



Shivaji University, Kolhapur
B.Sc.-III - FOOD SCIENCE AND QUALITY CONTROL
(Introduced from June, 2005)
(Vocational Degree Course)

Course structure: -

Theory Paper V	Two sections (50 Marks each)	100 marks.
Theory Paper VI	Two sections (50 Marks each)	100 Marks.
Theory Paper VII	Two Sections (50 Marks each)	100 Marks.
Theory Paper VIII	Two Sections (50 Marks each)	100 Marks.
Total Theory		400 Marks.
Practical – I		35Marks.
Practical – II		35 Marks.
Practical- III		35 Marks
Practical – IV		35 Marks.
Project work		30 Marks
Training report		20 Marks
Tour report		10 Marks
Total practical		200 Mark
Total Theory + Practical Marks		600 Marks

Paper Titles

Paper V Food Toxicology & Food Analysis.

Section I-	Food Toxicology.
Section II -	Food Analysis, Adulteration & Testing.

**Paper VI Introduction to Entrepreneurship Development
& Food Manufacture.**

Section I-	Introduction to Entrepreneurship Development.
Section II-	Introduction to Food Manufacture.

Paper VII Food Technology- I

Section I-	Dairy Technology.
Section II-	Bakery and confectionary Technology.

Paper VIII Food Technology II

Section I-	Fermentation Technology.
Section II-	Food Quality Control, By products & Waste Management.



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**Paper – V: Food Toxicology, Food Analysis,
Adulteration & Testing**

Section : I Food Toxicology.

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| 1. Importance of toxicology. | 4 |
| 2. Naturally occurring toxins in various foods. | 4 |
| 3. Residual chemicals utilized in food production & processing chemical preservatives, pesticides and heavy metals . | 8 |
| 4. Substances intentionally added to foods: Anti oxidants color Stabilizer and heavy metals. | 4 |
| 5. Microbial & Parasite Food Poisoning, food infections, and food borne illness. Mycotoxin-Afla toxin. Bacterial toxins - Exotoxins, Endotoxins, Enterotoxins. | 8 |
| 6. Physical treatment of food & health hazards: Irradiation Heat treatment. | 5 |
| 7. Carcinogens. | 4 |

Section: II Food Analysis, Adulteration & Testing

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| 1. Sampling techniques, fundamentals in Sampling methods
Preparation of reagents & culture media
Sterilizations, inoculation, microbial staining methods etc. | 5 |
| 2. Instrumentation - Types, Principles, Maintenance
Operation and Working of: G.C., H.P.L.C, G.L.C, A.A.S.
Organic C analyzer etc. | 6. |
| 3. General physical, Chemical and Biological methods for . .
analysis of food . | 4 |
| 4. Mathematical calculations in analysis – Concentration. Calculation, PPM, PPB, mg/l, Kg/ha, % Normal, Molar mg/100gm calculations. | 3 |
| 5. Quality control management in laboratory, standardization of reagents, solutions, cross analysis. | 3 |
| 6. Safety & Precautions in the laboratory, General safety ventilation. Equipment arrangement, safety wares, first aid, handling, & disposal of hazardous samples. | 3. |
| 7. Food standards. | 3 |
| 8. Composition & quality criteria for the following foods
Milk & Milk products, oil & fats, Spices & condiments, Foodgrains, canned food, flours, fruits & vegetable products, flesh foods, Sugar & Preservers, Beverages- Alcoholic & non-alcoholic. | 6 |
| 9. Food adulteration | 3 |
| 10. Sensory evaluation & product testing
Objectives & Subjective testing. | 6 |

PAPER- VI: Introduction to Entrepreneurship Development And Food Manufacture

Section I: Introduction to Entrepreneurship Development

- 1.ImportanceEntrepreneurship & its relevance in career growth coverage of the subject & its scope 4
2. Entrepreneur,Entrepreneurship & Enterprise:
 - a) Concept & role in development
 - b) Characteristics of Entrepreneurs.
 - c) Developing entrepreneurial competence. 5
3. Entrepreneurship for career growth:
 - a) Choosing a career path
 - b) Perceiving a business opportunity
 - c) Identification & Selection of business
 - d) Potential opportunities at the selected area.
 - e) Environment Scanning
 - f) Source of information: Institute, State, National & International networking 8.
4. Creativity & Invocation: Definitions, exercise on creativity & .how to develop creativity & innovation. 2
- 5.Reinforcing Entrepreneurial Motivation & Competences. 3
6. Management:
 - a) General Management:
 - I] Introduction and principles of management.
 - II] Key aspect of managing a small enterprise.
 - b) Production & Material Management.
 - c) Marketing Management & Export Marketing.
 - d) Financial Management & management of working capital
 - e) Inventory control & Quality Management 8.
7. Buisness communicatin:Importance and scope
8. Small Scale Industry (SSI) sector and its role in economic . development scheme and assistance of support agencies such Banks DIC, SFC, TCO, KVIC. 4
9. Legal Implications:Income Tax,Sales Tax,Excise.Food laws Labour Laws,Factory act, pollution control act etc 4.
10. Role of vouluntary agencies and legal aspects of consumar protection 4
11. Project report prepration 4

Section –II: Introduction to Food Manufacture.

1. Food situation in India & abroad 2
2. Trends In social change & its role in diet pattern. Using social trends as a framework in new product innovation. 3
3. Traditional foods – status & need for revival in the context of determined non-traditional foods, urbanization, & such factors. 3
4. Product Development. Primary Processing, Secondary processing, Types of products, e.g. quick cooking, fast foods, fabricated foods, convenience foods. 8

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|--|---|
| 5. Additives: - Preservatives, Processing, formulation, standardization & large-scale preparation. | 3 |
| 6 Chemical & physical properties of food, shelf life studies shelf life prediction and sanitation . | 4 |
| 7. Packaging – Packaging suitability & functions, development & management, Design & Package graphics, labeling, Research, & testing. | 5 |
| 8. Transportation: - Types/ modes and optimization of transportation, taking into account; type of product, distance, storage facilities etc | 4 |
| 9 Genetically engineered food pelts & their safety. | 3 |

Paper-VII:- Food Technology-I.

Section –I Bakery & Confectionary

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|--|----|
| 1. Raw materials used for bread making & their functions: Essential & optional. | 2 |
| 2. Stages in processing bread: Weighing, Mixing fermentation , Knock-back, Dividing & Rounding, Intermediate proofing, Moulding & Panning, Final Proofing, Baking, Booking, Slicing, Packaging, | 3. |
| 3. Bread making Method: Straighy dough method, Salt delayed method, No thime dough method, Ferment & dough method, Continuous breadmaking process, Chorleywood process, Advantages & disadvantages | 3 |
| 4. Characteristics of good bread: External characteristics & Internal characteristics | 1 |
| 5. Bread faults: External faults, Internal faults, Reasons & remedies. | 2 |
| 6. Bread diseases: Rope, Mould, Detect on, Prevention | 1 |
| 7. Scoring of Baked Goods: External characteristics, Internal characteristics, score card | 2 |
| 8. Stadeness of Bread: Definition, Types, Prevention. | 1 |
| 9. Bread, improvers: Physical improvers, Enriching agent | 2 |
| 10. Bakery layout: To set up a bakery unit for producing breads & confectionary goods | 2 |
| 11. Principles of sanitation in Layout, Layout of bakery: bakery, design, Washing up | 2 |

Confectionary:

- | | |
|---|---|
| 1. Cake making ingredients & functions: Essential, optional, Functions, Structure builders, Tenderizers, Moisteners, Drivers; Flavour Enhance | 2 |
| 2. Confectionary flours: Types, Functions | 1 |
| 3. Sugar: Types, Function | 1 |
| 4. Egg: Structure, Nutritive Value, and Functions | 2 |
| 5. Baking Facts & their role: Types, Functions | 1 |
| 6. Moisterring agent: Milk Types, Cream, Function, Eggs, Water. | 1 |
| 7. Colour & Flavour: Uses, Colour-types, Flavours, Additives: Natural, Processed | 1 |
| 8. Fruits & Nuts: Fruits-Fresh Glance & Preserved, Nuts, Nut Pastes | 2 |
| 9. Sundry Materials Used in Confectionary: Filling-Setting agent | 1 |

10. Cake Making Process: Sieving, Creaming, Whipping, Beating, Fold in consistency, Panning, Baking 2
11. Cake Make Method: Types, Sugarbatter Method, Flour batter Method, Blending Method, Boiled Method, Sugar water method, All in Process 2
12. Baking of cakes: Tins-selection & Preparation, Temperature & time for different Products changes during baking 1
13. Cake recipe balancing: definition, Formula balance, Derivation of basic formula, general rules for balancing a formula 1
14. Cake faults: Shape faults, Texture faults, Structure faults, Crust faults, and Miscellaneous faults 2
15. Cake judging: External features, Internal features 1
16. Pastry Making: Definition, Types, Method of incorporate fat. Rolling & making up technique, Baking variations 2
17. Cake decoration: Purpose, Icings, Flat Icing, creamed icing, Fluff icing, Chocolate couverture Cocoa, Chocolate couverture, Accessories
18. Pruchcall: - Preparation of Cooking & Biscuits: Types, Method of incorporating fat, Rolling & Making up techniques, Baking 1
19. Cake making Utensils & equipment: Small equipments, Big equipments, Oven 2
20. Raw materials used in Bakery: Major cereals, nutritive value of cereals Milled Products wheat, Jowar, Bajara, Maize, Rice, Rochemical composition of cereal grains. Physico chemical characteristics & distribution of nutrients in grain, different constituent present in food, properties of it & significance, Milling & Storage of cereal grain & Milled product 4

Section:II- Dairy Technology

1. Introduction and Development of Milk processing industry in India, Present status & future scope 3
2. Dairy lay out for small scale: Dairy design & sanitation layout 2
3. White Revolution in India 1
4. Food value of milk, composition of milk & factors affecting composition of milk. 3
5. Buying, Receiving, Collection, transportation of milk, storage & distribution of milk 3
6. Processing of milk, filtration, clarification, cream separation, & heat treatment of milk. 5
7. Processing of milk for butter, Ghee, condensed evaporated dried milk, Ice cream etc. 8
8. Technology of indigenous milk product, khoa, Rubri, Lassi, Paneer, Cheese etc 3

Paper VIII: - Food Technology-II

Section :-I Fermentation Technology :-

- 1) Basic of fermentation:
 - a) Basic concepts of Fermentation:- definition, Butch, Continuous & .
 - b) Dual Fermentation & Factors affecting Fermentation Process.
 - c) Selection & Strain improvement programme.
 - d) Types of fermentation media: i) Raw material used ii) Buffers & antifoaming agents & control of contamination in fermentation
 - e) Quality control in fermentation Industry. 8
- 2) Fermentation Processes:
 - a) Industrial production of Enzymes:- Pepsinase, amylase, Pullulanase, Cellulase
 - b) Industrial Production of Oriental fermented foods & SCP
 - c) Industrial production of amino acids & Vitamins:
 - i. Lysine
 - ii. Glutamic acid.
 - iii. Arginine
 - iv. Vitamin B12 & C. 16
- 3) Fermented Foods: - Organisms involved & their role in
 - b) Preparation of golli, Curd, bread & pickles
 - c) Process defects & spoilage of above mentioned fermented foods &
 - d) Significance of fermented foods in Indian diet 8
- 4) Mushroom Cultivation & its applications. 3

Section :-II: - Food Quality Control By Products & Waste Management

- 1) Introduction: Definition, importance of Quality control & related terminology 3
- 2) Quality attributes of food. Nutritional quality (composition of goods).
Microbial quality, Sensory quality viz. Colour flavour etc. 4
- 3) Food standards laws & regulations: Prevention of food adulteration, FPO .
adulteration & Misbranding, executive agencies, I.S.I., Ag. Mark, standard
for raw materials, bacteriological standards for foods with Special reference to
fruit, Vegetable, cereals, Milk & Milk products, Meat & poultry products etc. 10.
- 4) Effect of Processing & Storage on the quality of food. 2
- 5) Inplant quality control techniques employed in food industries to maintain
uniformity of products 5.
- 6) Industrial by products & wastes:
 - a) Potentials & Prospects of by products & waste utilization, available from
food industries in India.
 - b) Agricultural & Aerobased industries by product & waste with special
reference to cereals & baking fruit & vegetables, Meat & Poultry & dairy
industry. Their possible utilization 8
- 7) Indices of food sanitary quality. Microbiological standards & criteria. Coliform
bacteria as a indicators of food sanitary quality Microbiological standards &
criteria. 5

Practicals: -

- 1) Microbiological examination of table, containege, & packing materials.
- 2) Testing of antimicrobial agents.
- 3) Testing of toxins produced by microorganisms (exotoxins).
- 4) Estimation of afla -toxins.
- 5) Detection of Salmonella in meal & poullry.
- 6) Detection of pathogenic organisms in food clostridium perfringens.
- 7) Role of microflora in cereal based fermented foods. e.g. Jellabies, nan phool-waries, jowar papdi, Anarsa, kissra.
- 8) Role of microflora in legume cereal based fermented foods wada & Idli/ Dosa, Dhokla.
- 9) Detection of poisonous (DDT) material.
- 10) Determination of quality of water.
- 11) Tests for microbial standards of foods.
- 12) Sampling of milk.
Physical examination of milk, Determination of Acidity, Specific gravity, Freezing point & Viscosity. Platform tests, Adultration of milk, Cream-seperation, Factors affecting on efficiency and richness of cream, Standerdization, & homogenization of milk. preparation of flavoures & chocolate milk. Visit to Local milk supply scheme.
- 13) Physical & Biochemical analysis of wastes from different Agro-based industries.
 - a) Sugar
 - b) Ristillary
 - c) Dairy
 - d) Food
 - e) Starch industry
 - f) Brewary & Winery
 - g) Confectionary
 - h) Bakery
- 14) Study of Amylase Fermentation & it's Activity.
- 15) Study of Caseinase Acitivity
- 16) Vitamin B12 Assay & Amylase
- 17) Study of Milk Microbiology; qualitative and quantitative estimation. And to determination of efficiency of Pasteurization.
- 18) Sensory Evaluation, Primary test (Sweetness, Saltness, Acidity), Detect concentration in increasing or decreasing order, And Spices flavour.

LIST OF MINIMUM EQUIPMENTS:

In addition toequipments listed in B.Sc.I&II yllabus TDS analyzer, Vaccum cleaner, DO analyzer, Air Sampler, Slide and over Head Projecter, Juice extreter, Pulping Machine, Bleaching Machine, Drying Machine, Can Opening, Closing & Sealing Machine, Boiler, Water purifier, Glass Distillation Apparatus, water Deionizer, Corn corking machine, Laminar Air Flow System, Cooling Centrifuge, Digital Balance.

A separate room for fine instruments of at least 10x15 feet dimention and culture room of atleast 10x10 feet dimention and a separate laboratory for B.Sc. Part III class.

Suggested Readings:paper IV V VI & VIII

- 1) Marketing Management by Philip Kotler, PHI, 1997.
- 2) Management Accounting by I. M. Pandey, Vikas, 1998.
- 3) Production & operations management by Everetic Adam, PHI, 1997.
- 4) Business policy by Azhar Kazmi, Tata McGraw Hill (TMH), 1997.
- 5) Handbook of new Entrepreneurs by P.C. Jain, Oxford Uni. Press, 1998.
- 6) A manual on How to prepare a project report by J. B. Patel & D. G. Allampalli, EDI, 1991.
- 7) A manual on Business opportunity Identification & selection by J.B. Patel & S.S. Modi, EDI, 1995.
- 8) The seven Business crises by V.G. Patel, TMH, 1996.
- 9) Business Environment by Parag Diwan, Excel, 1997.
- 10) You can win by Shiv Kbera, Macmillan India, 1998.
- 11) Small Scale Industry Handbook by Jay Narayan Vyas, Granthvitran, 1994.
- 12) Food Microbiology- W.C. Frazier.
- 13) Microbiology of fermented foods- Pederson
- 14) Bacteriology- A.J. Salle.
- 15) Food Borne Infection & intoxications- Hans, Riemann & Frank.
- 16) Industrial Microbiology- Prescott & Dunn.
- 17) Progress in Industrial Microbiology- Honchen Hull. Microbiology – Food fermentation- C.S. Pederson.
- 18) Industrial Microbiology—L.E. Carida (Jr.)
- 19) Introduction of Food Science & Technology—C.F. Stewart & M.A. Amerine.
- 20) Food Processing Operations (3 Volumes)—M.A. Joslgn & J.J. Heid.
- 21) Technology & food Perservation: -- N. W. Desrosier.
- 22) Outlines of Dairy Technology—Sukumar, De.
- 23) A Dichianary of Dairy – J.G. Davis.
- 24) Drying of milk & milk products – C.W. Hall & J.J. Hedrick.
- 25) Cheeze making Technology – M.E. Schwartz.
- 26) Nutritional and Toxicological Aspects of food processing edt.
- 27) Walker and E. Quattrucci Tayloss & Francis New York, 1980.
- 28) Toxiciological Aspects of Foods. Edt. K. Lava Miller. E. Isevier Applied Science, London & New York.
- 29) The Chemical Analysis of Foods and Food Products. By Morris B.Jacobs, 3rd ed. Roberte Krieger.
- 30) Food Packaging Sacharow and Griffir Avi. Publishing Co.
- 31) Food & Packaging Interaction. Hotchikess American Chemical Society.
- 32) Packaging for Climatic Protection Cairns, Oswin Paine. Newness-Butterworths.

FOR PRACTICAL COURSE

- 33) IFCON: Proceedings (1983,88,93,98 & 2003) of the International Food Conventions..
- 34) ISI publications.
- 35) Prevention of Food adulteration Act, 1995.For
- 36) Pearson's chemical analysis of foods- Egan, Kiv and Sawyer.Methods in Food Analysis- Joslyn.
- 37) Chemical methods of food Analysis Jacob.
- 38) Standndard methods for examination of dairy products – E. M. Master.
- 39) Handbook of Analysis and quality control for Fruit and Vegetable products.

Nature of Question Paper of Each Section.

Q.1. Objective Type question	10
Q.2. Discriptive type question	10
OR	
Q.2. Discriptive type question	10
Q.3. Discriptive type question	10
OR	
Q.3. Discriptive type question	10
Q.4. Short notes (any 4 out of 6)	20

Nature of Practical Examination :-**Distribution of Marks:-**

1. Practical I, II, III & IV Each Practical section	35 Marks.
Total	140.Marks
2. Project Work-	
a) Satisfactory Submisson-	25Marks
b) Oral	05Marks
	30 Marks
3. Training Report	
a) Satisfactory Submisson-	15 Marks.
b) Oral	05 Marks
	20 Marks
4. Tour Report	10 Marks.
	10 marks
Total Marks-	200 Marks.

PATIL V. D.**BIRJE SR/ Jc**K:\eback\newsyllabus\science\BSc\Bsc-III\Food Science & QC\B.Sc. (FS & QC).doc / **birje**