Programme Structure for B. Sc. Food Science and Technology

(Minor in Medical Laboratory Technology)

First Year B. Sc. Programme Semester I: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC101	General Biology	3	-	-	3	-	-	3
U21PC103	General Chemistry	3	-	-	3	-	-	3
U25IK101	Indian Traditional Foods	2	-	-	2	-	-	2
U03AE002	English	2	-	-	2	-	-	2
U03VE001	Constitution of India	2	-	-	2	-	-	2
UXXOE01X	Open Elective-I	2	-	-	2	-	-	2
U25PC103	General Biology Lab	-	2	-	-	1	-	1
U21PC104	General Chemistry Lab	-	2	-	-	1	-	1
U25VS102	Fundamentals Food Technology Lab	-	4	-	-	2	-	2
U25SE101	Fundamental Microbiology	-	4	-	-	2	-	2
U04CC0XX	Co-Curricular Courses I	-	4	-	-	2	-	2
U03VE002	Universal Human Values-I #	-	-	-	-	-	-	Audit Course
	Total	**14**	**16**	**-**	**14**	**08**	**-**	**22**

#During the Induction program, students would get an initial exposure to human values through Universal Human Values- I

Programme Structure for B. Sc. Food Science and Technology

(Minor in Medical Laboratory Technology)

First Year B. Sc. Programme Semester I: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical * Oral/ POE	
		T1	T2	FET	Total				
U25PC101	General Biology	10	10	5	25	50	-	-	75
U21PC103	General Chemistry	10	10	5	25	50	-	-	75
U25IK101	Indian Traditional Foods	-	10	5	15	35	-	-	50
U03AE002	English	-	10	5	15	35	-	-	50
U03VE001	Constitution of India	-	10	5	15	35		-	50
UXXOE01	Open Elective-I	-	10	5	15	35	-	-	50
U25PC103	General Biology Lab	-	-	-	-	-	25	-	25
U21PC104	General Chemistry Lab	-	-	-	-	-	25	-	25
U25VS102	Fundamentals Food Technology Lab	-	-	-	-	-	25	25	50
U25SE101	Fundamental Microbiology	-	-	-	-	-	25	25	50
U04CC0XX	Co-Curricular Courses I	-	-	-	-	-	50	-	50
U03VE002	Universal Human Values I	-	-	-	-	-	-	-	Audit Course

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology

(Minor in Medical Laboratory Technology)

First Year B. Sc. Programme Semester II: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC201	Food Microbiology	3	-	-	3	-	-	3
U21PC203	Chemistry for Biologist	3	-	-	3	-	-	3
UXXMM0XX	Multidisciplinary Minor-I	2	-	-	2	-	-	2
UXXOE02X	Open Elective-II	2	-	-	2	-	-	2
U03AE001	Professional Communication	2	-	-	2	-	-	2
U01VE003	Environment Science	2	-	-	2	-	-	2
U25PC203	Food Microbiology Lab	-	2	-	-	1	-	1
U21PC204	Chemistry for Biologist Lab	-	2	-	-	1	-	1
U25VS203	Advanced Food Instrumentation Lab	-	4	-	-	2	-	2
U25SE202	Food and Nutrition	-	4	-	-	2	-	2
U04CC0XX	Co-curricular courses II	-	4	-	-	2	-	2
	Total	**14**	**16**	**-**	**14**	**08**	**-**	**22**

Programme Structure for B. Sc. Food Science and Technology

(Minor in Medical Laboratory Technology)

First Year Semester II: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical * Oral/ POE	
		T1	T2	FET	Total				
U25PC201	Food Microbiology	10	10	5	25	50	-	-	75
U21PC203	Chemistry for Biologist	10	10	5	25	50	-	-	75
UXXMM0XX	Multidisciplinary Minor-I	10	-	5	15	35	-	-	50
UXXOE02X	Open Elective-II	10	-	5	15	35	-	-	50
U03AE001	Professional Communication	10	-	5	15	35	-	-	50
U01VE003	Environment Science	10	-	5	15	35	-	-	50
U25PC203	Food Microbiology Lab	-	-	-	-	-	25		25
U21PC204	Chemistry for Biologist Lab	-	-	-	-	-	25	-	25
U25VS203	Advanced Food Instrumentation Lab	-	-	-	-	-	25	25	50
U25SE202	Food and Nutrition	-	-	-	-	-	25	25	50
U04CC0XX	Co-curricular courses II	-	-	-	-	-	50	-	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology Second Year

(Minor in Medical Laboratory Technology)

Second Year Semester III: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC301	Food Analysis	3	-	-	3	-	-	3
U25PC302	Milk and Milk Products	2	-	-	2	-	-	2
U25PC303	Human Nutrition	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor-II	3	-	-	3	-	-	3
UXXOE03X	Open Elective-III	2	-	-	2	-	-	2
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language: Marathi	2	-	-	2	-	-	2
U25PC304	Food Analysis Lab	-	2	-	-	1	-	1
U25SE303	Milk and Milk Products Lab	-	4	-	-	2	-	2
UXXMM0XX	Multidisciplinary Minor-II Lab	-	2	-	-	1	-	1
U25FP301	Field Project	-	4	-	-	2	-	2
U04CC0XX	Co-curricular courses III	-	4	-	-	2	-	2
	Total	**14**	**16**	**-**	**14**	**08**	**-**	**22**

Programme Structure for B. Sc. Food Science and Technology Second Year

(Minor in Medical Laboratory Technology)

Second Year Semester III: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical* Oral/ POE	
		T1	T2	FET	Total				
U25PC301	Food Analysis	10	10	5	25	50	-	-	75
U25PC302	Milk and Milk Products	10	-	5	15	35	-	-	50
U25PC303	Human Nutrition	10	-	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor-II	10	10	5	25	50	-	-	75
UXXOE03X	Open Elective-III	10	-	5	15	35	-	-	50
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language: Marathi	10	-	5	15	35	-	-	50
U25PC304	Food Analysis Lab	-	-	-	-	-	25	-	25
U25SE303	Milk and Milk Products Lab	-	-	-	-	-	25	25	50
UXXMM0XX	Multidisciplinary Minor-II Lab	-	-	-	-	-	25	-	25
U25FP301	Field Project	-	-	-	-	-	50	-	50
U04CC0XX	Co-curricular courses III	-	-	-	-	-	50	-	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology Second Year

(Minor in Medical Laboratory Technology)

Second Year Semester IV: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC401	Bakery Technology	3	-	-	3	-	-	3
U25PC402	Food Packaging	2	-	-	2	-	-	2
U25PC403	Fruit and Vegetable Technology	3	-	-	3	-	-	3
UXXMM0XX	Multidisciplinary Minor-III	3	-	-	3	-	-	3
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language: Marathi	2	-	-	2	-	-	2
UXXOE04X	Open Elective-IV	2	-	-	2	-	-	2
U25PC404	Bakery Technology Lab	-	2	-	-	1	-	1
U25PC405	Fruit and Vegetable Technology Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor-III Lab	-	2	-	-	1	-	1
U25SE404	Food Quality Evaluation	-	4	-	-	2	-	2
U04CC0X	Co-curricular courses IV	-	4	-	-	2	-	2
U03VE002	Universal Human Values II	-	-	-	-	-	-	Audit Course
	Total	**15**	**14**	**-**	**14**	**08**	**-**	**22**

Programme Structure for B. Sc. Food Science and Technology Second Year

(Minor in Medical Laboratory Technology)

Second Year Semester IV: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical * Oral/ POE	
		T1	T2	FET	Total				
U25PC401	Bakery Technology	10	10	5	25	50	-	-	75
U25PC402	Food Packaging	10	-	5	15	35	-	-	50
U25PC403	Fruit and Vegetable Technology	10	10	5	25	50	-	-	75
UXXMM0XX	Multidisciplinary Minor-III	10	10	5	25	50	-	-	75
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language: Marathi	10	-	5	15	35	-	-	50
UXXOE04X	Open Elective- IV	10	-	5	15	35	-	-	50
U25PC404	Bakery Technology Lab	-	-	-	-	-	25	-	25
U25PC405	Fruit and Vegetable Technology Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor-III Lab	-	-	-	-	-	25	-	25
U25SE404	Food Quality Evaluation	-	-	-	-	-	25	25	50
U04CC0X	Co-curricular courses IV	-	-	-	-	-	50	-	50
U03VE002	Universal Human Values II	-	-	-	-	-	-	-	Audit Course

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology Third Year

(Minor in Medical Laboratory Technology)

Third Year Semester V: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC501	Legume and Oilseed Processing	3	-	-	3	-	-	3
U25PC502	Spice and Condiments Processing	3	-	-	3	-	-	3
U25PE501	Food Safety and Management	3	-	-	3	-	-	3
U25VS503	Confectionary Technology	3	-	-	3	-	-	3
UXXMM0XX	Multidisciplinary Minor-IV	3	-	-	3	-	-	3
U25PC503	Legume and Oilseed Processing Lab	-	2	-	-	1	-	1
U25PC504	Spice and Condiments Processing Lab	-	2	-	-	1	-	1
U25PE502	Food Safety and Management Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor-IV Lab	-	2	-	-	1	-	1
U25VS504	Confectionary Technology Lab	-	2	-	-	1	-	1
U25CE501	Food Supply Chain	2	-	-	2	-	-	2
	Total	**17**	**10**	**-**	**17**	**5**	**-**	**22**

Programme Structure for B. Sc. Food Science and Technology Third Year

(Minor in Medical Laboratory Technology)

Third Year Semester V: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical * Oral/ POE	
		T1	T2	FET	Total				
U25PC501	Legume and Oilseed	10	10	5	25	50	-	-	75
U25PC502	Spice and Condiments	10	10	5	25	50	-	-	75
U25PE501	Food Safety and Management	10	10	5	25	50	-	-	75
U25VS503	Confectionary Technology	10	10	5	25	50	-	-	75
UXXMM0XX	Multidisciplinary Minor-IV	10	10	5	25	50	-	-	75
U25PC503	Legume and Oilseed Processing Lab	-	-	-	-	-	25	-	25
U25PC504	Spice and Condiments Processing Lab	-	-	-	-	-	25	-	25
U25PE502	Food Safety and Management Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor-IV Lab	-	-	-	-	-	25	-	25
U25VS504	Confectionary Technology Lab	-	-	-	-	-	25	-	25
U25CE501	Food Supply Chain	10	-	5	15	35	-	-	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology Third Year

(Minor in Medical Laboratory Technology)

Third Year Semester VI: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC601	Cereal Technology	3	-	-	3	-	-	3
U25PC602	Technology of Beverages	3	-	-	3	-	-	3
U25PE603	Food Adulteration and Analysis	3	-	-	3	-	-	3
UXXMM0XX	Multidisciplinary Minor-V	3	-	-	3	-	-	3
UXXOE05X	Open Elective-V	2	-	-	2	-	-	2
U25PC603	Cereal Technology Lab	-	2	-	-	1	-	1
U25PC604	Technology of Beverages Lab	-	2	-	-	1	-	1
U25PE604	Food Adulteration and Analysis Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor-V Lab	-	2	-	-	1	-	1
U25OT601	Internship	-	8	-	-	4	-	4
	Total	**14**	**16**	**-**	**14**	**08**	**-**	**22**

Programme Structure for B. Sc. Food Science and Technology Third Year

(Minor in Medical Laboratory Technology)

Third Year Semester VI: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical* Oral/ POE	
		T1	T2	FET	Total				
U25PC601	Cereal Technology	10	10	5	25	50	-	-	75
U25PC602	Technology of Beverages	10	10	5	25	50	-	-	75
U25PE603	Food Adulteration and Analysis	10	10	5	25	50	-	-	75
UXXMM0XX	Multidisciplinary Minor-V	10	10	5	25	50	-	-	75
UXXOE05X	Open Elective-V	10	-	5	15	35	-	-	50
U25PC603	Cereal Technology Lab	-	-	-	-	-	25	-	25
U25PC604	Technology of Beverages Lab	-	-	-	-	-	25	-	25
U25PE604	Food Adulteration and	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor-V Lab	-	-	-	-	-	25	-	25
U25OT601	Internship	-	-	-	-	-	50	50	100

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology Fourth Year

(Minor in Medical Laboratory Technology)

Fourth Year Semester VII: Teaching Scheme

(UG Honors with Research)

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC701	Food Regulations	3	-	-	3	-	-	3
U25PC702	Industrial Waste Management	3	-	-	3	-	-	3
U25PE705	Food Additives	3	-	-	3	-	-	3
U25PC703	Food Regulations Lab	-	2	-	-	1	-	1
U25PC704	Industrial Waste Management Lab	-	2	-	-	1	-	1
U25PE706	Food Additives Lab	-	2	-	-	1	-	1
U01RM001	Research Methodology	3	-	1	3	-	1	4
U25PR701	Research Project	-	8	-	-	4	-	4
	Total	**12**	**14**	**1**	**12**	**07**	**1**	**20**

Programme Structure for B. Sc. Food Science and Technology Fourth Year

(Minor in Medical Laboratory Technology)

Fourth Year Semester VII: Evaluation Scheme

(UG Honors with Research)

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical* Oral/	
		T1	T2	FET	Total				
U25PC701	Food Regulations	10	10	5	25	50	-	-	75
U25PC702	Industrial Waste Management	10	10	5	25	50	-	-	75
U25PE705	Food Additives	10	10	5	25	50	-	-	75
U25PC703	Food Regulations Lab	-	-	-	-	-	25	-	25
U25PC704	Industrial Waste Management Lab	-	-	-	-	-	25	-	25
U25PE706	Food Additives Lab	-	-	-	-	-	25	-	25
U01RM001	Research Methodology	10	10	5	25	50	25	-	100
U25PR701	Research Project	-	-	-	-	-	50	50	100

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology Fourth Year

(Minor in Medical Laboratory Technology)

Fourth Year Semester VIII: Teaching Scheme

(UG Honors with Research)

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC801	Advanced Sensory Techniques	3	-	-	3	-	-	3
U25PC802	Extrusion Technology	3	-	-	3	-	-	3
U25PE807	Nutraceutical Food	3	-	-	3	-	-	3
U25PC803	Advanced Sensory Techniques Lab	-	2	-	-	1	-	1
U25PC804	Extrusion Technology Lab	-	2	-	-	1	-	1
U25PE808	Nutraceutical Food Lab	-	2	-	-	1	-	1
U25PR802	Research Project	-	16	-	-	8	-	8
	Total	**09**	**22**	**-**	**09**	**11**	**-**	**20**

Programme Structure for B. Sc. Food Science and Technology Fourth Year

(Minor in Medical Laboratory Technology)

Fourth Year Semester VIII: Evaluation Scheme

(UG Honors with Research)

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical * Oral/ POE	
		T1	T2	FET	Total				
U25PC801	Advanced Sensory Techniques II	10	10	5	25	50	-	-	75
U25PC802	Extrusion Technology	10	10	5	25	50	-	-	75
U25PE807	Nutraceutical Food	10	10	5	25	50	-	-	75
U25PC803	Advanced Sensory Techniques Lab	-	-	-	-	-	25	-	25
U25PC804	Extrusion Technology Lab	-	-	-	-	-	25	-	25
U25PC808	Nutraceutical Food Lab	-	-	-	-	-	25	-	25
U25PR802	Research Project	-	-	-	-	-	50	150	200

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology

(Minor in Medical Laboratory Technology)

Fourth Year Semester VII: Teaching Scheme

(UG Honors)

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC701	Food Regulations	3	-	-	3	-	-	3
U25PC702	Industrial Waste Management	3	-	-	3	-	-	3
U25PC703	Industrial Equipment in Food Processing	3	-	-	3	-	-	3
U25PE705	Food Additives	3	-	-	3	-	-	3
U25PC704	Food Regulations Lab	-	2	-	-	1	-	1
U25PC705	Industrial Waste Management Lab	-	2	-	-	1	-	1
U25PC706	Industrial Equipment in Food Processing Lab	-	2	-	-	1	-	1
U25PE706	Food Additives Lab	-	2	-	-	1	-	1
U01RM001	Research Methodology	3	-	1	3	-	1	4
	Total	**15**	**8**	**1**	**15**	**04**	**01**	**20**

Programme Structure for B. Sc. Food Science and Technology Fourth Year

(Minor in Medical Laboratory Technology)

Fourth Year Semester VII: Evaluation Scheme

(UG Honors)

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical* Oral/	
		T1	T2	FET	Total				
U25PC701	Food Regulations	10	10	5	25	50	-	-	75
U25PC702	Industrial Waste Management	10	10	5	25	50	-	-	75
U25PC703	Industrial Equipment in Food Processing	10	10	5	25	50	-	-	75
U25PE705	Food Additives	10	10	5	25	50	-	-	75
U25PC704	Food Regulations Lab	-	-	-	-	-	25	-	25
U25PC705	Industrial Waste Management Lab	-	-	-	-	-	25	-	25
U25PC706	Industrial Equipment in Food Processing Lab	-	-	-	-	-	25	-	25
U25PE706	Food Additives Lab	-	-	-	-	-	25	-	25
U01RM001	Research Methodology	10	10	5	25	50	25	-	100

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

Programme Structure for B. Sc. Food Science and Technology Fourth Year

(Minor in Medical Laboratory Technology)

Fourth Year Semester VIII: Teaching Scheme

(UG Honors)

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U25PC801	Advanced Sensory Techniques	3	-	-	3	-	-	3
U25PC802	Extrusion Technology	3	-	-	3	-	-	3
U25PC803	Advance Food Packaging	3	-	-	3	-	-	3
U25PE807	Nutraceutical Food	3	-	-	3	-	-	3
U25PC804	Advanced Sensory Techniques Lab	-	2	-	-	1	-	1
U25PC805	Extrusion Technology Lab	-	2	-	-	1	-	1
U25PC806	Advance Food Packaging Lab	-	2	-	-	1	-	1
U25PE808	Nutraceutical Food Lab	-	2	-	-	1	-	1
U25OT802	Internship	-	8	-	-	4	-	4
	Total	**12**	**16**	**-**	**12**	**8**	**-**	**20**

Programme Structure for B. Sc. Food Science and Technology Fourth Year

(Minor in Medical Laboratory Technology)

Fourth Year Semester VIII: Evaluation Scheme

(UG Honors)

Course Code	Course Name	Theory Marks					Practical / Tutorial Marks		Total
		Internal Assessment*				ESE*	Term work*/ Tutorial	Practical * Oral/ POE	
		T1	T2	FET	Total				
U25PC801	Advanced Sensory Techniques II	10	10	5	25	50	-	-	75
U25PC802	Extrusion Technology	10	10	5	25	50	-	-	75
U25PC803	Advance Food Packaging	10	10	5	25	50	-	-	75
U25PE807	Nutraceutical Food	10	10	5	25	50	-	-	75
U25PC804	Advanced Sensory Techniques Lab	-	-	-	-	-	25	-	25
U25PC805	Extrusion Technology Lab	-	-	-	-	-	25	-	25
U25PC806	Advance Food Packaging Lab	-	-	-	-	-	25	-	25
U25PE808	Nutraceutical Food Lab	-	-	-	-	-	25	-	25
U25PR802	Research Project	-	-	-	-	-	50	150	200

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course.

B. Sc. Food Science and Technology

General Biology Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U25PC101	General Biology	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U25PC101	General Biology	10	10	5	25	40%	50	40%	75

Course Description: This course will focus on and explore the ideas from viewpoint of application of plant and animal sciences in food sciences, idea about biological processes and their relevant use in food sciences, various aspects of biochemical reactions and its applications as. This course will also focus on role of different glands in human body.

Course Outcomes: after the end of this course students will able to

CO1 Explain[1] basics of plant and animal classification.

CO2 Describe[1] anatomy of angiosperms and plant tissue system

CO3 Interpret[3] the physiological functions of plant systems.

CO4 Describe[2] the morphology, physiology and classification of animals.

CO5 Apply[4] the basic knowledge of living systems in food science.

Course Contents

Module	Unit	Description	Hours
1.0		**Classification of plant kingdom**	
1	1.1	Angiosperms- Anatomy, various types of tissue, vascular bundles etc. Angiosperm Physiology-Mineral nutrition and ion transport, mineral deficiencies	9
	1.2	Vernalization, Growth Substances- their chemical nature, role and application in Agri-horticulture. Growth indices, growth movements. Fruit ripening- its molecular basis and manipulation	
2.0		**Photosynthesis**	
2	2.1	Introduction of Photosynthesis, photosynthetic process, photophosphorylation. Respiration, aerobic and anaerobic including fermentation- electron transport chain and oxidative phosphorylation	9
	2.2	N_2 fixation and Nitrogen metabolism, photoperiodism and flowering, Fruit and seed physiology- Dormancy, storage and germination of seeds. Food chain and Food web.	
3.0		**Classification and morphology of Animals**	
3	3.1	BASIS OF CLASSIFICATION **of Animals** and morphology of Animals Fishes, Amphibians, Reptiles, Birds and mammals Composition of blood, blood groups in humans, Rh factors, blood coagulation, O_2 and CO_2 transport, hemoglobin	9
	3.2	Breathing and its regulation, Ultrastructure of kidney and urine formation, acid-base balance and homeostasis, Temperature regulation in humans, Mechanism of synapsis, neurotransmitters, vision, hearing and organoleptic properties	
4.0		**Physiology of Animals**	
4	4.1	Types of muscles, ultrastructure and mechanism of contraction of skeletal muscles, Role of salivary gland, liver, pancreas and intestinal gland in digestion, absorption of digested food, nutrition and balanced diet of man	9

	4.2	Mechanism of action of steroid and peptide hormone, role of pituitary, thyroid, parathyroid, pancreas, adrenal, Testes and ovary and their relationship. Reproduction in humans, pheromones in mammals.	
5.0		**Energy and Metabolism**	
5	5.1	Energy Flows through Living Systems The Laws of Thermodynamics Govern All Energy Changes ATP is the Energy Currency of Cells Enzymes Speed Chemical Reactions by Lowering Activation Energy Metabolism is the Sum of a Cell's Chemical Activities	9
	5.2	Cells Harvest Energy from Organic Compounds by Oxidation Glycolysis Splits Glucose and Yields a Small Amount of ATP The Krebs Cycle is the Oxidative Core of Cellular Respiration Electrons Harvested by Oxidation Pass along an Electron Transport Chain The Total Energy Yield Energy Yield of Aerobic Respiration far Exceeds that of Glycolysis	

Text Books

1 Mason, K. A., T. Duncan, G. Johnson, J. B. Losos, and S. R. Singer. 2018. Understanding Biology, 2 nd Ed. New York, NY: McGraw-Hill Education, Inc

2 Arihant, (2021). Handbook of Biology. Generic publishers.

Reference Books

1 Raven P.H., Johnson, G. B., Losos, J. B., Singer, S. R., (2005). Biology. Tata McGraw Hill, Delhi India

2 Sadava et al. (2011) Life: The Science of Biology, Ninth Edition

3 Bray, A., H. Johnson, L. Raff, and R. Walter (2010). Essential Biology, 3rd ed., Garland Science, Taylor & Francis Group, N

4 Hoefnagel, Marielle (2009). Biology: Concepts and Investigations, 1st ed., McGraw Hill Publishers, Dubuque, IA

- Internal Assessment (T1, T2 and FET):

  1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.

2. Fifth module will be assessed for 5 marks separately.

- End Semester Examination:
    1. Question paper will comprise of 5 questions, each carrying 10 marks.
    2. The duration of end semester examination shall be 2 hours.
    3. The students need to solve all 5 questions.
    4. Question No.1 will be compulsory and based on entire syllabus.
    5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U21PC103	General Chemistry	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		3	-	-	3	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U21PC103	General Chemistry	T1	T2	FE T	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:This course is being offered to nonchemistry biology majors. This course take an overview of concepts in chemistry and biology of everyday life.

Pre-requisites: The Students should have basic knowledge of concepts in chemistry and basic biology.

Course Objectives:

- To revisit the fundamental concepts in chemistry
- To correlate the principles of chemistry and biology.

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

- **CO1** Recall[1] the concepts of chemistry.
- **CO2** Relate[3] fundamental chemistry to everyday life.
- **CO3** Understand[2] the principles of chemistry that are relevant to biology.
- **CO4** Understand[2] the concepts of organic chemistry.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction:**	
1	1.1	Introduction to Chemistry, What is Chemistry?, Matter, Measurements: Numbers, Units & conversions, Significant Figures, Atoms: Review of Bohr's theory and its limitations, Dual behaviour of matter and radiation, de Broglie's relation, Heisenberg uncertainty principle. Shapes of atomic orbital. Molecules, Mass of Atoms and Molecules, Ions and ionic compounds.	9
	1.2	Periodic table: Historical perspectives, Period arrangements of elements and periodic trends, Periodic table for biology.	
2.0		**Stoichiometry and Chemical Reactions:**	
2	2.1	Mole concept: Determination of molecular weight by gram molecular volume relationship, Problems based on mole concept. Methods of expressing concentrations, strength, normality, molarity, molality, %w/v, %v/v, ppm, Standardization of solutions, Primary and secondary standards.	9
	2.2	Stoichiometry: Definition and balancing equations, Chemical reactions: Limiting reagents, yields and types of reactions. Chemical reactions in biological systems.	
3.0		**Gases, Energy and Chemistry, Chemical bonding:**	
3	3.1	Gases: Kinetic theory of Gases, Pressure, Gas laws, Idea gas laws. Gas mixtures, Law of conservation of Energy, Work and Heat, Enthalpy and Chemical Reactions.	9
	3.2	Chemical Bonding: Lewis dots and Ionic bonding (salts), and Covalent bonding (Vitamins and Minerals), Different aspects of covalent bonding.	
4.0		**Solids, Liquids and Solutions, Acids, Bases, Chemical Equilibrium:**	

4	4.1	Intermolecular forces, Phase transitions: Melting, Boiling and Sublimation, Properties of liquids, Solutions: Dilutions and Collegative properties, Solids: General Properties and Types.	9
	4.2	Theories of Acids and Bases, Strong and Weak acid and base, Titrations, pH and buffers, Chemical equilibrium, Equilibrium constants.	
5.0		**Oxidation and Reduction, Organic Chemistry**:	
5	5.1	Oxidation and Reduction reactions, Balancing redox reactions, redox reactions and Voltaic cell,	9
	5.2	Organic Chemistry: Hydrocarbons and functional groups, Basic Concepts in Organic chemistry. Polymers and biopolymers.	

References

1. David W Ball, The Basics of General, Organic, and Biological Chemistry, Saylor Foundation.

2. A. K. Day, Environmental Chemistry, New Edge International Ltd.

3. www.beyondbenign.com

- Internal Assessment (T1, T2 and FET):

T1 should be based on first two modules, T2 should be based on third and fourth modules, for 10 marks.

Fifth module will be assessed for 5 marks separately.

- End Semester Examination:

1. Question paper will comprise of 5 questions, each carrying 7 marks.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the module

Indian Traditional Foods Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25IK101	Indian Traditional Foods	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U25IK101	Indian Traditional Foods	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	--	5	15	40%	35	40%	50

Course Description:

This course will focus on and explore the ideas from viewpoint of knowing and understanding the basics of INDIAN FOOD product, imparting knowledge about the traditional food processing, basic ingredient of traditional food,

Course Outcomes: after the end of this course students will able to

CO1 Explain[2] status of INDIAN traditional FOOD.

CO2 Identify[2] Different Regional Indian traditional Food as meal.

CO3 Identify[2] Different Regional Indian traditional Food desert.

CO3 Application [3]of different equipment in Indian traditional Food.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction**	
1	1.1	Introduction to Indian Regional Cuisine, History & heritage of Indian Cuisine	6
	1.2	Factors that affect eating habits in different parts of the country Geographic location, Historical background,Seasonal availability	
2.0		**Foods Consumed in Different Regions of India**	
2	2.1	Foods Consumed in Different Regions of India- Northern Region and Western region,	6
	2.2	Foods Consumed in Different Regions of India- Southern region, Eastern region, Desert areas	
3.0		**Indian sweets**	
3	3.1	Introduction Origin and history of Indian sweets,Ingredients used in Indian Sweets	6
	3.2	Regional Influence on Indian Sweets,-Equipment used in preparing Indian Sweets.	
4.0		**Traditional Food I**	
4	4.1	Typical breakfast, meal and snack foods of different regions of India. Regional foods that have gone Pan Indian / Global. Popular regional foods.	6
	4.2	Traditional fermented foods, pickles and preserves, beverages, snacks, desserts and sweets, street foods, IPR issues in traditional foods	
5.0		**Traditional Foods II**	
5	5.1	Comparison of traditional foods with typical fast foods / junk foods – cost, food safety, nutrient composition, bioactive components; energy and environmental costs of traditional foods; traditional foods used for specific ailments /illnesses.	6

	5.2	Factors that affect eating habits in different parts of the country Eating Styles of India, Traditional Equipment s used for Cooking, Changes in consumption of Traditional Foods with different states.	

Text Books

1 Food Production Operations: Parvinder S Bali , Oxford Publication Prashad Cooking With Indian Masters, J. Inder Singh Kalra .

2 A Taste Of India, Madur Jaffery, Great Britain Pavilion Books Ltd.

References

1 Potter.(2007) Food Science CBS Publishers & Distributors,5th Edition.

2 Zaike Ka Safar, Jiggs Kalra Daawat, Jiggs Kalra, New Delhi, Allied Publishers The Professional Chef, Arvind Saraswat, New Delhi, Ubs Publishers

3 Davidar, Ruth N. Indian Food Science: A Health and Nutrition Guide to Traditional Recipes: East West Books, 2001

4 Sen, Colleen Taylor Food Culture in India Greenwood Press, 2005

- Internal Assessment (T1 and FET):

  3. T1 should be based on first two modules for 10 marks each.
  4. Fifth module will be assessed for 5 marks separately it will be taken as seminar.

- End Semester Examination:

  6. Question paper will comprise of 5 questions, each carrying 7 marks.
  7. The duration of end semester examination shall be 2 hours.
  8. The students need to solve all 5 questions.
  9. Question No.1 will be compulsory and based on entire syllabus.
  10. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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General Biology Lab course (With OUT POE)

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25PC103	General Biology Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U25PC103	General Biology Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		--	--	25	40	25

Course Outcomes: after the end of this course students will able to

CO1 Interpret[3] the physiological functions of plant systems.

CO2 Describe[2] the morphology, physiology and classification of animals.

CO3 Apply[4] the basic knowledge of living systems in food science.

List of Experiments

1. Study of common Lab instruments and equipment's used in Biology laboratory.
2. Study of morphology of plant parts like root, stem and leaf.
3. To study the structure and function of different parts of flowers (China Rose).
4. To study the phenomenon of photosynthesis in plants.
5. To study the ripening of different types of fruits.
6. Study of various Biogeochemical Cycles.
7. To study the classification of Animal Kingdom.
8. To study the structure and functions of kidneys.
9. To study the structure and functions of heart.
10. To study the role of human hormones.
11. To study organoleptic properties of different food samples.
12. To study the Morphology of Fish.

Text Book

1 Trishna (2021). Fundamentals of Biology. Pearson foundation, Noida, Ninth edition.

2 B.P Pandey (2018) Botany for degree students Part II. S Chand publications

Reference Books

3 Dr. V. K. Agarwal (2019). Zoology for degree students Part II. S. Chand Publications.

4 K. L. Ghatak (2011). Techniques and methods in Biology. PHI Learning Pvt. Ltd, New Delhi.

- Evaluation Scheme

    1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
    2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
    3. Based on above scheme grading and Term work assessment should be done.OE/POE shall be based on all Term work and work carried.

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U21PC104	General Chemistry Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U21PC104	General Chemistry Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40			25

Course Description: This course is a foundation course in chemistry for non chemistry majors. This course covers the basic laboratory skills in chemistry.

Pre-requisites: Basic knowledge of chemicals and basic laboratory equipments.

Course Outcomes: after the end of this course students will able to,

CO1 Understand[1] common laboratory techniques.
CO2 Understand[2] the purification methods for compounds.
CO3 Demonstrate[3] the basic laboratory skills of chemistry.

List of Experiments

1.	Introduction to good laboratory safety practices.
2.	Preparation of solutions. (2 examples of each) a. Normal b. Molar c.% solution
3.	To standardise NaOH solution & find the strength of given HCl solution
4.	Determination of alkalinity in given water sample.
5.	Determination of chloride content in given water sample
6.	Determination of amount of acetic acid in commercial vinegar.
7.	Determination of Physical constant.(BP, MP)
8.	To purify the given organic compound by sublimation method.
9.	Preparation of buffer solution of pH 7 and 4.
10.	Synthesis of polymer (Bakelite resin)

	Reference Books
1	Vogel's Textbook of Practical Organic Chemistry
2	Albert D. R., Chemistry Techniques and Explorations An Introductory Chemistry Laboratory Manual by PA-ADOPT.

- **Evaluation Scheme**

4. Teamwork assessment of 25 marks shall be based on the overall performance of the student with every assignment graded from time to time.
5. The grades will be converted to marks as per the ‘credit and grading system’ manual and should be added and averaged.
6. Based on the above scheme grading and Teamwork assessment should be done.

Fundamental of Food Technology Lab course Without POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25VS102	Fundamental of Food Technology Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U25VS102	Fundamental of Food Technology Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		--	--	25	40	25

Course Outcomes: after the end of this course students will able to

CO1 **Analyze[3]** Fundamental food processing techniques

CO2 **Demonstrate[2]** the various food processing equipments in laboratory.

CO3 **Apply[3]** Different unit operation in food processing

List of Experiments

To study different equipment's used in Food processing.
2. Demonstration of food lab instruments.
3. To study cooking of food and its types.
4. To study different preservation techniques.
5. To study the structure and composition of rice grain.
6. To study different types of dryers and their principles.
7. Detection of gluten in various foods.
8. To detect adulteration of fats and oils by qualitative tests.
9. To perform the recognition test for four basic tastes.
10. To recognize few odors and to learn to memorize them.

11. Demonstration of cereals, pulses and oil seeds.
12. Demonstration of fruits and vegetables.
13. Demonstration of condiments and spices.
14. Demonstration of dairy products.
15. Visit to food industry and writing of brief industrial visit report.

Text Books

1 B.Srilakshmi.,(2018) Food Science,K,R, New age internationalPvt.Ltd 7th Edition

2 B.Poornima.,(2012)Fundamental of Food Sciences Technology,Processing and Preservation Centrum Press.

References

1 Potter.,(2007) Food Science CBS Publishers & Distributors,5th Edition.

2 Sukumar De (194) Outlines of Dairy Technology OxfordUniversity Press 2nd Edition.

3 L. H. Meyer., (2006). Food Chemistry. CBS Publishers and Distributors, New Edition.

4 Triveni P., (2010). Food Preservation. Aadi Publications. 1st Edition.

5 Dr. Mamata Arora., (2020). Practical Manual of Food Processing. NiraliPrakashan.

6 Shalini Sehgal., (2020). A laboratory manual of food analysis. Wiley, Dreamtech Press.

- Evaluation Scheme

7. Termwork assessment shall be based on the overall performance of the student with every assignment graded from time to time.
8. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
9. Based on above scheme grading and Termwork assessment should be done.
10. OE/POE shall be based on all Termwork and work carried out during semester.

Fundamental Microbiology Lab course With (POE)

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25SE101	Fundamental Microbiology	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U25SE101	Fundamental Microbiology	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Outcomes: after the end of this course students will able to

CO1 Explain[1] basics of classification of microorganism

CO2 Identify[2] the various types of microscopes, their use in microbiology

CO3 Examine[3] the various types and structures of micro-organisms

List Of Experiments

1. Preparation of standard operating procedures (SOPs) for common microbiology laboratory instruments.
2. Study of different types of instruments and equipment's used in the microbiology lab.
3. To study the functional parts and working principle of Compound microscope.
4. To study cell morphology using simple staining technique. (Monochrome staining)
5. Study of differential staining technique. (Grams' Staining)
6. To study and demonstrate method of media sterilization and surface sterilization/disinfection.
7. Study of method of culture media preparation.
8. To study the serial dilution technique for microbial isolation.

9. Study of different microbial culture techniques (Streak plate, spread plate, pour plate methods).

10. To study aseptic transfer techniques. (Slant to slant & Slant to plate)

11. Isolation of bacteria using streak plate method and observation of culture characteristics.

12. Determination of the viable number of cells in the culture. (Standard plate count)

Text Book

1 K. R., Aneja, Pranay Jain, Raman Aneja. (2021) Basic and Applied Microbiology. New Age International Pvt. Ltd. 2nd Edition. September 2021.

2 William C. Frazier., Dennis C. Westhoff., (2017). Food Microbiology. Mc Graw Hill Education, 5th Edition

Reference Books

3 R. C. Dubey., Dr. D. K. Maheshwari. (2015). A textbook of Microbiology. S Chand Publishers

4 Bharati Arora. D. R. Arora (2020). Practical Microbiology. CBS Publishers and Distributors, 2nd Edition.

- Evaluation Scheme

11. Termwork assessment shall be based on the overall performance of the student with every assignment graded from time to time.
12. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
13. Based on above scheme grading and Termwork assessment should be done.

OE/POE shall be based on all Termwork and work carried

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25OE011	Food Safety	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U25OE011	Food Safety	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	--	5	15	40%	35	40%	50

Course Description:

This course will focus on and explore the ideas from viewpoint of knowing and understanding the basics of Indian food product, imparting knowledge about the food processing, This course will focus on to develop the knowledge of students on food safety, its management tools and the laws & standards related to food.

Course Outcomes: after the end of this course students will able to

CO1 Explain[2] types of hazards associated with food

CO2 Explain[2]knowledge on food regulations (national as well as international)

CO3 Analyze[3]the design and implementation of food safety management .

CO4 Analyze[3]the design and implementation of ISO series, HACCP and its prerequisites such as GMP, GHP etc.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Food Safety**	
1	1.1	Introduction to food safety, types of hazards, biological, chemical.	6
	1.2	Physical hazards , Factors affecting Food Safety ,Importance of Safe Foods.	
2.0		**Food Safety Management Tools -I**	
2	2.1	concept of Food Safety Management Tools - Prerequisites- GHPs, GMPs.	6
	2.2	HACCP- Principles, Prerequisites case studies	
3.0		**Food Safety Management Tools-II**	
3	3.1	ISO concept and need ,case studies series, TQM - concept and need for quality	6
	3.2	Risk Analysis Accreditation and Auditing Sanitation-Principles and Design Chemicals and Pest management	
4.0		**Food born diseases and poisoning**	
4	4.1	Food Borne Diseases: Definition, Classification - Food borne intoxication & Food borne infections	6
	4.2	Food poisoning: Types of food poisoning, method of investigation of food poisoning, prevention and control- food sanitation, refrigeration, surveillance.	
5.0		**Rules and Regulations**	
5	5.1	Rules and Regulations of Food Safety: Definition - Authorities and Oficers.	6
	5.2	Constitution, Functions and Powers –General Provisions as to Articles of Food Indian Food Regulatory ,Global Scenario ,Other laws and standards related to food	

Text Books

1 Food Production Operations: Parvinder S Bali , Oxford Publication Prashad Cooking With Indian Masters, J. Inder Singh Kalra .

2 A Taste Of India, Madur Jaffery, Great Britain Pavilion Books Ltd.

References

1 Potter (2007) Food Science CBS Publishers & Distributors,5th Edition.

2 Zaike Ka Safar, Jiggs Kalra Daawat, Jiggs Kalra, New Delhi, Allied Publishers The Professional Chef, Arvind Saraswat, New Delhi, Ubs Publishers

3 Davidar, Ruth N. Indian Food Science: A Health and Nutrition Guide to Traditional Recipes: East West Books, 2001

4 Sen, Colleen Taylor Food Culture in India Greenwood Press, 2005

- Internal Assessment (T1 and FET):

  5. T1 should be based on first two modules for 10 marks each.
  6. Fifth module will be assessed for 5 marks separately it will be taken as seminar.

- End Semester Examination:

  11. Question paper will comprise of 5 questions, each carrying 7 marks.
  12. The duration of end semester examination shall be 2 hours.
  13. The students need to solve all 5 questions.
  14. Question No.1 will be compulsory and based on entire syllabus.
  15. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Food Microbiology Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25PC201	Food Microbiology	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U25PC 201	Food Microbiology	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description: This course will focus on and explore the ideas from viewpoint of knowing and understanding the types of microbes , their growth patterns, effects of microbial enzymes on food and spoilage of food. Also, it will focus on the application part of food microbiology with respect to food science, development of new food preservativesand also it will shed light on topics like fermentation and fermentation products and microbial diseases associated with food consumption.

Course Outcomes: after the end of this course students will able to

CO1 Explain[1]the importance of microbes in food technology

CO2 Identify[2] the types of microbes in food spoilage and food contamination.

CO3 Examine[3] themicrobiology of fermented foods.

CO4 Analyze[4] methods to control food spoilage and ways to enhance food quality.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Food Microbiology**	
1	1.1	Microorganisms in foods, General characteristics and their importance in food industry	9
	1.2	Sources of microbial contamination- air, water, soil, sewage, and post-processing contamination.	
2.0		**Microbial Growth**	
2	2.1	Factors influencing growth of microorganisms in foods. Significance of spores Growth curve.	9
	2.2	Microbial growth in food, factors affecting growth of microbes, role of microbes in food spoilage. Food Spoilage and Food Contamination: Factors affecting spoilage.	
3.0		**Food Spoilage**	
3	3.1	Spoilage of fresh and processed fruits & vegetables, milk & milk products spoilage.	9
	3.2	Meat spoilage, fish and poultry products spoilage, cereals and pulses spoilage	
4.0		**Food Fermentation**	
4	4.1	Food Fermentation -Bacterial, Yeast & Mould cultures. Single and Mixed cultures, Propagation, maintenance & Evaluation of cultures.	9
	4.2	Factors affecting activity of cultures–Residual Antibiotics & Chemicals, Microbiology of fermented foods- milk, cereal foods, vinegar, sausages, alcoholic beverages.	
5.0		**Food Borne Diseases**	
5	5.1	Food Borne Diseases- Types and control measures, Food Infection and Intoxication- Bacteria and Non-bacteria.	9
	5.2	Probiotics: Nutritional and therapeutic aspects, Therapeutic values of fermented foods.	

Text Books

1 Martin Adams, Maurice O Moss, Peter McClure. (2016) Food Microbiology. Royal Society of Chemistry. 4th Edition

2 R. C. Dubey., Dr. D. K. Maheshwari. (2015). A Textbook of Microbiology. S Chand Publishers

Reference Books

1 William C. Frazier., Dennis C. Westhoff., (2017). Food Microbiology. Mc Graw Hill Education, 5th Edition.

2 Bibek Ray,Arun Bhunia., (2013). Fundamental food Microbiology. CRC Press, 2nd Edition

3 Pelczar, M.J., Chan E.C.S Crieg N.R, Microbiology 5th Edition, Tata McGraw Hill Publication Ltd, New Delhi.

4 Micheal Doyle., Colin Hill., (2019). Food Microbiology- Fundamentals to Frontiers, 5th Edition, ASM Press.

- Internal Assessment (T1, T2 and FET):
  1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  2. Fifth module will be assessed for 5 marks separately it will be taken as seminar.
- End Semester Examination:
  1. Question paper will comprise of 5 questions, each carrying 10 marks.
  2. The duration of end semester examination shall be 2 hours.
  3. The students need to solve all 5 questions.
  4. Question No.1 will be compulsory and based on entire syllabus.
  5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U21PC203	Chemistry for Biologist	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		3	-	-	3	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U21PC203	Chemistry for Biologist	T1	T2	FE T	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description: *Chemistry for Biologists* course aim to help you understand the chemistry and chemical principles that underlie a good deal of biology. This course is offered to non-chemistry biology majors. This course deals with structure and properties of biomolecules, such as amino acids, proteins, carbohydrates, lipids, and nucleic acids. The focus of this course will be on the relationship between protein structure and its biological function.

Pre-requisites: The Students should have basic knowledge of concepts in chemistry and basic biology.

Course Objectives:

- ❖ Understand the structure and properties of biomolecules.
- ❖ Correlate their pathways inside body.

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

- **CO1** Understand[1] the fundamental concepts in biology, chemistry and biochemistry.
- **CO2** Apply[3] basic principles of chemistry to biological systems and molecular biology.
- **CO3** Relate[2] various interrelated physiological and metabolic events.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction**	
1	1.1	Introduction to Chemistry of life, Organic Molecules for Biology, functional groups.	9
	1.2	Inorganic Ions: Plants, Nutrients, Cations and Anions in Mammelian diet. Water and Living Organisms: Water molecule, Solvent, Proton transfer reactions, Buffer, Metabolites and living environment, Amino acids, Concept of Chirality.	
2.0		**Carbohydrates, Proteins and Enzymes**	
2	2.1	Carbohydrates: Monosaccharides and Disaccharides, Polysaccharides, Glycogen and Cellulose. Lipids: Glycerol, Fatty acids, Esters, Triglycerides, Phospholipids.	9
	2.2	Proteins Importance of Proteins, Amino acids, Peptide bond formation, Primary and Three-dimensional structure and functions. Enzymes: Concept of Catalysis, General Properties of Enzymes, Function and structures, Enzyme catalysis.	
3.0		**Nucleic Acids, Cells and Metabolism**	
3	3.1	Nucleic Acids: Introduction, Sugars-Phosphates-Bases, Formation of nucleotides, Structure of DNA and hydrogen bonding.	9
	3.2	In and Out of Cell: Cells, Membranes and walls. Phospholipids, Proteins, Plant cell walls, Passive and active transport. Metabolism and Energy: Chemical reactions in cell, Anabolism and catabolism, Chemical reactions during metabolism.	
4.0		**Energy**	
4	4.1	Energy flow: Energy and chemical compounds, Photosynthesis, Transfer of energy through energy cycles. Gas Exchange during respiration and in flowering plants.	9

	4.2	Transport of Oxygen in blood: Blood, Red blood cells and Haemoglobin, Effect of CO_2 in blood. Respiration: ATP and cells, Oxidation and reduction, Aerobic and anaerobic respiration.	
5.0		**Biochemical transformations**	
5	5.1	Photosynthesis: Leaves and leaf structure, stages of photosynthesis, light dependent and light independent reactions. ATP from ADP.	9
	5.2	Excretion and the Liver: Excretion in mammals and function of liver, amino acid regulations, detoxification in liver. Nerves and Hormones: Nervous coordination in mammals. Carbonyl chemistry: Aldol reaction, Claisen Reaction, Prenyl Transfer Reaction.	

References

1. Carol Higginbotham, Introductory Biochemistry
2. Chemistry for Biologists (rsb.org.uk)

- Internal Assessment (T1, T2 and FET):

T1 should be based on first two modules, T2 should be based on third and fourth modules, for 10 marks.

Fifth module will be assessed for 5 marks separately.

- End Semester Examination:

1. Question paper will comprise of 5 questions, each carrying 7 marks.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

Food Microbiology Lab course Without POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25PC203	Food Microbiology Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U25PC203	Food Microbiology Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	--	--	25

Course Outcomes: after the end of this course students will able to

CO1 Identify[2] the types of microbes in food spoilage and food contamination.

CO2 Examine[3] themicrobiology of fermented foods.

CO3 Analyze[4] methods to control food spoilage and ways to enhance food quality.

List of Experiments

1. Microscopic examination of fungi causing rust and smut infection in plants.
2. Isolation and study of microscopic characters of microorganisms from spoiled food sample (Bread/Bhakri/Roti, etc.,)
3. Isolation and identification of Xanthomonas species from an infected food sample.
4. Isolation and identification of Aspergillus species from an infected food sample like onion or peanut.
5. Isolation and identification of lactic acid bacteria.
6. Microbial tests: Standard plate count.
7. Microbial tests: Direct microscopic count.
8. Microbial tests: MBRT and phosphatase test
9. Study of various sources of food contamination.
10. Visit to dairy/food industry.

Text Books

1 Micheal Doyle., Colin Hill., (2019). Food Microbiology- Fundamentals to Frontiers, 5th Edition, ASM Press.

2 Martin Adams, Maurice O Moss, Peter McClure. (2016) Food Microbiology. Royal Society of Chemistry. 4th Edition.

Reference Books

1 Neelima Garg, K. G Mukerji., K. L. Garg., (2020).Laboratory manual of Food Microbiology, Wiley Publications, Dreamtech Press.

2 William C. Frazier., Dennis C. Westhoff., (2017). Food Microbiology. Mc Graw Hill Education, 5th Edition.

3 Bibek Ray,Arun Bhunia., (2013). Fundamental food Microbiology. CRC Press, 2nd Edition

4 Pelczar, M.J., Chan E.C.S Crieg N.R, Microbiology 5th Edition, Tata McGraw Hill Publication Ltd, New Delhi.

- Evaluation Scheme

1. Termwork assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
3. Based on above scheme grading and Termwork assessment should be done.
4. OE/POE shall be based on all Termwork and work carried out during semester.

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U21PC204	Chemistry for Biologist Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U251PC204	Chemistry for Biologist Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40			25

Course Description: This course is a foundation course in chemistry for non chemistry majors. This course covers the basic laboratory skills in chemistry that are relevant to biology majors.

Pre-requisites: Basic knowledge of chemistry, biology and basic laboratory equipments.

Course Outcomes: after the end of this course students will able to,

CO1 Understand[1] and relate theory to common laboratory techniques.
CO2 Understand[2] the isolation and purification methods for biological samples.
CO3 Demonstrate[3] the basic laboratory skills of biochemistry.

List of Experiments

1.	Introduction to laboratory safety practices in biology laboratory.
2.	Preparation of reagents, buffers etc for biological samples
3.	Determination of total amino acid concentration by ninhydrin method.
4.	Estimation of protein concentration by- i) Biuret method ii) Lowry method iii) Spectrophotometric method.
5.	Estimation of reducing sugar concentration by DNSA method
6.	Estimation total sugar concentration by i) Phenol-H_2SO_4 method ii) Anthrone method
7.	Determination of fructose concentration by resorcinol method
8.	Isolation of DNA and RNA.
9.	Estimation of DNA and RNA

	a] Estimation of DNA by diphenyl amine method. b] Estimation of DNA by Spectrophotometric method. c] Estimation of RNA by orcinol method.
10.	Isolation of Characterization of casein from milk
11.	Isolation and characterization of starch from potato
12.	Isolation of cholesterol and lecithin from egg yolk
	Reference Books
1	Boyer, Rodney F.; Biochemistry laboratory : Modern theory and techniques
2	Philip L.R. Bonner, Alan J. Hargreaves, Basic Bioscience Laboratory Techniques, Wiley Blackwell.
3	E. Dilipan, Methods and Protocols: A Laboratory Manual for Biochemistry and Biotechnology, INSC International Publishers.

- **Evaluation Scheme**

5. Teamwork assessment of 25 marks shall be based on the overall performance of the student with every assignment graded from time to time.
6. The grades will be converted to marks as per the ‘credit and grading system’ manual and should be added and averaged.
7. Based on the above scheme grading and Teamwork assessment should be done.

Advanced Food Instrumentation Lab

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25VS203	Advanced Food Instrumentation Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U25VS203	Advanced Food Instrumentation Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Outcomes: after the end of this course students will able to

CO1 Identify[2] structures of biomolecules.

CO2 Examine[3]properties of enzymes.

CO3 Analyze[4]the important applications of proteins and nucleic acids in food science.

List of Experiments

1. To study the principle and working of laminar air flow.
2. To study the working principle of spray dryer.
3. To study the working principle of freeze dryer
4. To study the working principle of pasteurizer.
5. To study the working principle of homogeniser.
6. To study the working principle of viscometer.
7. To study the principle and working of soxhlet apparatus.
8. To study the principle and working of muffle furnace.
9. To study the principle and working of vaccume packaging machine.
10. To study the principle and working of extruder.
11. To study the working principle of spectrophotometer.

Textbooks

1. Food Analysis Laboratory Manual by S. Suzanne Nielsen
2. Food Process Engineering and Technology by Zeki Berk

Reference Books

1. Food Processing Technology: Principles and Practice by P.J. Fellows
2. Instrumental Methods of Analysis of Foods by George Charalambous and Paul J. Van Soest

- Evaluation Scheme

8. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
9. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
10. Based on above scheme grading and Term work assessment should be done.
11. OE/POE shall be based on all Term work and work carried out during semester.

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Food and Nutrition Lab course With POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U25SE202	Food and Nutrition	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U25SE202	Food and Nutrition	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Outcomes: after the end of this course students will able to

CO1 Identify[2] Various sources of nutrients and their function in diet

CO2 Examine[3]Importance of energy in nutrition

CO3 Analyze[2]Concept of Balanced Diet

List of Experiments

1. Calculation of BMR and body surface area
2. Enrichment and fortification of daily diet.
3. Preparation of list of nutrient rich food sources (Carbohydrates, proteins, fats
4. Calculation of nutritive value of foods
5. Preparation of high carbohydrate product from cereals.
6. Preparation of high protein product from plant source.
7. Detection of adulterants in foods such as milk, honey etc.
8. Planning of Normal Diet for a Pre School Child.
9. Planning of a Diabetic Diet for an Adult.
10. Planning and preparation of balanced diet for a pregnant woman.
11. Planning and preparation of balanced diet for a nursing mother.
12. Planning a diet for senior citizen - Preparation of meals

Text Book

1 Shubangini A Joshi, (1998): Nutrition and Dietetics, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi.

2 Shubangini A Joshi, (1998): Nutrition and Dietetics, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi.

Reference Books

3 Mahan, L.K. and Escott-Stump, S. (2000) Krause's Food, Nutrition and Diet Therapy, 10th Ed.W.B.Saunders Company, London..

4 Shills, M.E, Oslon, J.A, Shike, M and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition.

- Evaluation Scheme

12. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
13. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
14. Based on above scheme grading and Term work assessment should be done.
15. OE/POE shall be based on all Term work and work carried out during semester.

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