Sem I Paper 1
BvFt 101: Food Science (3 Credits-45 Lectures)

S.No	Title	Lectures (45L)
1	**Unit I : Introduction of food Science**	**8**
	Introduction & definition of Food Science; Palatability of food and measurement of acceptance by :I)testing ii)appearance iii)smell iv)test; Five Food Groups and Food guide, relationship between food and nutrition, functions of food, classification of nutrients, factors affecting food consumption and food acceptance. Food Preparation- Reasons for cooking, pre-preparation of foods, methods of cooking, medium of cooking, changes during cooking.	
2	**Unit II: Basics of Food Requirement**	**10**
	Food requirements - Consumer safety – Objectives of food science – Constituents of food – Food as a source of energy – Energy requirement in human body – Food health and disease.	
	Water – Role of water – Dietary requirements and sources – Important Physical properties of water – Concept of water activity	
3	**Unit III: Composition and nutritive value of plant foods**	**12**
	Cereals: General outline, Composition & Nutritive value, Structure of wheat and Rice	
	Pulses & Legumes: Composition, Nutritive value, Anti nutritional factors Changes during cooking, Factors affecting cooking time, Germination, Changes during germination.	
	Nuts & Oilseeds: Composition, sources of proteins and oil, Processing of oil seeds - Soya bean, coconut, Protein isolates, Texturized vegetable protein.	
	Fruits & Vegetables: Composition, Classification, Nutritive value, Vegetable Cookery, Changes during cooking, Ripening, Climacteric, Non Climacteric fruits, Changes during ripening.	
	Spices: Definition, Classification, Chemical composition, use of spices	
4	**Unit IV: Composition and Nutritive Value of Animal Foods**	**10**
	Eggs: Structure, Composition, Nutritive value, Grading Changes during storage.	
	Fish: Composition, Nutritive value	
	Meat: Structure, Composition, Nutritive value	
	Milk & milk products; Classification & properties of sugar; fats, oil & nuts; Spice & beverages & their roles.	
5	**Unit IV: Health Foods**	**5**
	Functional foods, Prebiotics, Probiotics, Nutraceuticals, organic foods, GM foods	

REFERENCES BOOKS

1) B. Sivasankar "Food processing and preservation", Prentice – Hall of India Pvt. Ltd. 2002.
2) Potter, N. N. and Joseph, H. Hotchkiss, "Food Science", CBS Publishers and distributors, New Delhi, 1996.
3) Fox, B. A. and Cameron, A.G., "Food Science, Nutrition and Health", 5th ed., Edward Arnold, London
4) Charley, H., Food Science, John Wiley and Sons Inc., New York, 1982.
5) Birch, G.G., Brennan, J. G. and Parker, K. J., The Sensory Properties of Foods, Applied Science Pub., London, 1977.-
6) Robinson, D. S., Food – Biochemistry and Nutritional Value, Longman Scientific and Technical, London, 1987.
7) Foods: Facts and Principles - N Shakuntalamanay M Shadakshara Swamy
8) Food Science - B Srilakshmi
9) Food science, Chemistry & Experimental Foods - M Swaminathan, Kukude, S and others.
10) Food Science, Sheth Publications.
11) Mudambi and Sheela Rao: Food science
12) Marion Benion & Hughes: Introductory Foods, Macmillan 'ew YORK
13) Thangam Phillip: Modern Cookery
14) Srilaxmi: Food Science, New Age International
15) Usha Raina: Basic Food Preparation
16) Shakuntala Manay: Foods Facts and Principles, Wiley Eastern

Sem I Paper 2
BvFt 102 : Fundamentals of Microbiology (3 Credit)

Sr. No	Content	Lectures (45L)
1	**Introduction to Microbiology** History and Development of Microbiology, Definition and Scope of food microbiology, Inter-relationship of microbiology with other sciences	**5**
	Methods in microbiology.: a) Introduction to instruments and equipments needed in Microbial studies., b) Colony formation patterns, Biofilm formation. Wet mount and dry mount. Staining Techniques (Monochrome, Negative, Differential, Special staining) c) Cultivation – *In vitro and in Vivo* Concept of Pure culture, co-culture and Mixed, culture. Design of media : Composition, Sterlisation.Preservation and Maintenance, Methods for microbial cultures.	**15**
2	**Microbial Growth** Growing Microorganisms in laboratory. Factors affecting microbial growth. Isolation and purification of Microorganisms.	**10**
3	**Microbial Food Spoilage** Sources of Microorganisms in foods Some important food spoilage bacteria Changes caused by micro-organisms during spoilage (breakdown of proteins, carbohydrates, fats and other constituents) Spoilage of specific food groups- Milk and dairy products, Meat, poultry and seafoods, Cereal and cereal products, Fruits and vegetables and Canned products.	**7**
4	**Control of Microbial growth in Food** Principles and methods of preservation Physical Methods of Food Preservation- Dehydration, Freezing, Cool Storage, Heat Treatment (esp. thermobacteriology), Irradiation, Chemical Preservatives Biopreservatives esp. Bacteriocins New Non Thermal methods Introduction to Hurdle concept and Predictive Microbiology	**8**

References

1) General Microbiology - Stanier, 5th ed.
2) Introduction to Microbiology - Ingraham, 2th ed.
3) Brock Biology of Microorganisms - Madigan et al, 9 th ed.
4) Industrial Microbiology - An introduction, Waites, M.J.

Sem I Paper 3
BvFt 103: Food Chemistry and Nutrition (3 credits)

S. No	Title	Lectures (45L)
1	**Unit I**	5
	Carbodydrates: Monosaccharides: **C**lassification and properties - Glucose, Fructose, ribulose, ribose	
	Disaccharides: Maltose, Lactose, Sucrose Polysacharides: Starch, Cellulose,Glycogen, Gums, Pectin	
2	**Unit II**	8
	Amino acids - Classification , properties and identification	
	techniques, Isoelectric points of amino acids, Amino acids - Classification and structure, properties and identification techniques, Isoelectric points of amino acids,	
	Formation of peptide linkages, biological activity,	
	Qualitative analysis of protein, Protein estimation-Kjeldahl's method	
3.	**Unit III**	10
	Lipids: Classification, Fatty acids: Saturated, Unsaturated, Polyunsaturated fatty acids, Rancidity, Characteristics,Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Chemical properties-reichert meissel value, polenske value, iodine value, peroxide value, saponification value. Effect of frying on fats, Changes in fats and oils- rancidity, lipolysis, flavor reversion, Auto-oxidation and its prevention Technology of edible fats and oils- Refining, Hydrogenation and Interesterification	
4.	**Unit IV**	16
	Concept of Nutrition Definition of terms Nutrition, Under nutrition, Mal nutrition and balanced diet, Basic food groups, Digestion and absorption of basic nutrients Energy: Definition of calorie & Joule Measurement of calorific value of food Basic nutrients: Source, requirements and deficiencies of carbohydrates , lipids Protein, Evaluation of protein quality Vitamins & Minerals: Structure ,Importance and Stability, Water soluble vitamins, Fat soluble vitamins, Classification, sources, function, requirements and deficiency	
5	**Flavour:** Definition and basic tastes, Chemical structure and taste, Description of food flavours, Flavour enhancers	6

References

1. Food and Nutrition M. Swaminathan
2. Fundamentals of Food & Nutrition S R. Mudambi, M.V. Rajagopal
3. A text book of foods, Nutrition and Dietetics M. Raheena Begum
4. Handbook of Food and Nutrition M Swaminathan
5. Food Chemistry O R. Fennema
6. Food Chemistry L H Meyer
7. Foods Facts and Principles N. Shakuntalamanay & M. Shadaksharaswamy
8. Food Science Norman N. Potter
9. Hand book of Analysis and Quality Control of Fruits & Vegetable Products S. Ranganna
10. Fats in Food Technology K K Rajah

Sem I Paper 4
BvFt 104: Food Processing and engineering (3 Credits)

S.No	Title	Lectures 45L
1	**Unit I: Introduction and Processing methods**	**5**
	Basic Principles of food processing, Dimensions and units, Dimensional Consistency, Conservation of mass and energy.	
	Heating, Blanching and Pasteurization. Freezing, Dehydration, canning, additives, fermentation, extrusion cooking, hydrostatic pressure cooking	
2	**Unit II: Drying**	**8**
	Moisture content, definition, methods of determination, Direct and indirect methods. Equilibrium moisture content, properties of air, water, vapour mixer.	
	Drying, mechanisms, constant rate period and falling rate period, methods and equipment used, factors affecting rate of drying.	
3	**Unit III: Food Conversion Operation**	**7**
	Size reduction, Fibrous foods, dry foods and liquid foods, Theory and equipment, membrane separation filtration, equipment and application.	
4	**Unit IV: Food Preservation by Cooling**	**5**
	Refrigeration, Freezing, freezing time, methods of freezing, freezing equipment, freeze drying, freeze concentration, thawing, effect of low temperature on food.	
5	**Unit V: Vessels& Agitators**	**5**
	Brief design and drawing of enclosures, supports and standard flanges	
	Brief design and drawing of various types of agitators used in Food process equipment.	
6	**Unit VI: Heat Exchangers& Evaporators**	**5**
	Brief design and drawing of various types of heat exchangers & Evaporators employed in Food processoperation.	
7	**Unit VII: Dryers**	**5**
	Brief design and drawing of dryers used in Food process operation.	
8	**Unit VIII: Crystallizers**	**5**
	Brief design and drawing of crystallizers used in Food process operation.	

References:

1. Introduction to food engineering. R. Paul Singh. 2000. Academic Press. B.
2. P.Fellows.1988. Food Processing Technology.Principles and practice.Ellis Horwood International publishers, Chichester, England.
3. Sinnott, R.K., Coulson & Richardson's "Chemical Engineering", Volume 6, 3rd Edn., Butterworth Heinemann, New Delhi, 1999.
4. Food Process Engineering by Dennis,R.H.
5. Engineering properties of foods by Rao, M.A. and Rizvi, S.S.H.40 FP – 07,08 – SRM – E&T
6. Perry, R.H., et al., Perry's "Chemical Engineers Handbook", 7th Edn., McGraw Hill, NewYork, 1997.
7. Joshi, M.V., and Mahajani, V.V., "Process Equipment Design", 3rd Edn., Macmillan India Limited, NewDelhi, 1996.
8. Bownell, L.E., and Young, E.M., "Process Equipment Design", Wiley Eastern, 1968.

Sem I Paper 5
BvFt 105: Value Education (1 Credit)

Sr. No.	Value Education (1 credit)	Lectures (15L)
1	Value Education—Introduction – Definition of values – Why values? – Need for Inculcation of values – Object of Value Education – Sources of Values – Types Values: Personal values, Social values, Professional values Moral and spiritual values, Behavioral (common) values	3
2	Personal values – Definition of person – Self confidence – Self discipline – Self Assessment – Self restraint – Self motivation – Determination – Ambition – Contentment – Humility and Simplicity - Sympathy and Compassion – Gratitude -Forgiveness – Honesty – Courtesy.	3
3	Social values – Definition of Society – Units of Society - Individual, family, different groups – Community – Social consciousness – Equality and Brotherhood – Dialogue – Tolerance – Sharing – Responsibility – Cooperation Freedom – Repentance and Magnanimity.	3
4	Professional values – Definition – Competence – Confidence – Devotion to duty –Efficiency – Accountability – Respect for learning /learned – Willingness to learn-Open and balanced mind – Team spirit – Professional Ethic – Willingness for Discussion – Aims – Effort – Avoidance of Procrastination and slothfulness –Alertness.	3
5	Behavioral values – Individual values and group values – Good manners at home and outside – Equality – Purity of thought, speech and action – Understanding the role of religion – Faith – Understanding the commonness of religions – respect for other faiths – unity in diversity – Living together – Tolerance – Nonviolence – Truthfulness – Common aim – Unified effort towards peace – Patriotism	3

REFERENCE BOOKS:

1. Dr. S. Ignacimuthu S. J., *"Values for life"*, Better yourself Books, Bandra Mumbai-600 050 (1999).
2. *"Values(Collection of Essays)"*., Published by : Sri Ramakrishna Math., Chennai—4.,(1996)
3. Prof. R.P.Dhokalia., "*Eternal Human Values*", NCRT –Campus Sri Aurobindo Marg., New Delhi - 110 11.
4. Swami Vivekananda., "*Education*", Sri Ramakrishna Math., Chennai-4(1957)
5. "*Tirukural*" (English Translation by Dr.G.U.Pope).
6. "*The Bible*"
7. "*The Kuran*"
8. "*The Bagavath Geetha*"

Sem I Practical 1
BvFt 106: Practicals of Food Science (3 Credits)

Sr. No.	Practicals of Food Science (3 Credits)	Lectures (15L)
1	Microscopic structure of food starches (raw and cooked)	1
2	Gelatinization properties of food starches	1
3	Determination of relative density of milk at different temperatures	1
4	Effect of salt, acid, sugar and fat on the stability of egg white foam	1
5	Effect of preparation techniques on meat tenderization	1
6	Effect of roasting on nuts and oilseeds	1
7	Inversion, Melting and caramelization of sugar	1
8	Determination of smoking point, absorption of oil and changes in physical parameters of fats and oils.	1
9	Preparation of brix solution and checking by hand refractometer	1
10	Estimation of reducing sugar by Fehlings procedure	1
11	Estimation of salt content in butter	1
12	Estimation of protein content by formol titration Qualitative test for Protein – Ninhydrine reaction, Xanthoproteic test, Biuret test.	1
13	Determination of acidity of water and alkalinity/ hardness of water	1
14	Determination of Moisture using) Hot air oven b) . Distillation method c). Infrared method	1
15	Qualitative test for carbohydrates – Molisch's test, Benedict's test, Iodine test, Anthrone test, Selivanoff's test.	1

REFERENCE

1.MohiniSethi and Eram S. Rao (2005) Food Science Experiments and Applications, CBS Publishers & Distributors, New Delhi.

2. Pomeranz, Y.(Ed), (1991), Functional properties of food components, (2nd edition),Academic press, New Delhi

3. Bowers, J. (1992): Food theory and applications, (2nd edition), Macmillan Publishing co., New Delhi

Sem I Practical 2
BvFt 107: Practical of Microbiology (3 Credits)

Sr.No	Content	Practical (15P)
1	Introduction to the Basic Microbiology Laboratory and Equipments	1P
2	Handling of compound microscope	1P
3	Cleaning and sterilization of glassware	1P
4	Aseptic transfer Techniques	1P
5	Cultivation and sub-culturing of microbes p reparation and sterilization of nutrient medium	2P
6	Morphological study of bacteria and fungi using permanent slides	2P
7	Monochrome staining	1P
8	Gram's staining	1P
9	Endospore staining	1P
10	Isolation and characterization of Microorganism from food sample	2P
11	.Enumeration of Microorganism from different food samples Direct Microscopic count, Spread plate technique , Pour plate technique	2P

Sem I Practical 3

BvFt 108: Practical for in Food Chemistry and Nutrition (3 Credits)

S.No	Title	Practical (15P)
1.	Colour reactions of carbohydrates	1
2.	Estimation of reducing sugar	1
3.	Colour reactions of proteins	1
4	Determination of acid value and free fatty acid in oils.	2
5	Determination of pH and acidity of different fruit juices.	1
6	Estimation of ascorbic acid	1
7	Estimation of protein by Lowry method.	1
8	Determination of Ash content.	2
9	Determination of Gluten content in wheat flour.	1
10	Determination of Water absorption power of Maida	1
11	Estimation of moisture content	1
12	Estimation of reducing and non-reducing sugars using potassium ferricyanide method.	1

References

1. FoodChemistry Owen R Fennema

2. Food Chemistry Lillian Hoagland Meyer

3. Foods Facts and Principles N Shakuntalamanay, M Shadaksharaswamy

4. Food science Norman N. Po

Sem I Practical 4
BvFt 109: Practicals in Food Processing and Engineering (3 Credit)

S.No	Title	Practical (15P)
1	Determination of physical properties of foods.	1
2	Determination of mechanical properties of foods.	1
3	Determination of texture properties of foods	1
4	Experiments on centrifugal separation (cream separator)	1
5	Experiments on oil extraction by soxhlet apparatus	2
6	Experiments of microwave heating of food materials	2
7	Experiments on hygroscopic properties of food materials	1
8	Experiments on biochemical properties of foods.	1
9	Experiments on determination of drying rate of given food materials	1
10	Experiments on microwave cooking	1
11	Experiments on freezing of foods	1
12	Experiments on determination of firmness of foods	1
13	Experiments on determination of physical properties of foods.	1

REFERENCE BOOKS

1. Earle R.L., "Unit operations in Food Processing", Pergamon Press.
2. Unit Operations in food engineering. Gustavo.V. 2003. CRC Press
3. McCabe, W.L. and Smith.J.C. "Unit Operations of Chemical Engineering", McGraw-Hill, 1976.
4. Magnard Joslyn, "Food Processing Operations", AVI Publishing Company.Food Process Design. Zacharias.B. 2003. CRC Press.

Sem II Paper 1
BvFt 201: Food Biochemistry (3 Credits)

Sr. No	Title	Lectures (45L)
1.	**Unit I : Carbohydrates**	**12**
	Chemistry of carbohydrates - Definition, classification, importance,	
	Monosaccharides-glucose, fructose,ribose, ribulose; functions and properties-Disaccharides-maltose, lactose, sucrose. Oligo saccharides-raffinose.	
	Polysaccharides-starch, cellulose, pectins, seed gum, sea weed and algal polysaccharides (application only).	
	Dietary sources – Functional properties of dietary carbohydrates.	
2.	**Unit II: Fats and Oils**	10
	Definition and classification –biological role and uses of lipids, Fat group. classification – Dietary sources	
	Fatty acids in foods nomenclature – Triglycerides – composition and functions. Physical properties of triglycerides – Polymorphism of triglycerides. Properties of fats – Rancidity and reversion of fats.	
3.	**Unit III: Proteins and Enzymes**	**10**
	Classification and functions – Role of proteins and requirements. Amino acids : Definition, classification, properties. Functions of proteins in foods – physical and chemical properties of proteins.	
	Important protein sources– Milk, Meat, Fish, Egg and Cereal proteins	
4.	**Unit IV: Vitamins and Minerals**	**10**
	Definition –Classification, general sources, properties, functions and dietary requirements Deficiency symptoms of vitamins A,D,E,K,C thiamins, riboflavin, niacin and biotin , role of minerals	
5	FIBRE- definition, types, sources, functions, importance in disease prevention.	3

REFERENCES

1. B. Sivasankar, "Food processing and preservation", Prentice – Hall of India Pvt. Ltd. 2002.
2. Potter, N. N. and Joseph, H. Hotchkiss, "Food Science", CBS Publishers and distributors, New Delhi,1996.
3. Fox, B. A. and Cameron, A.G., "Food Science, Nutrition and Health", 5th ed., Edward Arnold, London

1. Charley, H., Food Science, John Wiley and Sons Inc., New York, 1982.
2. Birch, G.G., Brennan, J. G. and Parker, K. J., The Sensory Properties of Foods, Applied Science Pub., London, 1977.
3. Robinson, D. S., Food – Biochemistry and Nutritional Value, Longman Scientific and Technical, London, 1987.

Sem II Paper 2
BvFt 202: Food processing operation (3 credits)

Sr. No.	Food processing operation (3 credits)	Lectures (45L)
1	**Cold preservation :** Freezing: requirements of refrigerated storage - controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing – concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences	4
2	**Freezing- Mechanism and freezers:** Freezing methods -direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing**.**	6
3	**Dehydration :** Normal drying curve , effect of food properties on dehydration , change in food during drying ,drying methods and equipments air convection dryer, tray dryer, tunnel dryer continuous belt dryer , fluidized bed dryer, dryer, drum dryer, vacuum dryer ,freeze drying ,foam mat drying**.**	9
4	**Food Irradiation and Microwave Heating:** Ionizing radiation and sources, unit of radiations, direct and indirect radiation effects, safety and wholesomeness of irradiated food. Microwave heating and application**.**	6
5	**Packaging of foods:** Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods	8
6	**Material handling:** Elementary concept of material handling in food industry, equipment and functioning of belt conveyor, screw conveyor, bucket elevator and pneumaticconveyor	2
7	**Thermal processing :** Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations	5
8	**Separation processes** : Principles and methods of: distillation, extraction, washing, filtration, sedimentation, sieving and centrifugation	5

Reference

1. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi, 1998
2. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India PvtLtd, New Delhi- 1992
3. Potter NH, Food Science, CBS Publication, New Delhi, 1998
4. Ramaswamy H and Marcott M, Food Processing Principles and ApplicationsCRC Press, 2006
5. Rao PG, Fundamentals of Food Engineering, PHI Learning Pvt Ltd, New Delhi,2010
6. Toledo Romeo T, Fundamentals of Food Process Engineering, AspenPublishers, 1999

Sem II Paper 3
BvFt 203: Food Safety and Hygiene (3Credit)

Sr. No	Content	Lectures (45L)
1	**Introduction to Food Safety** • Definition • Types of hazards, biological, chemical, physical hazards • Factors affecting Food Safety • Importance of Safe Foods	**5**
2	**Food Hazards of Physical and Chemical Origin** • Introduction • Physical Hazards with common examples • Chemical Hazards (naturally occurring ,environmental and intentionally added) • Impact on health • Control measures	**8**
3	**. Food Hazards of Biological Origin** • Introduction • Indicator Organisms • Food borne pathogens: bacteria • Food borne pathogens: viruses • Food borne pathogens: eukaryotes • Seafood and Shell fish poisoning • Mycotoxins	**12**
4	**. Management of hazards** • Need • Control of parameters • Temperature control • Food storage • Product design	**8**
5	**Hygiene and Sanitation in Food Service Establishments** • Introduction • Sources of contamination • Control methods using physical and chemical agents • Waste Disposal • Pest and Rodent Control • Personnel Hygiene • Food Safety Measures	**12**

References:

1. Handbook of food toxicology by S. S. Deshpande
2. The food safety information handbook by Cynthia A. Robert, 2009
3. Nutritional and safety aspects of food processing by Tannenbaum SR
4. Microbiological safety of food by Hobbs BC, 1973
5. Food Safety Handbook by Ronald H. Schmidt, Gary E. Rodrick
6. 1. Lawley, R., Curtis L. and Davis,J. The Food Safety Hazard Guidebook , RSC publishing, 2004
7. De Vries. Food Safety and Toxicity, CRC, New York, 1997
8. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985
9. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, Oxford, 2000 &Sons; USA, 1987

Sem II Paper 4
BvFt 204: Food Microbiology (2 Credit)

Sr. No.	Content	Lectures (30L)
1	**Microbial Growth in Food** Microbial Growth Characteristics- Bacterial growth curve, microbial reproduction and microbial growth in food Factors affecting the growth of micro organisms in food.	4
2	**Food Fermentations** Fermentation –definition and types Microorganisms used in food fermentations Dairy Fermentations-starter cultures ,types and methods of preservation and propagation, Lactic acid and aroma compounds production, Health benefits of LAB, probiotics, prebiotics and symbiotics Fermentated Foods-types, methods of manufacture for vinegar, sauerkraut, tempeh, miso, soya sauce ,beer, wine and traditional Indian foods	12
3	**Food borne Diseases** Types – food borne infections, food borne intoxications and toxic infections Origin, symptoms and prevention of some commonly occurring food borne Diseases Emerging pathogens of concern	10
4	**Trends in Food Microbiology** Rapid Methods of Detection SCP , SCO, probiotic food Recent Advances	4

Recommended Readings

1) Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004
2) Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
3) Garbutt, John. Essentials of Food Microbiology, Arnold, London, 1997
4) Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993

Sem II Paper 5
BvFt 205 : Communication skill and Technical English (3 Credits)

Sr. No.	Communication skill and Technical English (3Credits)	Lectures (45L)
1	Communication Skills: - Structural and functional grammar; - meaning andprocess of communication, - verbal and non-verbal communication; - listeningand note taking, - writing skills, - oral presentation skills; - field diary and lab record; - indexing, - footnote and bibliographic procedures. - Reading andcomprehension of general and technical articles, precise writing, summarizing,abstracting; individual and group presentations, impromptu presentation,public speaking; Group discussion. Organizing seminars and conferences.	6
2	Reading and Study skills - Skimming/Scanning - Note making - Comprehension Skills - Notice, agenda , - Reading a passage with intonation and voice modulation	4
3	Report writing - Basics of good reporting - Different kinds of reports/ Structure of report - Reporting an event - Writing minutes of a meeting - Preparing a project report	4
4	Four basic letter patterns: Personal and professional correspondence. - Application letters - Regret letters - Appeal/Request letters - Complaint letters	4
5	Conventions of conversation - Etiquette - Asking questions/making suggestions etc - Writing a dialogue and role play	3
6	- Resume Writing - Covering letter for a job application - Resume writing with ready made formats available on computer packages.	3
7	Devising a questionnaire and interpreting facts - How to prepare a simple questionnaire - How to interpret data from surveys, tables, graphs etc,and to present	3

	the interpretation in coherent and lucid language - Transfer of information from visual into verbal	
8	Conventions of Social Interaction - Dialogue writing for formal/semi-formal situations Etc - How to Prepare for an interview - mock interview sessions	3

References :

1.M. Frank. Writing as thinking: *A guided process approach, Englewood Cliffs,* Prentice Hall Reagents.

2. L. Hamp-Lyons and B. Heasely: Study Writing; *A course in written English.* For academic and professional purposes, Cambridge Univ. Press.

3. R. Quirk, S. Greenbaum, G. Leech and J. Svartik: *A comprehensive grammar of the English language*, Longman, London.

4. Daniel G. Riordan & Steven A. Panley: *"Technical Report Writing Today"* - Biztaantra.

5. Daniel G. Riordan, Steven E. Pauley, Biztantra: *Technical Report Writing Today*, 8th Ed (2004).

6. Contemporary Business Communication, Scot Ober, Biztantra, 5th Edition (2004)

Sem II Practical 1
BvFt 206: Practical on Techniques in Biochemistry (3 Credit)

Sr. No	Title	Practical (15P)
1.	Preparation of solutions - normal, molar and per cent solutions and preparation of buffers**.**	3
2.	Qualitative tests for carbohydrates	2
3.	Estimation total free amino acids (Ninhydrin method)	2
4.	Biuret test for proteins	1
5.	Estimation of protein (Lowry's method)	1
6.	Detection of adulteration in fats and oils	1
7.	Thin layer chromatography of amino acids.	1
8.	Estimation of reducing sugar (Dinitrosalicylic acid method)	1
9.	Detection of adulteration in fats and oils	2
10.	Estimation of starch (Anthrone reagent method)	1

References:

(i) An Introduction to Practical Biochemistry – David T Plummer
(ii) Introductory Practical Biochemistry – Sawhney& Singh
(iii) Biochemical Methods- For Agricultural Sciences. S. Sadasivam and A. Manikam. (Wiley Eastern Limited)

Sem II Practical 2
BvFt 207: Practical on Food processing operation (3 credits)

Sr. No.	Food processing operation (3 credits)	Lectures (45L)
1	Preservation of food by the process of freezing	1
2	Preservation of food by the process of freezing	1
3	Comparison of conventional and microwave processing of food	2
4	Preservation of food by canning(Fruit/Vegetable/meat)	1
5	Cut-out analysis of canned food	2
6	Practical on Packaging of foods:	1
7	Drying of food using Tray dryer/other dryers	1
8	Osmotic dehydration	2
9	Minimal Processing	1
10	Testing of Packaging material	1
11	Practical on Thermal processing : Thermal process Calculations	1
12	Practical on Separation processes : Principles and methods of: distillation, extraction, washing, filtration, sedimentation, sieving and centrifugation	1

Sem II Practical 3
BvFt 208: Practical on food safety and hygiene (3 Credit)

Sr. No.	Food safety and hygiene (3 Credit)	Practical (15)
1	Preparation of different types of media (complex, differential and selective)	2
2	Enumeration of aerial microflora using PDA	1
3	Microbiological Examination of different food samples	2
4	Bacteriological Analysis of Water	1
5	Assessment of surface sanitation by swab/rinse method	1
6	Assessment of personal hygiene	2
7	Biochemical tests for identification of bacteria	2
8	Scheme for the detection of food borne pathogens	2
9	Implementation of FSMS – HACCP, ISO : 22000	2

Sem II Practical 4
BvFt 209: Practical of Food Microbiology (2 Credits)

Sr. No.	Food Microbiology (2 Credits)	Practical (10P)
1	Introduction to the Basic Microbiology Laboratory Practises and Equipments	1
2	Fuctioning and use of compound microscope	
3	Cleaning and sterilization of glassware	1
4	Preparation and sterilization of nutrient broth	1
5	Preparation of slant, stab and plates using nutrient agar	1
6	Cultivation and sub-culturing of microbes	1
7	Morphological study of bacteria and fungi using permanent slides	1
8	Simple staining, Gram's staining, Negative staining, Endospore staining, Standard Plate Count Method	1
9	Microbial examination of curd, Microbial examination of processed fruit and vegetable products, Microbial examination of canned foods, Microbial examination of egg	1
10	Assay of quality of milk by methylene blue reduction test.	1
11	Control of microbial growth by physical methods-heat	1

Sem III Paper 1
BvFt 301: Principles of Food Preservation (3 Credits)

Sr. No.	Topics	Lectures (45L)
1.	**Introduction**	3
	Review of heat and mass transfer phenomena, Effects of processing on food materials, Energy in food processing	
2.	**Water in Foods**	4
	Structure and physical properties of water, Vapor pressure, Colligative properties, Moisture content and water activity, Solubility of sugars and salts in water, Microwave heating	
3.	**Drying**	10
	Definition, Psychrometry, Relative humidity, Drying theory. Sun drying and dehydration, factors affecting drying operations. Industrial drying operations. Spray drying. Drum drying, vacuum, air, fluidized beds and freeze drying. Quality and stability of dried foods. Rehydration properties. Sensory and nutritive aspects. Intermediate moisture foods.	
4.	**Freezing**	10
	Refrigeration and freezing. Freezing theory: ice nucleation and growth, supercooling, Freezing of aqueous solutions, freezing point depression, volume, solute effects. Freezing of cells and biological materials, Cryoprotective agents, types of freezing, i.e. quick and slow freezing, Freezing of solids, liquids and precooked foods, storage and thaw effects, freezer burn. Cold generation and food freezing technology: Responses of foods to freezing preservation, Related processes: freeze concentration, freeze texturation.	
5.	**Heat Preservation**	10
	Pasteurization, blanching and sterilization. Thermal resistance of major spoilage microorganisms, vegetative bacteria and spores. Destruction kinetics, D, F, z values. Heat penetration. Effects of heat on nutrients, enzymes and quality parameters. Industrial sterilization processes: canning, flame sterilization, retortable pouch, UHT, aseptic packaging, processing of particulates. Acid and low acid products. Inoculated packs, PA 3679, Vacuum in cans. Spoilage of canned foods.	
6.	**Food Irradiation**	5
	Kinds of ionising radiations used in food industry, Radiation dosimetry. Effects of radiation on microorganisms. Concept of cold sterilization. Flavor and texture changes in irradiated foods. Regulatory aspects. Current status of industrial irradiation processes.	

7.	**Non-thermal food preservation**	3
	Principles. High pressure processing. Current status of industrial processes.	

References:

1. Potter, N.N., Hotchkiss, J.H. 1995. Food science, 5th ed. New York, Chapman & Hall.
2. Manay s. Shadaksharswami M. : foods, facts and principles, New Age Publishers, 2004
3. De sukumar, outlines of dairy technology, Oxford University Press, 2007. Frazier W.C. *Food Microbiology*,(2000) 2nd edition Tata Mc Graw – Hill Publishing Company Ltd. New Delhi.
4. Jay J.M. (1992) *Modern Food Microbiology* 5th edition CBS Publishers and Distributors, New Delhi.
5. Pelczar, M.J. Chan. C.S. and Krieg N.R. (1996) *Microbiology* 5th edition, tata McGraw – Hill Edition.
6. Vasanthakumari R (2007) *Textbook of Microbiology* BI Publications Pvt. Ltd., New Delhi.
7. Ibarz, A., Barbosa-Cánovas, G.V. 2003. Unit operations in food engineering, Boca Raton, Fla.,CRC Press, 889 p.
8. Earle, R. L. 1983. Unit operations in food processing. Pergamon Press, Toronto, Canada.
9. Desrosier, N.W. 1970. The technology of food preservation. AVI Publ. Co., Westport, Conn.,pp. 170-174, 405 p.
10. Sun, D.W. 2006. Thermal food processing: new technologies and quality issues. Boca RatonCRC/Taylor & Francis, 640 p.

Sem III Paper 2
BvFt 302 : Food safety standard (3 Credit)

Sr. No.	Content	Lectures (45L)
1	**Food Safety Management Tools** • Basic concept • Prerequisites- GHPs ,GMPs, SSOPs etc • HACCP • ISO series • TQM - concept and need for quality, components of TQM, Kaizen. • Risk Analysis • Accreditation and Auditing	**15L**
2	**Microbiological criteria** • MRA • Microbiological standards and limits (for processed food, water) • Microbiological Assessmment and categories of food based on microbial • Quality • Sampling • Basic steps in detection of food borne pathogens • Water Analysis • Assessment of Surface Sanitation and Personal Hygiene	**12 L**
3	**Food laws and Standards** • Indian Food Regulatory Regime • Global Scenario • Other laws and standards related to food	**10 L**
4	**Recent concerns** • New and Emerging Pathogens • Packaging ,Product labelling and Nutritional labelling • Genetically modified foods \ Transgenics • Organic foods • Newer approaches to food safety • Recent Outbreaks	**12 L**

References:

1. Lawley, R., Curtis L. and Davis,J. The Food Safety Hazard Guidebook , RSC publishing, 2004
2. De Vries. Food Safety and Toxicity, CRC, New York, 1997
3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985
4. Forsythe, S J. Microbiology of Safe Food, Blackwell Science, Oxford, 2000 &Sons; USA, 1987

Sem III paper 3

BvFt 303 : Post Harvest management of fruit and vegetables (3 credits)

Sr. No.	Topics	Lectures (45L)
1.	**Introduction** 1. Importance of fruits and vegetables 2. History and need of preservation, Reasons of spoilage 3. Current status of production and processing of fruits and vegetables. Structural, compositional and nutritional aspects. 4. Post-harvest physiology, handling, losses and conservation of fruits and vegetables 5. Methods of preservation (short and long term)	7
2.	**Canning and bottling of fruits and vegetables** 1. Selection of fruits and vegetables 2. Process of canning 3. Factors affecting the process: time and temperature 4. Containers for packing 5. Lacquering 6. Syrups and brines for canning 7. Spoilage of canned foods	7
3.	**Fruit beverages** 1. Introduction 2. Processing of fruit juices (selection,juice extraction, deaeration, straining, filteration and clarification 3. Preservation of fruit juices (pasteurisation, chemical preservation with sugars, freezing, drying, tetra packing, carbonation) 4. Processing of cordials, nectars, squashes, concentrates and powders	7
4.	**Jams, Jellies and marmalades** 1. Introduction 2. Jams: constituents, selection of fruits, processing and technology 3. Jelly : essentials of constituents (role of pectin and ratio), theory of jelly formation, processing and technology, defects 4. Marmalade: types, processing and technology, defects	7
5.	**Pickles, chutney and sauces** 1. Types 2. processing and technology causes of spoilage	4
6.	**Tomato products** 1. selection of tomatoes 2. pulping and processing tomato puree, sauces, ketchup, soup and paste	4
7.	**Dehydration of foods and vegetables**	5

	1. sun drying and mechanical dehydration 2. process variation of fruits and vegetables packing and storage	
8.	**Technology of plantation products : tea- coffee and cocoa**	4
	1. processing 2. variety of products	

References:

1. Food science by B.Srilakshami;New Age International.
2. Fundamentals of Foods and Nutrition by R. Madambi& M.V. Rajgopal.
3. Foods :Facts and Principles by N Shakuntalamanay;New Age International (P) Ltd.
4. Preservation of Fruits and Vegetable by Girdharilal and Sidappa; CBS Publications
5. Food Science and Processing Technology,Vol., 2 by Mridula and Sreelata
6. Food Preservation by Sandeep Sareen
7. Fruit and Vegetable Preservation by Shrivastava and Kunal.
8. Post-Harvest Physiology & Handling of Fruits & Vegetables by Wills, Lee, Graham, Mc Glasson& Hall (AVI)
9. Literature from Spice Board of India, etc.
10. Girdharilal, Siddappaa, G.S and Tandon, G.L., Preservation of fruits &Vegetables, ICAR, New Delhi, 1998
11. W B Crusess. Commercial Unit and Vegetable Products, W.V. Special IndianEdition, Pub: Agrobios India
12. Manay, S. &Shadaksharaswami, M., Foods: Facts and Principles, New AgePublishers, 2004

Sem III Paper 4
BvFt 304: Food Analysis (3 Credit)

S.No	Title	Lectures (45L)
1.	Techniques of analysis: gravimetric, titrimetric, colorimetric, spectrophotometric, chromatographic (Brief principle and instrumentation)	10
2.	Physical, chemical and rheological properties of food	5
3.	Principles of analysis of various food constituents and subsequent changes on packaging Sensory attributes of foods: mechanisms of sensation and perception of colour, taste, odour, and flavour; importance and use of sensory evaluation methods; facilities required for sensory evaluation	10
4.	Texture profile; selection of trained panelists: type of panelist suitable for different tasks and methods;	5
5.	Conditions for sensory analysis: room, serving and preparation of samples; application of consumer tests;	5
6.	Control of factors affecting accuracy and precision of sensory data; Analysis of sensory data;	5
7.	Statistical testing; correlating instrumental and sensory measurements.	5

References:

1. A. V. Sathe, *A First Course in Food Analysis*, New Age International Pvt. Ltd. 1999
2. S. S. Nielsen, *Food Analysis, 3rd ed*., Kluwer Academic Publishers, 2003
3. S. S. Nielsen, *Food Analysis Laboratory Manual*, Kluwer Academic Publishers, 2003
4. R.Wood, L.Foster, A.Damant and P.Key, *Analytical Methods for Food Additives*, Wood head Publishing, 2004
5. Y. Pomeranz and C.E.Meloan, *Food Analysis: Theory and Practice, 3rd ed*., Chapman & Hall, 1994
6. AOAC, *Official Methods of Analysis and AOAC International*, 2005
7. R.E.Wrolstad, T.E. Acree, E.A.Decker, M.H.Penner and D.S.Reid, *Handbook of Food Analytical Chemistry*, John Wiley & Sons, 2004

Sem III Paper 5
BvFt 305: Applied Statics (1 Credits)

Sr. No.	Applied statics (1 Credits)	Lectures (15L)
1	Definition, Aims, Characteristics and Limitations of statistics, Classification and Tabulation of data. Scope of statistics in Plant science (examples) Statistics as statistical data : various types of data (Raw data, grouped data)Representation of data using frequency distribution diagram (Simple/Multiple/Subdivided bar diagram, Pie diagram),Graphs (Histogram, polygon, curve)	4
2	Population, sample, sampling methods (SRS, Stratified, sampling)	2
3	Definition, advantages and disadvantages of Arithmetic Mean, Median, Mode; Geometric Mean,	2
4	Mean Deviation, Variance, Standard Deviation and Coefficient of variation as measures of dispersion	2
5	Definition, merits and demerits of Non-random sampling and Random Sampling. Concept of Standard Error. Basic concepts used in tests of Significance like Null Hypothesis,	3
6	ANOVA 1) one way, 2) two way followed by t test (pairwise)	2

Reference books:

1.Statistical Methods for Agricultural Workers by Panse, V. G. & P.V. Sukhatme 1967.ICAR, New Delhi.
2. Statistical Methods by Snedecor, G.W. Cochran 1968. Oxford & IBH Publ. Co., Calcutta.
3. Biometrical Genetics by Mathur, K. & J.L. Jinks. 1974. Chapman & Hall Ltd. London.
4. Statistics (Theory, Methods & Application) by Sancheti, D.C. &V.K.Kapoor. 1985.Sultan Chand & sons, New Delhi.
5. A Textbook of Agricultural Statistics by Rangaswamy, R. 1995. New International publishers Ltd., New Delhi.

Sem III Practical 1
BvFt 306: Practicals on Food Preservation (3 Credits)

Sr. No.	Topics	Practical (15P)
1.	Carry out preservation of certain vegetables by dehydration.	1
2.	Study the re-hydration characteristics of dried vegetable.	1
3.	Carry out the preservation of fruits and vegetables by pickling	**1**
4.	Asses the adequacy of blanching.	**1**
5.	Perform osmotic dehydration of certain fruits and vegetables by sugar and salt solution.	**1**
6.	Study different parameters during processing of rice e.g. cooking time, %elongation, % width, expansion, %water uptake, CDC ratio.	**1**
7.	Preparation of squash to demonstrate the preservation by sugar.	**1**
8.	Bottling of peas.	**1**
9.	Preservation of vegetable with the help of fermentation technique (sauerkraut)	**1**
10.	Examination of canned pineapple.	**1**
11.	Carry out shelf life study of egg by using different preservation methods.	**1**
12.	Identification of different types of packaging material used in the food industry.	**1**

Sem III Practical 2
BvFt 307: Practicals on Food Safety standards (3 Credits)

Sr. No.	Content	Practical (15P)
1	Preparation of different types of media (complex, differential and selective)	2P
2	Enumeration of aerial microflora using PDA	2P
3	. Microbiological Examination of different food samples	2P
4	Bacteriological Analysis of Water	1P
5	. Assessment of surface sanitation by swab/rinse method	1P
6	Assessment of personal hygiene	2P
7	Biochemical tests for identification of bacteria	2P
8	Scheme for the detection of food borne pathogens	2P
9	Implementation of FSMS – HACCP, ISO : 22000	1P

Sem III Practical 3
BvFt 308 : Practical of Post Harvest management of fruit and vegetables

S.No.	Post Harvest management of fruit and vegetables (3 credits)	Practical (15P)
1	Determination of moisture content of fruit and vegetable	1
2	Quality parameter evaluation of fresh fruit and vegetable.	2
3	Controlling enzymatic browning in fruit and vegetable	1
4	Pre treatment and drying of fruit and vegetable	2
5	Experiment on dried product quality evaluation.	1
6	Preparation of mixed fruit jam	1
7	Preparation of jellies	1
8	Preparation of mango bar	1
9	Osmotic dehydration of fruits and vegetables.	1
10	Sensory evaluation of processed products.	1
11	Preparation of sauce and ketchup	2
12	Preparation of squash	1

Sem III practical 4
BvFt 309: Food Analysis (Practicals) Credits: 3

S.No	Title	Practical (15P)
1.	Quality analysis of milk	1
2.	Experiments on fat tests.	1
3.	Determination of gluten content	1
4.	Quality analysis of water	1
5.	Separation and identification of amino acids by paper chromatography	2
6.	Determination of total soluble solids	1
7.	Determination of titratable acidity and pH of fruit juice	1
8.	Saponification value and unsaponifiable matter of fats and oils.	2
9.	Iodine value of fats and oils	1
10.	Free fatty acids in fats and oils	2
11.	Determination of protein in foods (Folin/Ciocalteau method)	1
12.	Estimation of fat by Soxhlet extraction method.	1

BOOKS

1. Earle R.L., "Unit operations in Food Processing", Pergamon Press.
2. Unit Operations in food engineering. Gustavo.V. 2003. CRC Press
3. McCabe, W.L. and Smith.J.C. "Unit Operations of Chemical Engineering", McGraw-Hill, 76.
4. Magnard Joslyn, "Food Processing Operations", AVI Publishing Company.Food Process Design. Zacharias.B. 2003. CRC Press.

Sem IV Paper 1

BvFt 401: PROCESSING OF SPICES AND FLAVOURING AGENTS (3 Credits)

Sr No.	Topics	Lectures (45L)
1	Production and processing scenario of spices, flavour & plantation crops and its scope	2
2	Major Spices: (1) Post Harvest Technology composition, processed products of following spices (2) Ginger (3) Chilly (4) Turmeric (5) Onion and garlic (6) Pepper (7) Cardamom (8) Cashew nut	8
3	Minor spices, herbs and leafy vegetables: processing and utilization, All spice, Annie seed, sweet Basil, Caraway seed, Cassia, Cinnamon, Clove, Coriander, cumin, Dill seed Fern seed nutmeg mint marjoram, Rose merry, saffron, sage, thyme, Ajowan, Curry leaves, Asafoctida	5
4	Spice oils, packaging of spices and spice products	3
5	Overview on flavouring compounds used in Food	2
6	Synthetic flavouring agents and their stability (Wines, spirits, MSG and vinegars)	7
7	Flavours of soft drinks, Baking and confectionery industry	3
8	Natural flavouring agents and their stability(Vanilla, Cocoa beans, Olive oil, mustard oil and walnut oil)	7
9	Separation, purification and identification of natural flavoring	3
10	Marinades and types of marinades(cooked and raw)	2
11	Standards specification of spices and flavours	3

REFERENCE BOOKS

1. Spices – vol. II - Parry J.W.
2. Spice and condiments - Pruthi J.S.
3. Herbs and spices - Rosemery Hemphill
4. The book of spices - Rosen garten, F. and Livington Jr.
5. Spices and herbs for the Food Inudstry - Lewies, Y.S.
6. Spices Vol. I and II; Tropical Agril. Series - Purseglove, J.W. Brown E.G., Green C.L. And Robbins SRJ.
7. Food Flavourings - P.R. Ashust

Sem IV Paper 2

BvFt 402: Dairy Technology (Credit 3)

Sr. no	Content	Lectures (45L)
1	Present status of dairy industry in India; **Physical properties of milk** Color, taste,, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat, OR, electrical conductivity.	3
2	**Composition of milk :** Carbohydrates, proteins and fat content of milk from different sources.	4
3	**Lactose :** Lactose (alpha and beta forms and their differences) Significances of lactose in dairy industry.	1
4	**Milk fat :** Composition and structure, factors affecting melting point, boiling point, solubility and Refractive Index, fat constants (saponification value, iodine value, RM value, Polenske value, peroxide value). Chemical reactions of fat (hydrolysis, auto-oxidation), condition favouring auto oxidation, prevention, measurement of auto-oxidation.	7
5	**Protein and Enzymes :** General structure, amphoteric nature, difference between casein and serumprotein, different types of casein (acid and rennet), uses of casein, fractionationof protein. Enzymes- catalase, alkaline phosphatase, lipases and proteases.	6
6	**Dairy Microbiology :** Normal and abnormal flora of milk. Spoilage of milk. Preservation techniques of milk.	5
7	**Market milk industry and milk products** Systems of collection of milk, Reception, Platform testing, Various stages of processing, Filtration, Clarification, Homogenization Pasteurization, Description and working of clarifier, cream separator, homogenizer and plate heat exchanger. Manufacturing of milk products- Butter, ghee, flavored milk,yoghurt, dahi, shrikhand, ice-cream, condensed milk, milk powder,channa, paneer, cheese (cheddar).	13
8	**CLEANING AND PACKAGING** Principles of Cleaning- -can washing- - Cleaning Cycle, Washing Methods- Types of Can washers cleaning-inplace- Cleaning procedures, -Ccentralized and De-centralized CIP systems –- corrosion control.	6

References:

1.Tufail Ahmed, "Dairy Plant Engineering and Management", CBS Publishers and Distributors,New Delhi, 2001.

2. De Sukumar, "Outlines of Dairy Technology", Oxford University Press, New Delhi, 1999.

3. Modern Dairy Technology I: Advances in Milk Processing. R.K. Robinson (Ed.). 1986. Elsevier Applied Science Publishers, Ltd., London, UK.

4. Modern Dairy Technology II: Advances in Milk Products. R.K. Robinson (Ed.). 1986. Elsevier Applied Science Publishers, Ltd., London,

5. Dairy Technology _ P Walstra & T. J Geurts

6. Ananthakrishnan.C.P. and M.N.Sinha, "Technology and Engineering of Dairy Plant Operations", Laxmi Publications, New Delhi, 1997.

7. Farrall.A.W., "Engineering for Dairy and Food Products", John Wiley and Sons, New York, 1995.

10. Robinson .R.K., "Modern Dairy Technology Vol.1 "Advances in Milk Processing",

11. Elsevier Applied Science Publishers, London, 1996. 46 FP – 07-08 – SRM – E&T

12. Dairy Science and Technology: Principles and Applications. La Fondation de Technologie Laitiere du Quebec, Inc (Ed.). 1985. Les Presses de

13. 'Universite Laval, Quebec, Canada.

14. Food Engineering and Dairy Technology. H.G. Kessler. 1981. Verlag Kessler, Germany.

15. Milk and milk products – C H Ecles W B Combs

16. The Technology of Milk processing _ Ananthakrishnan, Khan, Padmanabhan

17. Modern Technology of Milk processing & Dairy products _ NIIR

Sem IV Paper 3

BvFt 403 : FOOD PACKAGING TECHNOLOGY (Credits 3)

Sr. No.	Topic	Lectures (45L)
1	**INTRODUCTION TO PACKAGING** Introduction- evaluation of packaging- economics- packaging operations- packaging terminology. Hazards in distribution- functions of package- design of packages for various foods.	5
2	**PROPERTIES AND SHELF LIFE OF PACAKGING MATERIALS** Development of protective packaging- shelf life studies using packaging materials-methods of shelf life estimation- packaging materials- properties and identification- paper and paper boards.	7
3	**TYPES AND METHODS OF PACKAGING** Regenerated cellulose film- plastic films- Aluminium foils and laminations. Edible packaging- Food packaging bags, pouches, carton boxes, metal and plastic tubes, moulded plastic containers, glass containers. Special packaging methods- vacuum and gas packaging, shrink package, retort pouches- Bio degradable packages.	10
4	**CANNING OPERATIONS** Canning of food products- types of cans- open top sanitary cans- tin plate grades- lacquering and sealing compounds for OTS cans- canning operations- can washing and sterilization- exhausting- seaming- reforming and flanging operations- retorting of cans.	7
5	**SELECTION OF PACKAGING MATERIALS** Special problems of packaging food stuffs- packaging of various foods- compatibility- toxicity- packaging equipments- packaging standards and regulations.	6
6	**LEGAL AND MANGEMENT ASPECTS OF PACKAGING** Laws and policies behind packaging, safety and legislative aspects of packaging. Testing and evaluation of packaging media- retail packs (including shelf life evaluation)and transport packages, Food marketing and role of packaging, packaging Aestheticand graphic design, labeling in packages, coding and marking including bar coding.	5
7	Evaluation of quality and safety of packaging materials – different testing procedures	**5**

REFERENCE BOOKS

1. Sachrow & Griffin, "Food packaging"
2. Heiss R., "Principles of food packaging"
3. Paine E.A, "Fundamentals of packaging".
4. Day P.T., "Packaging of food beverages"
5. Brody AL, "Flexible packaging of Foods"
6. Gordon L. Robertson Food Packaging principles & practice, New york, Marcell DekkerInc.
7. Ronald H. Schmidt Gary E. Roderick Handbook of Food packaging, Food safety Technology by NIIR Board of consultants & Engineers
8. Bureau of G and Multon J.K Food Packaging technology, (Vol.1 and 2) – VCH publishers, INC, New York.
9. Kadoya, T. (1994), Food Packaging, Academic Press, New York
10. Paine, F.A. and Paine, H. Y, (1993), Handbook of Food Packaging, Kluwa AcademicPublisher, van Nostrand, Rein hold, New York.

Sem IV Paper 4

BvFt 404: Computer Application in food industry (Credits 3)

Sr. No.	Computer Application (3 credits)	Lecture (45L)
1	Introduction to Computers, A brief history of computing. Data Processing and Information.Anatomy of Computers, Input and Output Devices. various types of memories.	4
2	Units of Memory, various types of memories. Hardware, Software and Classification of Computers.	4
3	Personal Computers, Types of Processors, booting of computer, warm and cold booting. Computer Viruses, Worms and Vaccines.	4
4	WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders; setting time and date, starting and shutting down of WINDOWS. Anatomy of a WINDOW, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars. DOS : Some fundamental DOS Commands, Rules for naming files in DOS and Types of files.	6
5	Applications – MSWORD: Word, processing and units of document, features of word-processing packages. Creating, Editing, Formatting and Saving a document in MSWORD;	5
6	MS Power Point: Features of Power Point Package. MSACCESS: Concept of Database, Units of database, creating database;	4
7	Principles of Programming: Flow Charts and Algorithms, illustration through examples.	4
8	Internet: World Wide Web (WWW), Concepts, Web Browsing and Electronic Mail. Network Topologies associated hardware devices,gadgets(router and switches)tools,services,resources. Network topologies and protocols11,LAN, MAN and WAN, Network security:firewalls	10
9	Internet searches: Google, Yahoo and concepts in text based searching. Computer Application in food industry,	4

Reference Book:

1. Computer Studies – a First course – J. Shelly and R. Hunt.
2. Programming in BASIC – E.Balagurusamy
3. Microsoft Windows XP Manual.
4. Microsoft Office XP Manual.

SEM IV Practical 1

BvFt 405: PRACTICALS OF PROCESSING OF SPICES AND FLAVOURING AGENTS

(Credit 3)

S. No.	TOPICS	Practicals (15P)
1	Identification and characterization of flavouring compounds of spices	**2**
2	Packaging study of spices	**2**
3	Preparation of curry powder	**3**
4	Preparation of flavoured oils(Garlic oil, Green chilli oil and Basil oil)	**2**
5	Preparation of Indian Masala for different foods	**3**
6	Preparation of various marinades	**2**
7	Study of standard specification of spices	**1**

Sem IV Practical 2

BvFt 406 : Practical of Dairy Technology (Credits 3)

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Sr. No.	Topic	Practical (15p)
1	Acidity of Milk, curd & butter.	**1**
2	Estimation of fat and protein content in Milk	**1**
3	Determination of total solids, SNF and specific gravity of milk	**1**
4	Determination of Total ash in milk	**1**
5	Moisture content of butter	**1**
6	Salt content in butter	**1**
7	Adulteration in milk	**1**
8	Preparation of different types of milk- pasteurized, toned, flavoured etc.	**1**
9	Preparation of Khoa, Peda	**1**
10	Moisture content in Ghee	**1**
11	FFA of Ghee	**1**
12	Preparation of paneer	**1**
13	Preparation of cheese- different types	**1**
14	Ice cream-ingredients and their roles, preparation	**1**
15	To prepare casein and calculate its yield	**1**

Sem IV Practical 3
BvFt 407: PRACTICAL ON FOOD PACKAGING TECHNOLOGY
(Credits 3)

Sr. No.	Topic	Practical (15P)
1	Identification of different types of packaging and packaging materials	**1**
2	Determination of tensile strength of given material	**1**
3	Performing destructive and non destructive test on glass container: determination of wax weights, tensile strength of papers, bursting strength and WVTR of packaging materials	**3**
4	Measurement of thickness of packaging materials; testing of chemical resistance of packaging materials	**2**
5	Determination of shelf life of packaged foods; determination of ERH of foods	**2**
6	Determination of drop test of food packages	**1**
7	Introduction of students with the latest trends in packaging consulting the websites and magazines	**2**
8	Determination of cooling load for cold storages.	**1**
9	Problems on Design of cold storages. Visit to cold storages.	**2**

Sem IV Practical 4

BvFt 408: Practical on Computer Application in food industry (Credits 3)

Sr. No.	Practical on Computer Application in food industry (3 credits)	Practical (15 P)
1	Study of Computer Components; Booting of Computer and its Shut Down;	2
2	Practice of some fundamental DOS Commands, TIME, DATE, DIR, COPY, FORMAT, VOL, LABEL, PATH;	2
3	Practicing WINDOWS Operating System, Use of Mouse, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars;	2
4	WINDOWS Explorer, Creating Folders, COPY and PASTE functions; MSWORD: Creating a Document, Saving and Editing; MSWORD, Use of options from Tool Bars, Format, Insert and Tools (Spelling & Grammar) Alignment of text;	2
5	MSWORD, Creating a Table, Merging of Cells, Column and Row width; MSEXCEL: Creating a Spreadsheet, Alignment of rows, columns and cells using Format tool bar; MSEXCEL: Entering Expressions through the formula tool bar and use of inbuilt functions, SUM, AVERAGE, STDEV;	1+1
6	MSEXCEL: Data Analysis using inbuilt Tool Packs, Correlation & Regression; MSEXCEL: Creating Graphs and Saving with & without data; MSACCESS: Creating Database, Structuring with different types of fields;	3
7	MS Power Point: Preparation of slides on Power Point; Transforming the data of WORD, EXCEL and ACCESS to other formats;	1
8	Internet Browsing: Browsing a Web Page and Creating of E-Mail ID. Searchingand surfing.	1

Sem V Paper 1

BvFt 501 : BAKERY AND CONFECTIONARY PRODUCTS (3 Credits)

Sr. No	TOPICS	Lectures (45L)
1	**Unit 1: Introduction to bakery and confectionery (2 L)** Scope of bakery, Organizational structure,Units of measurements,Bakery terms, Basic equipment, Baking temperatures for bread and confectionery	2
2	**Unit 2: Hygiene (2 L)** Concept of hygiene and its importance in bakery,Personal hygiene, Work area hygiene,Basic first aid,	2
3	**Unit 3:Bakery Materials & Products** Cereals : Structure of wheat grain, principle wheat countries and characteristics of wheat	20
	1 Milling : A general descriptive survey of the various processes. Flour : Refined – Its composition, nature of gluten and its functions in bread making and	
	Baking: simple tests for flour quality, colour, gluten and water absorption. Characteristics ofdifferent flours and their suitability for use in different types of baked products. Flour improvers. **Enriched Bakery Products :** Bakery goods with soya flour, ground-nut flour, whole wheatmeal .	
	Yeast : An elementary knowledge of baker's yeast, its production, its role in the fermentationof dough and conditions favorable for its action. Brewers yeast, otheryeasts like yeast tablets, their advantages and disadvantages. Yeast foods and breadimprovers.	
	Salt : The use and effects of salt in making bread.Descriptive terms used in judging characteristic of products and evaluation.Bread faults, bread diseases (rope and mould) and remedies.	
	Bread improvers and additives Natural : Milk, egg, S.M.P, soya flour, fat, sugar Chemical: Glycerol mono state, Potassium bromate, potassium iodate	
	Characteristics of good bread: external : volume, symmetry , shape, colour, internal: texture, aroma, clarity, elasticity	
	Study of cake making- flour, oil and fats, eggs, sugar, dried fruits and nuts. Chemical leavening agents- baking powder, sodium bicarbonate, ammonium bicarbonate, cream of tartar. Moistening agents, colours and flavours.	
	Cake making methods: Sugar batter method, Flour batter method Blending	
	Pastry making.: Sugar boiling.Fondants and chocolate work.Marzipans. Icings and cream fillings. Other sundry materials, and mixtures used in confectionery such as jams, jellies, curds, creams, custards, minced meat, gelatin, agar agar, isinglass, sodium alginate, pectin, gums. Recipe balancing, cake faults and remedies.	

5	**Confectionary:** **Introduction to confectionery** Scope of confectionery, Confectionary terms, Small and large equipment used in bakery and confectionery	**2**
	Unit 5: Characteristics of confectionery products and evaluation. Biscuit manufacture.Cake making utensils, equipment and machinery. Elementary knowledge of the construction and working of various types of ovens. Baking time and temperature for flour confectionery. Setting up a small scale bakery -feasibility, layout, equipment and production.	**7**
6	**Unit 6: Role of raw material required for confectionery** Wheat, flour, sugar, fat , eggs, Essential ingredients: flour, sugar, shortening, eggs, Optional ingredients: baking powder, milk, milk products, dry fruits, baking soda, dairy products, etc.	**5**
	Moistening agents: Milk, Egg, Water **Fats and oil** Composition, functions in confectionery, types of fats and oil, storage **Leavening agents:** Chemical, natural, water vapors and biological **Storage of raw material and the finished products**	
7	**Unit 7: Equipment, Maintenance and Service :** Elementary study of services with particular reference to economy and safety in their use., Heat and temperature- types of heat- latent heat; heat conduction, convection and radiation. Types of fuels- Solid, liquid, gaseous and electricity; comparison, cost, efficiency, and precautions. Types of oven, Electric oven: OTG, microwave, rotary, single deck, double deck, pizza oven, Non electric oven: Diesel oven, gas oven , brick oven Conductors and non – conductors; meaning of Ampere, volt, wattand fuse. Short circuit- causes and remedies; different types of thermostat. Meter reading. Break down maintenance and preventive maintenance equipment. Fire precautions – different types of fires, extinguishers; common fire hazards.	**5**
8	**Unit 8:Costing** Components of cost, behavior of cost(fixed cost, semi fixed cost, variable cost)	**2**

REFERENCE BOOKS

1. A Professional Text To Bakery And Confectionary by John Kingslee
2. Ornamental Confectionery And The Art Of Baking In All Its Branches by Herman Hueg
3. Bread: A Baker's Book of Techniques and Recipes by Jeffrey Hamelman
4. The Taste of Bread by Raymond Calvel
5. Special and Decorative Breads (The Professional French Pastry Series) by Roland ilheux

Sem V Paper 2
BvFt 502: MEAT, FISH AND POULTRY PROCESSING (Credits 3)

Sr. No	TOPICS	Lectures (45L)
1	**Introduction, importance of meat processing for entrepreneurship development and Meat plant sanitation and safety**	5
2	**Methods of meat processing(**Curing, Tumbling, Massaging and Smoking**)**	5
3	**Quality of meat(**Visual Identification, Juiciness ,Firmness Tenderness and Flavour)	5
4	**Canning, pickling, preservation of meat**	4
5	**Principle and methods of fish, processing (**Salting, Curing, Pickling, Cooking, Canning, Drying and Dehydration)	6
6	**Quality of fish suitable for processing(**appearance ,odour, flavor ,texture ,ingredients and composition packaging , defects and blemishes , size and weight)	4
7	**Methods Of Poultry Processing(**Tumbling and Massaging Smoking Deboning and Grinding)	5
8	**Quality Of Poultry(**Meat Quality , Meat Colour , Meat Tenderness Discolouration and Toughness)	5
9	**Importance of egg production(**Egg structure: Composition, quality characteristics: Shell Colour, Egg White Colour and Yolk Colour processing, storage and preservation methods of egg : Pickling and canning of eggs)	6

REFERENCE BOOKS:

1.Production and processing of healthy meat, poultry and fish products by A.M Pearson, T.R
2.Dutson and Thayne R.Dutson
3.Principles of Meat Science by F. J. Forrest
4.Meat Hand Book by Albert Levie
5. Developments in Meat Science Vol. I and II by Ralston Lawrie
6.Poultry Production by R. A. Singh
7.Meat Technology by Gerard F.

Sem V Paper 3

BvFt 503: Product development and formulation (Credit 3)

Sr.no	Content	Lectures (45L)
1	Introduction and overview	2
2	Phases in new food product development, product management and planning.	4
3	Generation of new product ideas, Product concepts, Product design.	6
4	Ingredients technology – carbohydrates, proteins, fat, stabilizers, flavors, colorants.	10
5	Prototype development	4
6	Sensory evaluation of products	3
7	Process development	3
8	Consumer testing, test market strategy	4
9	Shelf-life study, integration of R&D specification, manufacturing,	5
10	Product roll-out, presentation of products development.	4

References:

1. Lyon, D.H.; Francombe, M.A.; Hasdell, T.A.; Lawson, K. (eds) (1992): Guidelines for Sensory Analysis in Food Product Development and Quality Control. Chapman and Hall, London.
2. Amerine, M.A.; Pangborn, R.M.; Roessler, E.B. (1965): Principles of Sensory Evaluation. Academic Press, New York.
3. Kapsalis, J.G. (1987): Objective Methods in Food Quality Assessment. CRC Press, Florida.
4. Martens, M.; Dalen, G.A.; Russwurm, H. (eds) (1987): Flavour Science and Technology. John Wiley and Sons, Chichester.
5. Moskowitz, H.R. (eds) (1987): Food Texture: Instrumental and Sensory Measurement. Marcel Dekker Inc. New York.
6. Lawless, H.T. and Klein, B.P. (1991): Sensory Science Theory and Applications in Foods. Marcel Dekker Inc.
7. Jellinek, G. (1985): Sensory Evaluation of Food Theory and Practice. Ellis Horwood, Chichester.
8. Piggott, J.R. (ed) (1988): Sensory Analysis of Foods. Elsevier Applied Science, London.
9. Meilgaard, M.; Civille, G.V.; Carr, B.T. (1987): Sensory Evaluation Techniques, Vols. I and II, CRC Press, Florida.
10. Moskowitz, H.R. (1983): Product Testing and Sensory Evaluation of Foods: Marketing and R & D approaches. Food and Nutrition Press, Connecticut.
11. Moskowitz, H.R. (1985): New Directions for Product Testing and Sensory Analysis of Foods.Food and Nutrition Press, Connecticut.
12. O'Mahony, M. (1986): Sensory Evaluation Practices. Academic Press, London.
13. Thomson, D.M.H. (1988): Food Acceptability. Elsevier Applied Science, London.
14. Watts, B.M., Ylimaki, G.L., Jeffery, L.E. and Elias, L.G. (1989): Basic Sensory Methods for Food Evaluation. The International Development Research Centre, Ottawa, Canada.

15. Askar, A. and Treptow (1993): Quality Assurance in Tropical Fruit Processing. Springer-Verlag, New York.
16. ASTM (1968 to 1981): Special Technical Publications, American Society for Testing and Materials, Philadelphia.
17. Ball, A.D. and Buckwell, G.D. (1986): Work Out Statistics: 'A' level. MacMillan,London.
18. BSI (1975 to 1989) BS 5098 & BS 5929: Publications of British Standards Institution, London.
19. Resurrecion, A.V.A. (1998). Consumer Sensory Testing for Product Development. Aspen Publishers Inc., Guthersburg, Maryland USA.
20. BIS 6273 (1972) Guide for Sensory Evaluation of foods. Optimum Requirement. Part I. Bureau, Of Indian Standards, ManateBhavan, New Delhi.
21. Fuller, G.W.(1994) New Food Product Development : From Concept to Market place CRC Press, New York.
22. Man, C.M.D. and Jomes A.A. (1994) Shelf life Evaluation of Foods. Blackie Academic and Professional, London.
23. Shapton, D.A. and Shapton, N.F.(1991) Principles and Practices for the Safe Processing of Foods. Butterworth Heinemann Ltd , Oxford.
24. Graf, E. and Saguy, I. S. (1991). Food Product Development : From concept to the Market place, Van Nostrand Reinhold New York.
25. Oickle, J.G.(1990) New Product Development and Value Added. Food Development Division Agriculture, Canada.
26. Proc. Food Processors Institute : A key to Sharpening your Competitive Edge. Food Processors Institute, Washington, DC.

Journals:

1. International Journal of Food Science and Technology
2. Food Technology
3. Journal of Food Technology
4. Trends in Food Science and Technology
5. Critical Reviews in Food Science and Nutrition

Sem V paper 4
BvFt 504: Waste management in food industry (Credits 2)

S. No.	Waste management in food industry (2 Credits)	Lecture (30L)
1	Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry; Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment and disposal.	5
2	Treatment methods for liquid wastes from food process industries; Design of Activated Sludge Process, Rotating Biological Contactors, Trickling Filters, UASB, Biogas Plant.	6
3	Treatment methods of solid wastes: Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit.	5
4	Biofilters and Bioclarifiers, Ion exchange treatment of waste water, Drinking-Water treatment, Recovery of useful materials from effluents by different methods.	4
5	Water quality, treatment and recycle. BOD, COD and definitions, Discharge limits for effluents.	2
6	Value added products from of agri food processing industry	2
7	Recovery of biological from dairy, meat, fish and poultry processing industry	3
8	Case studies: Cane Sugar waste, molasses for alcohol, baggasse for paper pulp, chemicals, bioethanol, cogeneration. Other processes including vermi culture.	3

Text books/ References:

1. Food Industry Wastes: Disposal and Recovery; Herzka A & Booth RG; 1981, Applied Science Pub Ltd.
2. Water & Wastewater Engineering; Fair GM, Geyer JC & Okun DA; 1986, John Wiley & Sons, Inc.
3. Wastewater Treatment; Bartlett RE; Applied Science Pub Ltd.
4. Symposium: Processing Agricultural & Municipal Wastes; Inglett GE; 1973, AVI.
5. Food Processing Waste Management; Green JH & Kramer A; 1979, AVI.
6. Environmental Biotechnology: Principles and Applications; Rittmann BE & McCarty PL; 2001, Mc-Grow-Hill International editions.
7. Environmental Biotechnology; Bhattacharyya B C & Banerjee R; Oxford University Press.

Sem V Paper 5

BvFt 505 : MANAGEMENT PRINCIPLES AND BUSINESS ETHICS

Sr. No.	Topic	Lectures (30L)
1	**HISTORICAL DEVELOPMENT** Definition of Management - Science or Art - Management and Administration - Development of Management Thought - Contribution of Taylor and Fayol - Functions of Management - Types of Business Organisation.	3
2	**PLANNING** Nature & Purpose - Steps involved in Planning - Objectives - Setting Objectives - Process of Managing by Objectives - Strategies, Policies & Planning Premises- Forecasting - Decision-making.	4
3	**ORGANISING** Nature and Purpose - Formal and informal organization - Organization Chart - Structure and Process - Departmentation by difference strategies - Line and Staff authority - Benefits and Limitations - De-Centralization and Delegation of Authority - Staffing - Selection Process - Techniques - HRD - Managerial Effectiveness.	5
4	**DIRECTING** Scope - Human Factors - Creativity and Innovation - Harmonizing Objectives - Leadership - Types of Leadership Motivation - Hierarchy of needs - Motivation theories - Motivational Techniques - Job Enrichment - Communication - Process of Communication - Barriers and Breakdown - Effective Communication - Electronic media in Communication.	5
5	**CONTROLLING** System and process of Controlling - Requirements for effective control - The Budget as Control Technique - Information Technology in Controlling - Use of computers in handling the information - Productivity - Problems and Management - Control of Overall Performance - Direct and Preventive Control - Reporting - The Global Environment - Globalization and Liberalization - International Management and Global theory of Management.	3
6	**ETHICS AND BUSINESS** Why be ethical in business? How might ethical decision-making work? Corporate Culture and Ethical Leadership. Corporate governance, Accounting and finance practices	4
7	**CORPORATE SOCISAL RESPONSIBILITY- A CASE STUDY**	2
8	**RIGHTS AND DUTIES** Employer/ Employee rights and duties, sexual harassment, technology & privacy	2
9	**ETHICS AND CONSUMERS** Marketing and sales, advertising, environmental issues	2

REFERENCES

1. Harold Kooritz& Heinz Weihrich "Essentials of Management", Tata McGraw-Hill,1998
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.
3. Tripathy PC And Reddy PN, " Principles of Management", Tata McGraw-Hill, 1999.
4. Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996
5. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
6. Fraidoon Mazda, "Engineering Management", Addison Wesley,-2000.

Sem V Practical 1

BvFt 506 : PRACTICALS OF BAKERY AND CONFECTIONARY PRODUCTS

(Credits 3)

Sr.No	TOPICS	Practical (15P)
1	**Bakery:Basic Bread by different methods** Bread rolls, Bread sticks, White bread, Brown bread, Soft rolls, Buns Milk bread, Whole wheat bread,Pizza	4
2	**Confectionery:Cakes by different methods:** Vanilla Sponge cake, Fruit cake, Swiss roll, Chocolate sponge **Icing :** Fondant, Marzipan, Frosting, Dairy and non-dairy cream icing	4
3	**Biscuits and cookies**: Nan khatai,Salted biscuits **Puff pastry:** Veg patties, Chicken patties, Khara biscuit	3
4	**Equipment, maintenance and costing:** -Safety aspects of electricity, gas and other fuels, their comparative efficiency. -The equipment available for the specific craft, their specification cost. -Students gain basic skills in the use, care and cleaning of appropriate equipment. -Routine use, care and cleaning of all fixed and movable equipment including oven, dough mixer, bread sliver, bread molder, dough divider and refrigerator. -The equipment available for the specific craft, their specification and cost. -Importance of costing and control, methods of costing and costing methodology in bakeries and confectioneries.	4

Sem V Practical 2

BvFt 507: PRACTICALS ON MEAT, FISH AND POULTRY PROCESSING (Credit 3)

Sr. No	TOPICS	Practicals (15P)
1	Conduct survey of the different meat processing industries	2
2	Carryout survey of the different processed products from meat fish and poultry	2
3	Carryout meat processing : cutting (carcassing), cleaning storage, sanitation	2
4	Conduct practicals on canning, pickling, preservation of meat	2
5	Check quality of fish for processing	1
6	Produce Dehydrated canned, pickled fish, Fishmeal protein, and fishmeal powder	1
7	Prepare canned egg and canned egg pickle	2
8	Process chicken and test quality	1
9	Prepare processed product from chicken and other birds e.g. Sausages, pickle, dried chicken	1

Sem V Practical 3
BvFt 508: Practical on Product development and formulation (Credit 3)

Sr. no.	Content	Lectures (45L)
1	To Generate new product ideas, Product concepts, Product design.	2p
2	To study ingredients technology – carbohydrates, proteins, fat, stabilizers, flavors, colorants.	3p
3	To study Prototype development	1p
4	Sensory evaluation of products	1p
5	The Process development	4p
6	Consumer testing, test market strategy	2p
7	Shelf-life study, integration of R&D specification, manufacturing,	2p
8	Product roll-out, presentation of products development.	2p

Sem V Practical 4
BvFt 509: Practical for Waste management in food industry (Credits 2)

Sr. No.	Waste management in food industry (Credits 2)	Practical (10P)
1	Study of different waste management in food industry	1
2	Study of ETP;	1
3	waste water analysis;	1
4	waste material recovery;	1
5	water filtration;	1
6	By product utilization.	1
7	anaerobic digestion of food industry waste water,	1
8	waste water treatment of brewery winery and distillery,	1
9	utilization of plant by products for the recovery of proteins, dietary fibers, anti-oxidants and their use as neutraceutical	2

Sem VI Paper 1

BvFt 601: FOOD STORAGE AND WAREHOUSE TECHNOLOGY (Credits 3)

Sr. No.	Topic	Lectures (45 L)
1	**INTRODUCTION TO STORAGE AND WAREHOUSE** Introduction- evaluation of storage- economics- storagge operations- storage terminology. Warehouse design and construction. Material used for warehouse construction	8
2	**TYPES OF STORAGE AND RESPECTIVE WAREHOUSE DESIGNS** Cold storage, storage of dry and processed foods, storage of fresh foods, storage temperature, storage humidity and other environmental factors affecting storage.	8
3	**SUPPLY CHAIN MANAGEMENT** Principles of supply chain management, documentation and management of warehouse contents. Logistics of supply chain management. Perspectives of buyers, suppliers and producers. Strategies of supply chain management. Role of demand supply prediction in supply chain management.	16
4	**PEST CONTROL IN WAREHOUSES** Construction and material of warehouse, pests infesting different types of food materials, control measures for various pests. Permitted levels of pesticides.	6
5	**WAREHOUSE SAFETY AND DAMAGE CONTROL** Reasons for loss and damage of food. Possibility and extent of damage arising from natural events. Strategies for fire and flood control. Insurance cover for the stock and building. Theft protection and security.	8

Text/References:

1. Supply Chain Management – Sunil Chapra& Peter Meindl, PHI
2. Essentials of Supply Chain Management – Dr. R.P. Mohanty& Dr. S.G. Deshmukh, Jaico Publishing House
3. Designing & Managing The Supply Chain David Simchi-Levi , Philip Kamiusky, Edith Simchi-Levi, TATA Mc-Graw Hill
4. J.F.Eastam, L.Sharples, S.D.Ball. "*Food Supply Chain Management*", Butterworth –Heinemann, 2001.
5. M.A.Bourlakis, P.W.H. Weightman "*Food Supply Chain Management",*1sted., Wiley Blackwell, 2004

Sem VI Paper 2

BvFt 602: Quality Control and Quality Assurance (Credits 3)

Sr.no	Content	Lectures (45L)
1	Concept of quality: Quality attributes – physical, chemical, nutritional, microbial, and sensory. Quality control in Food industry : Concepts of quality management: Objectives, importance and functions of quality control; Principles of quality control.	10
2	Quality management systems in India; Sampling procedures and plans; Food Safety and Standards Act, 2006; Domestic regulations; Global Food safety Initiative; Various organizations dealing with inspection, traceability and authentication, certification and quality assurance (PFA, FPO, MPO, AGMARK, BIS); Labeling issues; International food standards.	15
3	Use of hazard analysis and critical control points in processing of foods. Quality assurance, Total Quality Management; GMP/GHP; GLP, GAP; Sanitary and hygienic practices; Quality manuals, documentation and audits; Indian & International quality systems and standards like ISO and Food Codex; Export import policy, export documentation; Laboratory quality procedures and assessment of laboratory performance; Applications in different food industries.	20

REFERENCE

1.Early, R. (1995): Guide to Quality Management Systems for the Food Industry, Academic and Professional, London

2. Gould, W.A. and Gould, R.W. (1988): total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.

3. Askar, A. and Treptow, H. (1993): Quality Assurance in Tropical Fruit Processing, Springer – Vertag, Bertin.

4. World Health Organisation (1998): Guidelines for Drinking Water Quality, 2nd edition, vols. 1,2, and 3, Geneva.

5. Marth, E.H. (1978): Standard Methods for the Examination of Dairy Products 14th ed or edition. Interdisciplinary Books and Periodicals, Washington, D.C.

6. Ranganna, S. (1986): Handbook of Analysis and Quality Control for Fruit andVegetable Products, 2nd edition, Tata McGraw Hill Publishing Co. Ltd., NewDelhi.

7. Hagstad, H.V. and Hubbert, W.T. (1986): Food Quality Control, Foods of Animal Origin, lowa State University press, AMES.

Sem VI Paper 3
BvFt 603: FOOD LAWS AND REGULATIONS (Credits 3)

S. No.	FOOD LAWS AND REGULATIONS (3 Credits)	Lecture (45L)
1	**Unit 1**: 1.Introduction - What is the need for food standards and their enforcement	**1**
2	2. Various types of laws- Mandatory/Regulatory and Voluntary/Optional – IIntroduction to various food laws (Mandatory) - Food Safety and Standards Act, 2006 (FSSA), Edible Oils Packaging (Regulation) Order, 1998, Environment (Protection) Act, 1986, Fruit Products Order, 1955 (FPO), Meat Food Products Order, 1973 (MFPO), Milk and Milk Product Order, 1992 (MMPO), Solvent Extracted Oil, De-oiled Meal and Edible Flour (Control) Order, 1967, Standards of Weights and Measures Act, 1976, The Essential Commodities Act, 1955, The Export (Quality Control and Inspection) Act, 1963, The Insecticides Act, 1968, Vegetables Oil Products(Control) Order, 1998, Prevention of Food Adulteration Act & Rules (PFA Act), 1954	8
3	3. Introduction to various food laws (Voluntary) – Agmark Standards (AGMARK), Codex Alimentarius Standards, BIS Standards and Specifications, Consumer Protection Act, 1986	6
4	**Unit 2**:1. Food Safety and Standards Act, 2006 (FSSA) - Need, Scope and Definitions (Chapter I of FSSA, 2006)	2
5	2. Establishment of Food Safety and Standards Authority of India (FSSAI) (II), Composition of FSSAI and qualifications for appointment of its Chairperson & other Members	3
6	3. Functions of the chairperson and other members of FSSAI	3
7	4. Establishment and Functions of Central Advisory Committee, Scientific Panels, Scientific Committees. Duties and functions of Food Authority	4
8	5. General principles to be followed in the administration of FSSA (III). General provisions as to articles of food in the FSSA (IV). Special responsibility as to safety (VI). Analysis of food (VIII). Offences and penalties (IX)	7
9	6. Enforcement of FSSA (VII). Food Safety Officer (FSO)/ Food Inspector (Called so by PFA Act) - Powers, Duties and functions of FSO	2
10	**Unit 3**:1. Prevention of Food Adulteration Act & Rules (PFA Act), 1954. Definition. Object of the act. Central committee for food standards	1
11	2. Consumer Protection Act, 1986 and Consumer Protection Rules, 1987. - Need,	3

	Scope, Functions and Enforcement	
12	3. Standards of Weights and Measures Act, 1976. - Need, Scope, Functions & Enforcement	3
13	4. AGMARK 5. Bureau of Indian Standards (BIS)	2

Reference Books:

1. Patricia and Curtis A, An operational Text Book, Guide to Food Laws and Regulations.
2. Srilakshmi B, Food Science.
3. Avanthi Sharma, A text book of Food Science and Technology.
4. Sumati R Mudambi, Shalini M Rao and Rajagopal M.V, Food Science.
5. Potter NN and Hotchkiss JH, Food science
6. Dev Raj, Rakesh Sharma and Joshi V.K, Quality for Value Addition in Food Processing.
7. The Food Safety and Standards act, 2006 along with Rules & Regulations 2011, Commercial Law Publishers (India) Pvt. Ltd.

Sem VI Paper 4
BvFt 604: Entrepreneurship Development (Credit 3)

Sr. No.	Entrepreneurship Development (3 Credit)	Lectures (45L)
1	Introduction to Entrepreneurship Definition, Concept and Need for entrepreneurship.	2
2	Types of entrepreneurs: Spontaneous, Motivated and Induced. (Teachers to explain and discuss case studies in class and invite different types of entrepreneurs to share the reasons and causes to entrepreneurship as a profession)	2
3	Kinds of Entrepreneurship: Proprietary, Partnership and Group Entrepreneurship. (Teachers to explain and discuss case studies in class and invite different kinds of entrepreneurs to share their experiences and talk about the advantages and disadvantages of proprietary partnership and group enterprises)	2
4	Exploring the World of Entrepreneurs: Legendary, Business, Social and Environmental,Artistic and Aesthetic Entrepreneurs (Students to Document case studies and present using different audiovisual aids, may be individual or group activity)	8
5	Entrepreneurs in Shadows, failed entrepreneurship(Students to Document case studies and present using different audiovisual aids, may be individual or group activity)	2
6	New Internet Entrepreneurs. (Students to Document case studies and present using different audiovisual aids, may be individual or group activity)	2
7	Entrepreneurial Assets : Entrepreneurial Values and attitudes. Entrepreneurial Qualities. Role demands and Requirements of Entrepreneurs. Barriers to entrepreneurship. (Teachers to discuss and expose students to entrepreneurs to share their views and importance they give to particular entrepreneurial values, attitudes, qualities, role demands, requirements and Barriers)	6
8	Entrepreneurial Motivation : Definition and Meaning of Achievement Motivation, - Need for Achievement Motivation, Motivating Factors: Internal and External.(Teachers to explain with examples)	4
9	Personality Development: experts in the field to take sessions with students., - Gaining Personal Focus: Defining ones own Intentions, goals and purpose.Internal Intentions: (Students to share what her business will accomplish for her in her life, like prestige, economic independence etc. etc. External Intentions: (Students to describe how and who the business will help.	4
10	Entrepreneurial Ideas 8- Creativity and Idea Generation, Searching and selecting Entrepreneurial Ideas..Dynamics of project Identification. Matching Project and enterprise. (Teachers to guide students) Gather Information on what works, How to succeed and Mistakes to avoid.(Students to interact with particular business persons related to their identified project/ field of interest, have Brainstorming sessions and share	8

	Ideas and Strategies in class)Research select articles written about the industry related to their product or service.	
11	Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalization and the emerging business / entrepreneurial environment. Government schemes and incentives for promotion ofentrepreneurship. Government policy on Small and Medium Enterprises (SMEs) / SSls.	5

References:

1. Bolton, B. & Thompson, J (2001): Entrepreneurs: Talent, Temperament, Technique, Replika Press Private Ltd, Delhi, 110 040, India.
2. Taneja, S. & Gupta, S.L. (1992) Entrepreneurship Development, New Venture Creation, Galgotia Publishing Company, New Delhi.
3. Hisrich, R.D. & Peters, M.P. (1995) Entrepreneurship: Starting, Developing and Managing a New Enterprise, Richard, D. USA, Irwin, INC.
4. Desai, V. (1991, 97, 99, Vol I & II,) Entrepreneurial Development, Himalaya PublishingHouse. Mumbai.

Sem VI Practical 1

BvFt 605: PRACTICALS IN FOOD STORAGE AND WAREHOUSE TECHNOLOGY

(credit 3)

Sr. No.	Topic	Practicals 15P
1	Design & construction of warehouse according to the food product being stored	2
2	Quality control and analysis during storage	2
3	Biochemical and nutritional changes in food products during storage	3
4	Facilities at a warehouse	2
5	A model for logistics and supply chain management at a warehouse with an example	3
6	Visit to a warehouse and write visit report	3

Sem VI Practical 2
BvFt 606: Quality Control and Quality Assurance Practical (3Credit)

Sr. No.	Content	Practical (15P)
1	Qualitative tests for fats and oils, spices and condiments.	2
2	Inspection of quality as per National and International standards for various food stuffs- pulses, spices, etc.	1
3	Estimation of residual sulphur dioxide in beverages.	1
4	Chromatographic estimation of colour.	1
5	Analysis of edible common salt for MC, MIW and total chlorides.	2
6	Estimation of ammonia in water.	1
7	Estimation of RM-PV value in oils.	1
8	Estimation of pesticide residues in food/water.	2
9	Estimation of benzoic acid in foods.	1
10	Visit to National Food research institute(NARFI)	3

References:

1.Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, New York.

2.Birk, G.G., Herman, J.G. and Parker, K.J. Ed. -1977. Sensory Properties of Foods. Applied Science, London.

3.Charalambous, G. and Inglett, G. 1981. The Quality of Foods and Beverages.(2 vol.set). Academic Press, New York.

4.Furia, T.E. Ed. 1980. Regulatory Status of Direct Food Additives. CRC Press, Florida. Krammer, A. and Twigg, B.A. 1970. Quality Control for the Food Industry.3rd Edn. AVI, Westport.

5.Pattee, H.E. Ed. 1985. Evaluation of Quality of Fruits and Vegetables. AVI, Westport. Ranganna, S. 1986. Handbook of Analysis and Quality Control for Fruits and Vegetable Products.Tata McGraw Hill, New Delhi.

6.Tannenbaum, S.R. Ed. 1979. Nutritional and Safety Aspects of Food Processing, marcel Dekker, New York.