT-063	Applied Recombinant DNA technology Lab	Major	(0+0+2)	35	15	50	2
3	6	VI	UF-BT-301	Dairy Engineering	Major	(3+0+0)	70	30	100	3
4	6	VI	UF-BT-302	Dairy Engineering Lab	Major	(0+0+2)	35	15	50	2
5	6	VI	UF-BT-004	Research Methodology	Major	(3+0+0)	70	30	100	3
6	6	VI	UF-BT-005	Food Business Management	Major	(3+0+0)	70	30	100	3
7	6	VI	UF-BT-007	Food Project Planning and Entrepreneurship	Major	(3+0+0)	70	30	100	3
8	6	VI	UF-BT-006	Sensory Evaluation	Minor	(2+0+0)	70	30	100	2
9	6	VI	UF-BT-303	Modeling & simulation of Bioprocess	Minor	(2+0+0)	70	30	100	2
10	6	VI	UF-BT-313	Molecular Therapeutics	Minor	(2+0+0)	70	30	100	2
11	6	VI	UF-BT-314	Molecular Therapeutics Lab	Minor	(0+0+2)	35	15	50	2
12	6	VI	UMC-003	Help Aid	UMC	2+0+0	GRADE BASED			2
13	6	VI	UMC-007	Community Development Activities	CDA	2+0+0				2
14	6	VI	ECA-001	Extra curriculum activities	ECA	2+0+0				2
						26+0+6	665	285	950	32



S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	6	VII	UF-BT-079	Traditional and fermented food	Major	(2+0+0)	70	30	100	2
2	6	VII	UF-BT-080	Traditional and fermented food Lab	Major	(0+0+2)	35	15	50	2
3	6	VII	UF-BT-315	Spice Processing Technology	Major	(2+0+0)	70	30	100	2
4	6	VII	UF-BT-316	Spice Processing Technology Lab	Major	(0+0+2)	35	15	50	2
5	6	VII	UF-BT-082	Dairy Plant Management	Major	(3+0+0)	70	30	100	3
6	6	VII	UF-BT-084	Immuno Technology	Major	(2+0+0)	70	30	100	2
7	6	VII	UF-BT-085	Immuno Technology Lab	Major	(0+0+2)	35	15	50	2
8	6	VII	UF-BT-087	Industrial Biotechnology	Major	(3+0+0)	70	30	100	3
9	6	VII	UF-BT-088	Industrial Biotechnology Lab	Major	(0+0+2)	35	15	50	2
10	6	VII	UF-BT-086	Pharma Biotechnology & Drug Designing(Minor	(2+0+0)	70	30	100	2
11	6	VII	UF-BT-081	Quality Control in Food Processing Industries	Minor	(2+0+0)	70	30	100	2
				Sub Total		16+0+8	630	270	900	24



S. No.	NHEQF levels	SEMESTER	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	6	VIII	UF-BT-083	Food Plant Design	Major	(4+0+0)	70	30	100	4
2	6	VIII	UF-BT-317	Protein Engineering	Minor	(4+0+0)	70	30	100	4
3	6	VIII	UF-BT-339	Dissertation	Project/ Dissertation	-	200	-	200	12
4	6	VIII	UMC-004	Gender Sensitization	UMC	2+0+0	GRADE BASED			2
5	6	VIII	UMC-007	Community Development Activities	CDA	2+0+0				2
6	6	VIII	ECA-001	Extra curriculum activities	ECA	2+0+0				2
Sub Total						14+0+0	340	60	400	26

Acronyms Expanded

- VAC : Value Added Course
- UMC : University Mission Course
- CC : Core Course
- SEC-SB/VB : Skill Enhancement Course-Skill Based/Value Based
- OEC : Open Elective Course
- DSE : Discipline Specific Elective
- L+T+P : Lecture+Tutorial+Practical(s)

Note: Practical Classes may be conducted in the Business Lab or in Computer Lab or in Class room depending on the requirement. 2 Hours of Practical Class is equal to 1 Hour of Teaching, however, whenever it is conducted for the entire class (i.e., more than 50 students) 2 Hours of Practical Class is equal to 2 Hours of Teaching.



First Semester Course Contents

Semester I								
Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	UF-BT-018	Fundamentals of Biotechnology	Major	(3+0+0)	70	30	100	3
2	UF-BT-019	Fundamentals of Biotechnology Labs	Major	(0+0+2)	35	15	50	2
3	UF-BT-101	Introduction to food technology	Major	(3+0+0)	70	30	100	3
4	UF-BT-105	Biomolecules	Minor	(2+0+0)	70	30	100	2
5	UF-BT-104	Biomolecules Lab	Minor	(0+0+2)	35	15	50	2
6	UF-BT-102	Basics of Biosciences	Minor	(2+0+0)	70	30	100	2
7	UF-BT-103	Basics of Biosciences Lab	Minor	(0+0+2)	35	15	50	2
8	UF-BT-020	Fundamentals Of Chemistry	Multi Disciplinary Course	(2+0+0)	70	30	100	2
9	UF-BT-021	Fundamentals Of Chemistry Lab	Multi Disciplinary Course	(0+0+2)	35	15	50	2
10	SEC-001	Hands on Training Courses on-Fruits and Vegetable dehydration techniques	Skill Enhancement courses (SEC)	(1+0+2)	70	30	100	3
Sub Total				13+0+10	530	240	800	23



Detailed Syllabus - 1st Semester

Credits= 03	Fundamentals of Biotechnology	3+0+0 Total Lectures: 45
Objective:	To get fundamental knowledge of biotechnology	
Unit 1	Fundamentals of RDT Definitions and Historical perspective of Biotechnology, Commercial Potential of biotechnology, Scope and Importance of Biotechnology. Introduction to Recombinant DNA technology. Tools of Recombinant DNA technology. Introduction of Recombinant DNA into host cell, Making of Recombinant DNA. Introduction and screening techniques for Identification of Recombinants. Polymerase chain reaction.	15
Unit 2	Basics of Animal and Plant cell culture Introduction to Microbial Culture Techniques. Different Microbial Culture Techniques. Measurement and Kinetics of Microbial Growth. Scale up of Microbial Process. Isolation of Microbial Products. Strain Isolation and Improvement. Applications of Microbial Culture Technology. Bioethics in Microbial Technology. Introduction to Plant tissue culture. Cell and Tissue Culture Techniques. Applications of Cell and Tissue Culture. Introduction to animal cell culture. Animal Cell Culture Techniques. Scale-up of Animal Culture Process. Applications of Animal Cell Culture.	17
Unit 3	Introduction to patenting Introduction to Patenting. Criterion for patents. Reading a patent. National and International Patent Laws. Ethical issues in agriculture and health care. Biotechnology in India and global trends. Product safety and Marketing.	13
Course Outcome: The student will be able to:		
1	Learn about basics and historical perspective of biotechnology	
2	Learn about basics perspective of introductory knowledge of advance technologies of biotechnology along with patenting and ethical issues	
Text Books:		
1	Biotechnology- U. Satyanarayan	
2	Gene cloning and DNA analysis- T.A. Brown	
Reference Books:		
1	Culture of animal cells- R. Ian Freshney	
2	Introduction to plant biotechnology- H.S. Chawla	
3	Microbiology- Pelczar	



Credits= 02	Fundamentals of Biotechnology Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to basics of biotechnology	
1	To isolate genomic DNA from E.coli	4
2	To prepare Agarose gel for gel electrophoresis	4
3	Introduction of new DNA into E.coli. by the technique of transformation	4
4	To demonstrate PCR.	2
5	To isolate pure strain of E.coli. by the technique of streaking plate method.	4
6	To clean glassware and accessories used in plant tissue culture	2
7	To prepare MS media.	2
8	To initiate callus culture from explants.	4
9	To learn aseptic techniques of animal tissue culture.	2
10	To prepare BSS solutions.	2
Course Outcome: The student will be able to:		
1	Learn basics of all all related streams of Biotechnological practical approaches such as DNA Isolation and its visualization, basics of Plant Tissue Culture, Molecular Biology and Microbiological techniques etc.	



Credits= 03	Introduction to food technology	3+0+0 Total Lectures: 45
Objective:	To get fundamental knowledge of Food technology	
Unit 1	Introduction to food composition Introduction , Food composition & Food group, Introduction Introduction to food science and technology, Food composition Food composition – Carbohydrates, protein, fat, vitamins and minerals water, Food groups Composition and nutritive value of Cereals, Pulses, Legumes, Oil seeds, Fruits, Vegetables, Meat, Fish, Poultry and Milk.	17
Unit 2	Introduction to food preservation Food preservation -High temperature, low temperature and chemical preservations. Concept of nutrition, Digestion and absorption of nutrients, balanced diet, malnutrition, Packaging-Functions of packaging, types of food packaging materials	15
Unit 3	Introduction to role of microbes in food technology Microbiology- Microorganisms important in foods, food contamination, food spoilage, food born diseases, Engineering -Unit operation, principles of heat exchangers, Pasteurizer, refrigerator, freezer and drier.	13
Course Outcome: The student will be able to:		
1	Understand the principles of food science, different areas of food science and the historical evolution of food processing	
2	Understand the basics of plant and animal foods, their types, structure and composition, nutritional value, changes taking place during storage and different processing methods used.	
Text Books:		
1	Food Science N N. Potter & J Hotchkiss	
2	Food Processing and Preservation G Subbalakshmi	
Reference Books:		
1	Food Packaging Technology Handbook NIIR	
2	A practical Guide for Implementation of ISO HACCP Sohrab	



Credits= 02	Biomolecules	2+0+0 Total Lectures: 30
Objective:	To get fundamental knowledge of Biochemistry	
Unit 1	Carbohydrates General account of the chemical nature of living cells. Carbohydrates: Classification (Monosachharides, Disachharides and Polysachharides), configurations and conformations, sugar derivatives, structural and storage polysaccharides.	12
Unit 2	Proteins Amino acids: General properties, peptide bond, essential and non-essential amino acids. Classification, different levels of protein structure, forces stabilizing protein structure, protein folding, protein modification.	11
Unit 3	Lipids and Vitamins Lipids: Classification, properties of lipid aggregates and biological significance. Vitamins: Water and fat soluble vitamins and their deficiency diseases .	7
Course Outcome: The student will be able to:		
1	Learn general account of the chemical nature of living cells including Carbohydrates, Lipids, Protein and Vitamins	
2	Gain knowledge from this course will make student able to learn advance knowledge related to Food and Biotechnology	
Text Books:		
1	Biochemistry- U. Satyanarayana, U. Chakrapani , BOOKS AND ALLIED (P) LTD. (2008)	
Reference Books:		
1	Fundamentals of Biochemistry - J.L. Jain , S. Chand publication	
2	Fundamentals of Biochemistry - Dr A C Deb	



Credits= 02	Biomolecules Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to basics of biochemistry	
1	To perform Molish test for the qualitative estimation of carbohydrate	2
2	To perform Benedict test for the qualitative estimation of carbohydrate.	2
3	To perform Fehling's test for the qualitative estimation of reducing sugar's	2
4	To perform Barfoed's test for the qualitative estimation of reducing sugar's	1
5	To perform Inversion of Sucrose:	4
6	To perform Ninhydrin test for the qualitative estimation of amino acids.	2
7	To perform Xanthoproteic test for the qualitative estimation of amino acids.	1
8	To perform Millon's test for the qualitative estimation of amino acids (Tyrosine, Phenylalanine & Glycine).	1
9	To perform Lead-Sulfide test for the qualitative estimation of Cysteine and Cystine.	1
10	To perform Sakaguchi test for the qualitative estimation of Arginine.	2
11	To Estimate the Saponification value of oils.	4
12	To Estimate the acid value of oils.	4
13	Determination of Total Lipid Concentration	4
Course Outcome: The student will be able to:		
1	Learn basics of all related streams of Biochemistry practical approaches such as qualitative analysis of all three biomolecules such as Carbohydrates, Proteins and Lipids etc.	



Credits= 02	Basics of Biosciences	2+0+0 Total Lectures: 30
Objective:	To get fundamental knowledge of all biological system	
Unit 1	Introduction to biology Diversity in biological systems, Cell biology and cell structure, difference between Prokaryotes & Eukaryotes systems, Five-kingdom classification and General characters, Brief account on Ecology, Morphology, Nutrition, osmosis, Locomotion and Reproduction, useful and harmful effects of Bacteria, Viruses, Algae, Fungi and Protozoans.	10
Unit 2	Classification and physiology of plants Classification of Plant Kingdom. Concepts of Growth, Meristems, Plant growth regulators, Bacterial & Plant photosynthesis; oxygenic and anoxygenic photosynthesis; chlorophyll as trapper of solar energy, photosynthetic reaction centres, Hill reaction, PS I & PS II, Photophosphorylation - cyclic & non-cyclic; Dark reaction & CO ₂ fixation	10
Unit 3	Classification and physiology of animals Classification of Animal Kingdom, Functions, morphology, growth and Reproduction, economic importance. Phylogeny of Invertebrate & Vertebrate Phyla, Concepts of Species & Ecosystem. Introduction of cell cycle, cell division, Electrolytes, Body fluids.	10
Course Outcome: The student will be able to:		
1	Learn about diversity in biological systems	
2	Buildup concept wise knowledge to understand advanced courses of Food and Biotechnology.	
Text Books:		
1	Cell and Molecular biology – P.K. Gupta	
2	Plant Physiology- H.S. Srivastav	
3	Animal Physiology- A.K. Berry	
Reference Books:		
1	NCERT Textbook for Class 11 Biology	
2	NCERT Textbook for Class 12 Biology	



Credits= 02	Basics of Biosciences Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to basics of biological system	
1	To perform gram staining.	2
2	To study different types of Algae by making their slides.	2
3	To study different types of Fungi by making their slides.	2
4	To study slides of Protozoans.	2
5	Study of osmosis by potato osmoscope.	4
6	To isolate chloroplast from plants.	2
7	Separation of plant pigments through paper chromatography.	2
8	Demonstration of O ₂ evolution during photosynthesis.	2
9	Study of distribution of stomata in the upper and lower surface of leaves.	2
10	To study mitosis in onion root tip.	2
11	To study meiosis in grasshopper testis	2
12	To test the presence of urea in urine.	2
13	To detect the presence of sugar in urine/blood sample	2
14	To detect the presence of albumin in urine.	2
Course Outcome: The student will be able to:		
1	Learn basics of all related streams of basics of Biological system practical approaches such as isolation and identification of microorganism, Various Chromatography, studies of Plant system and Animal system etc.	



Credits= 02	Fundamentals of Chemistry	2+0+0 Total Lectures: 30
Objective:	To get fundamental knowledge of chemistry	
Unit 1	Overview of Physical Chemistry Concept of homogeneous and heterogeneous solution, Introduction of the terms, Ionization, acidity, basicity, equivalent weight and gram equivalent weight with suitable example. Preparation of solution, Normality, Molarity, and Molality as applied in relation to a solution. Simple numerical problems related to volumetric analysis. Brief concept of gravimetric analysis.	10
Unit 2	Overview of Inorganic chemistry Occurrence and principles of extraction of aluminium, copper, zinc and Iron. position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; hydrides-ionic, covalent and interstitial; physical and chemical properties of water, heavy water. Hydrogen peroxide-preparation, properties and structure; hydrogen as a fuel. Uses of hydrogen peroxide.	10
Unit 3	Overview Organic Chemistry Stereochemistry of Organic Compounds: Concept of isomerism. Type of isomerism. Optical Isomerism - Elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules and erythrodiastereomers, *, D & L and R & S systems of nomenclature. Geometric Isomerism: Determination of configuration of geometric isomers. E & Z system of nomenclature. Conformational isomerism: Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Application of Stereochemistry in biochemistry.	10
Course Outcome: The student will be able to:		
1	Students will be able to identify various matters and equipment used in labs, perform some basic experiments.	
2	Buildup concept wise knowledge to understand basic chemistry and its types	
Text Books:		
1	I. A. Levine, Physical Chemistry, McGrawHill, 2009	
2	D.A. McQuarrie and J.D. Simon, Physical Chemistry – a Molecular Approach, Viva Books Pvt. Ltd., 1998.	
3	G. Solomons and C. Fryhle, Organic Chemistry, John Wiley & Sons (Asia) Pte Ltd.	
Reference Books:		
1	J.D. Lee, Concise Inorganic Chemistry, (5th Edition), ELBS, 1996.	
2	D. F. Shriver and P. W. Atkins, Inorganic Chemistry, Oxford University Press, 2006.	



Credits= 02	Fundamentals of Chemistry Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to basics of chemistry	
1	Preparation of original solution.	2
2	Correct group detection	4
3	Cu with change in concentration of electrolytes (CuSO ₄ Zn with ZnSO ₄ using starch solution as indicator (clock reaction).	4
4	Systematic detection of ion.	2
5	Any two confirmatory tests of cation.	2
6	Physical nature.	2
7	Flame test.	2
8	Charcoal cavity test.	2
9	Recrystallization.	2
10	Melting points and Boiling point and the identification of an unknown and known compound naphthalene, Benzene	2
11	Molecular modelling.	2
12	L.S modelling.	2
13	Distillation, steam distillation.	2
Course Outcome: The student will be able to:		
1	Learn basics of all related streams of Fundamentals of Chemistry practical approaches Related To Physical, Organic and Inorganic Chemistry	



Credits= 03	Hands on Training Courses on-Fruits and Vegetable dehydration techniques	1+0+2 Total Lectures: 15+30
Objective:	To get skill enhancement in the field of Fruits and Vegetable dehydration techniques	
Unit 1	Dehydration- definition and objectives, method of preservation, factors affecting rate of drying; Application of Dehydration; Dehydration plant layout; Dehydration Processes involved (Raw material, sourcing, Sorting, cutting, pretreatment, pulverizing, packing etc.); Various types of Dehydrators and Dehydrated products	15
Hands of Training on-		
1	Set up and maintenance of work area and process machineries for drying/dehydration of fruits and vegetables	5
2	Preparation process for drying/dehydration of fruits and vegetables	5
3	Drying/Dehydration of fruits and vegetables	10
4	Organizational Standards and Norms	2
5	Complete Documentation and record keeping of dehydrated products	4
6	Food Safety, Hygiene and Sanitization	4
Course Outcome: The student will be able to:		
1	Learn about handling the dehydration machines and Unit; standardization of the process of dehydration; maintenance of hygiene and sanitization of plant; Documentation of Products	



Second Semester Course Contents

Semester II								
Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	End Term	CA	Total Marks	Credits
1	UF-BT-120	Fundamentals of microbiology	Major	(3+0+0)	70	30	100	3
2	UF-BT-123	Fundamentals of microbiology Lab	Major	(0+0+2)	35	15	50	2
3	UF-BT-126	Unit operations in Food Industry	Major	(2+0+0)	70	30	100	2
4	UF-BT-127	Unit operations in Food Industry Lab	Major	(0+0+2)	35	15	50	2
5	UF-BT-122	Fundamentals of Food Science & Technology	Major	(2+0+0)	70	30	100	2
6	UF-BT-121	Fundamentals of Food Science & Technology Lab	Major	(0+0+2)	35	15	50	2
7	UF-BT-117	Cell biology	Minor	(3+0+0)	70	30	100	3
8	UF-BT-118	Cell biology Lab	Minor	(0+0+2)	35	15	50	2
9	SEC-002	Hands on Training Courses- Quality Analysis of Food Products	Skill Enhancement courses (SEC)	(1+0+2)	70	30	100	3
10	UMC-001	Women Rights & Law	UMC	2+0+0	GRADE BASED			2
11	UMC-005	Gow Gyan Science	UMC	2+0+0				2
12		Community Development Activities	CDA	2+0+0				2
13	ECA-001	Extra curriculum activities	ECA	2+0+0				2
14	UF-BT-033	Industrial Visit	Skill Enhancement courses (SEC)	-				
Total Credit				19+0+10	490	210	700	29
Students exiting the program after securing 40 credits will be awarded UG Certificate in the relevant Discipline /Subject provided they secure 4 credits in work based vocational courses offered during internship in addition to 6 credits from skill								



Detailed Syllabus – 2nd Semester

Credits= 03	Fundamentals of microbiology	3+0+0 Total Lectures: 45
Objective:	To get fundamental knowledge of microbiology	
Unit 1	Introduction-aims and scope Introduction-aims and scope, Role of microbes in agriculture, public health, medicine and industry, Organization of prokaryotic and eukaryotic cells: Structure and function of cell organelles and surface structure and cellular reserve materials; Distinguishing features of various groups of microorganisms: actinomycetes, bacteria, molds, yeasts and algae and their broad classification.	15
Unit 2	Characteristics of micro-organisms Characteristics of selected groups of microorganisms including microorganisms of extreme environment, Microbial nutrition and growth-principles of nutrition, growth measurement techniques, effect of environmental and culture parameters on growth, assimilation of nitrogen and sulphur, Isolation and preservation of cultures	15
Unit 3	Energy transduction in microbial systems Energy transduction in microbial systems: fermentation, aerobic and anaerobic respiration. Phototrophic microorganisms, Phosphoketolase, Entner-Doudoroff and glyoxalate pathways, Control of microbial growth effect of heat, disinfectants and therapeutic agents, Microbial pathogenicity, Bioassays	15
Course Outcome: The student will be able to:		
1	Learn about the basics of microbes; physiology of microbes and their role in agriculture	
2	Student will able to think and apply microbes with new innovative ideas for betterment in Food and Biotechnology	
Text Books:		
1	Microbiology – L. M. Prescott	
2	A Textbook Of Basic And Applied Microbiology - Aneja K.R	
Reference Books:		
1	Pelczar Microbiology	
2	Practical microbiology by Satish Gupte	



Credits= 02	Fundamentals of microbiology Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to basics of microbial system	
1	Purify the given bacterial sample by serial dilution method	2
2	Perform Gram's staining in given bacterial sample	2
3	Identify the fungal flora of soil and their microscopic view	2
4	Preparation of culture media for algae	2
5	Perform antagonistic activity of micro organisms	2
6	Isolate the microorganism of extreme environmental condition	2
7	Study the bacterial growth curve with complete phases	2
8	Isolate nitrogen fixating bacteria and their identification	2
9	Effect of environmental conditions on bacterial growth	2
10	Perform the preservation process for bacterial culture	2
11	Study the batch and fed batch culture condition on bacterial growth	2
12	Isolate the bacterial pigments form cyanobacteria	2
13	Chromatographic evaluation of bacterial pigments	2
14	To determine the ability of Microorganisms to degrade and ferment carbohydrates with the production of acid or acid and gas	2
15	To detect the antibiotic sensitivity on the given culture sample (Antibiotic Sensitivity Test)	2
Course Outcome: The student will be able to:		
1	Learn basics of all microbial streams with practical approaches such as isolation and identification of microorganism from various sources such as extreme environmental conditions, growth curves, and antibiotic sensitivity.	



Credits= 02	Unit Operations in food Industry	2+0+0 Total Lectures: 30
Objective:	To get knowledge about Unit operations in Food Industry	
Unit 1	Flow, Heat Transfer Principles of fluid flow, heat transfer, heat exchanger, EMC & Water activity, Evaporation, Distillation, Drying, Dehydration; Types of dryers, Material handling equipment; Size reduction, Energy requirement in Size Reduction.	10
Unit 2	Separation, Mixing Sieve analysis, Mixing, Kneading, Blending, Homogenization, Size Separation, Sedimentation, Extraction, Leaching, Crystallization, Thermal Processing, Refrigeration principles, Cooling, freezing, thawing of food materials	10
Unit 3	Mechanical Separation, Grading & Emulsification Absorption and adsorption, Mechanical Cleaning, Grading, Sorting, Filtration, Membranic Separation, Emulsification	10
Course Outcome: The student will be able to:		
1	Explain basic principles of unit operations and also waste treatment in food industry	
2	Explain the methods and effects of preservation and processing on food product quality	
Text Books:		
1	Albert Ibarz, Gustavo V. Barbosa-Canovas, Unit Operations in Food Engineering, CRC Press 2010	
2	Norman N. Potter, Joseph H. Hotchkiss. Food Science, Springer, 1998	
Reference Books:		
1	R.L. Earle and M.D. Earle, Food Engineering, 1978	



Credits= 02	Unit Operations in food Industry Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to unit operation in food industry	
1	Solvent Extraction (Extraction)	6
2	Distilled Water Preparation (Distillation)	6
3	Study & Demonstration of Spiral & Planetary Mixers (Mixing)	4
4	Sieve Analysis (Sieving)	6
5	Study & Demonstration of Ball Mill (Size Reduction)	4
6	Study & Demonstration of Refrigeration System (Refrigeration)	4
Course Outcome: The student will be able to:		
1	Student will be able to do practical related to this course such as solvent extraction, Sieve analysis	



Credits= 03	Fundamentals of Food Science & Technology	2+0+0 Total Lectures: 30
Objective:	To get fundamental knowledge of Food Science & Technology	
Unit 1	Food Processing & Packaging and Food Industries Scope of food processing in India; Introduction to food processing, food preservation, food packaging, food drying and dehydration. Important food industries in India; role of Food Science & Technology in national economy.	12
Unit 2	Processing of food products Fruit and vegetable processing, processing of meat and meat products, processing of milk and milk products, processing of marine products	9
Unit 3	Unit operations and Food Engineering Unit operations in food industry. Rheology of food. Basic principles of food engineering. Introduction to various food processing equipments.	9
Course Outcome: The student will be able to:		
1	Understand scope of food processing in India and different areas of food processing.	
2	Understand the processing of different food products like meat and meat products, Fruit and vegetable, milk and milk products and marine products	
Text Books:		
1	Norman N. Potter, Joseph H. Hotchkiss. Food Science, Springer, 1998	
2	Vickie A. Vaclavik, Elizabeth W. Christian, Essentials of Food Science, Springer, 2008	
Reference Books:		
1	B. Srilakshmi, Food Science, New Age International, 2007	



Credits= 02	Fundamentals of Food Science & Technology Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to fundamentals of Food Science & Technology	
1	Study of Various Processed foods available in the market	2
2	Study of Different Methods of Food Preservation	2
3	Study of Different types of Drying Techniques	2
4	Study of Different types of Packaging Materials	2
5	Study of Different Food Industries in India	2
6	Processing of Fruits	4
7	Processing of Vegetables	4
8	Processing of Milk & Milk Products	4
9	Processing of Meat Products	1
10	Processing of Marine Products	1
11	Study of Various Food Processing Equipments	2
12	Study of Unit operations in Food Industry	2
13	Study of Food Rheology	2
Course Outcome: The student will be able to:		
1	Student will be able to do practical related to this course such as Food preservation Techniques, Packaging types, Food processing techniques, Study of processing equipments, etc	



Credits= 03	Cell Biology	3+0+0 Total Lectures:40
Objective:	To get fundamental knowledge of Food Science & Technology	
Unit 1	Ultra-structure of Plant and animal cell Scope of food processing in India; Introduction to food processing, food preservation, food packaging, food drying and dehydration. Important food industries in India; role of Food Science & Technology in national economy.	15
Unit 2	Brief Idea about cell cycle Cell cycle: different phases of cell cycle (G ₁ , S-phase, G ₂ and M-phase). Regulation of cell cycle: role of cyclins and CDKs, Check points. Mitosis: phases of mitosis (prophase, metaphase, anaphase, telophase and cytokinesis). Significance of mitosis. Meiosis: phases of meiosis and gametogenesis	15
Unit 3	Cell signaling Cell Signaling: different pathways (G-protein mediated, cAMP mediated and tyrosine kinase mediated), secondary messengers. Cell differentiation, program cell death, techniques in Cell biology (microscopy, chromatography, centrifugation and spectroscopy).	15
Course Outcome: The student will be able to:		
1	Understand the structures and basic components of prokaryotic and eukaryotic cells, including membranes, and organelles	
2	Understand cell division process, significance of mitosis and meiosis process.	
Text Books:		
1	Molecular Biology of the Cell- Bruce Alberts, Alexander Johnson, Julian Lewis and Martin Raff.	
2	The Cell: A Molecular Approach, Sixth Edition by Geoffrey M. Cooper and Robert E. Hausman	
Reference Books:		
1	Cell and molecular biology by P.K. Gupta	
2	Cell biology by C. B. Panwar, Rastogi publication	



Credits= 02	Cell Biology Lab	0+0+2 Total Lectures: 30
Objective:	To get practical knowledge related to basics of cell biology	
1	Study of Microscopy: - Simple, Compound, & Phase Contrast Microscope	4
2	Study of cell organelles by using Models, Charts and Slides.	4
3	To demonstrate osmosis by using potato osmoscope.	4
4	Squash preparation of Onion root tip to study Mitosis.	4
5	Preparation of polytene chromosome in chironomous larva/fruit fly.	4
6	Study of meiosis in Grasshopper testis.	4
7	Learn about cell cycle and Gametogenesis through charts and models	6
Course Outcome: The student will be able to:		
1	Student will be able to do practical related to this course such as Food preservation Techniques, Packaging types, Food processing techniques	



Credits= 03	Hands on Training Courses on-Quality Analysis of Food Products	1+0+2 Total Lectures: 30+45
Objective:	To get skill enhancement in the field of Quality Analysis of Food Products	
Unit 1	Introduction and importance about the basics of required Food Analysis Parameters	15
Hands of Training on-		
1	Experiments on properties of monosaccharides, Disaccharides, Polysaccharides	2
2	Estimation of glucose in a given sample.	2
3	Determination of protein in foods	2
4	Experiments on properties of fats.	2
5	Determination of T S S, Tritatable acidity and pH	2
6	Estimation of gluten in foods.	2
7	Determination of moisture content	2
8	Determination of Ash content	2
9	Analysis of pesticide residues in foods	2
10	Determination of benzoic acid , sorbic acid in foods .	2
11	Iodine value, Saponification value and unsaponifiable matter of fats and oils.	2
12	Detection of adulteration in fats and oils	2
13	Estimation of non-enzymatic browning in foods and crude fibre in foods	2
14	Estimation and fat and SNF in milk	2
15	Operation of LTLT & HTST	2
Course Outcome: The student will be able to:		
1	Student will be skilled in this course for Quality Analysis of Food Products	
2	Student will learn about handling all essential Techniques related to quality analysis of various food products.	



Credits= 02	Women Right & Laws	2+0+0 Total Lectures: 25
Objective:	The paper aims at creating awareness as to importance and role of women in society through the medium of law. It also focuses on women welfare laws.	
1	Introduction of Women Rights And Law: Definition of women, awareness about women rights, appeal for remedies	1+1
2	Global Status of Women: Civil and Political Rights ii. Social and Cultural rights, Participation in Panchayat and Municipalities	1+1
3	Rights and awareness of marriage and divorce : Marriage Conditions, Ceremonies, Registration, ,Void & Voidable Marriages, Legitimacy of Children of Void & Voidable Marriages, Punishment of Bigamy	1
4	Divorce: Divorce Common Grounds for Divorce, No Petition for divorce within 1year of marriage, Divorced Person when may marry again	1+1
5	Rights on maintenance: Maintenance: Wife, widowed daughter-in-law, Children, Amount of Maintenance , Interim Maintenance, Maintenance Provisions under Cr.PC	1
6	Rights of Adoption: Adoption: Requisites of a valid adoption,Capacity of a male Hindu to take in adoption, Capacity of a female Hindu to take in adoption	1
7	Rights of private defence: Right of Private defence for body and property	1+1
8	Crime against women: Dowry Death, Cruelty by Husband or Relatives of Husband, Sex Selection & Causing Miscarriage, Outraging the modesty of a woman, Offences regarding Prostitution, Rape, Bigamy, Adultery, Domestic Violence,	1+1
9	Sexual harassment of women: Sexual harassment in home, society and work place	1+1
10	Medical termination Pregnancy act 1971: Liberalizing the provisions relating to abortion	1
11	The Pre-Conception and Pre-Natal Diagnostic Techniques Act, 1994: Pre-Natal Diagnostics test and oath	1+1
12	Surrogacy : Commercial Surrogacy in India & its regulation	1
13	Women empowerment: Role of Enforcement Machineries (Reform through judicious interventions)	1+1
14	Role for national women commission for women	1+1
15	Role of NGO and Reform from within society	1+1



Credits= 02	Gow Gyan Science	2+0+0
Objective: The paper aims at creating awareness as to importance and role of Gow Gyan in society		
1	Fundamentals of Gau with special reference to ancient Indian literature Unit-I: Introduction to Gau. Verities (Gau vansh) of Cows in India. Unit-II (Gau in ancient Indian literature) Description of Gau in various ancient Indian literatures	
2	Significance of Gau in current scenario Unit-I: Economical importance Unit-II: General, medicinal and spiritual importance	
3	Anatomy of Gau Unit-I: General structure and anatomy of Gau Unit-II: Effect of various factors on the quality of Gau-products	
4	Gau milk and its significance Unit-I: Physical and chemical properties of milk. Unit-II: Biological significance of milk. Milk as medicine. Research prospective of milk.	
5	Gaumutra and its significance Unit-I: Physical and chemical characteristics of milk. Unit-II: Biological significance of Gaumutra. Gaumutra as medicine. Research prospective of cow urine.	
6	Cow dung and its significance Unit-I: Physical and chemical characteristics of cow dung. Unit-II: Cow dung in medicine. Research prospective of cow dung	