

STALOYSIUSCOLLEGE

MANGALURU-575003

(Established– 1880)

Government AidedAutonomousCollege

CoveredunderSection2(f),12(B)oftheUGCAct,1956

Re-AccreditedbyNAACwithAgrade

Re-RecognizedbyUGCas “CollegewithPotentialforExcellence”–2014



COURSESTRUCTUREANDSYLLABUS

B.Voc

Food Processing andEngineering

DEEN DAYAL UPADHYAY CENTRE

**FORKNOWLEDGEACQUISITIONANDUPGRADATIONOF
SKILLEDHUMANABILITIESANDLIVELIHOOD(KAUSHAL)**

**(UGC approved B.Voc. Degree conducting institutions with
UGCassistance)**

(2015 –16)

Structure and Scheme **B.Voc(Bachelor of Vocation)(Food Processing and Engineering)**

Bachelor of Vocation (B.Voc.) is launched under the scheme of University Grants Commission for skill development based on higher education leading to Bachelor of Vocation (B.Voc.) Degree has multiple exits as Diploma/Advanced Diploma under the National Skill Qualification framework. The B.Voc. programme incorporates specific job roles and their National Occupational Standards along broad based general education.

BVoc in FOOD PROCESSING & ENGINEERING

1. Food Processing & Engineering

ICRA Management Consulting Services (IMaCS) conducted the district wise skill gap study for the State of Karnataka. Based on its research, sectors are identified which will be the development and employment growth engines in the districts in the next five years and will have skill training requirements. It forecasted the numbers for 20 high growth sectors identified by NSDC. Based on its forecasts, it has been estimated that between 2012 and 2022, an incremental demand (cumulative for ten years) for 8.47 million people will be generated in Karnataka. Maximum demand will be generated from sectors such as tourism, travel and agriculture and allied (mainly allied such as horticulture, fishery, animal husbandry, poultry and sericulture); building, construction and real estate; IT & ITES, transportation, logistics, warehousing and packaging; healthcare and education services. The supply side numbers have also been forecasted. It has been estimated that between 2012 and 2022, about 8.16 million persons will join the workforce in Karnataka. Of these, about 43 per cent will be minimally skilled, 40 per cent will be semi-skilled, 17 per cent will be skilled and the remaining about one per cent will be highly skilled.

As per NSDC district wise skill gap study in Karnataka 2011 Agriculture and Allied sectors are the biggest employment sources in the state.

Specialisation

Skill Gaps Identified

- | | |
|-----------------------------|-------------------------------------|
| 1. Food Technology | Handling of Food Process Equipments |
| 2. Food and Nutrition | Analytical Instrumentation |
| 3. Nutritional Biochemistry | Organoleptic studies |

1. B.Voc.Programme has been designed as per National Skill Qualification Framework emphasizing skill based education.

2. **4.1.3. Alignment with National Occupational Standard of the Sector Skills Council and National Skill Qualification Framework:**

S.No.	Name of the Sector /Programme	Semester	Jobrole(s)Covered	NSQF Level	Remarks
1	B.Voc in Food Processing & Engineering	1	Assistant System Manager	4	
		2	Food Safety Manager	5	
		4	Packaging and Labelling Associate Food Process Engineer	6	
		6	Instrumental Analyst Food Production Manager	7	

1. **LEVELS OF AWARD:**

AWARD	DURATION	Core Level corresponding NSQF Level
Certificate Course	6 Months	4
DIPLOMA	1 YEAR (TWO SEMESTERS)	5
ADVANCED DIPLOMA	2 YEAR (FOUR SEMESTERS)	6
B.VOC.DEGREE	3 YEAR (SIX SEMESTERS)	7

Credits for each of the year

NSQFL LEVEL	SKILL COMPONENT CREDITS	GENERATED EDUCATION CREDITS*	NORMAL CALENDAR DURATION	EXIT POINT / AWARDS
Year1	36	24	Two Semesters	Diploma in Food Processing
Year2	36	24	Two Semesters	Advanced Diploma in Food Processing
Year3	36	24	Two Semesters	Degree in Food Processing
Total	108	72		

The formula used for conversion of time into credit hours is as follows:

- a) One Credit would mean equivalent of 15 periods of 60 minutes each, for theory, workshops/lectures and tutorials;
- b) For internship/fieldwork, the credit weightage for equivalent hours shall be 50% of that for lectures/workshops;
- c) For self-learning, based on content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

2. **ELIGIBILITY FOR ADMISSION IN B.VOC.** A candidate will be eligible to join 1st semester of B.Voc. Food Processing & Engineering course, if he/she has passed 10+2 examination (Any stream/Arts/Science/Commerce) or 10+2 vocational stream related to Food processing of recognized Board/university, or any other examination recognized as equivalent thereto without reappear.

3. The course of study of B.Voc. shall be divided into six semesters and end semester examination will be held at the end of every semester in the months of October (for semester I, III & V) and April (for semester II, IV & VI) or as fixed by registrar of evaluation.

4. Semester examination will be open to regular candidates who have been on the rollsofacollegeaffiliatedtothisUniversityandmeettheattendanceandotherrequirements.

5. **BVocinFOODPROCESSING& ENGINEERING**

SEMESTER-1		Credits
1	CommunicationSkills -1	4
2	Kannada/Hindi/French/Malayalam/Konkani-1	4
3	Basiccomputerskills-1	4
4	BasicsofFoodProcessing-BV-134.1	3
5	FundamentalsofFoodand Nutrition-BV-135.1	3
6	BasicsofFoodSafetyandRegulatoryAct-BV-136.1	3
7	PracticalPaperpertainingtoBV-137.1P	3
8	PracticalPaperpertainingto-BV-138.1P	3
9	PracticalPaperpertainingto-BV-139.1P	3
10	Industrialvisit-BV140.1	-
SKILLOUTCOMEINGENERALEDCATION– SEMESTER1		
Supervisory development		
programEnhanced supervisory		
productivityEffectivehandlingofchallengesa		
ndstress		

OwnershipandAccountability

Accepting responsibility and taking ownership at the workplace

SEMESTER-2		Credits
1	Communication Skills -2	4
2	Kannada/Hindi/French/Malayalam/Konkani-2	4
3	Basic computer skills-2	4
4	Introduction to Cereals, Legumes and Oil Processing-BV-134.2	3
5	Fundamentals of Food Chemistry and Microbiology-BV-135.2	3
6	Introduction to Fruit and Vegetable Processing-BV-136.2	3
7	Practical Paper pertaining to BV-137.2P	3
8	Practical Paper pertaining to BV-138.2P	3
9	Practical Paper pertaining to BV-139.2P	3
10	Industrial Visit- BV140.2	
SKILL OUTCOME IN GENERAL EDUCATION – SEMESTER 2		
Learning how to take accountability while performing complex tasks Going beyond the blame game to achieve collaboration		
Business communication		
Infusing the heart of effective communication		

SEMESTER-3		Credits
1	Softskills	4
2	HealthsafetyandEnvironment	4
3	FundamentalsofIndianconstitution	4
4	IntroductiontoBakery&ConfectionaryProcessing-BV-134.3	3
5	FoodEngineeringandInstrumentation-BV-135.3	3
6	IntroductiontoDairyTechnology-BV-136.3	3
7	PracticalpaperpertainingtoBV-137.3P	3
8	PracticalpaperpertainingtoBV-138.3P	3
9	PracticalpaperpertainingtoBV-139.3P	3
10	IndustrialVisit- BV140.3	-
SKILLOUTCOMEINGENERALEDCATION– SEMESTER3		
Buildingeffectiverelationshipsthroughthepowerofcommunication.Writtenbusinesscommunicationforsuccess.		
Timemanagement		
Gaininginsightsintomultitaskingtomanagetime		

SEMESTER-4		Credits
1	Behaviouralskills	4
2	HumanRightsandValueEducation	4
3	FundamentalsofBusinessLaw	4
4	IntroductiontoMeat,FishandPoultryProcessing-BV-134.4	3
5	BasicsofFoodPackaging -BV-135.4	3
6	FoodAdditivesandPreservatives-BV-136.4	3
7	PracticalPaperpertainingto BV-137.4P	3
8	PracticalPaperpertainingtoBV-138.4P	3
9	PracticalPaperpertainingtoBV-139.4P	3
10	IndustrialVisit- BV140.4	-
SKILLOUTCOMEINGENERALEDCATION– SEMESTER4		
WithstandingpressuretoenhanceperformanceIncreasingth		
ethresholdlevelofpressure		
Salesleadershipprogram		
Knowyourcustomerbehaviourtomaximizesales		

SEMESTER-5		Credits
1	GenderEquityandValueEducation	4
2	LegalandethicalaspectsofBusiness	4
3	Entrepreneurship	4
4	FoodDryingandConcentration Techniques-BV-134.5	3
5	SpicesandPlantation CropTechnology-BV-135.5	3
6	IntroductiontoFermentationTechnology-BV-136.5	3
7	Practicalpaper pertaining-BV-137.5P	3
8	Practicalpaper pertainingto BV-138.5P	3
9	PracticalpaperpertainingtoBV-139.5P	3
10	IndustrialVisit- BV136.6	
SKILLOUTCOMEINGENERALEDCATION– SEMESTER5		
Businessacumen		
Gainingknowledgeaboutthebusinessandindustry		
Learning the impact of different factors of economy on		
businessHow todocompetitorprofiling		

SEMESTER-6		Credits
1	GeneralProjectManagement	4
2	InventoryManagement	4
3	PrinciplesofMarketing	4
4	FoodindustryWasteManagement- BV-134.6	3
5	PracticalpaperpertainingtoBV-135.6P	3
6	IndustrialProject-B.VFP-611	12

Structure and Syllabus of B.Voc in Food Processing and Engineering

Scheme and Syllabus Bachelor of Vocation

B.Voc First Year: Food Processing and Engineering (1st Semester)

CODE	SUBJECTS	L	T	P	TOTAL CREDITS*	External Marks	Internal Marks	Practical Marks	TOTAL MARKS
BV131.1	Communication Skills-1	4			4	70	30		100
BV132.1	Kannada/Hindi/ French/Malayalam/Konkani-1	4			4	70	30		100
BV133.1	Basic computer skills -1	4			4	70	30		100
BV134.1	Basics of Food Processing	3	0	0	3	70	30		100
BV135.1	Fundamentals of Food and Nutrition	3	0	0	3	70	30		100
BV136.1	Basics of Food Safety and Regulatory Act	3	0	0	3	70	30		100
BV137.1P	Practical Paper pertaining to- BV134.1			4	2	40	10	50	50
BV138.1P	Practical Paper pertaining to- BV135.1			4	2	40	10	50	50
BV139.1P	Practical Paper pertaining to- BV136.1			4	2	40	10	50	50
BV140.1	Industrial Visit				3				50
	Total				30				800

15 hrs L = 1 credit; 30 hrs of practical = 1 credit

B.Voc First Year: Food Processing and Engineering (2nd Semester)

CODE	SUBJECTS	L	T	P	TOTAL CREDITS*	External Marks	Internal Marks	Practical Marks	TOTAL MARKS
BV131.2	Communication Skills-2	4			4	70	30		100
BV132.2	Kannada/Hindi/ French/Malayalam/Konkani -2	4			4	70	30		100
BV133.2	Basic computer skills -2	4			4	70	30		100
BV134.2	Introduction to Cereals, Legumes and Oil Processing	3	0	0	3	70	30		100
BV135.2	Fundamentals of Food Chemistry and Microbiology	3	0	0	3	70	30		100
BV136.2	Introduction to Fruit and Vegetable Processing	3	0	0	3	70	30		100
BV137.2P	Practical Paper pertaining to- BV134.2			4	2	40	10	50	50
BV138.2P	Practical Paper pertaining to- BV135.2			4	2	40	10	50	50
BV139.2P	Practical Paper pertaining to- BV136.2			4	2	40	10	50	50
BV140.2	Industrial Visit				3				50
	Total				30				800

15hrsL=1 credit;30hrsofpractical=1 credit

B.VocSecondYear:FoodProcessingandEngineering(3rdSemester)

CODE	SUBJECTS	L	T	P	TOTALCRE DITS*	ExternalM arks	InternalM arks	Practical Marks	TOTALM ARKS
BV131.3	Softskills	4			4	70	30		100
BV132.3	Health safety and Environment	4			4	70	30		100
BV133.3	FundamentalsofIndian constitution	4			4	70	30		100
BV134.3	IntroductiontoBakery& ConfectioneryProcessing	3	0	0	3	70	30		100
BV135.3	FoodEngineeringand Instrumentation	3	0	0	3	70	30		100
BV136.3	Introductionto Dairy Technology	3	0	0	3	70	30		100
BV137.3P	PracticalPaperpertainingto BV134.3			4	2	40	10	50	50
BV138.3P	PracticalPaperpertainingto -BV 135.3			4	2	40	10	50	50
BV139.3P	PracticalPaperpertainingto- BV136.3			4	2	40	10	50	50
BV140.3	IndustrialVisit				3				50
	Total				30				800

15hrsL=1 credit;30hrsofpractical=1 credit

B.VocSecondyear: FoodProcessingandEngineering(4thSemester)

CODE	SUBJECTS	L	T	P	TOTALCR EDITS *	External Marks	Internal Marks	Practical Marks	TOTALM ARKS
BV131.4	Behavioralskills	4			4	70	30		100
BV132.4	HumanRightsandValue Education	4			4	70	30		100
BV133.4	FundamentalsofBusiness Law	4			4	70	30		100
BV134.4	IntroductiontoMeat,Fish andPoultryProcessing	3	0	0	3	70	30		100
BV135.4	Basicsof FoodPackaging	3	0	0	3	70	30		100
BV136.4	FoodAdditivesand Preservatives	3	0	0	3	70	30		100
BV137.4P	PracticalPaperpertainingto- BV134.4			4	2	40	10	50	50
BV138.4P	PracticalPaperpertainingto- BV135.4			4	2	40	10	50	50
BV139.4P	PracticalPaperpertainingto- BV136.4			4	2	40	10	50	50
BV140.4	IndustrialVisit				3				50

	Total				30				800
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15hrsL=1 credit;30hrsofpractical=1 credit

B.VocThirdyear: FoodProcessingandEngineering(5thSemester)

CODE	SUBJECTS	L	T	P	TOTALCR EDITS *	External Marks	Internal Marks	Practical Marks	TOTALM ARKS
BV131.5	GenderEquityandValueEd ucation	4			4	70	30		100
BV132.5	Legal and ethical aspects ofBusiness	4			4	70	30		100
BV133.5	Entrepreneurship	4			4	70	30		100
BV134.5	FoodDryingand ConcentrationTechniques	3	0	0	3	70	30		100
BV135.5	SpicesandPlantationCrop Technology	3	0	0	3	70	30		100
BV136.5	IntroductiontoFermentation Technology	3	0	0	3	70	30		100
BV137.5P	Practical Paper pertaining to- BV134.5			4	2	40	10	50	50
BV138.5P	Practical Paperpertaining to- BV135.5			4	2	40	10	50	50
BV139.5P	Practical Paper pertaining to- BV136.5			4	2	40	10	50	50
BV140.5	IndustrialVisit				3				50
	Total				30				800

15hrsL=1 credit;30hrsofpractical=1 credit

B.VocThirdyear: FoodProcessingandEngineering(6thSemester)

CODE	SUBJECTS	L	T	P	TOTALCR EDITS *	External Marks	InternalM arks	PracticalM arks	TOTALM ARKS
BV131.6	General ProjectManagem ent	4			4	70	30		100
BV132.6	InventoryManagement	4			4	70	30		100
BV133.6	PrinciplesofMarketing	4			4	70	30		100
BV134.6	FoodIndustryWasteM anagement	3	0	0	3	70	30		100
BV135.6P	PracticalPaperpertainingtoB V134.6			4	2	40	10	50	50
BV136.6	IndustrialProject				12				350
	Total				30				800

15hrsL=1credit;30hrsofpractical=1credit

Syllabus of B.Voc in Food Processing and Engineering

Structure and Scheme

B.Voc (Bachelor of Vocation) (Food Processing and Engineering) B.VOC.FOOD PROCESSING AND ENGINEERING- FIRST YEAR (1ST SEMESTER)

B.VOC.FOOD PROCESSING AND ENGINEERING

Max.Marks: 70

Total lectures: 45hrs.

1. Introduction to Food Processing: Definition, Objectives, scope of food processing industries, Introduction to Different processes employed in food processing viz. Milling, Cooking, Boiling, Steaming, Braising, Stewing, Roasting, Frying, Grilling, Baking, Fermentation, Pickling, Refining.

2. Food Preservation: Heat: Evaporation, boiling, paraboiling, steam under pressure, pasteurization, blanching, canning). Low Temperature: (Thawing, refrigeration, cold storage, de-hydro freezing): Drying (Methods of drying – dehydration by Air drying, sundrying and freeze drying) Radiations: (Ultraviolet and ionizing irradiations). Their effect on microorganisms, use of aspects of canning and bottling, processing operations

3. Food Preservation: Preservation by fermentation – Curing and Pickling; Smoking Chemical preservatives- (Objectives, principles, types of preservatives, Different types of chemical preservatives, Safety in use and certification levels, Preservation by high osmotic pressure (Pickling, salting, curing – principles). Effect of various food processing operations on the nutrients of foods. Preservation of meat and poultry products: Electrical stimulation, chilling and freezing of fresh meat. Cold shortening and thaw rigor, Chilling and freezing processing of poultry meat.

6. Methods in Food Processing- Microwave processing, Extrusion cooking, Ohmic Heating, Reverse Osmosis, Electro dialysis, Ultra-filtration, High Pressure Processing, Supercritical fluid extraction .

7. Advances in fortification: synthetic nutrients, techniques of food fortification and stability of nutrients in relation to processing.

REFERENCES:

1. Jood, Sudesh, 2002, Food Preservation, Agrotech Publisher Academy, Udaipur.
2. Potter, N.N., 2002, Food Science, CBS Publishers, ND.

3. Sethi, Mohini, 2001, Food Science, CBS Publishers, ND.

4. Srilakshmi, B., 2001, Food Science, New Age International Pvt. Ltd., ND.
5. Mahendru, S. N., 2000, Food Additives, Tata McGraw Hills, ND.
6. Manay, N. S., 2001, Foods: Facts & Principles, Wiley Eastern Ltd., ND.
7. Fellows, P., 2005, Food Processing Technology : Principles & Practices, CRC Press, Woodhead Publishing Ltd., England.

PRACTICALS

BV-134.1-PRACTICAL PAPER I (BV-137.1P-114: Basics of Food Processing)

1. To blanch a seasonal fruit or vegetable & assess quality of blanching process.
2. To study the effect of browning on raw fruits & vegetables.
3. To study effect of heat and acidity on milk proteins.
4. To study the effectiveness of pasteurization.
5. To study Pasteurization of milk using microwave technique.
6. To study different methods of food processing i.e. by heat, low temperature & drying of given food sample.
7. To check the shelf life of a given food at ambient temperature and under refrigeration.
8. Basic of GLP,
Glassware cleaning, Phmeter, preparation of reagent, Normality and Molality, Labeling techniques.
9. Phosphate test for the effect of pasteurization
10. Introduction to safety of Laboratory Equipments, Sterilization of glasswares in the food microbiology laboratory.

BV-135.1 FUNDAMENTALS OF FOOD & NUTRITION

Max.Marks: 70

Total lectures: 45 hrs.

- 1. Introduction to Food:** Definition, classification and constituents of food :Carbohydrates, Fats , Proteins ,Fat soluble vitamins- (A,D,E and K) Water soluble vitamins – (Thiamin, Riboflavin, Niacin, Pyridoxine, Folate, Vitamin B12 and Vitamin C) Minerals – (Calcium, Iron, Zinc, Iodine and Fluorine). (neena)
- 2. Nutritional Concept in Food Design:** Nutritive values of cereals, pulses, oil seeds, fruits & vegetables, fish, meat and eggs)
- 3. Functions:** Of food, Effect of deficiency & overconsumption of dietary sources on health, Basic food groups, Recommended Dietary Allowance (RDA), Food guide pyramid, Dietary fibers, Functions of water in body. . Balanced Diet: Definition, food groups used in planning balanced diets.
- 4. Nutrition:** Basic terms used in nutrition, relationship between food, health and nutrition, bioavailability of nutrients. Basal Metabolic Rate (BMR). Protein quality, Dietary allowances and standards for different age groups: adult man/woman, pre-school children, adolescent children, pregnant woman. geriatric nutrition, nutrition for athletes
- 5. HUMAN NUTRITION-** Concept and definition of terms- Nutrition, Malnutrition and Health; Scope of Nutrition. Growth & development from infancy to adulthood.

REFERENCES:

1. N.Shakuntala Manay & M. Shadaksharaswamy Food Facts and Principles by, New Age International (P) Ltd. Publishers.
2. N.Potter & J. Hotchkiss, Food Science CBS Publisher and Distributors.
3. Manoranjan Kalia and Sagita Sood, Food Preservation and Processing by Kalyani Publishers.
4. Shubhangini Joshi, Nutrition and Dietetics Tata Mcgraw Hill Co. Ltd.
5. M.Swaminathan, Vol-I Food and Nutrition, Bangalore Printing and Publishing Co.
6. Gopalan C, Rama Sastri BV, Balasubramanian SC. 1989. Nutritive Value of Indian Foods. National Institute of Nutrition, ICMR, Hyderabad.
7. Wardlaw and Insel MG, Insel PM. 2004. Perspectives in Nutrition. Sixth Edition, McGraw Hill.
8. Srilakshmi B 2012. Nutrition Science. 4th Revised Edition, New Age International Publishers.
9. Khanna K, Gupta S, Seth R, Passi SJ, Mahna R, Puri S .Textbook of Nutrition and Dietetics. Phoenix Publishing House Pvt. Ltd.
10. ICMR. 2010. Recommended Dietary Allowances for Indians. Published by National Institute of Nutrition, Hyderabad
11. Antia, F.P. and Abraham, P. 2011: Clinical Dietetics and Nutrition, Fourth Edition, Oxford University Press.
12. Joshi, V.D. 2005: Handbook of Nutrition and Dietetics, Vora Medical Publications, Mumbai.

13. Masih, S. 2011. *Essentials of Food and Nutrition*, Lotus Publishers.
14. Sharma, R. 2011. *Diet Management, Fourth Edition*, Elsevier, A Division of Reed Elsevier India Private Limited.

PRACTICALS

BV-135.1-PRACTICAL PAPER II (BV-138.1P -115: Fundamentals of Food and Nutrition) Max.

1. To study nutritional information in different packed foods available in the market.
2. Qualitative and quantitative determination of carbohydrates in food.
3. Qualitative and quantitative determination of proteins in food.
4. Qualitative and quantitative determination of different vitamins in different food products.
5. To plan diet chart for different age groups with special reference to different age groups.
6. To prepare scrap files showing excess and deficiency of different food components.

BV-136.1–BASICS OF FOOD SAFETY AND REGULATORY ACT

Max. Marks: 70

Total lectures: 45 hrs.

1. **General principle of food hygiene:** Hygiene in relation to food preparation, personal hygiene and food handling habits, sanitizers, role of sanitation, general sanitary consideration and sanitary evaluation of food plants.
2. **Sanitary practices of food:** Cleaning of plant, Establishing and maintaining sanitary practices in food plants. Place of sanitation in food plants. Sanitary aspects of building and equipment.

³**Introduction to concepts of food quality:** Food safety and quality assurance. Control of QC & QA. HACCP, Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents. Microbial quality control: determination of microorganisms in foods by cultural, microscopic, physical and chemical methods.

4. **Food Safety** – Role of voluntary agencies & legal aspects of consumer protection. National & International food laws – FSSA, BIS, AGMARK, FDA, Export (quality & inspection act, Consumer protection act), Labeling requirements of foods. Food adulteration ; Definition, object of act, central committee for food standards; public analysis, food inspector, duties of Food inspectors, Report of Public analyst, sealing, fastening and dispatch of samples, powers of court.

REFERENCES:

1. Nielsen, S.S., 2004, Introduction to chemical Analysis of foods, CBS Publishers, New Delhi.
2. Ranganna. S., 2001, Handbook of Analysis & Quality control for Fruit & Vegetable Products, Tata McGraw Hill, New Delhi.
3. Pomeranz. Y, Meloan. C.E, 1996, Food Analysis – Theory & Practice, CBS Publishers, New Delhi.
4. Jacobs. M.B., 1999, Chemical Analysis of Food & Food Products, CBS Publishers, New Delhi.
5. Jay. J.M, 1996, Modern Food Microbiology, CBS Publishers, New Delhi.
6. Debnath, 2005, Tools & Techniques of Biotechnology, Pointer Publishers, Jaipur.
7. Ingraham, John. L. 2004, Introduction to Microbiology, 3Ed., Thomson Brooks/Cole Inc.
8. Tortora G. J et al, 2008, Microbiology: an introduction, Pearson Education
9. Nester, E. W, 2009, Microbiology, McGraw-Hill Higher Education
10. Dubey, R.C., Maheshwari, D.K., 2008, Textbook of Microbiology, S. Chand Publications, ND
11. Adams, M.R., Moss, M.O., 2007, Food Microbiology, New Age International Pvt. Ltd., ND.
12. Pelczar, Reid and Chan, 2008, Microbiology, McGraw Hill Ed, ND

13. Ananthanarayan, Panikar, CKJ., 2006, Textbook of Microbiology, Oriental Longman Pvt. Ltd., Hyderabad.
14. Frazier, William, C. 2008, Food Microbiology, Tata McGraw Hill Ed., ND.
15. S. Roday 1998, food Hygiene and sanitation Tata McGraw Hill Ed., ND.
16. Bean Malicse 2012 Principles of food sanitation, safety and hygiene Patima University

PRACTICALS

BV-136.1-PRACTICAL PAPER III (BV-139.1P-114: Basics of Food Safety and Regulatory A

ct)

1. Introduction and study of microbiological instruments.
2. Cleaning of glasswares, preparation of media, cotton plugging and Sterilization.
3. Different staining techniques for identification of microbes: simple staining, negative staining, gram staining, acid fast staining.
4. Personal hygiene-microbes from hands, tooth-Gums and other body parts.
5. Isolation of microorganisms from food samples.
6. To analyze the quality of water.
7. Determine the Critical Control Points for production line of Milk, Fruits & Vegetables and Meat in industry as per HACCP system.
8. To prepare a chart of specifications for different food products as specified by BIS.
9. Sterility and Swab test.
10. Acrylamide test

BV-140.1-INDUSTRIAL VISIT

FirstYear:FoodProcessingandEngineering(2ndSemester)

BV-134.2-INTRODUCTION

TOCEREALS,LEGUMEANDOILPROCESSING

Max.Marks:70
45hrs.

Totallectures:

1. Paddy Processing:

Paddy Varieties - Their Composition and Quality characteristics. Curing of Paddy. ParboilingProcesses, Cold Water soaking and Hot water soaking processes, Paddy Dryer - LSU Dryer.By Products of Paddy Processing - Paddy husk and its uses as boiler fuel, husk ash, activatedcarbon, furfural and other by products. Production of Flattened Rice and Puffed Rice fromPaddy. Rice Milling: Paddy Dehusking Processes. Rice Mill Flow Chart. Modern Rice Mills,Paddy, Bran and Broken separators. Utilization of by products: rice bran, rice bran oil, flourmixesanddough and otherreadymadepowders(idli, dosaandgulab jamun).

2. Milling of Pulses:Major Pulses grown in the country and their application, Status of Pulsemilling industry in India, need for modernization, Traditional milling process - merits anddemerits.Drying of legumes- Sundrying,TraditionalProcessing steps.Modernmillingprocess- Processflowchart- Mechanicalhotairdrying andconditioning-meritsanddemerits, Dehusking in Pulse Pearler, Water conditioning, splitting of pulses in Pulse splitter,Meritsanddemerits. Mini dhal mill.

3. MillingandProcessingofMaize: Drymillingofmaize:Storageanddrying,Pre-cleaning,cleaningequipment,DegerminationandDehusking,Rollermilling,Sifting,Purifying, Aspiration, Pneumatics in a maize mill. Products of milling - Flour, Semolina,Brewers' grits etc and their applications. Wet milling of Maize and corn: Modern methods ofprocessing, Cleaning, Steeping, Degermination, Bran and Fibre separation, Gluten and StarchSeparation, Equipment needed for Degermination, Debraning and starch separation. Starchconversionintoothervalueaddedproducts. ExtractionandrefiningofCorn oil inbrief.

4. GrainStorageandHandling:BagStorage-AdvantagesandDisadvantages-BagStorage structure design. Parameters of good storage structure, Cover Plinth Storage Structures, CAPstorage (Ceiling and Plinth Storage), Plans for Bag storage, lay outs, Dunnage, Materials forDunnage, Pallets, Protection against Rodents, Fungi, Pests and Mites. Fumigation Processesfor bag storage piles.BulkStorageinsilosandlargeBins, Relative merits and demerits ofSilostoragettoBagStorage.

ReferenceB ooks

1. Chakraverty,A.:PostHarvestTechnologyofCereals,PulsesandOilseeds.OxfordandIBH PublishingCo, Calcutta(1995)

2. Samuel Matz: The Chemistry and Technology of Cereals as Food and Feed, Chapman & Hall (1992)
3. N.L. Kent and A.D. Evans: Technology of Cereals (4th Edition) Elsevier Science (Pergamon), Oxford, UK, (1994)
4. George E. Inglett: Maize - Recent Progress in Chemistry and Technology Academic Press, London (1982)
5. Ruth H. Matthews: Pulses - Chemistry, Technology and Nutrition Marcel Dekker Inc. USA (1989)
6. Y. Pomeranz: Modern Cereal Science and Technology VCH Publishing Inc. New York (1987)
7. Cryde M. Christensen: Storage of Cereal Grains and their Products American Association of Cereal Chemists inc., St. Paul, USA 1982

PRACTICALS

BV-137.2P - PRACTICAL PAPER I (BV-134.2 Introduction to Cereals and Legume Processing)

1. Milling of Wheat flour.
2. Determination of Gluten.
3. Preparation of chapatis, bread, biscuits and cakes.
4. Paraboiling of Rice.
5. Study of malting of Barley.
6. Identification and description of common pulses.
7. Preparation of fried snacks and baked goods
8. Preparation of germinated foods.
9. Visit to food industry - Visit to bakery
10. Germination study
11. Smoky cake
12. Proximate analysis of given sample

BV-135.2-FUNDAMENTALS OF FOOD CHEMISTRY AND MICROBIOLOGY

Max. Marks: 70

Total lectures: 45 hrs.

- 1. Moisture in Foods:** Structure, Properties, Types of water in food, water activity and their specific function, Water activity and stability, Lipids: Classification, Structures, Physical and chemical properties, rancidity and its types, Hydrogenation, Refining of oils, Margarine and its importance in diet. Carbohydrates: Definition, Classification, Functions, Properties of simple & complex carbohydrates, food chemistry - definition and importance.
- 2. Proteins:** Introduction, Sources of protein, Classification and structures, Nutritive, Physicochemical properties, Nutritive and supplementary value of food proteins, Denaturation and its implications, Gel formation and its theories. Effect of processing on food proteins. Pigments: Introduction and significance of natural pigments in food - Chlorophylls, Carotenoids, Haemoglobin and Myoglobin, Anthocyanins, Flavonoids, Betalains Tannins. Enzymes in foods, and food industry
- 3. Minerals:** Main elements and trace elements in different food, Functions, sources, deficiency diseases and RDA. FOOD ADDITIVES: Definitions, uses and functions of: Acids, Bases, Buffer system, Chelating/sequestering agents, Low calorie and non-nutritive sweeteners, Antioxidants.
- 4. Microbiology:** Introduction, historical developments of general and food microbiology; prokaryotes and eukaryotes; classification of microorganisms - a brief account; sources of microorganisms in foods; microbial growth, growth curve; factors affecting growth - intrinsic and extrinsic factors controlling growth of microorganisms. public health: food poisoning, types of food poisoning, Food Toxicology: Naturally occurring toxicants in foods: Aflatoxins: Introduction, types of Aflatoxins, Goitrogens, Cyanogens.

REFERENCES

1. Food Chemistry by L. H. Meyer (CBS Publisher, Delhi)
2. Food Facts and Principles by N. Shakuntala Manay & M. Shadaksharaswamy (New Age International (P) Ltd. Publishers, New Delhi)
3. Food Chemistry by O. R. Fennema, 2nd edn. (Marcel Dekker Inc.)
4. Food Chemistry by H. D. Belitz and W. Groech (Springer Publ.)
5. Food Additives by S. N. Mahindru
6. Food Processing and Preservation by B. Siavsankar (Prentice Hall India)
7. Pelezar, M. I. and Reid, R. D. (1993) Microbiology McGraw Hill Book Company, New York, 5th Edition.
8. Frazier, W. C. (1988) Food Microbiology, McGraw Hill Inc. 4th Edition.
9. Doyle, P. Bonehat, L. R. and Mantville, T. J. (1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.
10. Textbook of Microbiology (6th edition) by Ananthnarayan & CK Paniker
11. Basic Food Microbiology by George J. Banwart
12. Food Microbiology by M. R. Adams and M. O. Mos
13. Industrial microbiology L. E. Casida
14. A textbook of Biotechnology by R. C. Dubey
15. Neelima Garg. Laboratory Manual of Food Microbiology. 2010. I. K. International

PRACTICALS

BV-138.2P: -PRACTICAL PAPER II (BV-135.2 Fundamentals of Food Chemistry and Microbiology)

1. Basic activities in the food microbiology laboratory (Preparing dilution blanks and media, bacterial transfers, isolating single colonies, preparing slides, simple stain, Gram stain, enumeration of food-borne microorganisms).
2. Preparation of nutrient media and types of different culture methods.
3. Staining of bacteria
4. Testing pectin strength in fruit & vegetable extracts.
5. Isolation of starch, Changes on heating of starches/gelatinization properties of starches
6. Effect of acid & alkaline colour of fruits & veg.
7. Effect of sugar on boiling point of water.
8. Microbial examination of bread moulds.
9. Microbial quality of street foods.
10. Microbial spoilage of milk.
11. Acid value of Fat/oil

BV-136.2: INTRODUCTION TO FRUIT AND VEGETABLE PROCESSING andFOODBEVERAGES

Max.Marks: 70

Total lectures: 45hrs.

1. **Chemicalcomposition:**Postharvestchanges,Preparingfruitandvegetableforprocessing.Pectin:Rawmaterials;processesandusesofpectin;productsbasedonpectinmanufactureandqualitycontrol.Post-harvesthandlingoffreshfruitsandvegetablesforProcessing ,Storage of Horticultural Crops: Containers-Tin, glass and other packaging materialsusedin fruits andvegetables preservations,
2. **Factors:**Natural,Ventilated,ControlledAtmosphereStorage,Lowtemperaturestorage(Generalmethods offreezingoffruits&vegetables).Fruitandvegetableplantlayoutandprocessingline.Fruitandvegetableproductqualitystandardsandqualitycontrol measures.
3. **Canning of fruits and vegetables:** basic requirements, process, machinery, operation andeffect. Drying/Dehydrationoffruitsandvegetables:types,Process,machinery,operation,Problemsrelated to storageof dehydrated products
4. **Formulation and preparation of fruit juices,** Jams, jelly, pickles, tomato products (sauce),potatochips:principle, processingtechniques.

Beverage:Non-carbonatedBeverages:Introduction,dilutablebeverages-ingredients,manufacturing operation, filling and packaging. Ready to drink non-carbonated products. Coffeebean preparation-processing-brewing-decaffeination-instant coffee-Tea-types-black, green ,juicesbasedbeverages.Carbonatedbeverages:Ingredients,carbondioxideproduction,Alcoholicbeverages:Introduction.Wine-winevariety,Fermentation andotheroperations.

REFERNCES:

1. Srivastava,R.P.andKumar,S.,1998,FruitandVegetablepreservation:PrinciplesandPractices, 2ndEd,InternationalBook DistributingCo,Lucknow.
2. Salunkhe,D.K.andKadam,S.S.,1995,HandbookofvegetableScienceandTechnology,Production, Composition,StorageandProcessing,MarcelDekker,New York.
3. Dauthy,M.E.,1997,FruitandVegetableprocessing,InternationalbookDistributingCo.Lucknow,India.
4. Siddappa,L.G.,andTondon,G.L.,1986,PreservationoffruitandVegetables,Indian

PRACTICALS

BV-139.2P -PRACTICAL PAPER III (BV-136.2: Introduction to Fruit and Vegetable Processing and Food Beverages)

1. Preparation of jams and jellies from different fruits.
2. Demonstrate various concepts, principles and procedures involved in processing of food beverage manufacturing beverages
3. To prepare different types of pickles (sweet & sour).
4. Estimation of Ascorbic Acid contents spectrophotometrically.
5. Determination of Brix (sugar content) of total soluble sugars by refractometer
: Acid ratio of fruits and vegetable products
6. Drying by different methods of fruits and vegetables.
7. Preparation of tomato ketchup, sauce & chutney.
8. Preparation of potato chips, finger chips.
9. Determination of starch content of apples/potatoes.
10. Industrial visit to fruit & vegetable processing unit.

BV-140.2-INDUSTRIAL VISIT

Suggested Readings

Arsdel W.B., Copley, M.J. and Morgen, A.I. 1973. Food Dehydration, 2nd Edn. (2 vol. Set). AVI, Westport.
Bender, A.E. 1978. Food Processing and Nutrition. Academic Press, London.
Fellows, P. and Ellis H. 1990. Food Processing Technology: Principles and Practice, New York. Jelen, P. 1985. Introduction to Food Processing. Prentice Hall, Reston Virginia, USA.
Lewis, M.J. 1990. Physical Properties of Food and Food Processing Systems. Woodhead, UK.
Willey, R.C. Ed. 1994. Minimally Processed Refrigerated Fruits and Vegetables. Chapman and Hall, London.

Second Year: Food Processing and Engineering (3rd Semester)

BV134.3- INTRODUCTION TO BAKERY, AND CONFECTIONERY PROCESSING

Max. Marks: 70

Total lectures: 45 hrs.

1. **Introduction to baking:** Bakery ingredients and their functions; Testing of flour; Manufacture of cake and biscuits; Analysis of bakery products; Cake Icing techniques, manufacture of wafer, cookies and crackers, Malting of cereals-uses of malt, Malt extract and oat technology. (neena)
2. **Manufacture :** Of bread, sweet yeast dough products, , pies, pastries, doughnuts, chocolates and candies; Chocolate Confectionery: Cocoa beans, chocolate liquor, cocoa butter, cocoa bean processing and chocolate manufacturing plant operations. Wheat flour, quality characteristics and its uses in bakery products: bread, biscuits & cakes, pasta goods and processed cereal foods for infants. Manufacturing of cakes-Causes of variation in cake quality, shortened cakes, Unsharpened cakes (sponge cakes);
3. **Extrusion:** Objectives and importance; Components and functions of an extruder; Classification of extruder; Advantages and disadvantages of different types of extrusion; Maintenance, safety and hygiene of bakery plants.
4. **Commercial Baking Technology & Status:** Introduction: Ingredients used in baking, The Equipment of baking, Reactions of baking, Manufacturing of bread-Kind of breads, Manufacturing of Biscuits and cookies, Of bakery and confectionary industries in India. Machines & equipment for batch and continuous processing of bakery products.

REFERENCES:

1. Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
2. Bakery Technology & Engineering; Matz SA; 1960; AVI Pub.
3. Up-to-date Bread Making; Fance WJ & Wrogg BH; 1968, MacLaren & Sons Ltd.
4. Modern Cereal Chemistry; Kent-Jones DW & Amos AJ; 1967, Food Trade Press Ltd.

PRACTICALS

BV 137.3P-PRACTICAL PAPER I (BV 134.3: Introduction to Bakery and Confectionery Processing)

1. Determination of total ash content of wheat flour.
2. Determination of acid insoluble ash in wheat flour.
3. Determination of dry gluten in wheat flour.
4. Demonstration of stages of sugar cookery.
5. Preparation of different types of cakes.
6. Preparation of different types of cookies.
7. Preparation of chocolate.
8. Making of bread
9. Industrial visit

BV135.3-FOOD ENGINEERING AND INSTRUMENTATION

Max.Marks: 70

Total lectures:45hrs

1. Physical Properties and frictional properties of Foods: Methods of estimation of - Shape, size, volume, density, porosity, surface area, moisture content, equilibrium moisture content, water activity. Sorption Isotherm and its determination. Friction, Static and kinetic friction, and angle of repose. Mechanical properties

2. Rheological Properties of Foods: Rheological Classification and models, Viscosity—effect of temperature on viscosity, measurement of viscosity –capillary tube viscometer– plate and cone viscometer–coaxial cylinder viscometer. Texture measuring instruments, Hardness and brittleness of food materials. Extrusion, Objectives and importance; Components and functions of an extruder; (Adarsha)

3. Thermal Properties of Foods: Definitions- specific heat, enthalpy, conductivity and diffusivity, surface heat transfer coefficient. Measurement of thermal properties like specific heat, enthalpy, conductivity and diffusivity;

4. Units, Dimensions and Conversions, SI System. Properties of steam and moist air, Steam tables and P sychrometric chart (for Drying), Unit operations in Food Processing.

5. Food samples and sampling techniques:, storage and preservation of samples, expression of results, Sensory analysis of foods, Electronic evaluation of sensory attributes-Electronic nose, electronic tongue, Colour measurement in foods, texture analysis in foods.

REFERENCES:

1. Rao, M.A. Rizvi, S.S.H., and Datta, A.K. Engineering Properties of Foods. Taylor and Francis, USA, 2005.
2. Serpil Sahin, and Sumnu. Physical Properties of Foods. Springer Science+ Business Media LLC, USA. 2006.
3. M.J. Lewis: Physical Properties of Foods and Food Processing Systems Woodhead Publishing Cambridge, UK (1990)

PRACTICALS

BV138.3P-PRACTICAL PAPER II (BV135.3: Food Engineering and Instrumentation)

1. Study of dehydration characteristics of different food materials.
2. Determination of particle size of given flour sample using Sieve analysis.

3. Homogenization of milk and measurement of size of fat globules before and after homogenization.
4. Coefficient of viscosity of water, milk, juices etc. by flow through a capillary tube.
5. Surface tension of water by Jaeger's method.
6. Mechanical equivalent of heat by calorimeter and Borne's apparatus.
7. Study of different types of Mixers.
8. To study different components of evaporator.
9. Determination of viscosity of different food products.
10. Food Plant Design and preparation of layout and working and handling of the food instrument

Max.Marks: 70

Totallectures:45hrs.

1. **Definition of milk:** Chemical composition of milk Principle and methods of milk processing (Filtration, Clarification, Pasteurization, Homogenization, Sterilization (neena))
Types of processed milk: pasteurized, toned, flavored &
Preparation methods and principles of Paneer, Curd, Yoghurt.()

2. **Processing of market milk-** and storage of raw pasteurization,
Practices for reception, chilling, milk. Storage sterilization,
and processing of fluid milk:

homogenization: Effect of homogenization on physicochemical

Processing, aseptic packaging Membrane processing of milk.

3. Technology of indigenous milk products: Utilization of milk
industry by-products: Importance/Need and food applications of dairy products.

4. Newer concepts in dairy products: cream powder, sterilized cream, butter spread,
cheese spread, Lactose powder.

REFERENCES:

1. Sukumar, De (1994). Outlines of Dairy Technology. Oxford University Press.
2. Smith G. (2003). Dairy processing improving quality. Woodhead Publishers.
3. Andrews, A. T. (1994). Biochemistry of Milk Products. Woodhead Publishers.
4. Technology of Dairy Products by Early, R.
5. Aneja P, Mathur BN, Chandan RC & Banerjee AK. 2002. Technology of Indian Milk Products. Dairy India Pub.

PRACTICALS

BV139.3P-PRACTICAL PAPER III (BV 136.3: Introduction to Dairy Technology)

1. To check the heat stability of milk by COB and Alcohol tests.
2. Quantitative estimation of acidity of milk by Titration method.
3. Determination of specific gravity, SNF% and TS% of milk.
4. Estimate the milk fat by Gerber method.
5. To determine the Casein content of the milk.
6. To check the sterility of milk by Turbidity test.
7. Bacteriological estimation of milk by sterilized milk, SPC method.
8. To estimate the purity of ghee by Baudouin test.
9. Preparation of Ghee by different methods
10. Preparation of dahi, cream and buttermilk
11. To prepare ice cream and testing of its quality.
12. Estimation of free fatty acids in ghee sample
13. Estimation of milk PH
14. Phosphate test for pasteurization milk.
15. Adulteration test milk.
16. Milk based beverages

BV140.3-INDUSTRIAL VISIT

Second Year: Food Processing and Engineering (4th Semester)

BV134.4-INTRODUCTION TO MEAT, FISH AND POULTRY PROCESSING

Max. Marks: 70

Total lectures: 45 hrs.

1. Status and scope of meat industry in India: Structure and physico-chemical properties of muscle meat: meat pigments, composition and nutritive value, conversion of muscle into meat. Global commercial fisheries resources, production trends

2. **Meat-nutritional quality:** Meat and poultry, structure of muscles-factor affecting quality of fresh meat. Postmortem changes – rigor mortis. Meat products – Ham and Bacon, sausage, standards for meat products, Components of carcass viz. muscles, postmortem glycolysis, rigor mortis and contraction of muscles.

3. **Fish preservation** - low temperature chilling and freezing, Thermal processing,

dehydration-curing and smoking, preservation using antibiotics, preservation by irradiation.

Types of fish. postmortem changes in fish, handling, storage and transportation of fish. Marine products segment includes sundried, artificially dehydrated, radiation preserved, processed, preserved and canned fish.

4. **Egg processing:** Structure and composition of egg, nutritive value of egg. collection, grading cleaning washing, processing of egg, types of egg products. storage and transportation.

REFERENCES:

1. Modern Dairy Products, Lampert LH; 1970, Chemical Publishing Company.
2. Developments in Dairy Chemistry – Vol 1 & 2; Fox PF; Applied Science Pub Ltd.
3. Outlines of Dairy Chemistry, DeS; Oxford.
4. Richardson and Mead. 1999. Poultry meat science.
5. Pearson and Tauber. 1989. Muscle and meat biochemistry.
6. Pearson and Dutson. 1994. Quality attributes and their measurement in meat poultry
7. Egg Science and Technology by Stadelman WJ, and Cotterill OJ, 2002, CBS Publishers, New Delhi.
8. The Meat We Eat by Romans. JR and Costello WJ, Carlson WC, Greaser ML and Jones KW, 2004, Interstate Publishers, USA

PRACTICALS

BV 137.4P-PRACTICAL PAPER I (BV 134.4: Introduction to Meat, Fish and Poultry Processing)

1. To conduct survey of different meat processing industries.
2. To process chicken and test quality.
3. Determination of egg components.
4. Preparation of egg products, boiled, fried, omelet.
5. To determine quality of egg by brine floatation technique.
6. Determination of egg density.
7. Assessment of quality of meat and fish.
8. Chemical analysis of trimethylamine, BBM
9. Teach something about Hallal chicken.
10. Preparation of different products
11. Fish and meat pickling products, like fermentation products.
12. Microbial quality analysis.
13. Utilization of byproducts from waste by chicken, poultry, meat, pork.
14. Tenderization of meat by Pepin .
15. Rigarmortis

BV135.4-BASICS OF FOOD PACKAGING

Max. Marks: 70

Total lectures: 45 hrs

1. Introduction to Food Packaging: Protection of Food products - major role of food packaging

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Functions of packaging, Effect of environmental factors like Light, Oxygen, Moisture, Temperature and mechanical forces and biological factors on food quality and shelf life, Need for protective packaging. Estimating the Shelf life requirement of food products for packaging - accelerated storage studies etc.

2. Metal Cans and Glass Bottles as Packaging: Merits and demerits, Metallic can types employed, Tin can and Aluminum cans, relative merits and demerits, specialty of **Open top sanitary cans (OTS)**, Lacquers and their use, Three piece cans and Two piece cans, **Aerosol Cans**, Relative merits and demerits. Basics of Canning operations, Cans closures.

3. Flexible Films Packaging: Relative merits and demerits. Formation of Films and pouches, Plastics used and their. Specific applications, advantages and disadvantages - Polyethylene (LDPE and HDPE), Cellulose, Polypropylene (PP), Polyesters, **Polyvinylidene Chloride (PVDC)** - **Diofan, Ixan and Saran**, Polyvinyl chloride, Copolymers their applications. Different types of paper, paperboard, plastics, cellulose films,

4. Filling and Sealing Operations for various types of packages. **Can double seam - can seam** formation and defects - terminology, Metal caps for bottles and jars - **Crown corks, lug caps, Twist off lid and ROPP caps**, Description and applications. **Closing and sealing of Rigid plastic containers. Filling and sealing of Flexible plastic containers, Seal types - Bead seals, Lap Seals and Fin seals.**

5. Packaged foods:

This includes spices, snacks and savouries, ready-to-eat (RTE) and ready-to-cook (RTC) meals, beverages, chocolate and non-chocolate based confectionery, biscuits and bakery items.

REFERENCES:

1. Gordon L. Robertson: Food Packaging- Principles and Practice Marcel Dekker Inc, USA(1993)
2. Donald Downing: Complete Course in Canning (3 Volumes) CTI Publications inc, USA(1996)
3. Mathlouthi M.(Editor):Food Packaging and Preservation Elsevier Applied Science Publications Essex, UK(1986)
4. J. R.D.David, R. H Graves and V.R.Carlson: Aseptic Processing and Packaging of Foods: CRC Press, New York
5. Sachrow & Griffin, "Food packaging"
6. Heiss R., "Principles of food packaging"
7. Paine E.A, "Fundamentals of packaging".
8. Day P.T., "Packaging of food beverages"
9. Food Packaging: Principles and Practice. Gordon L. Robertson. Marcel Dekker. 1993
10. Food Packaging Materials – M. Mahadevish R.V. Gowramma.

PRACTICALS

BV138.4P-PRACTICAL PAPER II (BV135.4: Basics of Food Packaging)

PRACTICAL PAPER XII (B.VFPE-315) M.M:45

1. Shelf life studies of packaging foods.
2. To determine grease resistance of packaging materials.
3. Gas/Vacuum packaging of foods and shelf life studies
4. To find out the porosity of tin plate.
5. Determination of Water Vapor Transmission rate of Packaging Material.
6. To find out the uniformity and amount of wax on wax paper.
7. Edible packaging of Food Samples.
8. Puncture resistance of corrugated boxes.
9. To find out the tin coating weight.
10. To see the chemical resistance of packaging material.
11. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.
12. Bursting strength
13. Testing of paper boards, swap test for packaging

BV135.4-FOOD ADDITIVES AND PRESERVATIVES

Max.Marks: 70

Totallectures:45hrs

- 1. Introduction:**Food additives definition – Determination of the limit for addition – NOEL – Toxicity data
Method of determining toxicity – LD50, carcinogenicity, teratogenicity – PFA, FDA, FPO, regulations – GRAS additives. Types, chemical properties, levels of additions in individual products, toxicity data of Acidulants – Preservatives – Emulsifiers and gums -Antioxidants
2. Types, chemical properties, levels of additions in individual products, toxicity data of Dough conditioners-flour improvers – Humectants – Enzymes, Starches
3. Types, chemical properties, levels of additions in individual products, toxicity data of Colourants – Natural and artificial, Flavourants, Flavour enhancers, Fat substitutes and replacers
4. Types, chemical properties, levels of additions in individual products, toxicity data Sweeteners – Natural and synthetic, Chelating agents, anti-browning agents, Nutritional additives

REFERENCES:

1. Food additives by Brannen A.L., Davidson P.M., Salminen S. and Thorngate J.H. Second Edition, Revised and Expanded. Marcel Dekker Inc. USA, 2002.
1. Handbook of Food additives by Thomas Furia, Manual of methods of analysis of analysis of foods food additive lab manual, govt of india. Latest addition of books

PRACTICALS

BV139.4P-PRACTICAL PAPER III (BV136.4: Food Additives and Preservatives)

1. Analysis of food additives
2. Quantitative methods for the identification of benzoic acid in food samples.
3. Estimation of benzoic acid in the presence of saccharin ready to serve beverages.
4. Determination of nitrate and nitrite in foods
5. Isolation, identification and estimation of synthetic food colours.
6. Oil soluble colors

7. Test for sulphur dioxide in food samples.
8. Isolation of pigments by food samples, beetroot, turmeric

BV140.4-INDUSTRIAL VISIT

Third Year: Food Processing and Engineering (5th Semester)

BV134.5- FOOD DRYING AND CONCENTRATION TECHNIQUES

Max. Marks: 70

Total lectures: 45 hrs

1. Drying definition: Moisture removal and its need, Dehydration of food, Evaporation of water below its boiling point, Utilities of drying, Theoretical aspects of drying, Thermal properties related to drying

of foods. Moisture content measurement, representation and determination, Equilibrium moisture content (EMC), its determination, methods, models and importance, Moisture sorption curves, Hysteresis phenomenon.

2. Drying process and methods, Drying rate periods – constant and falling rate periods and their calculation, Heat and mass transfer coefficient calculations, Capillary and diffusion theory, Thin layer and deep bed drying, Dryer performance indices – overall thermal efficiency, specific energy consumption, coefficient of performance.

3. Classification and selection, Quality criteria for dryer selection.

Basic construction and application of the following dryers – Grain dryers, Tray dryers, Vacuum dryers, Spray dryers, Fluidized bed dryers, Freeze dryers, Flash Dryers, Superheated steam drying, Solar energy based dryers, Osmotic Dehydration, Drum dryer.

Basic design steps and calculations – Tray dryer, Vacuum dryer, Freeze dryer, Fluidized bed dryer.

4. Physical, Chemical and Microbiological characteristics of dehydrated foods: Rehydration ratio, size and density, shelf-life, water activity, Microbial stability of selected foods.

Novel drying techniques, Hybrid dryers, Energy and environment conservation.

REFERENCES:

1. Unit operations of chemical engineering by McCabe and Smith. McGraw-Hill
2. Chemical engineering handbook by Perry R.H. McGraw-Hill
3. Dairy plant engineering and management by Tufail Ahmad, Kitab Mahal Publications
4. Engineering for dairy and food product by Farrall A.W. John Wiley and Sons
5. Milk Pasteurization by Hall C.W. The AVI Publication
6. Introduction to Chemical Engineering By Salil K Ghosal, Shyamal K Sanyal, Siddhartha Datta, Tata McGraw Hill

PRACTICALS

BV137.5P- PRACTICAL PAPER I (BV134.5: Food Drying and Concentration Techniques)

1. Hot air oven drying methods.
2. Study on conventional and Non-conventional drying process.
3. Sundrying
4. Evaporators
5. Concentration of heating
6. Pad making
7. Milk made by condensation method.
8. Visit industries - milk

BV135.5-SPICESANDPLANTATIONCROPTECHNOLOGY

Max.Marks: 70

Total lectures:45hrs

- 1. Importance of spices:** Spices—production and importance—pepper, cardamom, chilli, turmeric, ginger, clove, nutmeg and other minor spices— stage of harvesting and harvesting methods—threshing, shelling, decortication of spices—methods—merits and demerits. Cleaning, grading and packaging of spices Processing of spices—drying—traditional and mechanical drying—cleaning, grading and grinding—construction and operation of different mills
– cryogenic grinding, packaging and storage of spices.
- 2. Processing of spices:** Processing of major and minor spices—pepper, cardamom, chilli, turmeric, ginger, clove, nutmeg,—quality analysis of spices—processes involved in the manufacture of oleoresins and essential oils.
- 3. Processing of coconut, oil palm, arecanut and cashew:** Processing of plantation crops—production and importance – processing of coconut, oil palm, arecanut, cashew— harvesting and stages of harvest—drying, cleaning and grading—production of value added products—packaging and storage of produces.
- 4. Processing of coffee, tea, cocoa and vanilla:** Processing of coffee, tea, cocoa and vanilla—methods, process and equipment— value added products —packaging and storage

REFERENCES:

1. Pruthi, J.S. 2001. Minor Spices and Condiments: Crop management and post harvest technology, ICAR Publications, New Delhi, India pp.1-781.
2. Pruthi, J.S. 1998. Major Spices and Condiments: Crop management and post harvest technology, Reprint: ICAR Publications, New Delhi, India pp. 1-514. K. V. Peter, 2004, Handbook of herbs and spices, Woodhead Publishing Ltd, Cambridge England
3. The complete Book on Coconut & Coconut Products (Cultivation & Processing). By NIIR Board, Asia Pacific Business Press Inc., New Delhi— 110 007.
4. Hand Book on Spices. By NIIR Board, Asia Pacific Business Press Inc., New Delhi – 110007.

PRACTICALS

BV138.5P-PRACTICAL PAPER II (BV135.5: Spices and Plantation Crop Technology)

1. Extraction of essential oil in spices. (Clove oil)
2. Detection of adulteration in spices.
3. Analysis of cocoa beans
4. Analysis of chocolate
5. Extraction of virgin coconut oil.
6. Estimation of caffeine in coffee.

BV136.5-INTRODUCTION TO FERMENTATION TECHNOLOGY and NUTRACEUTICALS

Max.Marks: 70

Totallectures:45hrs.

1. Introduction to fermentation: Types of fermentations, fermentation kinetics, fermenter design, Types of fermenter, fermentation systems.
2. Process description and control for preparing fermented products. Traditional Indian products like *idli, dosa, dhokla*. soy based products like soy sauce, natto.
3. Downstream processing in fermentation: objectives and problems with downstream processing; various equipment for product recovery.
4. Micro-filters and ultrafiltration systems for separation of cells and fermentation medium and for concentration of medium containing product; extraction of product with solvent, evaporation, crystallization, centrifugation and drying.

Nutraceuticals : Introduction: Phytonutrients and antinutrients, sources, definition to functional foods, nutraceuticals pre- and probiotic interactions. Free radical scavengers; Mechanism and biological role of antioxidant molecules.

REFERENCES:

1. Vogel, H.C. and Todaro, C.L. (2005). Fermentation and Biochemical Engineering Handbook: Principles, Process Design and Equipment, 2nd Edition, Standard Publishers.
2. El-Mansi, E.M.T. (2007). Fermentation Microbiology and Biotechnology 2nd Edition, CRC/Taylor & Francis.
3. Joshi, V.K. and Ashok Pandey, (1999), Biotechnology: Food Fermentation, Microbiology, Biochemistry and Technology, Vol. I & vol. II Educational Publisher.
4. Pepler, H.J. and D. Perlman, (2004), Microbial Technology: Fermentation Technology, 2nd Edition, Vol. II Academic Press / Elsevier.
5. Stanbury, P.F., A. Whitaker and S.J. Hall, (1997), Principles of Fermentation Technology, 2nd Edition Aditya Books (P) Ltd.
6. Philip R Ashurst. 1998. Chemistry & Technology of soft drinks & fruit juices published by Blackwell Publishers.
7. Mitchel A.J. 1997. Formulation and production of carbonated soft drinks published by Blackwell Publishers

8. Maurice Shachman. 2000. The soft drinks companion - A technical handbook for the beverage industry published by CRC Press.
9. Shakuntala Manay. Nand M. Shadakshara Swamy. 2000. FOODS: Facts and Principles Published by New Age International (p) Ltd. publishers
10. Hui et al., Hand book of food and beverage fermentation
11. Boulton, Brewing yeast and fermentation.

PRACTICALS

BV139.5P-PRACTICAL PAPER III

(BV136.5: Introduction to Fermentation Technology)

1. List the quality control steps in beverage preparation
2. To prepare different soft drinks
3. To test quality of beverages.
4. To prepare ready-to-serve (RTS) fruit beverages.
5. Preparation of natural sauerkraut fermentation
6. Preparation of yoghurt and analysis
7. Wine production + Beer production
8. Visit to Bharathmall
9. Fermented traditional foods.

V-BV140.5: INDUSTRIAL VISIT

Third Year: Food Processing and Engineering (6th Semester)

BV134.6:-WASTE MANAGEMENT IN FOOD INDUSTRY

Max. Marks: 70

Total lectures: 45 hrs

1. Food Industry By-

products and Waste: Introduction, status in India, definition, origin and type of waste and by products, their identification, classification, composition and characterization, need for treatment and utilization, impact on environment, food waste as source of biogenic raw material and energetic utilization.

2. Introduction to Food Waste Treatment, basic unit operations, techniques & equipment for treatment, primary treatments like screening, sedimentation, skimming, floatation, coagulation & flocculation, flow equalization, filtration, adsorption, chemical oxidation, membrane separation, ion exchange. Anaerobic & aerobic digestion of organic wastes, activated sludge process, biomass generation & its utilization.

3. Food Wastes and By-products Related to Specific Processing Industries like fruit and vegetables (apple, orange, mango, potato etc.), dairy industry, oil and oil seeds industry, sugar industry, grains and milling industry, fermentation (alcohol and beer), livestock and poultry, fish, meat.

4. Introduction to Food Packaging Waste handling and treatment, Farm wastes. Incineration of solid food waste and its disposal. **Future Trends,** introduction to legal and statutory requirements for food waste handling, treatment and disposal.

References

1. Waste Management for the Food Industries, by Ioannis S. Arvanitoyannis, First edition 2008, Elsevier Inc, USA.
2. Food and Agricultural Wastewater Utilization and Treatment, Sean X. Liu, First edition 2007, Blackwell Publishing, Iowa 50014, USA.
3. Managing Food Industry Waste, ROBERT R. ZALL, First edition, 2004, Blackwell Publishing Professional, Iowa, USA.
4. The Treatment and Handling of Waste by Bradshaw AD Chapman & Hali.
5. Alternative Strategies for the Treatment of Food Processing Waste by Rockey J.
6. Food Processing Waste Management by Green J.H. AVIPublications.
7. Postharvest Technology of Fruits and Vegetables by L.R. Verma. Indus Pub.

PRACTICALS

BV 135.6P-PRACTICALPAPERI(BV134.6:Waste ManagementinFoodIndustry)

1. Utilization of byproducts from different food waste.
2. Lycopene extraction from tomato peel.
3. Isolation of starch in potato peel
4. Extraction of pectin from citrus peel
5. Utilization of waste for preparation of different products like vinegar, starch, pectin.
6. Biogas production.
7. Solid waste management, liquid waste management. Eg- vermiculture
8. Waste management in dairy industries
9. Mango bar preparation
10. Urva market visit

BV136.6-INDUSTRIALPROJECT