VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY, BALLARI-583 105

SYLLABUS

FOR

DEPARTMENT OF U.G. STUDIES IN

FOODTECHNOLOGY

SEP BASED

2025-26& ONWARDS

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY, BALLARI-583 105

(Effective from the academic year 2025-2026)

Course outline and Syllabus for Bachelor of Science in FOOD TECHNOLOGY (FT) Under SEP

The Board has framed and approved the Syllabus/Scheme of examination of CBCS and SEP and recommended for implementation from 2025-26. The following are the core papers and scheme of examination proposed by the Board.

1. B.Sc, Degree in Food technology - I and II Semester
2. B.Sc, Degree in Food technology- III and IV Semester
3. B.Sc, Degree in Food technology- V and VI Semester

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme Food Technology with effect from 2025-26 (single programme structure)

Semester	Course -A	Course-B	Course-C	Elective /Optional	Language	Compulsory / Skill Courses	Total Credits
1	Fundamentals of Food Science & Technology (6) (L:T:P = 4:0:2)	Food Chemistry (6) (L:T:P = 4:0:2)	Food Microbiology (6) (L:T:P = 4:0:2)	-	L1 (3) (L:T:P = 3:0:0) L2 (3) (L:T:P = 3:0:0)	Constitutional Values (2) (L:T:P = 2:0:0)	26
2	Food Biotechnology (6) (L:T:P = 4:0:2)	Biochemistry & Nutrition (6) (L:T:P = 4:0:2)	Food Engineering 2 (6) (L:T:P = 4:0:2)	-	L1(3) (L:T:P = 3:0:0) L2 (3) (L:T:P = 3:0:0)	Environmental Studies (2) (L:T:P = 2:0:0)	26
3	Food Processing & Preservation (6) (L:T:P = 4:0:2)	Food Packaging Technology (6) (L:T:P = 4:0:2)	Technology of Fruits, Vegetables, Spices & Plantation Crops (6) (L:T:P = 4:0:2)	-	L1 (3) (L:T:P = 3:0:0) L2 (3) (L:T:P = 3:0:0)	SEC-1 (2) Food Business and Entrepreneurship Development (L:T:P = 2:0:0)	26
4	Technology of Cereals, Pulses & Oilseeds (6) (L:T:P = 4:0:2)	Industrial Microbiology (6) (L:T:P = 4:0:2)	Technology of Milk & Milk products (6) (L:T:P = 4:0:2)	-	L1 (3) (L:T:P = 3:0:0) L2 (3) (L:T:P = 3:0:0)	SEC-2 (2) Communication Skills (L:T:P = 2:0:0)	26
5	Food Analytics & Instrumentation (6) (L:T:P = 4:0:2)	Technology of Meat&Marine Foods (6) (L:T:P = 4:0:2)	Flour Milling, Bakery & Confectionery technology(6) (L:T:P = 4:0:2)	1. Nutraceutical and Functional Foods 2. Traditional foods & beverages 3.Managerial economics &Business environment (2)(L:T:P = 2:0:0)	-	SEC-3 (2) Sensory science &Evaluationof Foods. (L:T:P = 2:0:0)	22
6	Marketing management & international trade (6) (L:T:P =4:0:2)	Digital Innovations in Food Sector (6) (L:T:P = 4:0:2)	Food Safety, Standards & Quality Management Systems (6) (L:T:P = 4:0:2)	1. Food Product Development 2. Start-ups and Entrepreneurship in agribusiness 3. Food waste Management and utilization (2)(L:T:P = 2:0:0)	-	Research Project (2) (L:T:P =0:0:2)	22
Total	**36**	**36**	**36**	**04**	**24**	**12**	**148**
Total Credits							

Note:

1. The curriculum for all Courses except L1, L2, Constitutional Values, Environmental values and Elementary Research Methodology will be framed by the respective Board of Studies (A/B/C). Here for example A – Physics, B – Chemistry and C – Mathematics.

2. The Curriculum for Languages L1 & L2 will be framed by respective Board of Studies (BoS) (Example Kannada/ English/ Hindi/ Sanskrit/ Telugu etc.).

3. The curriculum for Constitutional values will be framed by Board of Studies (BoS) in Political Science.

4. The curriculum for Environmental Science will be framed by special/common Board of Studies (BoS) set up by the University.

5. The curriculum for Elementary Research Methodology will be set by special/common Board of Studies (BoS - Faculty of Science & Applied Science) set up by the University.

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2025-26 (single programme structure)

Structure of 1st Semester UG Food technology with single programme of course A,B,C

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of SEE (Hrs)
		IA	SEE	Total	L	T	P		
25MJFT101L	Fundamentals of Food Science and Technology	20	80	100	4	0	0	4	03
25MJFT101P	Fundamentals of Food Science and Technology Lab	10	40	50	0	0	4	2	03
25MJFT102L	Food Chemistry	20	80	100	4	0	0	4	03
25MJFT102P	Food Chemistry Lab	10	40	50	0	0	4	2	03
25MJFT103L	Food Microbiology	20	80	100	4	0	0	4	03
25MJFT103P	Food Microbiology Lab	10	40	50	0	0	4	2	03
25LGCC1L	Language 1	20	80	100	3	0	0	3	03
25LGCC1L	Language 2	20	80	100	3	0	0	3	03
25CVCM1L	Constitutional Values	10	40	50	2	0	0	2	1.5*
TOTAL		**140**	**560**	**700**	**20**	**0**	**12**	**26**	**-**

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2025-26 (single programme structure)

Structure of 2nd Semester UG Food technology with single programme of course A,B,C

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
25MJFT2L	Food Biotechnology	20	80	100	4	0	0	4	03
25MJFT2P	Food Biotechnology Lab	10	40	50	0	0	4	2	03
25MJFT2L	Biochemistry & Nutrition	20	80	100	4	0	0	4	03
25MJBB2P	Biochemistry & Nutrition Lab	10	40	50	0	0	4	2	03
25MJCC2L	Food Engineering	20	80	100	4	0	0	4	03
25MJCC2P	Food Engineering Lab	10	40	50	0	0	4	2	03
25LGCC2L	Language 1	20	80	100	3	0	0	3	03
25LGCC2L	Language 2	20	80	100	3	0	0	3	03
25ESCM2L	Environmental Studies	10	40	50	2	0	0	2	1.5*
TOTAL		**140**	**560**	**700**	**20**	**0**	**12**	**26**	**-**

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2025-26 (single programme structure)

Structure of 3rd Semester UG Food technology with single programme of course A,B,C

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
25MJAA3L	Food Processing & Preservation	20	80	100	4	0	0	4	03
25MJAA3P	Food Processing & Preservation Lab	10	40	50	0	0	4	2	03
25MJBB3L	Food Packaging Technology	20	80	100	4	0	0	4	03
25MJBB3P	Food Packaging Technology Lab	10	40	50	0	0	4	2	03
25MJCC3L	Technology of Fruits, Vegetables, Spices & Plantation Crops	20	80	100	4	0	0	4	03
25MJCC3P	Technology of Fruits, Vegetables, Spices & Plantation Crops lab	10	40	50	0	0	4	2	03
25LGCC3L	Language 1	20	80	100	3	0	0	3	03
25LGCC3L	Language 2	20	80	100	3	0	0	3	03
25MJAA3S	Food Business and Entrepreneurship development	10	40	50	1	0	2	2	1.5*
TOTAL		**140**	**560**	**700**	**20**	**0**	**12**	**26**	**-**

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2025-26 (single programme structure)

Structure of 4th Semester UG Food technology with single programme of course A,B,C

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
25MJAA4L	Technology of Cereals, Pulses & Oilseeds	20	80	100	4	0	0	4	03
25MJAA4P	Technology of Cereals, Pulses & Oilseeds Lab	10	40	50	0	0	4	2	03
25MJBB4L	Industrial Microbiology	20	80	100	4	0	0	4	03
25MJBB4P	Industrial Microbiology Lab	10	40	50	0	0	4	2	03
25MJCC4L	Technology of Milk & Milk Products	20	80	100	4	0	0	4	03
25MJCC4P	Technology of Milk & Milk Products Lab C4	10	40	50	0	0	4	2	03
25LGCC4L	Language 1	20	80	100	3	0	0	3	03
25LGCC4L	Language 2	20	80	100	3	0	0	3	03
25MJAA4S	Communication Skills	10	40	50	1	0	2	2	1.5*
TOTAL		**140**	**560**	**700**	**20**	**0**	**12**	**26**	**-**

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2025-26 (single programme structure)

Structure of 5th Semester UG Food technology with single programme of course A,B,C

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
25MJAA5L	Food Analytics & Instrumentation	20	80	100	4	0	0	4	03
25MJAA5P	Food Analytics & Instrumentation Lab	10	40	50	0	0	4	2	03
25MJBB5L	Technology Of Meat &Marine Foods	20	80	100	4	0	0	4	03
25MJBB5P	Technology Of Meat &Marine Foods Lab-B5	10	40	50	0	0	4	2	03
25MJCC5L	Flour Milling, Bakery & Confectionery Technology	20	80	100	4	0	0	4	03
25MJCC5P	Flour Milling, Bakery & Technology Lab-C5	10	40	50	0	0	4	2	03
25MJAA5E	Nutraceutical And Functional Foods	10	40	50	2	0	0	2	02
25RMBS5SA	A.Traditional Foods And Beverages	10	40	50	2	0	0	2	01*
25RMBS5SB	B. Managerial Economics & Business Environment								
TOTAL		**110**	**440**	**550**	**16**	**0**	**12**	**22**	**-**

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2025-26 (single programme structure)

Structure of 6th Semester UG Food technology with single programme of course A,B,C

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
25MJAA6L	Marketing Management & International Trade	20	80	100	4	0	0	4	03
25MJAA6P	Marketing Management & International Trade Lab	10	40	50	0	0	4	2	03
25MJBB6L	Digital Innovations in Food Sector	20	80	100	4	0	0	4	03
25MJBB6P	Digital Innovations in Food Sector Lab	10	40	50	0	0	4	2	03
25MJCC6L	Food Safety, Standards & Quality Management Systems	20	80	100	4	0	0	4	03
25MJCC6P	Food Safety, Standards & Quality Management Systems Lab-C6	10	40	50	0	0	4	2	03
25MJAA6A	A.Food Product Development	10	40	50	2	0	0	2	02
25MJAA6EB	B.Start-ups & Entrepreneurship In Agribussiness								
25MJAA6EC	C.Food waste management &Utilization								
25MJAA6R	Research Project	10	40	50**	0	0	4	2	01**
TOTAL		**110**	**440**	**550**	**14**	**0**	**16**	**22**	**-**

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SYLLABUS

FOR

DEPARTMENT OF U.G. STUDIES IN

FOOD TECHNOLOGY

I SEMESTER SYLLABUS

Semester – I

Course Title: Fundamentals of Food Science and Technology	Course Code: 25MJFT101L
Total Contact Hours: 54hrs	No. of Credits: 4
L:T:P:	4:0:0
Internal Assessment Marks: 20	Duration of SEE: 3 Hours
Semester End Exam Marks: 80	

Course Outcomes (COs):

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

1. Understand the basics of food science and technology.

2. Appreciate the importance of nutrients and enable them todevelop new product ofhigh nutritive value.

Unit	Description	Hours
1	Food, Sustainability and Health Nature and types of foods:Cereals and millets, Pulses, Oil Seeds, Fruits, Vegetables, Milk and Milk Products, Egg, Meat, Poultry, Fish; Food production and processing challenges; Energy and nutritional value of foods; Balanced diet; Food Structure and Functional Relationship; Methods of cooking; Food adulteration – detection and control of common food adulterants.	12
2	Sensory Quality Attributes of Food – Functions of flavour, taste, odour and appeal. Sensory evaluation methods;Novel techniques in sensory evaluation- e-Tongue, e-Nose, e-eye, etc; Consumer acceptability,Major chemical and biochemical reactions during food processing, handling and storage	11
3	Food Macronutrients – Structure of water and ice, free and bound water, water activity (aw) and food stability; Sources, types and functions of carbohydrates, lipids and proteins	10
4	Food Micronutrients – Sources, types, functions and deficiencies of vitamins and minerals; Importance of micronutrients in human nutrition and health, Phytochemicals and bioactive compounds; Pigments and colours; Flavouring compounds.	10
5	Food Preservation- Introduction to food microorganisms; bacteria, yeast and molds; Spoilage of foods; Food poisoning;Basic concepts and principles of food additives and contaminants, Food Preservation, Food packagingFood Formulation and Processing,Innovations in food processing.	**11**

References:

1. Food Chemistry (Revised and Expanded Ed) – Owen R. Fenemma
2. Modern Food Microbiology – James M. Jay
3. Mechanism of Action of Food Preservation Procedures – G. W. Gould
4. Food Science and Technology – Geoffrey CampbellPlatt
5. Food Processing Technology Principles and Practice – P J Fellows
6. Food Physics Physical Properties-Measurement and Applications – Figura L. O. and Teixeira A.A.
7. Principles of Food Science (Part – II) Physical principles of Food Preservation – M Karel, Owen R Fennema and D B Lun

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Semester - I

Course Title: Fundamentals of Food Science and TechnologyLab	**Course Code:25MJFT101P**
Total Contact Hours: 56hrs	**No. of Credits:**2
L:T:P:	**0:0:4**
Internal Assessment Marks: 20	**Duration of SEE:** 3 Hours
Semester End Exam Marks: 80	

Course Outcomes (COs):

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

1. Understand the concepts of food science and recognize its importance.
2. Outline the principles of cereals, millets and pulses processing technology.
3. Appreciate the importance of nutrients in milk, fruits and vegetables.
4. Construe the basics of structure, composition, nutritive value of fleshy foods.
5. Recognize the composition of sugar, spices, nuts, oilseeds and food adulteration

List of Experiments / Programs (For a Lab Course)

Sl. No	Experiment / Program
1	Introduction to Food Groups
2	Experiments on determination of edible portions in fruits and vegetables
3	Experiments on determination of moist heating characteristics of starch
4	Experiments on determination of dry heating characteristics of starch
5	Experiments on browning reaction on fruits and vegetables
6	Experiments on determination of cooking characteristics of egg
7	Experiments on determination of the effect of soaking on pulses
8	Experiments on determination of characteristics of milk
9	Experiments on determination of characteristics of milk
10	Experiments on determination of the effect of cooking in different media
11	Experiments on determination of the effect of cooking in different methods
12	Experiments on determination of tenderization and cooking characteristics of fleshy foods

References:

1. B. Srilakshmi, (2015). Food Science. New age International P. Ltd, New
2. DelhiS. N. Mahindru (2009). Food Science and Technology, Hardbound P.Ltd, New Delhi.
3. Norman N. Potter (2009). Food Science, Fifth Edition, Springerlink,, New York.
4. N. Shakuntala Manay& M. Shadaksharaswamy (2014). Food Facts and
5. Principles - New Age International (P) Limited, New Delhi.
6. Meyer LH, Food Chemistry, CBS Publication, New Delhi, 1987 8. PotterNH, Food Science,
7. CBS Publication, New Delhi, 1998
8. Ramaswamy H and Marcott M,Food Processing Principles and Applications CRC Press, 2006
9. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency, 2013.

Semester – I

Course Title: Food Chemistry	**Course Code: 25MJFT102L**
Total Contact Hours: 54	**No. of Credits: 4**
L:T:P:	**4:0:0**
Internal Assessment Marks: 20	**Duration of SEE: 3 Hours**
Semester End Exam Marks: 80	

Course Outcomes (COs):

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

1. Study chemical aspects of food and biomaterials and their importance in food processing
2. Gain an understanding of chemicals responsible for flavour, pigments and colorants
3. Have an idea of about the effect of processing on these biomolecules
4. Gain the knowledge about role of enzymes in food processing

Unit	Description	Hours
1	Profile of Foods Proximate composition - Physicochemical properties; Organic and inorganic food components; Different food forms – colloids, emulsions and related types. WaterImportance in foods; Role of moisture in foods; Physical & chemical properties; Bound & free water foods; Water activity and its impact in food preservation.	12
2	Carbohydrates Primary classification; Occurrence, structure and properties; Functional properties - Maillard reaction, caramelization, gelatinization, dextrinization, retrogradation. Fibre - classification, food sources, functional properties and uses. Proteins Major classification; Structure, physical & chemical properties; Functional properties - denaturation, hydration, swelling, foam formation, emulsification & stabilization; Major protein types in milk, cereals, legumes, meat, egg and related.	12
3	Lipids Major classification; Visible fats and invisible fats, Physical and chemical properties; Fatty acids – classification, structure and properties; Functional properties; Undesirable effects.	10
4	Vitamins Classification and types; Structure & properties of water- and fat-soluble vitamins. Minerals Structure & properties of calcium, phosphorus, iron, zinc, copper, selenium, sodium, potassium & iodine.	**10**
5	Desirable & undesirable traits Phytonutrients; Bioactives; Antioxidants; Phytates; Antinutritional factors; Residuals of pesticides and heavy metals;	**10**

References:

1. Food Chemistry (Revised and Expanded Ed) – Owen R. Fenemma
2. Modern Food Microbiology – James M. Jay
3. Mechanism of Action of Food Preservation Procedures – G. W. Gould
4. Food Science and Technology – Geoffrey CampbellPlatt
5. Food Processing Technology Principles and Practice – P J Fellows
6. 6.Food Physics Physical Properties-Measurement and Applications – Figura L. O. and Teixeira A.A.
7. Principles of Food Science (Part – II) Physical principles of Food Preservation – M Karel, Owen R Fennema and D B Lun

Semester – I

Course Title: Food Chemistry Lab	**Course Code: 25MJFT102P**
Total Contact Hours: 56hrs	**No. of Credits: 2**
L:T:P:	**0:0:4**
Internal Assessment Marks: 20	**Duration of SEE: 3 Hours**
Semester End Exam Marks: 80	

Course Outcomes (COs):

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

1. Study chemical aspects of food and bio materials and their importance in food processing
2. Gain an understanding of chemicals responsible for flavour, pigments and colorants
3. Have an idea of about the effect of processing on these biomolecules
4. Gain the knowledge about role of enzymes in food processing

List of Experiments / Programs (For a Lab Course)

Sl. No	**Experiment / Program**
1	Determination of water absorption capacity of select foods
2	Microscopic examination of flour/starches
3	Determination of gelatinization and retrogradation properties of cereal/pulse flour
4	Prevention of browning reaction in fruits
5	Determination of gluten content in wheat flour
6	Determination of relative density and casein content in milk
7	Determination of crude ash
8	Estimation of calcium, phosphorus, iron, magnesium
9	Estimation of tannins and phytic acid from food
10	Determination of vitamin A (Total carotenoids) and E; Determination of ascorbic acid by dye method
11	Determination of thiamine and riboflavin
12	Determination of food colors.

References

1. Belitz, H.-D., Grosch, W. and Schieberle, P. 2009. Food Chemistry, 4th edn. Springer-Verlag Berlin Heidelberg.
2. Fennema, O.R. 1996. Food Chemistry, 3rd edn. Marcel Dekker, Inc., New York, USA

Semester – I

Course Title: Food Microbiology	**Course Code: 25MJFT103L**
Total Contact Hours: 54hrs	**No. of Credits: 4**
L:T:P:	**4:0:0**
Internal Assessment Marks: 20	**Duration of SEE: 3 Hours**
Semester End Exam Marks: 80	

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1. To understand the association of microbes in food and the quality testing of food
CO2. To understand the preservation and food safety protocols
CO3. To understand the methods of spoilage of food and the diseases associated with it
CO4. To learn the properties of milk and the types of preservation of milk.
CO5. To learn the types of fermented food and dairy products and its significance

Unit	**Description**	**Hours**
1	Introduction to microbiology Historical Developments and scope; Prokaryotes, and eukaryotes; Microscopy, Microbial classification; Morphology, growth, nutrition and reproduction of bacteria, yeast, fungi, algae and viruses.	**10**
2	Factors affecting the growth of microorganisms in food Intrinsic and extrinsic parameters that affect microbial growth; Growth and survival of microorganisms in foods; Physical and chemical methods to control microorganisms; Spoilage organisms of milk, fruits, vegetables, grains, oilseeds, meat & meat products and canned foods.	**11**
3	Influence of physical and chemical factors on microbes Thermal destruction of microorganisms include thermal death time, and Z, F, and D values; Effect of chemical preservatives; water activity and pH levels on microbial survival & growth.	**11**
4	Determination of microorganisms and their products in food Sampling plan, sample collection, transport and storage, sample preparation for analysis; Microscopic and culture-dependent methods - Direct microscopic observation, microbiological media preparation, culture, enumeration and isolation methods for general and select pathogenic bacteria.	**12**
5	Microorganisms and public health Food poisoning, types and importance of food poisoning; Microbial agents of foodborne illness - A brief account	**10**

References:

1. Doyte MP, Loory RB & Thomas JM; Food Microbiology, ASM Pres, Washington DC.
2. Jay JM, Modern; Food Microbiology, Chapman & Hall, New York.
3. Joshi VK &Pandey Ashok; Biotechnology of Food Fermentation, Asia tech Publ. Delhi, India.
4. Frazier WC &Westhoff DC; Food Microbiology, 3rd Ed., Tata McGraw Hill.
5. Doyle PM et al; Food Microbiology – Fundamentals & Frontiers, 2nd Ed., ASM Press.
6. Danwart GJ; Basic Food Microbiology, CBS Publ. Delhi.
7. Pitt J & Hocking. (1985); Fungi & Food spoilage, Academic Press.
8. SandeepSareeen; Food Preservation, Sarops&Soni, New Delhi.
9. Ananthakrishnan CP. Et al. (1994); Dairy Microbiology, Sreelakshmi Publ. Chennai.
10. Adams, M.R and Moss, MO. 1995. Food Microbiology. The Royal Society of Chemistry, Cambridge. James. M. Jay, 1992, Modern food microbiology 4ed.

Semester – I	
Course Title: Food Microbiology LAB	**Course Code: 25MJFT103P**
Total Contact Hours: 54hrs	**No. of Credits: 4**
L:T:P:	**4:0:0**
Internal Assessment Marks: 20	**Duration of SEE: 3 Hours**
Semester End Exam Marks: 80	

Course Outcomes (COs):

Course outcome: After the successful completion of the course, the student will be able

CO1: To analyze the quality of food and milk.

CO2: Able to detect food borne pathogens.

CO3: Able to study probiotics.

List of Experiments / Programs (For a Lab Course)

Sl. No	Experiment / Program
1	Introduction to basic microbiology - Laboratory practices
2	Cultivation and sub-culturing of microbes
3	Direct microscopic examination of foods
4	Study of the growth curve of microorganisms
5	Estimation of a viable count of bacteria, yeast, and molds
6	Estimation of a total microbial count of fruits and vegetable products, canned foods, packed food products
7	Estimation of a total microbial count of milk and milk products, meat, fish and poultry products
8	Microbial assessment of air and process equipments
9	Study of food borne pathogens- *Staphylococcus, Salmonella, Clostridium* Detection of Aflatoxin by TLC

References:

1. Doyle M. P. and Beuchat L. R. (2007). Food Microbiology- Fundamentals. Frontiers, ASM Press.
2. Garbutt J. (1997). Essentials of Food Microbiology, Armold- International Students edition, London. Marriott N. G. and Gravani R. B. (2006).
3. Principles of Food Sanitation, Food Science text Series, Springer International, New York, USA.
4. ThomasJ., Matthews,Karl; Kniel, Kalmia E (2017), Food Microbiology: An Introduction, American Society for (ASM).
5. Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co., New Delhi.
6. Shen, C., Zhang, Y. (2017). Food Microbiology Laboratory Safety and Notebook Record. In: Food Microbiology Laboratory for the Food Science Student. Springer, Cham. https://doi.org10.1007/978-3-319-58371-6_1.

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SYLLABUS

FOR

DEPARTMENT OF U.G. STUDIES IN

FOOD TECHNOLOGY

I I SEMESTER SYLLABUS

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2025-26 (single programme structure)

Structure of 2nd Semester UG Food technology with single programme of course A,B,C

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
25MJFT2L	Food Biotechnology	20	80	100	4	0	0	4	03
25MJFT2P	Food Biotechnology Lab	10	40	50	0	0	4	2	03
25MJFT2L	Biochemistry & Nutrition	20	80	100	4	0	0	4	03
25MJBB2P	Biochemistry & Nutrition Lab	10	40	50	0	0	4	2	03
25MJCC2L	Food Engineering	20	80	100	4	0	0	4	03
25MJCC2P	Food Engineering Lab	10	40	50	0	0	4	2	03
25LGCC2L	Language 1	20	80	100	3	0	0	3	03
25LGCC2L	Language 2	20	80	100	3	0	0	3	03
25ESCM2L	Environmental Studies	10	40	50	2	0	0	2	1.5*
TOTAL		**140**	**560**	**700**	**20**	**0**	**12**	**26**	**-**

Department Name: Food Technology

Semester – II

Course Title: Food Biotechnology	**Course Code:25MJFT201L**
Total Contact Hours: 54Hrs	**No. of Credits:** 04
L:T:P: 4:0:0	
Internal Assessment Marks: 20	**Duration of SEE:** 03 Hours
Semester End Exam Marks: 80	

Course Outcomes (COs):

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

1. Gain knowledge on the enzymes as tools used in genetic engineering
2. Expand the knowledge of food biotechnology in relation to genetic engineering and plant tissue culture.
3. Understand on the basic principles of fermentation technology and the application of fermentation in biotechnological industry.
4. Helps to keep abreast application of microbes in food industry. CO5: Understanding the role of enzymes in food industry.

Unit	Description	Hours
1	Introduction to Food Biotechnology Definition, scope and applications.Enzymes - exonucleases, endonucleases, ligases, reverses transcriptase and alkaline phosphatase, cloning vectors-plasmids, bacteriophage, cosmids and phasmids. Nutrigenomics and its nutritional implications.	12
2	Genetic Engineering and Tissue Culture Outline of genetic engineering in prokaryotes (microbial cells), concepts of molecular cloning, tissue culture, micro propagation, transgenics, genetically modified foods, applications of genetic engineering, isolation of DNA, RNA and Plasmids.Safety assessment of GMOs. Significance of Recombinant DNA technology, mRNA technology, RNAitechnology in foods.	12
3	Microbial Fermentation General structure of bioreactors and their types, bacterial growth curve, batch, continuous andsynchronous culture, solid state and submerged fermentation.Basic concepts of bioreactors, biochips and biosensors.	10
4	Microbial Metabolites Primary and secondary metabolites, synthesis of citric acid, glutamate, xanthangum, vitamin B_{12}, Riboflavin, microbial pigments and flavour components. Recovery of metabolites. Single Cell Protein – spirulina and yeast biomass.	10
5	Enzyme Biotechnology Soluble enzymes, immobilization of enzymes – methods of immobilization, role of enzymes in food industry and safety guidelines.	10

References:

1. Dubey, C., 2014, A Text Book of Biotechnology, 5th revised edition, S. Chand and Company Ltd., New Delhi.
2. Green, J., 2010, Introduction to Food Biotechnology, CRC Press, USA.
3. Dietrich Knorr, 2017, Food Biotechnology, Marcel Dekker , New York.
4. Owen, Ward, 2018, Fermentation Biotechnology, Principles, Processes and Products, Prentice Hall, Advanced Reference Series, New Jersey, 07632

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Department Name: Food Technology

Semester – II

Course Title: Food Biotechnology Lab	**Course Code:25MJFT201P**
Total Contact Hours: 56 Hrs	**No. of Credits:** 02
L:T:P: 0:0:4	
Internal Assessment Marks: 10	**Duration of SEE:** 03 Hours
Semester End Exam Marks: 40	

Course Outcomes (COs): At the end of the course, students will be able to:

1. Gain an understanding and hands on experience on DNA isolation and restriction digestion, and an understanding of amplification using PCR and RT-PCR and restriction digestion.
2. Understand the methodology of enzyme assay, expressing activity and exemplify the applications of enzymes in food processing.
3. Prepare themselves for research project work for parts of research involving applications of core biotechnological techniques and strengthen their abilities to pursue a research career in this field.

List of Experiments / Programs (For a Lab Course)

Sl. No	Experiment
1	Isolation and analysis of chromosomal/genomic DNA from bacteria
2	Isolation and analysis of chromosomal/genomic DNA from plant
3	To carry out fermentation of microbial enzymes
4	Demonstration of Enzyme immobilization
5	Demonstration of PCR
6	Detection of pathogen by real time PCR
7	Demonstration for detection of GMO foods
8	Demonstration for gene cloning
9	Application of enzyme in Fruit processing, and inactivation of enzyme by blanching
10	Isolation of microbial pigments and flavors.

References:

1. B.D. Singh. 2014. Biotechnology - Expanding Horizons. Kalyani Publishers, New Delhi. Meenakshi Paul. 2007. Biotechnology and Food Processing Mechanics. Gene-Tech Books, New Delhi.
2. James D. Watson. 2013. Molecular Biology of the Gene, 7th Ed. Benjamin Cummings, San Francisco, USA.
3. Oliver Brandenberg, Zephaniah Dhlamini, Alessandra Sensi, Kakoli Ghosh and Andrea Sonnino 2011. Introduction to Molecular Biology and Genetic Engineering.
4. FAO, Rome, Italy. S.B. Primrose and R.M. Twyman. 2006. Principles of Gene Manipulation and Genomics, 7th Ed. Blackwell Publishing, Victoria, Australia.
5. Ashok Agarwal and Pradeep Parihar. 2005. Industrial Microbiology: Fundamentals and Applications. Agrobios India, Jodhpur

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Semester – II

Course Title: Biochemistry and Nutrition	**Course Code:25MJFT202L**
Total Contact Hours: 54Hrs	**No. of Credits:** 04
L:T:P: 4:0:0	
Internal Assessment Marks: 20	**Duration of SEE:** 03 Hours
Semester End Exam Marks: 80	

Course Outcomes (COs):

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

1. Perform calculations and unit of expressions of solutions; prepare the buffers used in biology.
2. Understand the structure and function of biomolecules. Such as proteins amino acids, carbohydrates, lipids and nucleic acids.
3. Understand the concept of respiration and fatty acid oxidation.
4. Know the synthesis and degradation of Amino acid and nucleotide mechanism
5. To understand the physiology and metabolism of microorganisms and also how they respond to stress conditions.

Unit	Description	Hours
1	Carbohydrate Metabolism: Carbohydrates, Oxidation of glucose by Glycolysis, TCA cycle,Oxidative Phosphorylation, HMP pathway, Glycogenesis,Glycogenolysis and Gluconeogenesis. Glycogen storage in normal and diseased states, Role of carbohydrates in determining glycemic index. Fatty Acid Metabolism: Types of fatty acids, Oxidation and bio synthesis of fatty acids, Lipid breakdown. Lipids of biological significance, Metabolic Interrelationships between Carbohydrate, Lipid and Protein	12
2	Proteins and Amino Acids: Sources, structure, biosynthesis, functions, digestion andabsorption of proteins, Classification of amino acids, Nucleic acid - DNA, RNA,Bases - Purines and Pyrimidines, Enzymes – Classification, functions of enzymes; factors affecting enzyme activity. Hormones - Classification and functions of hormones.	10
3	Energy: Units of Energy, Measurement of Calorific Value, Determination of energy requirements-Direct and Indirect calorimetry,Relation between Respiratory quotient and Energy output, BMR, Factors Affecting BMR. Energy requirements for various age groups	10
4	Basic Nutrients: Macro and Micro Nutrients, Recommended dietary allowance (RDA) -Requirements and deficiency. Dietary fiber - definition, sources, functions and types - Soluble and Insoluble Fiber.Evaluation of protein quality - PER, NPU, NDPER, BV, PDCAAS, DIAAS and related scores.	10
5	Vitamins: Sources, functions (also their role as cofactors in metabolism) deficiency states, factors influencing bioavailability and requirements. Minerals: sources, functions (also their role as cofactors in metabolism) deficiency states, factors influencing bioavailability and requirements of Calcium, Phosphorus, Iron, Iodine, Zinc, Sodium, Potassium and Selenium. Significance of antioxidants and phytochemicals.	12

References:

1. Berdanier, C.D., Feldman, E.B. and Dwyer, J. 2008. Handbook of Nutrition and Food, 2nd edn. CRC Press, Boca Raton, FL, USA.
2. . Berg, J.M., Tymoczko, J.L., Stryer, L. and Gatto Jr., G.J. 2002. Biochemistry, 7th edn. W.H. Freeman and Company, NY, USA.
3. Buchanan, B.B., Gruissem W. and Jones, R.L. 2002. Biochemistry and Molecular Biology of Plants. John Wiley and Sons, Inc., NY, USA.
4. Moe, G., Kelley, D., Berning, J. and Byrd-Bredbenner, C. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.
5. Nelson, D.L. and Cox, M.M. 2012. Lehninger Principles of Biochemistry, 6th edn. Macmillan Learning, NY, USA. 6. Voet, D. and Voet, J.G. 2011. Biochemistry, 4th edn. John Wiley and Sons, Inc., NY, USA.

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Semester – II

Course Title: Biochemistry and NutritionLab	**Course Code:25MJFT202P**
Total Contact Hours: 56 Hrs	**No. of Credits:** 02
L:T:P: 0:0:4	
Internal Assessment Marks: 10	**Duration of SEE:** 03 Hours
Semester End Exam Marks: 40	

Course Outcomes (COs): At the end of the course, students will be able to learn:

1. The characterization of biomolecules in foods
2. The nutrition requirements of Humans

List of Experiments / Programs (For a Lab Course)

Sl. No	Experiment
1	Preparation of various solutions and buffers;
2	Qualitative and quantitative determination of carbohydrates, proteinsand lipids
3	Isolation of functional enzymes from various sources;
4	Measurement of energy using bomb calorimeter;
5	Qualitative and quantitative determination carbohydrates;
6	Qualitative and quantitative determination of protein;
7	Qualitative and quantitative determination of fats and lipids
8	Separation of amino acids using thin layer chromatography;
9	Native and PAGE electrophoresis for separation of proteins
10	Estimation of phosphorus/iron/calcium/zinc/magnesium in food sample.
11	Estimation of β-carotene using column chromatography;
12	Identification of food sources for various nutrients using food composition tables.
13	Planning of nutritious foods for different age groups.
14	Estimation of BMI and other nutritional status parameters

References:

1 Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd.

2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
3. Wardlaw MG, Paul M Insel Mosby 1996). Perspectives in Nutrition, Third Edition.
4. Introduction to Human Nutrition ed.Gibney et al, Blackwell Publishers, 2005
5. Khanna K, Gupta S, Seth R, Mahna R, Rekhi T (2004). The Art and Science of Cooking: A Practical Manual, Revised Edition. Elite Publishing House Pvt Ltd.
6. NIN, ICMR (1990). Nutritive Value of Indian Foods.
7. Seth V, Singh K (2005). Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Fourth edition, Elite Publishing House Pvt Ltd.
8. ICMR (2010). Nutrient Requirements and Recommended Dietary Allowances for Indians

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Semester:II

Course Title: Food Engineering	**Course Code:25MJFT203L**
Total Contact Hours: 54Hrs	**No. of Credits:** 04
L:T:P: 4:0:0	
Internal Assessment Marks: 20	**Duration of SEE:** 03 Hours
Semester End Exam Marks: 80	

Course Outcomes (COs): At the end of the course, students will be able to:

1. To develop students knowledge through organized, scattered information and to deal with the recent development of the food engineering processes, operations and classifications, principles in food industrial operations and equipments.
2. To improve student's skills based on the principles and applications of engineering process, energy consumption, material and energy balances during the industrial operations.
3. Help students to solve problems of in-plant food process machinery/equipments operations and will also enhance the skills of food industry operations.

Unit	Description	Hours
1	Introduction to food engineering–units and dimensions. Material and energy balances.Properties of solid food materials: Physical, fictional, thermal and aerodynamic properties. Size reduction: Size measurement, size analysis, size reduction equipments. Food Conveying Equipment: Conveyors and elevators Heat transfer: Conduction, convection and radiation with examples and basic equations; Overall heat transfer coefficient and its significance.	10
2	Mass transfer: Fick's law of diffusion for steady state and unsteady state mass transfer. Reynold's number, Prandtlnumber, Nusselt number, Bernoulli's equation, Fourier's law and related heat transfer equations. Mechanical separation sedimentation, gravitational and centrifugal methods. Membrane separation–electro dialysis, microfiltration, ultra-filtration and reverse-osmosis.	10
3	Heat exchangers: Principles and functioning of pasteurisers, sterilizers, chillers, evaporators, dryers, heat exchangers applied to food industries – Jacketed pans, heaters, coolers – tubular, scrapped surface and plate heat exchangers	10
4	Mixing–characteristics of mixtures, mixing index, particle mixing, liquid mixing, equipment, emulsification and emulsifying agent. Kneading: Principles, types of	12

	equipment and applications in food Processing. Rheology – Newtonian and Non-Newtonian fluids, Bingham plastic, pseudoplastics and rheopectic fluids	
5	Thermal processing: Canning and aseptic processing and applications. Extruders - Single/twin screw and hot/cold extruders. Drying and dehydration: Principles of drying, dehydration and types of dryers. Freeze drying, spray drying, drum drying, fluidized bed drying, tunnel drying and other novel drying techniques. Non-Thermal Processing: High pressure processing, irradiation, microwave, Ohmic heating, Pulsed electric field, Ultrasound, Cold Plasma, Super Critical Fluid Extraction (SCFE). Freezing and Thawing: Principles, applications and equipment, Plank's equation and numerical on estimation of freezing time.	12

References:

1. .Zeki Berk, Food Process Engineering and Technology.Third Edition. AP Accademic Press. ISBN 978-0-12-812018-7.
2. Fellows, P. J., Food Processing technology: Principles and practice. Second edition. CRC press.
3. Nuri N. Mohsenin, 1986, Physical properties of plant and animal materials: Structure, physical characteristics and mechanical properties. Second Revised and Updated Edition. Gordon and Breach Science Publishers, New York, United States of America.
4. K. M. Sahay and K. K. Singh., Unit operations agricultural processing, 2009, Second Revised Edition, Vikas Publishing House Pvt Ltd. Noida (UP).

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Semester:II

Course Title: Food Engineering Lab	**Course Code:25MJFT203P**
Total Contact Hours: 56 Hrs	**No. of Credits:** 02
L:T:P: 0:0:4	
Internal Assessment Marks: 10	**Duration of SEE:** 03 Hours
Semester End Exam Marks: 40	

Course Outcomes (COs): At the end of the course, students will be able to:Course Outcomes (COs):

1. Students can learn skills on conversion of units and dimensions, material and mass balance, thermal process, and energy calculation.
2. Students able to identify the problems in food production process line and ability to rectify them instantly.
3. To determine the techno-economical feasibility of food products process operations.
4. Learning ability principles, operations of food processing machineries and equipments.

List of Experiments / Programs (For Lab Course)

Sl. No	Experiment
1	Calculations of units and dimensions, material and energy balances.
2	Study of psychrometric charts (Steam table)
3	Determination of engineering properties of food.
4	Determination of freezing time and study of freezing curve
5	Study of different evaporators, determination of evaporation rate of liquids.
6	Study of spray, vacuum, freeze, fluid bed drying
7	Study of single and twin screw extruders.
8	Study of hot and cold extruders
9	Study of membrane separation system.
10	Visit to food industries.

References:

1 Zeki Berk, Food Process Engineering and Technology.Third Edition. AP Accademic Press. ISBN 978-0-12-812018-7.

2 Fellows, P. J., Food Processing technology: Principles and practice. Second edition. CRC press.

3 Nuri N. Mohsenin, 1986, Physical properties of plant and animal materials: Structure, physical characteristics and mechanical properties. Second Revised and Updated Edition. Gordon and Breach Science Publishers, New York, United States of America.

4 K. M. Sahay and K. K. Singh., Unit operations agricultural processing, 2009, Second Revised Edition, Vikas Publishing House Pvt Ltd. Noida (UP).

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