ST ALOYSIUS COLLEGE

MANGALURU- 575003

COURSE STRUCTURE AND SYLLABUS

B.Voc

Food Processing and Engineering

(2022 –23)

B.Vocational - 1 Year - I Sem

Semester- I	Category/ Mode	Code	Subject	Theory Hours/ Week	Duration of Exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credit
General Education / General Component	Language - 1:	BV 131.1	Communication Skill-1	2	3	20	80	100	2
	Language - 2:	BV 132.1a BV 132.1b BV 132.1c BV 132.1d BV 132.1e BV 132.1f	Kannada Hindi Additional English Malayalam French Konkani	2	3	20	80	100	2
	Core paper- 1 Theory	BV 133.1	Basics Of Food Processing	3	3	20	80	100	3
	Core paper- 2 Theory	BV 134.1	Fundamentals Of Food Chemistry And Microbiology	3	3	20	80	100	3
	Elective Foundation	BV 135.1	Value Education	2	2	10	40	50	2
Skill Component	Practical-1	BV 136.1P	Basics Of Food Processing	6	3	30	120	150	6
	Practical-2	BV 137.1P	Fundamentals Of Food Chemistry And Microbiology	6	3	30	120	150	6
	Project/ Internship	BV 138.1P	Project-1	6		30 Viva	120	150	6
Total				**30**		**180**	**720**	**900**	**30**

B.Vocational (Diploma)- 1 Year - II Sem

Semester II	Category/ Mode		Subject	Theory Hours/ Week	Duration of Exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credit
General Education / General Component	Language - 1:	BV 131.2	Communication Skill-2	2	3	20	80	100	2
	Language - 2:	BV 132.2a BV 132.2b BV 132.2c BV 132.2d BV 132.2e BV 132.2f	Kannada Hindi Additional English Malayalam French Konkani	2	3	20	80	100	2
	Core paper-1 Theory	BV 133.2	Fundamentals Of Food & Nutrition	3	3	20	80	100	3
	Core paper- 2 Theory	BV 134.2	Basics Of Food Safety And Regulatory Act	3	3	20	80	100	3
	Elective Foundation	BV 135.2	Fundamentals of Indian constitution	2	2	10	40	50	2
Skill	Practical-1	BV 136.2P	Fundamentals of Food & Nutrition	6	3	30	120	150	6
	Practical-2	BV 137.2P	Basics Of Food Safety And Regulatory Act	6	3	30	120	150	6

Component	Project/ Internship	BV 138.2P	Project-2	6		30 Viva	120	150	6
Total				**30**		**180**	**720**	**900**	**30**

B. Vocational (Advanced Diploma)-2 Year

Semester- III	**Category/ Mode**		**Subject**	**Theory Hours/ Week**	**Duration of Exams (Hrs)**	**Marks & Credits**			
						IA	**Exam**	**Total**	**Credit**
General Education / General Component	Language - 1:	BV 131.3	Communication Skill-3	2	3	20	80	100	2
	Language - 2:	BV 132.3a BV 132.3b BV 132.3c BV 132.3d BV 132.3e BV 132.3f	Kannada Hindi Additional English Malayalam French Konkani	2	3	20	80	100	2
	Core paper- 1 Theory	BV 133.3	Introduction To Fruit And Vegetable Processing	3	3	20	80	100	3
	Core paper-2 Theory	BV 134.3	Introduction To Cereals, Legume And Oil Processing	3	3	20	80	100	3
	Elective Foundation	BV 135.3	Fundamentals of Business Law	2	2	10	40	50	2
Skill Component	Practical-1	BV 136.3P	Introduction To Fruit And Vegetable Processing	6	3	30	120	150	6
	Practical-2	BV 137.3P	Introduction To Cereals, Legumes And Oil Processing	6	3	30	120	150	6
	Project/ Internship	BV 138.3P	Project-3	6		30 Viva	120	150	6
Total				**30**		**180**	**720**	**900**	**30**

B.Vocational (Advanced Diploma)- 2 Year

Semester- IV	**Category /Mode**		**Subject**	**Theory Hours/ Week**	**Duration of Exams (Hrs)**	**Marks & Credits**			
						IA	**Exam**	**Total**	**Credit**
General Education / General Component	Language-1:	BV 131.4	Communication Skill- 4	2	3	20	80	100	2
	Language- 2:	BV 132.4a BV 132.4b BV 132.4c BV 132.4d BV 132.4e BV 132.4f	Kannada Hindi Additional English Malayalam French Konkani	2	3	20	80	100	2
	Core paper- 1 Theory	BV 133.4	Introduction To Dairy Technology	3	3	20	80	100	3

	Core paper-2Theory	BV 134.4	Introduction To Meat, Fish And Poultry Processing	3	3	20	80	100	3
	Elective Foundation	BV 135.4	Gender Equity & Value Education	2	2	10	40	50	2
Skill Component	Practical- 1	BV 136.4P	Introduction To Dairy Technology	6	3	30	120	150	6
	Practical- 2	BV 137.4P	Introduction To Meat, Fish And Poultry Processing	6	3	30	120	150	6
	Project/ Internship	BV 138.4P	Project-4	6		30 Viva	120	150	6
Total				**30**		**180**	**720**	**900**	**30**

B.Vocational (Degree)- 3 Year

Semester- V	Category/ Mode		Subject	Theory Hours/ Week	Duration of Exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credit
General Education / General Component	Core paper- 1 Theory	BV 131.5	Introduction to Bakery and confectionary processing	3	3	20	80	100	3
	Core paper- 2 Theory	BV 132.5	Food Engineering And Drying Techniques	3	3	20	80	100	3
	Core paper- 3 Theory	BV 133.5	Introduction to Fermentation Technology	3	3	20	80	100	3
	Core paper- 4 Theory	BV 134.5	Food Additives and Preservatives	3	3	20	80	100	3
Skill Component	Practical-1	BV 135.5P	Introduction to Fermentation Technology and Food Engineering And Drying Techniques	6	3	30	120	150	6
	Practical-2	BV 136.5P	Introduction to Bakery and confectionary processing and Food Additives and Preservatives	6	3	30	120	150	6
	Project/ Internship	BV 137.5P	Project-5	6		30 Viva	120	150	6
Total				**30**		**180**	**720**	**900**	**30**

Semester- VI	Category/Mode		Subject	Theory Hours/ Week	Duration of Exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credit
General Education / General Component	Core paper- 1 Theory	BV 131.6	Entrepreneurship and agribusiness management	3	3	20	80	100	3
	Core paper- 2 Theory	BV 132.6	Basics of Food Packaging	3	3	20	80	100	3
	Core paper-3 Theory	BV 133.6	Waste Management In Food Industry	3	3	20	80	100	3
	Core paper- 4 Theory	BV 134.6	Spices And Plantation Crop Technology	3	3	20	80	100	3
Skill Component	Practical-1	BV 135.6P	Basics of Food Packaging and Waste management	6	3	30	120	150	6
	Practical-2	BV 136.6P	Spices And Plantation Crop Technology	6	3	30	120	150	6
	Project/ Internship	BV 137.6P	Project-6	6		30 Viva	120	150	6
Total				**30**		**180**	**720**	**900**	**30**

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)

BV-133.1 BASICS OF FOOD PROCESSING

Max. Marks: 80 Total lectures: 45 hrs.

1. **Introduction to Food Processing:** Definition, Objectives, scope of food processing industries, Introduction to Different Food Processing Unit Operations. Viz Preheating, Filtration, Clarification, Separation, Milling, Fermentation, Objectives of Cooking, Methods, Microwave processing, Extrusion cooking, Induction Cooking, Advantages and Disadvantages

2. **Introduction to Food Preservation:** Principles of Food Preservation, Different types of Food Spoilage, Preservation of Food by High temperature (Blanching, Pasteurization, Commercially Sterile Products, Sterilization, Evaporation). Preservation by Low Temperature: (Thawing, refrigeration, cold storage, freezing); Aseptic processing operations. Effect of various food processing operations on the nutrients of foods.

3 **Methods of food Preservation:** Preservation by fermentation, Smoking, Introduction to Natural and Chemical preservatives- (Objectives, principles, types of preservatives, Preservation by high smotic pressure (Pickling, salting, curing – principles), Intermediate moisture foods, Preservation by lowering water activity, Drying- dehydration by air drying, sun drying, freeze drying, Radiations: (Ultraviolet and ionizing irradiations). Canning.

4. **Novel Methods in Food Processing** - Microwave processing, Extrusion cooking, Ohmic Heating, Reverse Osmosis, Electro dialysis, Ultra-filtration, High Pressure Processing, Super critical fluid extraction.

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.

PRACTIC

ALS PRACTICAL PAPER - I

BV-136.1P: Basics of Food Processing

1. Introduction to safety of Laboratory Equipment's and GLP
2. Preparation of reagents (Molar, Normal and buffer solutions)
3. To blanch a seasonal fruit or vegetable & assess quality of blanching process.
4. Effect of different cooking methods on food
5. Testing pectin strength in fruit & vegetable extracts
6. To study effect of heat and acid on milk proteins
7. To study effect of change in PH during cooking of fruits and vegetables
8. Estimation of Total Soluble solids
9. To study the effect of browning on raw fruits & vegetables
10. Stages of sugar cookery
11. Study of Processing technology behind new products in the current market

BV-134.1-FUNDAMENTALS OF FOOD CHEMISTRY AND MICROBIOLOGY

Max. Marks: 80 Total lectures: 45 hrs.

1. Introduction- Importance of food chemistry. Water in foods, structure and its properties. Water activity, free and bound moisture. **Carbohydrate:** functional properties of sugars and polysaccharides in foods, chemical reactions of carbohydrates.
Proteins: Classification of proteins and their functional properties of proteins, Denaturation, renaturation, Gelation, and Hydrolysis of proteins. Browning Reactions in Food: Browning, Maillard reaction, Caramelization reaction.

2. Lipids & Minerals: Classification of lipids, Physical and Chemical properties of lipids. Effect of frying on fats, Changes in fats and oils on storage and its prevention, Technology of edible fats and oils - Refining, Hydrogenation and Interesterification, Minerals: Major and minor minerals, Toxic metals Natural Food Pigments: Introduction. and classification, Water soluble and insoluble food pigments (chlorophyll, carotenoids, anthocyanins and flavonoids, beet pigments) . Introduction to enzymes.

3. Concepts of Microbiology: Introduction, historical developments of general and food microbiology; Scope of 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, uses of microorganisms, Food borne illness, types
of Food borne illness:

4. Microbial Toxins and Control of Micro-organisms: Microbial Toxins (Endotoxin and Exotoxin), Introduction and types. Control of Micro organisms**:** Control of micro organisms by physical, chemical and other chemotherapeutic agents, Hurdle technology

REFERENCES

1. Food Chemistry by L H Meyor (CBS Publisher, Delhi)
2. Food Facts and Principal by N. Shakuntala Manay & M. Shadaksharaswamy (New Age International (P) Ltd. Publishers, New Delhi)
3. Food Chemistry by O.R. Fennema, 2nd edn. (Marcel Dekkar 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, NewYork, 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 & C K J 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

PRACTICAL PAPER II

BV-137.1P
FUNDAMENTALS OF FOOD CHEMISTRY AND MICROBIOLOGY

1. Introduction and study of microbiological instruments.
2. Basic activities in the food microbiology laboratory (Cleaning of glass wares, Preparation of media, cotton plugging and Sterilization).
3. Techniques to isolate, culture and sub-culture microbes
4. Viable cell count by serial dilution technique
5. Staining techniques
6 Determination of moisture in a given food sample
7. Determination of ash in a given food sample.
8. Determination of crude fiber t in a given food sample
9. Estimation of acidity of given food sample/beverage
10. Acid value of Fat /oil.
11. Determination of crude protein in a given food sample using Kjeldahl's apparatus

PRACTICAL III

BV-138.1P – Project Work- II

BV-133.2 FUNDAMENTALS OF FOOD & NUTRITION

Max. Marks: 80 Total lectures: 45 hrs.

1. **Introduction to Food:** Definition, concepts, terms and scope-Nutrition. Pre requisites of Food, Terminology related to Food, Functions of Food, Basic food groups, ICMR Five Food Group, Food Exchange List Food guide pyramid, My plate. Balanced Diet: Definition, Types, Advantages and Disadvantages. Meal Planning: Definition, Principles and Steps involved in Meal Planning. Dietary fibers. Functions of water in body

2. **Nutritional Concept in Food Design:** . 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 Flourine).

3. **Metabolism of nutrients**: Carbohydrates, Proteins and Fats. Deficiency and Disorders including that of Vitamins and Minerals. Over consumption of Food.

4. **Nutrition:** Relationship between food, health and nutrition, bioavailability of nutrients. Recommended Dietary Allowance (RDA) and Factors affecting it, Basal Metabolic Rate (BMR). Protein quality, Dietary allowances, Methods of assessing nutritional status – Population sampling, collection of data on the nutritional adequacy of diet consumes, anthropometric measurements. Specific Dynamic Action (SDA) of foods. Energy needs of the body. Measurement of energy balance of the body. Direct and indirect calorimetry. Calculation of energy requirements.

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 PublishingCo.
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 Interntional 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.

BV-133.2-PRACTICAL PAPER- I- BV-136.2P : Fundamentals of Food and Nutrition

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 file showing excess and deficiency of different food components.
7. Crude lipid estimation- groundnut, egg yolk, soya product.
8. Estimation of carotene in the given sample
9. Analysis of food for thiamine and riboflavin
10. Estimation of vitamin C by EDTA method

BV-134.2– BASICS OF FOOD SAFETY AND REGULATORY ACT

Max. Marks: 80 **Total lectures: 45 hrs.**

1. **General principles of food safety and hygiene :** Terms and terminologies in food safety. Perishability of food, food hazards - Factors contributing to physical, chemical and biological hazards in food chain-

prevention and control, food allergens, food borne infection and Intoxication, Personal Hygiene, Food handling habits viz storage, transportation, processing.

2. **Sanitary practices :** Definition and meaning of cleaning, sanitization, disinfection and sterilization, Pre requisites Programs and SOP's, Cleaning of plant, Sanitary aspects of building and equipment's. cleaning compounds, sanitation and disinfection methods, waste disposal strategy (solid and liquid waste), pest control.

3. **Introduction to the concepts of food quality and documentation:** concepts of Quality control and Quality assurance. HACCP, Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents. Microbial quality control: detection of microorganisms in foods by cultural, microscopic, physical and chemical methods.

4. **Food Safety regulations:** Role of voluntary agencies, National & International food laws –FSSA, BIS, AGMARK, FDA, ISO, BRC, FSSC, Export (quality & inspection act, Consumer protection act- , Labeling requirements for foods, central committee for food standards; public analysis, food safety officer- duties of food safety officer, Report of Public analyst, sealing, fastening and dispatch of samples, powers of court offences and penalties.

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 Publiushers, New Delhi.
4. Jacobs.M.B., 1999, Chemical Analysis of Food & Food Products, CBS Publiishers, 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, 3 Ed., Thomson brocks/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-134.2-PRACTICAL PAPER II (**BV-137.2P Basics of Food Safety and Regulatory Act)**

1. Detection of adulteration in foods.
2. Screening tests for the detection of pathogens
3. Estimation of total microbial bacterial plate count of food sample by SPC method
4. Study of the microbiological quality of milk by MBR test
5. Sterility and Swab test.
6. Estimating the Microbial quality of street foods
7. Microbial examination of bread molds
8. Isolation of microorganisms from the surrounding using air expose plate method
9. To prepare a chart of specifications for different Food products as specified by FSSAI
10. Determine the Critical Control Points for production line of Milk, Fruits & Vegetables and Meat industry as per HACCP system
11. Food Safety audit

PRACTICAL III

BV-138.2P – Project Work- 2

SEMESTER III 2ND YEAR

BV 133.3 INTRODUCTION TO FRUIT AND VEGETABLE PROCESSING

Max. Marks: 80 Total lectures: 45 hrs.

UNIT I

Chemical composition: Post harvest changes, Preparing fruit and vegetable for processing. Pectin: Raw materials; processes and uses of pectin; Post-harvest handling of fresh fruits and vegetables for Processing , Storage of Horticultural Crops: Containers-Tin, glass and other packaging materials used in fruits and vegetables preservations.

UNIT II

Primary processing: Natural, Ventilated, Controlled Atmosphere Storage. . Low temperature storage (General methods of freezing of fruits & vegetables) Grading, sorting, cleaning, washing, peeling, slicing and blanching.

UNIT III

Canning and Dehydration of fruits and vegetables: process, machinery, operation and effect. Drying or dehydration using various technologies like sun drying, solar drying, osmotic tunnel drying, fluidized fed drying, freeze drying.

UNIT IV

Fruit and vegetable processed products : Jams, jelly, pickles, tomato products (sauce), Manufacturing of fruit juices concentrates, puree, potato chips: principle, processing techniques. Non-carbonated Beverages: Introduction, dilatable beverages (squash, syrup) - ingredients, manufacturing operation, filling and packaging. Ready to drink non-carbonated products.

UNIT V

Waste management and value added products: Preparation of preserve and candied fruits, fruit toffee, butter, cheese. Enzymes (papain), colors, flavors etc.

REFERNCES:

1. Srivastava, R.P. and Kumar, S., 1998, Fruit and Vegetable preservation: Principles and Practices, 2nd Ed, International Book Distributing Co, Lucknow.
2. Salunkhe, D. K. and Kadam, S.S., 1995, Handbook of vegetable Science and Technology, Production, Composition, Storage and Processing, Marcel Dekker, New York.
3. Dauthy, M.E., 1997, Fruit and Vegetable processing, International book Distributing Co. Lucknow, India.

4. Siddappa, L.G., and Tondon, G. L., 1986, Preservation of Fruit and Vegetables, Indian Council of Agricultural Research, New Delhi.

BV 136.3P INTRODUCTION TO FRUIT AND VEGETABLE (PRACTICAL)

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. Evaluation of pectin content.
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 ketch-up, 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.

PROJECT/INTERNSHIP 138.3P

BV 134.3 **INTRODUCTION TO CEREALS, LEGUME AND OIL SEEDS**

Max. Marks: 80 Total lectures: 45 hrs.

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UNIT I

Introduction: Status, production and major growing areas of cereals, in India and world.

Coarse Cereals Products: Maize- Dry and wet milling of corn, corn products, sorghum, pearl millet and small millets processing. Post harvest handling.

Paddy Processing: Paddy Varieties - Their Composition and Quality characteristics. Rice grain quality indicators, Rice cultivation, including genetic modification, Curing of Paddy. Parboiling Processes, 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, activated carbon, furfural and other by products. Production of Flattened Rice and Puffed Rice from Paddy. Rice Milling**:** Paddy Dehusking Processes. Rice Mill Flow Chart. Modern Rice Mills, Paddy, Bran and Brokens separators. Utilization of by products: rice bran, rice bran oil, flour mixes and dough and other readymade powders.

UNIT II

Wheat, corn and Maize Processing: Structure of wheat. Milling of wheat, Dry milling of maize: Storage and drying, Pre-cleaning, cleaning equipment, Degermination and Dehusking, Roller milling, 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 of processing, Cleaning, Steeping, Degermination, Bran and Fibre separation, Gluten and Starch Separation, Equipment needed for Degermination, Debraning and starch separation. Starch conversion into other value added products.

UNIT III

Milling of Pulses: Major Pulses grown in the country and their application, Status of Pulse milling industry in India, need for modernization, Traditional milling process - merits and demerits.
Drying of legumes - Sun drying, Traditional Processing steps. Modern milling process - Process flow chart - Mechanical hot air drying and conditioning - merits and demerits, Dehusking in Pulse Pearler, Water conditioning, splitting of pulses in Pulse splitter, Merits and demerits. Mini dhal mill.

UNIT IV

Oil seeds Processing: Groundnut, Mustard, Soybean, Sunflower, Sesame and other oil seeds processing.

UNIT V:

Newer concepts: Innovative products from Cereals, millets, pulses and oilseeds. Extrusion technology for cereals.

Reference Books

1. Chakraverty, A.: Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford and IBH Publishing Co, Calcutta (1995) 21
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 (Pergaman), 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 Mercel DekkerInc. 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

BV 137.3P INTRODUCTION TO CEREALS, LEGUME AND OIL SEEDS (practicals)

1. Milling of Wheat flour.
2. Determination of Gluten.
3. Quality tests for oils.
4. Physicochemical tests of rice and flour quality of wheat- gelatinization temperature, water absorption tests.
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

SEMESTER 4

BV 133.4 INTRODUCTION TO DAIRY TECHNOLOGY

Max. Marks: 80 Total lectures: 45 hrs.

UNIT I

Milk and Properties of milk: Dairy development, milk production – Dairy development in India and its importance. Systems of collection of milk- Reception, Platform testing. chilling, clarification, and storage of raw milk storage

Properties of milk: Milk Composition, its Constituents. Physicochemical properties of milk- Color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat.

UNIT II

Various stages of processing: Filtration, Clarification, Standardization, Homogenization, Pasteurization (LTLT, HTST.UHT), Sterilization, Packaging and Storage. Effect of homogenization on physicochemical properties of milk. UHT Processing, aseptic packaging, Membrane processing of milk (Reverse Osmosis and Ultra Filtration).

UNIT III

Processing of milk Products: Types of processed milk: pasteurized, skim, toned, flavored & fermented milk, infant milk. Milk powder manufacturing. Preparation methods and principles of Paneer, different types of cheese, mozzarella, cheddar Cheese, shrikhand, butter milk, Curd, Yoghurt, *dahi*, butter, ghee. Frozen milk products: process of manufacture, defects (their causes and prevention).

UNIT IV

Newer concepts in dairy products: cream powder, sterilized cream, butter spread, butter powder, cheese spread, Skim Milk – Casein and Caseinates. Whey – Whey Beverages, Whey Powder whey protein concentrates, Lactose powder. Probiotics and their applications.

REFERENCES:

1. Sukumar, De (1994). Outlines of Dairy Technology. Oxford University Press.

2. SmithG. (2003). Dairy processing improving quality. Wood head Publishers.

3. Andrews, A.T. (1994).Biochemistry of Milk Products. Wood head Publishers.

4. Technology of Dairy Products by Early, R.

5. Aneja P, Mathur BN,Chandan RC & Banerjee A K.2002. Technology of Indian Milk Products. Dairy India Pub.

6. Webb and Johnson, Fundamentals of Dairy Chemistry, 3rd ed., CBS Publishers, New Delhi 1988

BV 136.4P INTRODUCTION TO DAIRY TECHNOLOGY (practical)

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. Bacteriological estimation of milk by sterilized milk , SPC method.
7. To estimate the purity of ghee by Baudouin test.
8. Preparation of flavoured yogurt, yogurt and paneer
9. Milk based beverages
10. Phosphate test for pasteurization milk.

BV 134.4 INTRODUCTION TO MEAT, FISH AND POULTRY PROCESSING

Max. Marks: 80 Total lectures: 45 hrs.

UNIT I:

Introduction to meat and poultry: Development of meat and poultry industries in India. Structure and physico-chemical properties of muscle meat: meat pigments, composition and nutritive value, conversion of muscle into meat. Slaughtering and dressing, Whole sale and retail cuts. Meat and poultry, structure of muscles-factor affecting quality of fresh meat.

UNIT II

Postmortem changes – rigor mortis, postmortem glycolysis, rigor mortis and contraction of muscles. Chilling and freezing of carcass and meat; Meat tenderization methods. Meat products – Ham and Beckon, sausage, Canning of meat and meat products, Restructured meat products, curing and smoking of meat. intermediate moisture and dried meat products.

UNIT III

Fish preservation: Types of fish. post mortem changes in fish, handling, storage and transportation of fish. low temperature, chilling and freezing, Thermal processing, dehydration(sundried, artificially dehydrated)- curing and smoking, preservation by irradiation, canned fish. Waste management, by products from fish industries.

UNIT IV

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. internal quality of eggs and its preservation. Effects of egg, Eggs spoilage, Spray dried and frozen egg products.

REFERENCES:

1. Richardson and Mead. 1999. Poultry meat science.

2. Pearson and Tauber. 1989. Muscle and meat biochemistry.

3. Pearson and Dutson. 1994. Quality attributes and their measurement in meat poultry

5. Egg Science and Technology by Stadelman WJ, and Cotterill OJ, 2002, CBS Publishers, New Delhi.

6. The Meat We Eat by Romans. JR and Costllo WJ, Carlson WC, Greaser ML and Jones KW, 2004, Interstate Publishers, USA

BV 137.4 INTRODUCTION TO MEAT, FISH AND POULTRY PROCESSING

(Practical)

1. To conduct survey of different meat processing industries.
2. To estimate glycogen content.

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 met myoglobin content.
7. Assessment of quality of meat and fish.
8. Preparation of different products (restructured or IMF)
9. Fish and meat pickling products, like fermentation products.
10. Microbial quality analysis.
11. Tenderization of meat
12. New product development.
13. Water holding capacity of meat.

PROJECT/INTERNSHIP 138.4P

3 RD YEAR

5TH SEMESTER

BV 131.5- INTRODUCTION TO BAKERY, AND CONFECTIONERY PROCESSING

Max. Marks: 70 Total lectures: 45 hrs.

UNIT I

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 oats technology

UNIT II

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);

UNIT III

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.

UNIT IV

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, Maclasen & Sons Ltd.
4. Modern Cereal Chemistry; Kent-Jones DW & Amos AJ; 1967, Food Trade Press Ltd.

BV-132.5-FOOD ENGINEERING AND DRYING TECHNIQUES

Max. Marks: 80 Total lectures: 45hrs.

1. Physical Properties and Thermal Properties of Foods: Methods of estimation of - Shape, size, volume, density, porosity, surface area, Friction, Static and kinetic friction, and angle of repose.Thermal Properties - specific heat, enthalpy, conductivity and diffusivity, surface heat transfer coefficient.

2.Units, Dimensions and Conversions, SI System: Physical Quantities, Units and Dimensions Of A Few Derived Quantities

3. Sensory analysis of foods:

sampling techniques:,Sensory analysis of foods, Electronic evaluation of sensory attributes- Electronic nose, electronic tongue, Colour measurement in foods, texture analysis in foods.

4. Basic Concepts of Drying: Drying and Dehydration definition: Moisture removal and its need, Factors affecting drying of food Evaporation of water below its boiling point, Microbial stability of dried foods, Drying rate periods – constant and falling rate periods, Moisture content measurement, representation and determination,Equilibrium moisture content (EMC), Relative Humidity (RH).

5. Classification and selection of dryer

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

BV 133.5 INTRODUCTION TO FERMENTATION TECHNOLOGY

Max. Marks: 80 Total lectures: 45 hrs.

UNIT I

Introduction to fermentation: Types of fermentations, Microorganisms used in food fermentation, fermentation kinetics, fermenter design, Types of fermenter, fermentation systems.

UNIT II

Fermenter : Types of fermentation sub-merged/solid state, Batch /continuous fermentation, Fermenter design and Operation. Downstream processing in fermentation: objectives and problems with downstream processing; various equipment for product recovery.

UNIT III

Fermented food products: Process description and control for preparing fermented products . Traditional Indian products like *idli, dosa, dhokla*. methods of manufacture for vinegar, saurkraut, tempeh, miso, soya sauce.

UNIT IV

Fermented products: Probiotics, production of enzymes. Alcoholic beverages: wine, beer, whisky, rum,Vodka and fenny

REFERENCES:

1. Vogel,H.C. andTodaro,C.L.(2005). Fermentation and Biochemical Engineering Handbook: Principles, Process Designand 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. Peppler, 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 AJ. 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. N and 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.

BV 135.5 P INTRODUCTION TO FERMENTATION TECHNOLOGY AND FOOD ENGINEERING AND DRYING TECHNIQUES (Practicals)

1. Preparation of natural sauerkraut fermentation
2. Preparation of yoghurt and analysis
3. Wine production+ Beer production
4. Estimation of viscosity.
5. osmotic dehydration of fruits and vegetables.
6. staining of Yeast cells.
7. Estimation of alcohol content
8. Cell count by Haemocytometer
9. Viability test of yeast
10. Demonstration of freeze dryer.
11. rehydration ratio
12. Demonstration of spray dryer
13. calculation of relative humidity
14. angle of repose and angle of co-efficient.
15. texture analysis.

PROJECT/INTERNSHIP 137.5P

BV 134.5 FOOD ADDITIVES AND PRESERVATIVES

Max. Marks: 80 Total lectures: 45 hrs

1. **Introduction**:Food additives definition – Determination of the limit for addition – NOEL – Toxicity data. Method of determining toxicity – LD50, carcinogenicity, teratogenicity FDA, regulations – GRAS additives and INS. Concerns in food additives

2. **Additives for preservation**

Types, chemical properties, levels of additions in individual products:antibrowning agents, Chelating agents, Antioxidants, Class1 and Class 2 preservatives

3. **Additives for texture modification**

Types, chemical properties, levels of additions in individual products: Dough conditioners - flour improvers, Starches, stabilizers, Emulsifiers, gums, humectants, Enzymes

4. **Additives for Enhancing taste, Nutritional quality and appearance**

Types, chemical properties, levels of additions in individual product:, Colourants – Natural and artificial, Flavourants, Flavour enhancers, Fat substitutes and replacers, Nutritional additives,Sweeteners, Acidulants.

5. **Novel techniques:** Recent innovation in the field of food additives

BV 136.5P INTRODUCTION TO BAKERY AND CONFECTIONARY PROCESSING AND FOOD ADDITIVES AND PRESERVATIVES

1. Estimation of sodium benzoate
2. Estimation of aspartame
3. Estimation of synthetic colors in cream biscuits
4. Preparation of food using class 1 preservatives.
5. Preperation of cookies.
6. Acid insoluble ash
7. Fermentation power of yeast.
8. Studying the role of different ingredients in cake making.
9. Preparation of chocolate and other confectionaries.
10. Preparation of brownie and doughnuts.

11. Cake icing and frosting techniques.

6TH SEMESTER

BV 131.6 ENTREPRENEURSHIP AND AGRIBUSINESS MANAGEMENT

UNIT-I

Introduction, The scope and size of the agri-food system; Changing perception of food; Evolution and future of the Agri-Food System; The Future of the Agri-Food System: The Input Sector, Production Sector; Shifting roles of exports and imports; agriculture and the environment; Commodity processing and food manufacturing sector.
The Role of Management in Successful Businesses; Business Decision Making; Element in Enterprise Management: Basic management concepts, personnel, production, materials, financing and marketing managements, agribusiness management challenge.

UNIT-II

Environmental analysis, project selection, project appraisal, modification/ finalization of project, collaborations, preparations for launching, trial run and test marketing.

UNIT-III

The Role of Marketing, Marketing of Agricultural input and Marketing of Agricultural product. Market research for agribusiness.

UNIT-IV

Commodity trading and forecasting for agribusiness. Retail and supply chain management. Management of cooperation. Management of agribusiness projects and enterprise. Management of agribusiness trade in WTO environment. Agricultural and food policy. Rural environment and institution.

Books Recommended:

1. Principles of Agribusiness Management by James G.Beierlein, Kenneth C.Schneeberger and Donald D. Osburn
2. Marketing Management by Philip Kotler, Pearson Education Publishers
3. Marketing Management by Dr. P. K. Srivastava, Sterling Pub. Pvt. Ltd. 1991.
4. Marketing Management by Dr. S. C. Jain, IBP(International Business Press)

BV 132.6- BASICS OF FOOD PACKAGING

Max. Marks: 80 Total lectures: 45 hrs

1.Introduction to Food Packaging: Protection of Food products - major role of food packaging - 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 cans 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, Can 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, Poyvinylidene 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)

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.. Day P.T., "Packaging of food beverages"
7. Food Packaging: Principles and Practice. Gordon L. Robertson. Marcel Dekker. 1993
8. Food Packaging Materials – M. Mahadevish R.V. Gowramma.

BV 135.6P BASICS OF FOOD PACKAGING AND WASTE MANAGEMENT

1. Lycopene extraction from tomato peel.
2. Isolation of starch in potato peel
3. Extraction of pectin from citrus peel
4. To determine grease resistance of packaging materials.
5. Gas/Vacuum packaging of foods and shelf life studies
6. Determination of Water Vapor Transmission rate of Packaging Material.
7. To find out the uniformity and amount of wax on wax paper.
8. Puncture resistance of corrugated boxes.
9. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.
10. Bursting strength
11. Testing of paper boards, swap test for packaging

BV 133.6 **WASTE MANAGEMENT IN FOOD INDUSTRY**

Max. Marks: 80 Total lectures: 45 hrs

UNIT I

Food industry By-products and Waste: Introduction, origin and type of waste and byproducts, 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.

UNIT II

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.

UNIT III

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.

UNIT IV

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. AVI Publications.

BV 134.6 SPICES AND PLANTATION CROP TECHNOLOGY

Max. Marks: 80 Total lectures: 45 hrs

UNIT I

Importance of spices: Spices – production and– 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.

UNIT II

Importance and processing: pepper, cardamom, chilli, turmeric, ginger, clove, nutmeg, cinnamon and other minor spices.

UNIT III

Processing of coconut, oilpalm, arecanut and cashew: Processing of plantation crops – production and importance – processing of coconut, oilpalm, arecanut, cashew– harvesting and stages of harvest – drying, cleaning and grading – production of value added products – packaging and storage of produces.

UNIT IV:

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 Produts (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

BV 136.6 SPICES AND PLANTATION CROP TECHNOLOGY (PRACTICALS)

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.
7. Estimation of antioxidant property of spices by DPPH method.
8. determination of antimicrobial property of different spices.
9. Detection of adulteration in coffee powder.
10. Identification of cashew grades and quality evaluation.
11. Processing of turmeric.
12. New product development.

PROJECT/INTERNSHIP 137.6P