

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA

PHONE:EPABX–2609000, www.unishivaji.ac.in, <u>bos@unishivaji.ac.in</u>

Estd. 1962 "A++" Accredited by NAAC (2021) With CGPA 3.52 शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४ ०२३१—२६०९४८७



Date: 01/01/2024

SU/BOS/Science/06

То,

The Principal,	The Head/Co-ordinator/Director
All Concerned Affiliated Colleges/Institutions	All Concerned Department (Science)
Shivaji University, Kolhapur	Shivaji University, Kolhapur.

Subject: Regarding syllabi of B.Sc. Part-III (Sem. V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of B.Sc. Part-III (Sem. V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

	B.ScIII (Sem. V & VI) as per NEP-2020 (1.0)							
1.	Mathematics	12.	Computer Science (Opt)					
2.	Statistics	13.	Computer Science (Entire)					
3.	Physics	14.	Information Technology (Entire)					
4.	Microbiology	15.	Food Science and Technology (Entire)					
5.	Industrial Microbiology	16.	Food Science					
6.	Electronics	17.	Food Science and Quality Control (Entire)					
7.	Chemistry	18.	Food Technology & Management (Entire)					
8.	Sugar Technology (Entire)	19.	Biochemistry					
9.	Geology	20.	Biotechnology (Optional/Vocational)					
10.	Zoology	21.	Biotechnology (Entire)					
11.	Botany	22.	Environmental Science (Entire)					

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website <u>www.unishivaji.ac.in NEP-2020(Online Syllabus)</u>

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

by Registrar r. S. M. Kubal

Copy to:

SHIVAJI UNIVERSITY, KOLHAPUR



Estd. in 1962 'A⁺⁺' Accredited by NAAC (2021) with CGPA 3.52

CHOICE BASED CREDIT SYSTEM WITH MULTIPLE ENTRY AND MULTIPLE EXIT OPTIONS AS PER NEP 2020

Syllabus For B.Sc.

Part - III

Food Science (Entire)

SEMESTER V AND VI

(Syllabus to be implemented from June-2024)

B.Sc. Part-III

Food Science (Entire)

SEMESTER V AND VI

(Syllabus to be implemented from June, 2023 onwards)

✤ Guidelines shall be as per B.Sc. Regular Program

Rules and Regulations shall be as per B.Sc. Regular Program except CBCSR. B. Sc. 3 Structure of Program and List of Courses.

Preamble:

This syllabus is framed to gives ound knowledge with understanding of Food Science subject to undergraduate students of B.Sc. Food Science (Entire) Program. Students will learn Food Science as a separate course (Subject) from B.Sc. Part-I.

The goal of the syllabus is to make the study of Food Science more popular, generate an interest amongst the students about the field and encourage them for higher studies including research.

Structure of Program and List of Courses are as follows

Structure of B.Sc. Food Science (Entire) Program [Semester I & II]

(Level 5)

				SI	EM	IESTEI	R–I(Du	ration–	6M	lontl	ns)					
	TEACHINGSCHEME EXAMINATIONSCHEME								E							
Sr.		T	HEORY	7	PF	RACTIC	AL			TH	EORY		PRACTICAL		L	
No.	Course (Subject) Title	Credits	No. of lectures	Hours		Credits	No. of lectures	Hours		Hours	Max	Total Marks	Min	Hours	Max	Min
1 2	DSC-FS-A1 DSC-FS-A2	2 2	5	4		2	4	3.2		22	50 50	100	35		50	10
3 4	DSC-FS-A3 DSC-FS-A4	2 2	5	4		2	4	3.2		2 2	50 50	100	35	ation	50	18
5 6	DSC-FS-A5 DSC-FS-A6	2 2	5	4		2	4	3.2		$\frac{2}{2}$	50 50	100	35	amina	50	18
7 8	DSC-FS-A7 DSC-FS-A8	2 2	5	4		2	4	3.2		2 2	50 50	100	35	ical E ₃	50	10
9	AECC-A	2	4	3.2						2	50	50	18	acti		
	Total	18	24	19.2		8	16	12.8				450		Pr is/	200	
10	SEC-1	-	-			2	4	4								
11	VBC-1	-	-	-		1	2	2								
1	DSC-ES-B1	2		SI	EN	IESTEI	R–II (D	uration	-6	Mon	ths)					
2	DSC-FS-B1 DSC-FS-B2	2	5	4		2	4	3.2		2	50	100	35			
3	DSC-FS-B3 DSC-FS-B4	2	5	4		2	4	3.2		2	50 50	100	35	-	50	18
5	DSC-FS-B5	2	5	4		2	4	3.2		2	50	100	35	les		
7	DSC-FS-B7	2	5	4		2	4	3.2	-	2	50	100	35	uidelin	50	18
8	DSC-FS-B8	2	1	3.2					-	2	50	50	10	os G		
,	Total	<u>-</u> 18		<u> </u>		8	16	12.8		2	50	450	10	rBC	200	
	Grand Total		48	38.4			32	25.6				900		vs pe	200	
10	SEC-2	-	-	-		2	4	4						₹		
11	VBC-2	-	-	-		1	2	2								
• St • Th	udent contact hou neory and Practica	irs per we al Lecture	eek:32H es:48 Mi	ours(Min nutes Ea	.) ch	I	I	TotaTota	al N al C	Iarks Fredits	for B.Sc.	I (Inclu cI (Sem	ding Er lester I d	nglish): 110 & II): 52)	
• D	SC–Discipline S	pecific C	ore cours	se: All pa	per	s are con	npulsory.									
• Pr	actical Examinati	on will t	e condu	cted annu	all	y for 50 N	Marks per	course (sut	ject).						
• A • SI	ECC – Ability Er EC: Skill Enhance	ement Co	ourse (V	pulsory C	Stu	rse (A & idies): Fi	B)- Engli eld Projec	ish cts/ Interr	nsh	ip/ Aj	prentish	ip/ Com	munity	Engagemen	t and se	rvice.
A	ny one from pool	of course	es. For S	EC cours	es t	there shall	ll be only	practical	l ex	âmin	ation of 5	50 marks			-	
	BC: Value Based	Course (NSS/N	C/ Sport	:s/ (Jultural,	etc.)									
	weent English the	ate pass	a combine	ed passi	pra	for two 41	urses.	reas of 50)	arlea	ach that	ic mini-	25	marke are r	anirad	for
	assing out of 100.	e snan D	e comon	ieu passi	ng		ieory cou	1303 01 30	<i>i</i> m	arks		15 1111111	10111 33	marks are f	equiled	101

Structure of B. Sc. Food Science (Entire) Program (Semester III & IV)

				S I	EMES	TER	– III (D	ur	ation	- 6 M	(onths)						
			T	EACHIN	G SCHEN	ИE						Ε	XAMIN	ATIO	N SCHEM	Е	
Sr.		THEORY P			P	RACTIC	CAL				THE		PRACTICAL				
NO.	urse iject itle		1			Т	1		Inte	rnal		Univ	versity			1	
	Col (Sub Tj	Credits	No. of lectures	Hours	Credits	No. of lectures	Hours		Max Marks	Min Marks	Hours	Max	Total Marks	Min	Hours	Max	Min
1	DSC-FS-C1	2	3	2.4	4	0	<i>C</i> 1		10	4	2	40	00	20		50	10
2	DSC-FS-C2	2	3	2.4	4	8	0.4		10	4	2	40	80	28	_	50	18
3	DSC-FS-C3	2	3	2.4	4	0	<i>C</i> 1		10	4	2	40		20	atior	50	10
4	DSC-FS-C4	2	3	2.4	4	8	0.4		10	4	2	40	80	28	mim	50	18
5	DSC-FS-C5	2	3	2.4	4	8	6.4		10	4	2	40	80	28	Ex:	50	18
6	DSC-FS-C6	2	3	2.4	- +	0	0.4		10	4	2	40	00	20	tical	50	10
7	AECC-C	4	4	3.2					-						Prac is Aı		
8	SEC III		Any on	e	2				-						5	50	18
	TOTAL	16	22	17.6	14	24	19.2		60			240	350				
				S I	EMES	TER	– IV (D	ura	ation	-6 M	onths)						
1	DSC-FS-D1	2	3	2.4	4	0	6.4		10	4	2	40	80	26		50	10
2	DSC-FS-D2	2	3	2.4	4	0	0.4		10	4	2	40	00	20		50	10
3	DSC-FS-D3	2	3	2.4	4	8	64		10	4	2	40	80	28	lines	50	18
4	DSC-FS-D4	2	3	2.4		Ű	011		10	4	2	40	00		uide	•••	
5	DSC-FS-D5	2	3	2.4	4	8	6.4		10	4	2	40	80	28	DS G	50	18
6	DSC-FS-D6	2	3	2.4					10	4	2	40			ır B(
7	AECC-C										3	70	100	25	vs pe		
	AECC-D										Project	30		10	ł		
8	SEC - IV	Any	one from	n pool	2										2	50	18
	TOTAL	12	18	14.4	14	24	19.2						400				
		28	40	32	28	48	38.4						750			350	
• St	udent contact hou	ırs per w	veek : 36	5.8 Hours	(Min.)		• Total	Ma	arks foi	B.Sc	II (Inclu	ding 1	EVS)		1100		
• Tl	neory and Practic	al Lectur	res : 48	Minutes	Each		• Total	Cre	edits fo	or B.Sc.	-II (Sen	nester	III & IV	/):	56		
• I	DSC : - Disciplin	e Specifi	c Core	Course : A	All papers	are comp	oulsory.										
• A	• AECC- Ability Enhancement Compulsory Course (C) : Environmental Studies: EVS (Theory – 70 & Project – 30 Marks)																
• T	here shall be se	parate j	passing	g for inter	rnal and	Univers	ity theor	y a	is well	l as pra	actical	/ proj	ect exa	minat	ions.		
• P1	actical Examinat	ion will	be cond	ucted annu	ually for1(00 Marks	per cours	se (subjec	t).							
• E: re	xcept Environme equired for passir	ental Stung ng out of	dies, th 80. • N	ere shall t Iinimum 4	be combir 4 marks a	ned passi re requir	ng for tw ed for pa	vo tł .ssir	heory j ng out	papers of 10 f	of 40 m or Inter	arks e nal Ez	each. i. e caminat	e. mini ion of	mum. 28 r each paper	narks a :	e

• Examination of SEC shall be either theory or practical depending upon type of SEC.

Structure of B. Sc. Food Science (Entire) Program [Semester V& VI]

Structure V

				S	E	MES	TER	– V (D	ura	ation -	- 6 M	onths)					
~			T	EACHIN	IG S	SCHEN	ſE						E	XAMI	NATION	SCHEM	Е
Sr.	\sim	THEORY PRACTI					RACTIC	AL				THE	ORY			PRA	CTICAL
INO.	ırse ject tle									Inte	rnal		Uni	versity		•	[
	Cou (Sub) Ti	Credits	No. of lectures	Hours		Credits	No. of lectures	Hours		Max Marks	Min Marks	Hours	Max	Min	Hours	Max	Min
1	DSE-FS-E1	2	3	2.4						10	4	2	40	14			
2	DSE-FS-E2	2	3	2.4						10	4	2	40	14	s		
3	DSE-FS-E3	2	3	2.4		8	20	16		10	4	2	40	14	i no		
4	DSE-FS-E4	2	3	2.4						10	4	2	40	14	al nati	_	
5	AECC-E	4	4	3.2						10	4	2	40	14	Practic Exami	Annua	
6	SEC V		Any one	e		2				-					2	50	18
	TOTAL	12	16	12.8		10	20	16		50			200				
				S	E	MES	TER	– VI (I	Dur	ation	-6 M	lonths)				
1	DSE-FS-F1	2	3	2.4						10	4	2	40	14			
2	DSE-FS-F2	2	3	2.4		8	20	16		10	4	2	40	14		200	70
3	DSE-FS-F3	2	3	2.4						10	4	2	40	14	S s		
4	DSE-FS-F4	2	3	2.4						10	4	2	40	14	er BO deline		
5	AECC-F	4	4	3.2						10	4	2	40	14	As p Guid		
8	SEC – V I	Any o	one fror	n pool		2							1		0	50	18
	TOTAL	12	16	12.8		10	20	16		50		400	200				
		24	32	25.6		20	40	32					800				
• St	udent contact hou	urs per w	eek : 28	3.8 Hours	s (N	/lin.)		• Total	Ma	arks for	B.Sc	III (Inc	luding	Englis	sh)	800	1
• T	neory and Practic	al Lectur	es : 48	Minutes	Ea	ch		• Total	Cr	edits fo	r B.Sc.	-III (Se	meste	r V &	VI) :	44	
• 1	DSE : - Discipline	e Specifi	c Electiv	ve : All j	pap	ers are c	compulso	ry.									
• A	ECC- Ability Er	hanceme	ent Con	pulsory	Cou	urse (E&	k F) : Eng	glish for	Cor	nmunio	cation						
• T	here shall be se	parate p	passing	for inte	erna	al and U	Universi	ty theor	ry a	as well	as pra	actical	/ proj	ject ex	aminatio	ns.	
• P1	actical Examinat	ion will	be cond	ucted ani	nua	lly for20	00 Marks	, & mir	im	um 70	marks	s are re	quire	d for j	passing.		
• U	niversity semeste	r end exa	m shall	be of 40	ma	rks per p	paper and	l minimu	m 1	4 mark	ts are re	equired	for pa	ssing.			
• M • E	inimum 4 marks	s are requ EC shall	uired fo be eithe	r passing er theory	g ou or	t of 10 practica	for Internal depend	nal Exar ling upo	nina n ty	ation o pe of S	f each j SEC .	paper.					

CBCS B. Sc. Food Science (Entire): List of courses

B. Sc Food Science Part-III (Semester V & VI)

	1112		
Course code	Name of Course	Course code	Name of Course
	Semester-V		Semester-VI
DSE FS-E1	Principles of Food Packaging	DSEFS-F1	Food Additives
DSE FS-E2	Snack Food Processing	DSE FS-F2	Sugar and Confectionery Processing
DSE FS-E3	Food Safety Management System	DSE FS-F3	Food Business Entrepreneurship
DSE FS-E4	Fundamentals of Research	DSE FS-F4	Fundamentals of New Product
	Methodology		Development
AECC-E	English – III	AECC-F	English – IV

THEORY

PRACTICAL

DSE FS-P8	Lab Course VIII (Based on DSE FS-E1 & DSE FS-E2)
DSE FS-P9	Lab Course IX (Based on DSE FS-F1 & DSE FS-F2)

	PROGRAM OUTCOMES
PO1	Apply the scientific method to food science problems
PO2	Apply critical thinking and analytical evaluation to contemporary food science
	information and literature.
PO3	Apply principles from general chemistry, microbiology, analysis biotechnology and
	biochemistry to food science problems.
PO4	To provide knowledge and skills for better preservation techniques, processing and value addition to agricultural products.
PO5	To promote research and development for food product and process and guarantee
	sanitation and safety of processed food items.
PO6	Utilize advanced instruments and technologies to process and analyze food products
	and to solve food safety problems.
PO7	Critically access and analyze food science information available in the public domain
	in an innovative and ethical way.
PO8	Design food products that meet the various food regulations and laws
PO9	Utilize knowledge from the physical and biological sciences as a basis for understanding the role of food and nutrients in health and disease processes.
PO10	Taking roles as researchers, academics, practitioners, or professionals with reliable
	skills, mastering concepts and theories, and applying and developing food and related
	sciences.

	PROGRAM SPECIFIC
	OUTCOMES
PSO1	To impart knowledge in various aspects of Food Technology through
	Theory and Practical knowledge.
PSO2	To impart the knowledge about various compounds such as protein, carbohydrates, lipids amino acids, minerals, vitamins etc associated with the chemical compositions of food, their structures and functions.
PSO3	The students can gain knowledge about some very essential topic of nutrition and its metabolism balance inside the body
PSO4	To make the students familiar with the technologies of food processing and preservation of plant and animal foods, cereals, pulses, oilseeds, fruits vegetables, spices, meat, fish, poultry, sea food, milk and dairy products.
PSO5	To development students understanding and communication skills through various assignments which will enable them to develop skills in writing and effective's interpersonal skills. A presentation in different topics enhances their confidence, ability to express themselves & presentation skills

COURSE OUTCOME PRINCIPLES OF FOOD PACKAGING

CO1	Explain the roles of packaging in the food industry and the legislation involve.
CO2	Describe the making process, suitability, and functionality of each type of packaging materials for a specific product
CO3	Explain the principles of innovative packaging technologies for use with food products
CO4	Evalute different packaging materials based on various types of analysis in the laboratory.

B.Sc. Part III, Semester V DSE FS-E1 PRINCIPLES OF FOOD PACKAGING Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Unit I	Hours
Introduction to Food Packaging	15
Package functions	
Need of Packaging	
Classification of packages-Primary, secondary & Tertiary	
Introduction of Packaging Material	
Different packaging and its properties	
Types of Packaging materials : Metal, Glass and Paper	
Unit II	
	1.5
Packaging Accessories	15
Active packaging	
Controlled and modified atmospheric packaging (CAP and MAP)	
Aseptic packaging	
Packages for microwave ovens	
Biodegradable packaging	
Edible gums and coating	
Packaging Machines	
Vacuum packaging machine	
CA & MA packaging machine	
Gas Packaging machine	
Seal and Shrink packaging machine	
Form and Fill Sealing machine	
Retort pouches	
Bottling machine and carton making machine	
Different forms of packaging material	
Principles in development of safe and protective packing	

Suggested Reading:

1. International Pvt. Ltd. New Delhi- 110 002A Handbook on Food Packaging, P.Jacob John

2. Food Packaging, Prof.NeelamKhetarpaul and Dr.DarshanPunia

3. Food Packaging, Takashi Kadoya

4. Handbook of Food Processing, Packaging and Labelling, Jerry D'souza and Jatin Pradhan

5. Aseptic Processing & Packaging of Food A Food Industry Perspective, Jairus R. D. David, Ralph H. Graves and V.R. Carlon

6. International Pvt. Ltd. New Delhi- 110 002A Handbook On Food Packaging ,P.Jacob John

7. Food Packaging, Prof.NeelamKhetarpaul and Dr.DarshanPunia

8. Food Packaging, Takashi Kadoya

9. Handbook of Food Processing, Packaging and Labelling, Jerry D'souza and Jatin Pradhan 10. Aseptic Processing & Packaging of Food A Food Industry Perspective, Jairus R.D David, Ralph H. Graves and V.R. Carlon

11. Innovations in Food Packaging (second Edition), Jung H. Han

COURSE OUTCOME SNACK FOOD PROCESSING

CO1	To give knowledge of various development of snack food products.
CO2	The student will be able to practically prepare snack foods from a variety of raw
	material
CO3	The student will be competent in analyzing the shelf life and quality of snack food
CO4	Provides knowledge about shelf life and quality characteristics of snack food
	product

B.Sc. Part III, Semester V DSE FS-E2 SNACK FOOD PROCESSING Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Unit I	Hours
Introduction to Snack Food Ingredients	15
Importance and scope of snack food technology	
Ingredients commonly used in snack food, their attributes and	
functions.	
Equipment and Packaging	
Equipment for frying, drying, baking, Equipment for popcorn	
processing.Quality Evaluation of Snack Food	
Unit II	
Snack Food Products and Processing	15
Potato Chips, Meat based snacks.	
Snacks based on popcorn, Puffed and flaked cereals, simulated	
potatochips, baked snacks.	
Nut based snacks (salted, spiced and sweetened), Savory and	
Farsans, Processing of Papad, Chips and Wafers	
Application of	
seasoningsIndian	
Savory Sweets	
Extruded Snack	
Foods.	
Extruded Snack Foods- Extrusion Process and Types of	
extrusionprocess.	
Single Screw and Twin Screw extruder, Hot and Cold Extrusion.	
Types of Extruded Snack food – First, Second and third generation	
snackfood	

Suggested Reading:

1. Snack Foods Processing, Edmud W Luaas, Lloyd W Rooney, CRC Press, 2001.

2. Advances in Food Extrusion Technology, MedeniMaskan, Aylin Altan, illustrated edition, 2016.

3. Snack Foods, R. Gordon Booth, Springer, 5th edition, 2011.

4. The Complete Technology Book on Snack Foods, Dr.Himatri Panda, NIIR Project Company Services, 2nd edition, 2013.

COURSE OUTCOME FOOD SAFETY MANAGEMENT SYSTEM

CO1	To recognize and identify the food contaminants influencing the safety of
	agricultural products
CO2	Understand and apply properly the national and international legislation/
	regulation
CO3	I Implement food safety management systems for primary production
CO4	Evaluate food safety management systems and recommend the preventive
	measures

B.Sc. Part III, Semester V DSE FS-E3 FOOD SAFETY MANAGEMENT SYSTEM Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Unit I	Hours
 Food safety and security. Food laws and standards – ISO 9000 and ISO 14000 Indian food laws and regulations – Prevention of Food Adulteration Act Food safety and standards act 2006 Functions of FSSAI , Enforcement of act,Food Licensing and Registration, Offences and penalties, regulations for labelling and packaging. Various Organizations in the area of Food standardization and quality Food and Agriculture organization, World Health organization, World Trade Organization United states Department of Agriculture, USFDA, 	15
Food and Drug Administration Codex Alimentations commission	
Unit II	
Definition of food safety, Importance of food safety, Hazards-Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Food, microbiological considerations in food safety. Acute toxicity, Mutagencity and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioural effect Food safety Management System Voluntary Standards: BIS and AGMARK Objectives, Salient features TQM - concept and need for quality, components of TQM, HACCP ISO: 22000, FSSC, PRPs (GAP,GMP, GHP, GSP.)	15

Suggested Reading:

1. Training manual for Food Safety Regulators, Vol II- Food Safety Regulations and Food Safety Management, 2010.

2. Food Quality and Safety Systems- A training manual on Food Hygiene and the Hazard Analysis and Critical Control Point(HACCP) system, Food and Agriculture Organization of the United Nations, Rome, Publishing Management Group, FAO Information Division, 1998.

3. Quality Control for Food Industry - Krammer&Twigg

4. Food Plant Sanitation: Design, Maintenance and Good Manufacturing Practices, Michael M. Cramer, CRC Press, 3rd edition, 2013.

5. Training manual for Food Safety Regulators, Vol II- Food Safety Regulations and Food Safety Management, 2010.

6. Food Quality and Safety Systems- A training manual on Food Hygiene and the Hazard Analysis and Critical Control Point(HACCP) system, Food and Agriculture Organization of the United Nations, Rome, Publishing Management Group, FAO Information Division, 1998.

7. Quality Control for Food Industry - Krammer&Twigg

8. Food Plant Sanitation: Design, Maintenance and Good Manufacturing Practices, Michael M. Cramer, CRC Press, 3rd edition, 2013

COURSE OUTCOME FUNDAMENTALS OF RESEARCH METHODOLOGY

CO1	To understand and comprehend the basics in research methodology and applying
	them in research/ project work.
CO2	This course will help them to select an appropriate research design
CO3	With the help of this course, students will be able to take up and implement a research project/ study
CO4	The Students will develop skills in qualitative and quantitative data analysis and presentation.

B.Sc. Part III, Semester V DSE FS-E3 FUNDAMENTALS OF RESEARCH METHODOLOGY Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Unit I	Hours
Basic Concepts of Research	15
Importance and scope of research in different fields of study,	
Types of research -Fundamental vs. Applied,	
Concept of researchable problem – research prioritization –selection of	
research problem, Approach to research – research process., Review of	
Literature	
Data Collection Methods	
Data collection	
Mailed questionnaire and interview schedule – structured, & unstructured,	
open ended and closed-ended questions.	
Interviewing techniques and field problems - methods of conducting survey	
Unit II	
Sampling Techniques	15
Sampling theory and sampling design – sampling error - methods of	
sampling	
Research design and techniques – Types of research design.,	
Hypothesis – meaning - characteristics - types of hypothesis –testing of	
hypothesis.	
Report Writing	
Meaning of Report,	
Types of Research Reports,	
Contents or Structure of Research reports,	
Characteristics of a good research report,	
Practical vs Academic Report,	
Importance of proof reading,	
Significance of good layout,	
Ethics in Research and Reporting	

Suggested Reading:

1. Black TR. 1993. Evaluating Social Science Research - An Introduction. SAGE Publ.

2. Creswell JW. 1999. Research Design - Qualitative and Quantitative Approaches. SAGE Publ.

3. Dhondyal SP. 1997. Research Methodology in Social Sciences and Essentials of Thesis Writing. Amman Publ. House, New Delhi.

4. Kothari CR. 2016. Research Methodology - Methods and Techniques. WishwaPrakashan, Chennai.

5. Rao KV. 1993. Research Methodology in Commerce and Management. Sterling Publ.,New Delhi. Singh AK. 1993. Tests, Measurements and Research Methods in Behavioral Sciences, Tata McGraw-Hill.

6. Black TR. 1993. Evaluating Social Science Research - An Introduction. SAGE Publ.

7. Creswell JW. 1999. Research Design - Qualitative and Quantitative Approaches. SAGE Publ.

8. Dhondyal SP. 1997. Research Methodology in Social Sciences and Essentials of Thesis Writing. Amman Publ. House, New Delhi.

9. Kothari CR. 2016. Research Methodology - Methods and Techniques. WishwaPrakashan, Chennai.

10. Rao KV. 1993. Research Methodology in Commerce and Management. Sterling Publ., New Delhi. Singh AK. 1993. Tests, Measurements and Research Methods in Behavioural Sciences, Tata McGraw-Hill.

SEMESTER V AECC E

MODULE I

- A. Interview Skills
- B. Enterprise Nissim Ezekiel

MODULE II

- A. E-Communication B. The Ant and the Grasshopper – W.S. Maugham MODULE III
 - A. English for Competitive Examinations
 - B. The Look-Out Man Nicholas Bentley

MODULE IV

A. Forgetting Our Own History Sudha MurtyB.(i) The Butterfly –
Arun Kolatkar

(ii) For Your Lanes, My Country --Faiz Ahmed Faiz

*Note: Semester V: 10 Marks for Internal Evaluation: STUDENTS' SEMINAR

COURSE OUTCOME FOOD ADDITIVES

CO1	Understand the role of food additives in manufacturing of food products.
CO2	Have the knowledge regarding chemistry, applications, and International numbering system for Food Additives
CO3	Comprehend the effects of processing on flavor generation, extraction of flavours and colours and their regulatory effects
CO4	Ingredients and their chemistry used in food production

B Sc. Part III, Semester VI DSEFS- F1 FOOD ADDITIVES Credits 2 (Marks 50) Hours 30, 37.5 Lectures 48 minutes

Unit I	Hours
Introduction of food additives.	15
Additives in food processing and preservation – classification and their	
functions,	
ADI, GRAS and naturally occurring compounds,	
Nutritional and non- nutritional food additives.	
Safety and quality evaluation of food additives and contaminants,	
International numbering system for food additives.	
Direct food additives	
Introduction to different food additive their chemistry, types and	
functions.	
Unit II	
Sweeteners- Natural and low calorie/ Non –nutritive sweeteners, Their	15
Chemistry Food Contaminants– Definition, Types,	
Food Toxicants– Definition, Types, Terminologies in Toxicology	
Acute and Chronic studies, LD50 Value	
Methods for Detection of Food Additives,	

Suggested Reading:

1.Fennema, O.R. Marcel Dekker Principles of Food Science: Part-I Food Chemistry,, New York, Ed. 1976

2. Potter, N.N. AVI Food Science, , Westport. 3rd Ed. 1978.

3. Furia T.E. Handbook of food additives. VolI and VolII, 1980

4. George A.B Encyclopedia of food coloradditives, ,VolIII; CRC Press, 1996.

COURSE OUTCOME SUGAR AND CONFECTIONARY PROCESSING

CO1	Identify commodities and specialist equipment associated with the production of
	sugar and chocolate confectionery items and demonstrate knowledge of their
	application.
CO2	Produce a range of chocolate candies, using appropriate pre-crystallization
	methods
CO3	Produce a range of sugar confectionery items, using appropriate cooking methods
CO4	Describe and discuss the principles, techniques and methods used in the
	production of sugar and chocolate confectionery.

B.Sc. Part III, Semester VI DSEFS- F2 SUGAR AND CONFECTIONERY PROCESSING Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Unit I	Hours
Introduction to Confectionary	15
Present status and future scope of sugar and confectionery industries.	
Fundamentals of confectionery	
Processing of Invert sugar, Glucose syrup, High fructose corn syrup.	
Sugar based confectionery processing: High boiled sweets, Toffee,	
Fudge, and Caramel, Lozenges, fondants and chewing gums.	
Problems in confectionery products	
Unit II	
Machinery and Additives in confectionery	15
Types of machinery in confectionery industry	
Quality parameters of confectionary products	
Chocolate Processing	
Cocoa processing	
Chocolate processing: Ingredients, mixing, refining, conching,	
tempering, moulding, cooling, coating.	
Problems in Chocolate processing	

Suggested Reading:

1. Yogambal Ashok kumar, Textbook of Bakery and Confectionery, Prentice Hall India Learning Private Limited, 2012.

2. William P Edwards, The Science of Sugar confectionery, Royal Society of Chemistry, 2nd edition, 2018.

3. Peter P. Greweling, Wiley, Chocolate and Confections; Formula, Theory and Technique for the Artisan Confectioner, 2nd edition, 2012.

4. Ferenc A. Mohos, Wiley-Blackwell, Confectionery and Chocolate Engineering: Principles and Applications, 2010.

5. Bakery and Confectionery, Acharya NG Ranga Agricultural University.

6. Yogambal Ashok kumar, Textbook of Bakery and Confectionery, Prentice Hall India Learning Private Limited, 2012.

7. William P Edwards, The Science of Sugar confectionery, Royal Society of Chemistry, 2nd edition, 2018.

8. Peter P. Greweling, Wiley, Chocolate and Confections; Formula, Theory and Technique for the Artisan Confectioner, 2nd edition, 2012.

9. Ferenc A. Mohos, Wiley-Blackwell, Confectionery and Chocolate Engineering: Principles and Applications, 2010.

10. Bakery and Confectionery, Acharya NG Ranga Agricultural University

CO1	Explain the unique characteristics of the food industries
CO2	Demonstrate an understanding of the basic food industry segments and value
	chains,
CO3	Identify how socio-economic trends and technological progress provide emerging
	food industry opportunities
CO4	Survey the institutions, policies, laws, and regulations that are relevant to the
	operation of food and agribusiness firms

COURSE OUTCOME FOOD BUSINESS ENTREPRENEURSHIP

B.Sc. Part III, Semester VI DSEFS- F3 FOOD BUSINESS ENTREPRENEURSHIP Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Unit I	Hours
Entrepreneurship and its support system	15
Concept/ Meaning	
Need	
Qualities of an entrepreneur	
District industry centres (DICs),	
Small industrial development Bank of India(SIDBI)	
National bank for agriculture and rural development(NABARD),	
National Small Industry Corporation(NSIC),	
Khadi Village and industries commission(KVIC)	
Other revelant institutions/ organization/ NGOs at state level	
Business Planning and project report preparation	
Identification and guidance business plants Assessment,	
Procedures for registration of small scale industry,	
List of items reserved for exclusive manufacture in small scale	
industry,	
Considerations in product selection. Data collection for setting up small	
ventures	
Preliminary Project Report.	
Techno-Economic feasibility report.	
Project Viability	
Unit II	
Managerial Aspects of Small Business	15
Principles of Management (Definition, functions of management viz planning,	
organization, coordination and control)	
Marketing Techniques,	
Legal Aspects of Small Business	
Elementary knowledge of Income Tax, Sales Tax, Patent Rules,	
Excise Rules,	
Factory Act and Payment of Wages Act,	

Suggested Reading:

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)

2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi

3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi

4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan, New Delhi

COURSE OUTCOME FUNDAMENTALS OF NEW PRODUCT DEVELOPMENT

CO1	Explain how new products are planned
CO2	Identify approaches to generate new product ideas
CO3	Identify methods to evaluate new product ideas
CO4	Explain the process to create and commercialize new products

B.Sc. Part III, Semester VI DSEFS- F4 FUNDAMENTALS OF NEW PRODUCT DEVELOPMENT Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Unit I	Hours
Paging of Food Product Development	15
Dasics of Food Frouder Development	15
Definition, Classification of new food product	
Reason for new food, Product development-social concerns, Health	
concerns.	
Product development- Market place influences, Technological	
influences, Governmental influences	
Product life cycle	
New Product Development team, concept of market and marketing	
Steps in Food Product Development)	
Unit II	
Technology for New Product & Scale up Trials	15
Adaptable technology and sustainable technology for standardized	
formulation for process development	
Process control parameters	
Scale up production trials for new product development at lab and pilot	
scale	
Quality assessment of new developed products	
Market testing and marketing plan	
Costing and economic evaluation of developed products,	
Commercialization / product launch for marketing	

Suggested Reading:

1. Food Product Development, M Earle, R Earle, A Anderson, Woodhead Publishing, 2001.

2. New Food Product Development: from Concept to Marketplace, Gordon W Fuller, CRC Press, 3rd edition, 2011.

3. Methods for Developing the New Food Products, FadiAramouni, Kathryn Deschenes, Desteh Publications, 2nd edition, 2017.

4. Strategies for Formulations Development: A step-by-step Guide using JMP, Ronald D. Snee, Roger W. Hoeri, SAS Institute; revised edition, 2016

5. New Food Product Design and Development: Beckley, Blackwell Publishing Oxford UK

6. Sensory and Consumer Research in Food Product Design and Development Moskowitz, Blackwell Publishing Oxford UK

SEMESTER VI

AECC F

MODULE V

A. Group Discussion

B. Evolution - Alexie Sherman Alexie

MODULE VI

A. Note Making and Note Taking

B. Gateman's Gift - R. K. Narayan

MODULE VII

A. Media Writing

B. Karma - Khushwant Singh

MODULE VII

A. Bhaurao in America – P. G.Patil

- B. (i) The Grass is Really Like Me- Kishwar Naheed
 - (ii) To Granny Tejaswini Patil

*Note: Semester VI: 10 Marks for Internal Evaluation: STUDENTS' GROUP PROJECT

Division of Teaching Hours 8 Modules x 15 Hours = 120 Hours

NATURE OF QUESTION PAPER FOR B.Sc. PART – III, (40 + 10 PATTERN)ACCORDING TO REVISEDSTRUCTURE AS PER NEP – 2020 TO BE IMPLEMENTED FROM ACADEMIC YEAR 2022-23

Maximum Marks: 40

Duration: 2 hrs

Q. 1 Select the most correct alternate from the following [8]

i) to viii) MCQ one mark each with four options

A) B) C) D)

Q.2 Attempt any TWO of the following [16]

- A) B)
- C

Q. 3 Attempt any FOUR of the following [16]

- a)
 b)
 c)
 d)
 e)
- f)

DSE FS-P8	Lab Course VIII (Based on DSE FS-E1 & DSE FS-E2)
DSE FS-P9	Lab Course IX (Based on DSE FS-F1 & DSE FS-F2)

Practical

DSE FS – P8

Lab Course VIII (Based on DSE FS-E1 & DSE FS-E2)

- 1. Measurement of thickness of paper and paper boards
- 2. Measurement of water absorption of paper and paper boards
- 3. Measurement of bursting strength of paper and paper boards
- 4. Measurement Tear resistance of papers
- 5. Measurement of puncture resistance of paper and paperboard
- 6. Measurement of tensile strength of paper of paper boards
- 7. Determination of gas transmission rate of package films
- 8. Determination of WVTR and Gas transmission rate of film
- 9. Identification of Packaging materials
- 10. Edible packaging of Food Products (Fruits, Bread, Dairy)
- 11. Estimation of shelf life of packaged food stuff
- 12. Preparation of Papad and its quality evaluation.
- 13. Preparation of Chips and its quality evaluation.
- 14. Preparation of Flaked cereals (Poha) and its quality evaluation.
- 15. Preparation of Puffed cereals (Churmura) and its quality evaluation.
- 16. Preparation of Expanded snack and its quality evaluation.
- 17. Preparation of Roasted grains or nuts andits quality evaluation.
- 18. Preparation of Coated grains or nuts and its quality evaluation.
- 19. Preparation of instant food premixes and its quality evaluation.
- 9. Preparation of extruded snack food and its quality evaluation.
- 20. Preparation of popcorn and its quality evaluation.

DSE FS – P9 Lab Course IX (Based on DSE FS-F1 & DSE FS-F2)

- 1. Detection/Estimation of adulterants in some foods
- 2. Determination of carotenoids content
- 3. Determination of chlorophyll content
- 4. Estimation of tannins content
- 5. Extraction of essential oils
- 6. Determination of vitamin c content
- 7. Effect of acidulants in food products
- 8. Effect of thickener in food products
- 9. Effect of natural sweeteners/ artificial sweeteners in food products
- 10. Effect of stabilizing agents in food products
- 11. Development of Invert Sugar by chemical method
- 12. Effect of a Boiling point on the solubility of sugar
- 13. Development of Jaggery based nutritious.
- 14. Development of Hard boiled candy
- 15. Development of fruit-based Toffee
- 16. Preparation of Fudge/ Fondant
- 17. Preparation of medicated lozenges
- 18. Effect of different emulsifier on chocolate quality
- 19. Preparation of caramel
- 10. Development Indian traditional sweet