Rayat Shikshan Sanstha's

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA (AUTONOMOUS)

(Lead College Karmaveer Bhaurao Patil University, Satara)

Reaccredited by NAAC with 'A+' Grade

Syllabus for

Bachelor of Science

Part - I

B.Sc. Food Technology

Syllabus

to be implemented from June, 2023 onwards

(As Per NEP-2020 Guidelines)

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Lead college, Karmaveer Bhaurao Patil University, Satara

Syllabus for Bachelor of Science Part I

1. **Title**: B.Sc. Food Technology
2. **Year of Implementation**:2023-24
3. **Preamble:**

B.Sc. Food Processing and Packaging course under autonomy has been prepared keeping in view the unique requirements of B.Sc. Food Processing and Packaging students. The emphasis of the contents is to provide students the latest information along with due weightage to the concepts of classical trends in Processing and Packaging in food so that they are able to understand the all subjects.

The course content also lists new practical exercises so the students get hands on experience of the latest techniques that are currently used in Food industries. Project curriculum spanning over the one year of the course is designed in a way to understand he basics of food processing and packaging. Along with students are also provided with an opportunity to peruse the practical knowledge about subject. The course will also inspire students to pursue higher studies and research in Food Processing and Packaging, for becoming an entrepreneur a deniable students to get employed in Food, Nutraceutical and Agriculture Industries.

4. **General Objectives**:

- To construct and designing of the courses to suite industrial needs.
- To more emphasis on applied aspects of Food Technology.
- To develop aptitude of students in the field of research.
- To enrichment of basic knowledge in areas of Food Technology.
- To shape good and informed citizens from the students entering into the programme.

5. Programme Outcomes:

i] The students will graduate with proficiency in the Food technology

ii] The students will be eligible to continue higher studies in Food technology

iii] The students will be eligible to pursue higher studies abroad.

iv] The students will be eligible to appear for the examinations for jobs in government organizations.

v] The students will be eligible to apply for jobs with a minimum requirement of B.Sc. programme

5. PROGRAM SPECIFIC OBJECTIVES

i. The broad goal of the teaching of under graduate students in Food technology is to provide an understanding of various basic concepts in wide ranging contexts which involve the use of knowledge and skills of Food Technology.

ii. Their understanding, knowledge and skills in food technology needs to be developed through a thorough teaching learning processes in the class, practical skills through the laboratory work, their presentation and articulation skills, exposure to industry and interaction with industry experts, write short research-based projects where they are guided and mentored by the academic and other experts of the subject.

iii. The graduate students of Food Technology should have knowledge of the diverse places were food technology is involved. The graduate students of food technology should have Understood of diverse food technology processes.

iv. The graduate students of food technology should have basic skills such as food analysis, food processing, shelf-life testing, sensory analysis, food preservation techniques, etc.

v. The main objective of the course is to provide students with the basis to face the study of the major fundamentals of food chemistry, food processing, food microbiology, food preservations, food packaging, food engineering etc.

vi. At the time of completion of the programme the student will have developed extensive knowledge of food safety and regulatio

6. PROGRAM SPECIFIC OUTCOMES

At the end of the three-year programme the student will understand and be able to explain different branches of food technology .

ii] The student will be able to explain about various applications of food technology such as food processing, food packaging, food preservation, food analysis etc

iii] The students will be able to design and execute experiments related to Basic of food chemistry, food analysis , food processing, etc.

iv] The students will be able to execute a short research project incorporating techniques of Basic and Advanced food technology under supervision

7. **Duration**: Three/Four Year

8. **Exam Pattern:** Semester

9. **Medium of Instruction**: English

10. **Structure of B. Sc. I:**

B. Sc I SEMESTER I COURSE STRUCTURE

Sr. No.	Course Category	Course Code	Name of the Course
1	Major I	BFTT 111	Principles of Food Processing-I
2	Major II	BFTT 112	Food Packaging-I
3	Lab I	BFTP 113	Major Lab- I
4	Minor I	BFTT 114	Food Microbiology-I
5	Minor II	BFTT 115	Food Preservation –I
6	Lab II	BFTP 116	Minor Lab- I
7	OE-I	BFTTOE 117	Agricultural Economics
8	OE-II	BFTTOE 118	Agricultural and Economics Development
9	OE-III	BFTTOE 119	Democracy Election and Good Governance
10	IKS	BFTTIKS 1	Indian Traditional Foods
11	CC	BFTTCC 1	Social Media Management

Note: - GE-General Elective, OE- Open Elective, IKS- Indian Knowledge System

B.Sc I SEMESTER II COURSE STRUCTURE

Sr. No.	Course Category	Course Code	Name of the Course
1	Major I	BFTT 121	Principles of Food Processing-II
2	Major II	BFTT 122	Food Packaging-II
3	Lab I	BFTP 123	Based on BFPT 121 and BFPT 122
4	Minor I	BFTT 124	Food Microbiology-II
5	Minor II	BFTT 125	Food Preservation -II
6	Lab II	BFTP 126	Based on BFPT 124 and BFPT 125
7	OE-I	BFTTOE 127	Farm Management
8	OE-II	BFTTOE 128	Agricultural Risk Management
9	OE III	BFTTOE129	Based on BFTT 127 and BFTT 128
10	SEC	BFTTSEC 1	Analytical Techniques-I
11	VEC	BFTTVEC 1	Digital Technology

Note: GE-General Elective, OE- Open Elective, SEC- Skill Enhancement Course, VEC - Value Education Course.

SEMESTER I
MAJOR

SEMESTER I

COURSE BFTT 111: - PRINCIPLES OF FOOD PROCESSING-I

Course Objectives: Students should be able to…

1. understand different methods of primary processing in food industry.
2. know different methods of secondary processing in food industry.
3. illustrate various cooking methods.
4. explain objectives of food processing.

Credits (Total 02 Credits)	BFTT 111 PRINCIPLES OF FOOD PROCESSING-I	No. of hours (30 hrs)
UNIT-I	**Introduction to food**	**7**
	• Definition of food and food processing, classification of food, constituents of food • Introduction of Food preservation, food spoilage, causes of food spoilage, Factors affecting food spoilage, food poisoning	
UNIT-II	**Primary processing.**	**8**
	• Introduction, classification, and methods of cleaning. • Sorting, grading, cutting, seeding, chilling, and freezing.	
UNIT-III	**Secondary processing.**	**7**
	• Introduction, classification, and methods of Slicing • Pulping, paste, frying, chilling, and freezing, milling	
UNIT-IV	**Common food processing**	**8**
	• Introduction, Classification and Method of Cooking. • Baking, frying, roasting, toasting, grilling, blanching, extrusion.	

Course Outcomes: **Student will be able to…**

1. analyze different methods of primary processing in food industry.
2. apply methods of secondary processing in food industry.
3. identify food spoilage.
4. implement preservation and processing methods in food.

REFERENCE BOOKS:

1. Mishra. J. P., Mohapatra. S., Rastogi. M, Verma. S. and Singh. V. 2023. Textbook of Integrated Farming Systems for Sustainable Agriculture. B. P. International, Kolkata.
2. Mercer, Donald G. 2023. Bridging the gap in the communication of food science knowledge and technology. Science Direct.
3. Porter, M. E. 2023. Mrs. Porter's New Southern Cookery Book. Andrews McMeel Publishing LLC. Sydney, London.
4. Greer, Sandra C., 2023. Chemistry for Cooks: An Introduction to the Science of Cooking. MIT Press, Cambridge.
5. Jafari. S. M., Hedayati, Sara, Vahid B., 2023, Cooking equipment for the food industry. In High-Temperature Processing of Food Products, Woodhead Publishing, New Delhi.
6. Girdharilal, Siddapa. G. S., Tandon. G. L., 2022. Preservation of fruits and vegetables. 3rd ed. Indian Council of Agricultural research, New Delhi.
7. Fellows, Peter John., 2021. Food processing technology: principles and practice. Woodhead publishing,
8. Jafari, Seid. M., 2021. Engineering Principles of Unit Operations in Food Processing: Unit Operations and Processing Equipment in the Food Industry. Woodhead Publishing, New Delhi.
9. Acton, Eliza., 2020. Modern cookery. Longmans publications, London.
10. Earle, Richard L. 2013. Unit operations in food processing. Elsevier Publications, Dutch.
11. Mark J. K., Coles, Richard, Derek McDowell, 2003. Food packaging technology. Vol. 5. CRC press, Boca Raton.

COURSE BFTT 112: FOOD PACKAGING-I

Course Objectives: Students should be able to…

- understand the importance, functions and types of food packaging.
- know the properties and functions of wood and paper
- list the properties and functions of glass and metal packaging.
- explain the different packaging techniques.

Credits (Total 02 Credits)	BFTT 112 FOOD PACKAGING-I	No. of hours (30 hrs)
UNIT-I	**Introduction to Food Packaging**	**7**
	• History, define packaging, Importance and functions of Food packaging. Properties of packaging. • Types of packaging, application of packaging, Types of packaging material, Materials used in packaging- rigid, semi rigid and flexible,	
UNIT-II	**Wood and Paper Packaging**	**8**
	• Packaging materials: Wood-structure, types, properties and wooden containers used in packaging, types of wooden boxes. • Paper and paperboard-structure, making, properties, types and uses of paper and paperboard, CFB boxes and their comparison with wooden containers.	
UNIT-III	**Glass and Metal Packaging**	**7**
	• Packaging materials: Glass–composition, properties, structure, types and manufacture of glass containers, their uses, breakage in glass, closure for glass containers. • Metals- properties of metals, different metals used in food packaging, steel plate and functions of various constituents of steel, formation of two piece and three-piece cans, formation of aluminum containers, requirement of effective food packaging.	
UNIT-IV	**Packaging Methods**	**8**
	• Aseptic packaging of foods: sterilization of packaging material, food contact surfaces and aseptic packaging systems • Active food packaging–definition, scope, physical and chemical principles involved edible films and coatings.	

Course Outcomes- Students will be able to…

1. analyze the types of food packaging materials.
2. determine the types and uses of paper, CFB boxes.
3. describe the manufacturing process of glass and metal .
4. make use of active food packaging.

REFERENCE BOOKS:

1. Robertson G.L., 2012. Food Packaging - Principles and Practice 3rd Ed Narendra Publishing House. New Delhi
2. Robertson G.L., 2009. Food Packaging and Shelf life: A Practical Guide, Narendra Publishing House, New Delhi
3. Singh R.P. and Heldman D.R. 2010. Introduction to Food Engineering, Academic Press, New Delhi.
4. John, P.J. A. 2008. Handbook on Food Packaging. Narendra Publishing House, New Delhi.
5. Robertson. G. L., Taylor and Francis. G. B., 2006. Food Packaging: Principles and Practice, 3rd Ed. London New York press.
6. Robertson G.L., 2005. Food Packaging: Principles and Practice, 2nd Ed. London New York press.
7. Shrilakshmi. B. 2003. Food Science, New Age International Publishers, New Delhi
8. Ahvenainen. R. 2003 Novel Food Packaging Techniques, 1st Ed, Woodhead Publishing Limited. New Delhi.
9. Richard C., McDowell. M. and Mork. J. 2003 Food Packaging Technology, CRC press, New Delhi.
10. Gosby. N.T. 2001. Food Packaging Materials. Applied Science Publication, New Delhi.
11. Frank A. P. 1983. A Handbook of Food Packaging, ARM publications. Bangalore.

BFTP 113 Major LAB I
BFTP 113: - PRINCIPLES OF FOOD PROCESSING AND FOOD PACKAGING–I

Course Objectives: Students should be able to…

1. understand the principle of various cooking methods
2. know the measurement of Cobb's value and GSM value of paper and paperboard.
3. explain the principle and working of vernier caliper to measure thickness of paper and paperboard.
4. develop nutritional labeling of food products.

Credits (Total Credits 2)	BFTP 113 PRINCIPLES FOOD PROCESSING AND FOOD PACKAGING-I	No. of hours (60 hrs)
1	To study the principle and working of baking process.	
2	To study the principle and working of frying process.	
3	To study the principle and working of roasting process.	
4	To study the principle and working of grilling process.	
5	To study the principle and working of blanching process.	
6	To identify different types of packaging materials.	
7	To determine GSM (gram per square meter) of paper and paperboard.	
8	To determine thickness of paper.	
9	To determine Cobb's value of a paperboard.	
10	To determine the thickness of plastic	
11	To find out the porosity of tin plate.	
12	To determine thickness of paperboard	
13	To determine puncture resistance test	
14	To determine food packaging seal integrity test	
15	To determine edge crush test of a food pack	

Course Outcomes: Students will be able to…

1. identify different equipment's used in cooking
2. analyze different type of packaging material.
3. measure compete strength of different food packaging material.
4. create labeling of food products.

REFERENCE BOOKS:

1. George. W. 2023. Handbook of odors in plastic materials. Elsevier Publications, New Delhi.
2. Fellows. P., Peter J. 2022. Food processing technology: principles and practice. Woodhead publishing, New Delhi.
3. Proctor and Andrew, 2018. Alternatives to Conventional Food Processing 2nd Edition. Vol. 53. Royal Society of Chemistry, London.
4. Robertson, Gordon L. 2016. Food packaging: principles and practice. CRC press, New Delhi.
5. Baker, Christopher. G. J., Ranken. M. D., and Kill. R. C. 2012. Food industries manual. Springer Science & Business Media, Bangalore
6. Kadoya, Takashi, 2012. Food packaging. Academic Press, New Delhi.
7. Heldman, Dennis R., 2012. Food process engineering. Springer Science & Business Media, New Delhi.
8. Ramaswamy, Hosahalli. S., and Michele. M. 2005. Food processing: principles and applications. CRC Press, New Delhi
9. Weaver, Connie M., and James R. D. 2003. The food chemistry laboratory: a manual for experimental foods, dietetics, and food scientists. CRC press, New Delhi.
10. Barham, Peter, John. S.A., Edwards and Joachim M. S. 2001. The science of cooking. Berlin: Springer, New Delhi.

SEMESTER I

MINOR

COURSE BFTT 114:- FOOD MICROBIOLOGY- I

Course Objectives: Students should be able to…

1. understand the important contributions of various scientists in microbiology and scope of microbiology.
2. know the important genera of micro-organisms associated with food and their characteristics.
3. illustrate the microbial nutrition and culture media.
4. explain the control of microorganisms and mode of action of antiseptic and disinfectants.

Credits (Total 02 Credits)	**BFTT 114 FOOD MICROBIOLOGY- I**	**No. of hours (30 hrs)**
UNIT-I	**History and Scope of Microbiology**	**8**
	• Important contributions of various scientists, Scope of microbiology. • Introduction to microorganisms-bacteria, algae, fungi, protozoa and viruses, importance of bacteria, yeast, and moulds in foods.	
UNIT-II	**General Characteristics of Microorganisms**	**7**
	• Structure of Prokaryotic and Eukaryotic cell, Morphology of bacteria: Size, Shape and Arrangements. • Cytology of bacteria-structure and functions of cell wall, cell membrane, Capsules and slime layer, flagella, Pilli, nuclear material, mesosome, ribosome and spores.	
UNIT-III	**Microbial Nutrition And Culture Media**	**8**
	• Microbial Nutrition- Nutritional requirements of microorganisms. • Nutritional types of microorganism based on carbon and energy sources, Culture media: Common components of media and their functions, Types of media.	

UNIT-IV	**Control of Microorganisms**	**7**
	• Definitions Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Antisepsis, Sanitization. • Mode of action, application and advantages of: Physical agents, Chemical Agents, Gaseous Agent.	

Course Outcomes: **Student will be able to…**

1. recall history of microbiology.
2. classify the nutritional requirements of micro-organisms.
3. apply the techniques required for control of microorganism
4. explain functions of cell organelles.

REFERENCE BOOKS:

1. Ananthanarayan and Paniker's, 2016. A Textbook of Microbiology, 7th edition. Orient Blackswan, Hyderabad.
2. Tolaro. K.P., 2009. Foundations in Microbiology, 7th International edition. McGraw Hill Education, Bangalore.
3. Michael. T. M., Thomas. D. B., 2008. Brock biology of microorganisms, 12th edition, CA: Pearson/Benjamin Cummings, San Francisco
4. Purohit S. S., 2003. Microbiology fundamentals and applications, 6th edition, Agrobios Publisher, Jodhpur.
5. Frazier W.C. and Westhoff D.C. 2004. Food Microbiology, TMH Publication, New Delhi.
6. Stanier. R.Y., Ingraham. J. L., Wheelis. M. L. and Painter. P. R., 2001. General Microbiology, 5th edition, Macmillan Education Ltd., London.
7. Michael J. P., Chan. C. S., Noel R. K., 1986. Microbiology 5th edition, McGraw Hills Publication, America.
8. Salle. A. J., 1973. Fundamental Principles of Bacteriology. 7th Edition, McGraw-Hill Book Co. New York and London,
9. Martin. F., 1962.Fundamentals of Microbiology W. B. Saunders, 7th edition, Philadelphia. U.S.
10. Adams, Martin R., Maurice O. Moss, and Maurice O. Moss. 2000. Food microbiology. Royal society of chemistry, Cambridge.

COURSE BFTT 115 :- FOOD PRESERVATION–I

Course Objectives: Students should be able to…

1. understand the scope of food preservation
2. know the food preservation by high temperature and low temperature.
3. illustrate the food preservation by drying and dehydration.
4. explain the principles and types of preservation, shelf life of food products

Credits (Total Credits 2)	BFTT 115 FOOD PRESERVATION–I	No. of hours (30 hrs)
UNIT-I	**Introduction of food preservation**	**7**
	• Definition and scope of food preservation, principles of preservation. • Preservatives and its types, shelf life of food products.	
UNIT-II	**Food Preservation by high temperature**	**8**
	• Introduction, classification and method of sterilization, pasteurization, blanching and canning	
UNIT-III	**Food Preservation by Drying and dehydration**	**7**
	• Definition, drying as a means of preservation, Differences between sun drying and Dehydration (Mechanical drying). • Factors affecting rate of drying, normal drying curve, Types of driers used in the food industry.	
UNIT-IV	**Food Preservation by Low temperature.**	**8**
	• Introduction to refrigeration, cool storage and freezing, definition and principle of freezing, freezing curve, Changes occurring during freezing. • Types of freezing- slow freezing, quick freezing, freeze drying, Introduction to thawing, changes during thawing and its effect on food.	

Course Outcomes- Students will be able to…

1. explain the principle of preservation
2. compare the between sun drying and dehydration.
3. apply the processes of pasteurization and sterilization.
4. explain principle and type of freezing.

REFERENCE BOOKS:

1. Man. M., John. F., Hurst. W. J., 2018. Chang Lee Principles of Food Chemistry, 4rd Ed., Springer International Publishing, New York.
2. Bawa. A. S., Chauhanetal. O. P., 2013. Food Science, New India Publishing agency, New Delhi.
3. Manual of method of analysis of food for microbial testing–Food Safety and Standard Authority of India, Ministry of family welfare, Government of India, New Delhi-2012
4. Rahman. M. S., 2007. Handbook of food preservation, CRC Press, New Delhi.
5. Ramaswamy H. and Marcotte M., 2005. Food Processing Principles and Applications, CRC Press,
6. Meyer, 2004. Food Chemistry**,** New Age Publishers, New Delhi.
7. Frazier W.C. and Westhoff D.C., 2004. Food Microbiology, TMH Publication, New Delhi.
8. B. Srilakshmi, 2002. Food science, New Age Publishers, New Delhi.
9. Manay N.S. and Shadaksharaswamy M., 1987. Food-Facts and Principles, New Age International Ltd. Publishers, New Delhi.
10. Marion L. F., 1983. Laboratory manual in food preservation, 4^{th} edition, Avi Publishing, New Delhi.

BFTP 116 MINOR LAB I

BFTP 116 FOOD MICROBIOLOGY AND PRESERVATION

Course Objectives: Student should be able to…

1. understand the principle and working of various laboratory instruments.
2. know the handling techniques of laboratory equipment.
3. explain the role of microbiology in food processing.
4. apply the preservation techniques in food.

Credits (Total Credits2)	BFTP 116 FOOD MICROBIOLOGY AND PRESERVATION	No. of hours (60 hrs)
1	To study the Introduction to the Basic Microbiology Laboratory Practices.	
2	To study the use of instruments for microbiology (Incubator, oven, autoclave, water bath etc).	
3	To study the Principle and working of analytical instrument such as colorimeter, weighing Balances, muffle furnace and centrifuge.	
4	To study the functioning and use of compound microscope.	
5	Cleaning and sterilization of glassware.	
6	To Prepare culture media (Nutrient broth, Nutrient agar, Macconkeys agar, Sabouraud's agar).Sterilization of media	
7	To prepare slant, stab and plates using nutrient agar.	
8	To study the preservation of food by the process of freezing	
9	To study the drying of food using Tray dryer/other dryers	
10	To study the preservation of food by canning. (Fruit/Vegetable/meat)	
11	To study the cut-out analysis of canned food.	
12	To study the preservation of food by osmotic dehydration.	
13	To Identify the class I preservatives from different food products	
14	To study the preservation of food by using chemical preservatives.	

15	To study the preservation of food by using sugar as preservative.	

Course Outcomes- Students will be able to…

1. recall basic microbiology laboratory practices.
2. formulate media required for cultivation of different microorganism.
3. apply techniques of cleaning and sterilization and preparation, sterilization of different media
4. elaborate the preservation of food by canning and osmotic dehydration.

REFERENCE BOOKS:

1. Ronald. A., 2013. Handbook of Media for Clinical and Public Health Microbiology, CRC Press, New Delhi.
2. Food Safety Standard Authority of India, 2012. Ministry of family welfare, Government of India, New Delhi.
3. Jayraman. J., 2011. Laboratory Methods in Biochemistry New Age International, New Delhi.
4. William G. W., 2011. Laboratory manual for food microbiology, 4th edition, I. K. Publishers, New Delhi.
5. Singh. R., Sawhney. S. K., 2009. Introductory Practical Biochemistry, Narosa,
6. Patel. R., 2009. Experimental Microbiology 5th edition, Vol. I and Vol. II, Aditya Book Centre, New Delhi.
7. Emanuel. G. and Lorrence. G., 2008. Practical Handbook of Microbiology, Taylor and Francis
8. Frazier W. C. and Westhoff D. C., 2004. Food Microbiology, TMH Publication, New Delhi,
9. Shafiur R. M., 2007. Handbook of food preservation, CRC Press, New Delhi.
10. Stanier. R. Y. Palgrave. M., 1987. General microbiology, 5th revised edition, Palgrave Macmillan, New York.
11. Wilson. K., Goulding. K. H., 1986. Principles and techniques of Practical biochemistry, 3rd edition, Edward Arnold, London.
12. Marion L. F., 1983. Laboratory manual in food preservation, 4th edition, Avi Publishing, New Delhi.
13. David T. P., 1978. An Introduction to practical biochemistry, 2nd edition, McGraw-Hill Book Company (U.K.) Ltd., London
14. Frobisher, Hinsdill, Crabtree, Good heart, 1974. Fundamentals of microbiology, 9th edition, W.B. Saunders. Company,
15. Dey and Dey, 1973. Medical bacteriology, 7th edition, Allied agency,
16. Baker F.J., 1967. Bacteriological techniques, Butterworth & Co-Publishers Ltd, New York.

SEMESTER I

OPEN ELECTIVE

SEMESTER I

COURSE BFPT 117: -
COURSE BFTTOE 117 :- Agricultural Economics

Course Objectives: Students should be able to…

1. get introduced to the branch of Agricultural Economics.
2. study the role of Agricultural sector in economic Development of India.
3. study the system of Farm Management.
4. study the techniques of Risk Management in Agricultural Sector.

Credits (Total 02 Credits)	**Agricultural Economics l**	**No. of hours per unit/credits**
Unit-I	**Introduction of Agricultural Economics**	**15**
	Introduction of Agricultural Economics: Definition, Nature and Scope for the separate study of agricultural economics Utility of agricultural economics Nature of uncertainty in agriculture Characteristics of agriculture	
Unit-II	**dian Agriculture**	**15**
	Role of Agriculture in Indian Economy Place of agriculture in rural Economy Difference between agriculture and industry Systems of Cultivation – Peasant, Co-operative, State Farming, Corporate, Contract, Precision and Organic Farming, Farmers Club	

Course Outcomes- Students will be able to…..

1. Describe the branch of Agricultural Economics.
2. Explain the role of agricultural sector in economic Development of India.
3. Discuss technological changes in Indian Agricultural sector.
4. Explain the system of Farm Management.
5. Apply Risk Management Techniques in Agricultural Sector.

Reference Books:

1. Bhende, M.J., 2005, Agricultural Insurance in India: Problems and Prospects, NABARD, Occasional Paper-44
2. Bilgram, S. A. R. (1996), Agricultural Economics, Himalaya Publishing House, Delhi.
3. Christopher Ritson (1977), Agricultural Economics – Principles and Policy, Czosby Luckwood Staples, London
4. Desai R G (2001): Agricultural Economics - Models Problems and Policy Issues, Himalaya Publishing House, Mumbai.
5. Donald J. Epp & John W. Malone (1981), Introduction to Agricultural Economics, Mc-Million Publishing Company, Inc. New York.
6. Ghatak, S. and K. Ingerscent (1984), Agriculture and Economic Development, Select books, New Delhi.
7. GOI (2007), Report of The Working Group on Risk Management in Agriculture for the Eleventh Five Year Plan (2007-2012) , GOI, New Delhi
8. Kumar K N R (2015): Agricultural Production Economics, Volume-I, Daya Publishing House, A Division of Astral International Pvt. Ltd, New Delhi.
9. Lekhi R K & Singh Jogindar (2013): Agricultural Economics, Kalyani Publisher, New Delhi.
10. Publishing House, Bombay.
11. Reddy, Ram, Sastry & Devi (2010): Agricultural Economics Oxford & IBH publishing Co. Pvt. Ltd, New Delhi.
12. Sadhu A. N. & Singh Amarjit, Fundamentals of Agricultural Economics, (1996), Himalaya
13. Soni, R. N. (1995), Leading Issues in Agricultural Economics, Arihant Press, Jalandhar. 7. Agriculture in Economic Development (1964), Carl Eicher and Lawrence Wit, McGraw Hill Book Company, New York

COURSE BFTT 118 :- Agricultural and Economics Development

Course Objectives: Students should be able to…

1. Learn the branch of Agricultural Economics.
2. study the role of Agricultural sector in economic Development of India.
3. study the system of Farm Management.
4. study the techniques of Risk Management in Agricultural Sector.

Credits (Total 02 Credits)	**Agriculture and Economic Development**	**No. of hours per unit/credits**
Unit-I	**Agriculture and Economic Development**	**15**
	Role of agriculture in economic development Agricultural Policy During Plan Period and Recent National Agricultural Policy Land Reforms in India Land Utilization in India – Change in Cropping Pattern	
Unit-II	**Agriculture Reforms**	**15**
	od security - Buffer Stock and Public Distribution System (PDS) reen Revolution, White Revolution, Blue Revolution, Yellow Revolution aste Land Development Programmes ational Commission on farmers and Agriculture	

Course Outcomes- Students will be able to…

1. describe the branch of Agricultural Economics.
2. analyze the role of agricultural sector in economic Development of India.
3. discuss the technological changes in Indian Agricultural sector.
4. awareness regarding the system of Farm Management.

Reference Books:

1. Bhende, M.J., 2005, Agricultural Insurance in India: Problems and Prospects, NABARD, Occasional Paper-44
2. Bilgram, S. A. R. (1996), Agricultural Economics, Himalaya Publishing House, Delhi.
3. Christopher Ritson (1977), Agricultural Economics – Principles and Policy, Czosby Luckwood Staples, London
4. Desai R G (2001): Agricultural Economics - Models Problems and Policy Issues, Himalaya Publishing House, Mumbai.
5. Donald J. Epp & John W. Malone (1981), Introduction to Agricultural Economics, Mc-Million Publishing Company, Inc. New York.
6. Ghatak, S. and K. Ingerscent (1984), Agriculture and Economic Development, Select books, New Delhi.
7. GOI (2007), Report of The Working Group on Risk Management in Agriculture for the Eleventh Five Year Plan (2007-2012) , GOI, New Delhi
8. Kumar K N R (2015): Agricultural Production Economics, Volume-I, Daya Publishing House, A Division of Astral International Pvt. Ltd, New Delhi.
9. Lekhi R K & Singh Jogindar (2013): Agricultural Economics, Kalyani Publisher, New Delhi.
10. Publishing House, Bombay.
11. Reddy, Ram, Sastry & Devi (2010): Agricultural Economics Oxford & IBH publishing Co. Pvt. Ltd, New Delhi.
12. Sadhu A. N. & Singh Amarjit, Fundamentals of Agricultural Economics, (1996), Himalaya
13. Soni, R. N. (1995), Leading Issues in Agricultural Economics, Arihant Press, Jalandhar. 7. Agriculture in Economic Development (1964), Carl Eicher and Lawrence Wit, McGraw Hill Book Company, New York

BFTTOE-119 :Democracy, Election and Good Governance (DEGG)

Learning objectives: Students should be able to…..

1. understand the meaning of democracy and its importance.
2. know the various approaches in democracy and governance.
3. demonstrate the election procedure in India.
4. summarize the role of the good Governance and its initiatives in India.

Credits (Total 02 Credits)	**Name of Course: Democracy, Election and Good Governance (DEGG)**	**No. of hours per unit/credits**
Unit-I	**Democracy in India**	**8**
	Introduction: Meaning, Definition of democracy Classification: Direct democracy and representative democracy, features of direct and representative democracy	
Unit-II	**Democracy and Decentralization**	**8**
	Dimensions of Democracy: Social, Economic and Political Decentralization: Grassroots Level Democracy Challenges before Democracy: women and marginalized sections of the society	
Unit-IlI	**Election**	**8**
	–73rd and 74th Constitutional Amendment Acts: Institutions at the local level and Role of State Election commission – Local Body Elections: Urban & Rural – Duties of an Individual towards electoral process	
Unit-IV	**Good Governance**	**6**
	Meaning and concept Government and Governance Good Governance initiatives in India	

Learning outcomes: students will be able to……

1. explain the meaning of democracy and its importance.
2. apply the various approaches of democracy and governance.
3. examine critically the election process of the country.
4. define the role of the good Governance and its initiatives in India.

References :

1. Banerjee-Dube, I, A history of modern India, Cambridge University Press, (2014).
2. Basu, D. D. ,Introduction to the Constitution of India, Delhi: Prentice Hall of India, (1982).
3. Bhargava, R, Political theory: An introduction. Chennai: Pearson Education India, (2008). Bhargava, R., &Vanaik, A, Understanding Contemporary India: Critical Perspective. New Delhi: Orient Blackswan, (2010).
4. Chandhoke, N., &Proyadardhi,P. (Ed.), Contemporary India: Economy, Society, Politics. Chennai: Pearson Education India, (2009).
5. Chandra, B, Essays on contemporary India, New Delhi: Har-Anand Publications Pvt Ltd, (1999)
6. Chaterjee, P, State and Politics in India. New Delhi: Oxford university Press. (1997). Dasgupta. S., (Ed.). Political Sociology. Chennai: Pearson Education India, (2011

SEMESTER I

IKS

INDIAN KNOWLEDGE SYSTEM (IKS)

COURSE BFTTIKS 1- INDIAN TRADITIONAL FOODS

Course Objectives: Students should be able to…

1. understand the importance of Indian traditional food.
2. know the government policies for food industries
3. determine the historical and cultural perspective of traditional food
4. explain the health aspects of traditional foods.

Credits (Total Credits 2)	BFTTIKS 1 INDIAN TRADITIONAL FOODS	No. of hours (30 hrs)
Unit I	**Indian Traditional Foods**	**7**
	• Historical and Cultural perspective • Traditional Food Patterns (typical breakfast, meal and snack foods of different regions of India, fermented foods, pickles, preserves) • Health aspects of Traditional Foods	
Unit II	**South Indian Traditional Foods**	**8**
	• Introduction to South Indian Traditional Foods • South Indian Traditional Food Patterns(Idli, Dosa, Vada, Uttapam) • Benefits and Health Aspects of South Indian Traditional foods • Commodities and their usage in Indian Kitchen	
Unit III	**North Indian Traditional Foods**	**7**
	• North Indian Traditional Food Patterns (Dal Makhani, Chole Bhature, Paratha, KadhiChawal) • Benefits and Health Aspects of North Indian Traditional Foods • Energy, shelf life and environmental costs of North Indian Traditional Foods	
Unit IV	**Government Initiative to boost the Food Processing Industry**	**8**
	• Pradhan Mantri Kisan Sampada Yojana(PMKSY) • Pradhan Mantri Formalization of Micro Food Processing Enterprises Scheme (PMFME) • Production Linked Incentive Scheme for Food Processing Industry(PLISFPI)	

Course Outcomes-Students will be able to…

1. understand the health aspects of traditional food.
2. analyze the commodities and their usage in Indian kitchen
3. determine the North Indian traditional food patterns
4. implement the government initiative to boost food processing industry

REFERENCE BOOKS :

1. Tulli. K. K., 2019. Innovations in Traditional Foods ,
2. Kristbergsson. K., Olieveira. J. 2016. Traditional Foods: General and Consumer Aspects.
3. Saunders, Raine. 2010. "What Are Traditional Foods?" Agriculture Society. New Delhi.
4. Rat. R. C., Didier. M. 2014. Microorganisms and Fermentation of Traditional Foods.
5. Gabriel. J. 2014. How to cook like a Southerner : Classic Recipes from the South's Best Down - Home Cooks
6. Jeyaram. K., Singh. A., Romi. W., Devi. A. R., Singh. W. M., Dayanithi H, 2009. Traditional fermented foods of Manipur. Indian J Traditional Knowledge,
7. Bradenton. H. 2008. Try traditional southern foods for New Years.
8. Allende. A., Tomas. F. and Gil. M. 2006.Minimal processing for healthy and Traditional Foods.
9. Sen, Colleen. T. 2005. Food Culture in India Greenwood Press, New Delhi.
10. Davidar, Ruth. N. 2001. Indian Food Science : A Health and Nutrition Guide to Traditional Recipes: East West Books, New Delhi
11. Ferrando, R. 1981. Traditional and Non Traditional Foods. FAO Food and Nutrition series, New Delhi.

SEMESTER I

CC

Course Name: BFTTCC 1 Social Media Management

Course objectives: **Students should be able to …**

1. understand the basics of social media management
2. learn to develop a strategic social media plan for own social brand
3. learn about social media marketing campaign
4. understand brand development on social media

Credit(1)	Name of the Unit	No of Hrs. (30)
Unit I	**Introduction to Social Media Management**	8
	Social media, Social networking sites, Logic of Social media	
Unit II	**Social Media Strategy and planning**	7
	Social Media measurement, Content creation, Facebook and Instagram for business, YouTube and Live Streaming, Trends	
Unit III	**Social Media Marketing Campaign of food Product**	**8**
	Introduction to marketing Campaign, Types of Social media marketing campaign, Planning of social media marketing, Templet Preparation,	
Unit IV	**Brand Development on social media platform**	**7**
	Definition and introduction of branding, Importance of brand development on social media, Strategies for social media branding	

Course outcomes: Students will be able to…

1. explore the different social media and management strategies
2. develop and implement a strategic social media plan for own social brand
3. aware abut social media marketing campaign
4. develop brand on social media platform

Reference Books:

1. Martin Gail Z. , 2018, First Edition, The Essential Social Media Marketing Handbook, Rupa Publications, India, Calcutta
2. Fuchs Christian, 2021, Third Edition, Social Media A Critical Introduction , Sage Publishing, New York
3. Gillin, P., 2007. The New Influencers. A Marketer's Guide to the New Social Media. World Dancer Press, Sanger, California, CA.
4. Greenberg, P., 2010. The impact of CRM 2.0 on customer insight. Journal of Business and Industrial Marketing, 25(6), pp.410–419

5. Hollebeek, L. D., Glynn, M. S. and Brodie, R. J., 2014. Consumer brand engagement in social media: Conceptualization, scale development and validation. Journal of Interactive Marketing, 28(2), pp.149- 165. ahn, B. and Kunz, W., 2012. How to transform consumers into fans of your brand. Journal of Service Management, 23, pp. 344–361.

SEMESTER II

MAJOR

Semester II

COURSE BFTT 121: - PRINCIPLES OF FOOD PROCESSING–II

Course Objectives: Students should be able to…

1. understand importance and future prospects of food processing industry.
2. know the classification, scope and importance of animal food processing.
3. illustrate packaging of food material.
4. explain objectives and functions of food packaging.

Credits (Total 02 Credits)	BFPT 121 PRINCIPLES OF FOOD PROCESSING-II	No. of hours (30 hours)
UNIT-I	**Processing Industry**	**7**
	• Scope of food processing industry, importance and future Prospects. • Sectors of food processing industry, Classification of food – perishable and semi perishable food.	
UNIT-II	**Principle of Plant Food Processing**	**8**
	• Introduction, classification, scope and importance of plant food processing industries. • Fruit and vegetable processing, cereal and legume processing, oilseeds processing	
UNIT-III	**Principle of Animal Food Processing**	**7**
	• Introduction, classification, Scope and Importance of animal food processing industries. • Milk processing, meat processing, fish processing, poultry processing	
UNIT-IV	**Effect of processing on nutritional value of food.**	**8**
	• Introduction, consuming raw foods, changes during meat grilling • Effect of processing on vitamins, minerals, carbohydrates, lipids.	

Course Outcomes: Student will be able to…

1. explain scope of food processing sector.
2. categorize food on the basis of perishability.
3. distinguish food processing industries.
4. protect the nutritional value of food.

REFERENCE BOOKS:

1. Mishra. J. P., Mohapatra. S., Rastogi. M, Verma. S. and Singh. V. 2023. Textbook of Integrated Farming Systems for Sustainable Agriculture. B. P. International, Kolkata.
2. Mercer, Donald G. 2023. Bridging the gap in the communication of food science knowledge and technology. Science Direct.
3. Porter, M. E. 2023. Mrs. Porter's New Southern Cookery Book. Andrews McMeel Publishing LLC. Sydney, London.
4. Greer, Sandra C., 2023. Chemistry for Cooks: An Introduction to the Science of Cooking. MIT Press, Cambridge.
5. Jafari. S. M., Hedayati, Sara, Vahid B., 2023, Cooking equipment for the food industry. In High-Temperature Processing of Food Products, Woodhead Publishing, New Delhi.
6. Girdharilal, Siddapa. G. S., Tandon. G. L., 2022. Preservation of fruits and vegetables. 3rd ed. Indian Council of Agricultural research, New Delhi.
7. Fellows, Peter John., 2021. Food processing technology: principles and practice. Woodhead publishing,
8. Jafari, Seid. M., 2021. Engineering Principles of Unit Operations in Food Processing: Unit Operations and Processing Equipment in the Food Industry. Woodhead Publishing, New Delhi.
9. Acton, Eliza., 2020. Modern cookery. Longmans publications, London.
10. Earle, Richard L. 2013. Unit operations in food processing. Elsevier Publications, Dutch.
11. Mark J. K., Coles, Richard, Derek McDowell, 2003. Food packaging technology. Vol. 5. CRC press, Boca Raton.

COURSE BFTT 122: FOOD PACKAGING–II

Course Objectives: Students should be able to…

. 1. understand classification and uses of plastic polymers.

2. know the techniques and methods used for packaging.

3. state the types of oxygen absorbents and its application.

4. explain the safety considerations in food packaging.

Credits (Total 02 Credits)	BFPT 122 FOOD PACKAGING–II	No. of hours (30 hrs)
UNIT-I	**Plastic Packaging**	**7**
	• Plastic packaging materials: types of polymer, classification of polymers, functional and mechanical properties of thermoplastic polymers • functional and mechanical properties of thermosetting polymers, functional and mechanical properties of Elastomer polymers, Testing of plastic packages.	
UNIT-II	**Packaging systems**	**8**
	• Aseptic packaging – application, uses and function. Modified atmospheric packaging – application, uses and function. Active packaging – application, uses and function. • Intelligent packaging – application, uses and function. Edible packaging, material used in edible packaging.	
UNIT-III	**Scavengers and absorbents**	**7**
	• Classification and main types of oxygen absorbents, factors influencing the choice of oxygen absorbents • Carbon-dioxide scavengers, ethylene scavengers, moisture absorbers, preservative releasers, ethanol emitters, flavor and odor absorbers.	

UNIT-IV	**Safety Considerations in Food Packaging**	**8**
	• Labeling, Types of food safety problems associated with package, package labeling and nutritional labeling. • Food packaging and environment-recycling, composting, thermal treatment and landfilling	

Course Outcomes: **Students will be able to…**

1. recall functional and mechanical properties of polymers.
2. implement the methods used for packaging
3. examine the labeling and food safety problems associated with package.
4. create awareness regarding recycling, composting, thermal treatment and landfill.

REFERENCE BOOKS:

1. Robertson G.L., 2012. Food Packaging - Principles and Practice 3rd Ed Narendra Publishing House. New Delhi
2. Robertson G.L., 2009. Food Packaging and Shelf life : A Practical Guide , Narendra Publishing House ,New Delhi
3. Singh R.P. and Heldman D.R. 2010. Introduction to Food Engineering, Academic Press, New Delhi.
4. John, P.J. A. 2008. Handbook on Food Packaging. Narendra Publishing House, New Delhi.
5. Robertson. G. L., Taylor and Francis. G. B., 2006. Food Packaging: Principles and Practice, 3rd Ed. London New York press.
6. Robertson G.L., 2005. Food Packaging: Principles and Practice, 2nd Ed. London New York press.
7. Shrilakshmi. B. 2003. Food Science, New Age International Publishers, New Delhi
8. Ahvenainen. R. 2003 Novel Food Packaging Techniques, 1st Ed, Woodhead Publishing Limited. New Delhi.
9. Richard C., McDowell. M. and Mork. J. 2003 Food Packaging Technology, CRC press, New Delhi.
10. Gosby. N.T. 2001. Food Packaging Materials. Applied Science Publication, New Delhi.
11. Frank A. P. 1983. A Handbook of Food Packaging, ARM publications. Bangalore

LAB BFPP 123 (BASED ON BFPT 121 AND BFPT 122)
BFPP 123: - PRINCIPLES OF FOOD PROCESSING AND PACKAGING–II

Course Objectives: Students should be able to…

1. know the principle and working of pulping and paste making.
2. explain the principle and working of frying and toasting processes.
3. know the principle and working of tearing, bursting and tensile strength.
4. compare transmission rate of various packaging materials.

Credits (Total Credits 2)	BFPP 123 PRINCIPLES OF FOOD PROCESSING AND PACKAGING-II	No. of hours (60 hrs.)
1	To study the principle and working of pulping process.	
2	To study the principle and working of Paste process.	
3	To study the principle and working of frying process.	
4	To study the principle and working of toasting process.	
5	Identification of plastic packaging material.	
6	To study and determine grease resistance of packaging materials.	
7	To study and determine water vapor transmission rate of various packaging materials.	
8	To study the preparation of labels for different types of food products according to package labeling laws.	
9	To study and determine tear resistance of different packaging materials.	
10	To study and determine bursting strength of different packaging materials.	
11	To study and determine tensile strength of different packaging materials.	
12	To study the measurement of stiffness of packaging material (Paperboard).	
13	To study and measure the quantity of oxygen, carbon dioxide and nitrogen in headspace of packaged product.	
14	To study and determine tin coating weight.	
15	To study oil absorption rate of oil .	

Course Outcomes: Students will be able to…

1. make use of pulping, paste making, frying and toasting principle.
2. analyze tear resistance, bursting strength, tensile strength of packaging material.
3. design labels for different food products.
4. compare different type food packaging materials.

REFERENCE BOOKS:

1. George.W. 2023. Handbook of odors in plastic materials. Elsevier Publications, New Delhi.
2. Fellows. P., Peter J. 2022. Food processing technology: principles and practice. Woodhead publishing, New Delhi.
3. Proctor and Andrew, 2018. Alternatives to Conventional Food Processing 2nd Edition. Vol. 53. Royal Society of Chemistry, London.
4. Robertson, Gordon L. 2016. Food packaging: principles and practice. CRC press, New Delhi.
5. Baker, Christopher. G. J., Ranken. M. D., and Kill. R. C. 2012. Food industries manual. Springer Science & Business Media, Bangalore
6. Kadoya, Takashi, 2012. Food packaging. Academic Press, New Delhi.
7. Heldman, Dennis R., 2012. Food process engineering. Springer Science & Business Media, New Delhi.
8. Ramaswamy, Hosahalli. S., and Michele. M. 2005. Food processing: principles and applications. CRC Press, New Delhi
9. Weaver, Connie M., and James R. D. 2003. The food chemistry laboratory: a manual for experimental foods, dietetics, and food scientists. CRC press, New Delhi.
10. Barham, Peter, John. S.A., Edwards and Joachim M. S. 2001. The science of cooking. Berlin: Springer, New Delhi.

SEMESTER II

MINOR

COURSE BFTT 124: FOOD MICROBIOLOGY –II

Course Objectives: Students should be able to…

1. understand the role of microbes in contamination of food and spoilage of food.
2. know the cultivation of micro-organisms
3. demonstrate the stains and staining techniques.
4. illustrate identification of bacteria.

Credits (Total Credits 2)	BFPT 124 FOOD MICROBIOLOGY-II	No. of hours (30 hours)
UNIT-I	**Microbial contamination of food and spoilage of food.**	**7**
	• Contamination from air, water, soil, sewage, Techniques for evaluation of contamination, Spoilage of Specific Food Products. • Food poisoning, Intoxication, Food borne illness.	
UNIT-II	**Cultivation of Micro-organisms**	**8**
	• Pure culture technique, Methods of isolation and cultivation. • Enumeration of Microorganisms- qualitative and quantitative	
UNIT-III	**Stains and staining techniques**	**7**
	• Classification of stains- acidic, basic and neutral, Principles, Procedures, mechanisms and applications of staining procedures. • Simple staining, Negative staining, Gram staining, Differential staining.	
UNIT-IV	**Identification of bacteria**	**8**
	• Maintenance of stock cultures – (Agar slants and Agar stabs) Systematic study of pure cultures: • Morphological characteristics. • Cultural characteristics • Biochemical Characteristics-Sugar fermentation, Production of metabolites -H_2S gas, Production of enzymes - Amylase, Caseinase and Catalase Serological and genetic characteristic	

Course Outcomes: Students will be able to…

1. find the microbial contamination of food and techniques for evaluation of contamination.
2. examine microorganisms from food.
3. explain the principle, mechanism, procedure and applications of different staining procedures.
4. elaborate the biochemical characteristics for identification of microorganism.

REFERENCE BOOKS:

1. Ananthanarayan and Paniker's, 2016. A Textbook of Microbiology, 7th edition. Orient Blackswan, Hyderabad.
2. Tolaro. K.P., 2009. Foundations in Microbiology, 7th International edition. McGraw Hill Education, Bangalore.
3. Michael. T. M., Thomas. D. B., 2008. Brock biology of microorganisms, 12th edition, CA: Pearson/Benjamin Cummings, San Francisco
4. Purohit S. S., 2003. Microbiology fundamentals and applications, 6th edition, Agrobios Publisher, Jodhpur.
5. Frazier W.C. and Westhoff D.C. 2004. Food Microbiology, TMH Publication, New Delhi.
6. Stanier. R.Y., Ingraham. J. L., Wheelis. M. L. and Painter. P. R., 2001. General Microbiology, 5th edition, Macmillan Education Ltd., London.
7. Michael J. P., Chan. C. S., Noel R. K., 1986. Microbiology 5th edition, McGraw Hills Publication, America.
8. Salle. A. J., 1973. Fundamental Principles of Bacteriology. 7th Edition, McGraw-Hill Book Co. New York and London,
9. Martin. F., 1962.Fundamentals of Microbiology W. B. Saunders, 7th edition, Philadelphia. U.S.
10. Adams, Martin R., Maurice O. Moss, and Maurice O. Moss. 2000. Food microbiology. Royal society of chemistry, Cambridge.

COURSE BFTT 125 : FOOD PRESERVATION II

Course Objectives: Students should be able to …

1. understand mechanism of action of radiation in food preservation.
2. know effect of radiation on microorganisms.
3. illustrate the non-thermal preservation of food.
4. explain the plasma, bio-preservation and hurdle technology.

Credits (Total Credits-2)	BFPT 125 FOOD PRESERVATION-II	No. of hours (30 hrs)
UNIT-I	**Food preservation by radiation**	**7**
	• Introduction and units of irradiation, Mechanism of action of radiation, Radiation process • Effect of radiation on food, Effect of radiation on Microorganisms	
UNIT-II	**Non-thermal preservation of food**	**8**
	• Pulsed electric field processing, Ohmic heating, Dielectric heating, Microwave processing	
UNIT-III	**Other methods non-thermal food preservation**	**7**
	• Infrared heating • High pressure processing • Processing using ultrasound	
UNIT-IV	**Recent methods of food preservation**	**8**
	• Plasma • Bio-preservation • Hurdle technology	

Course Outcomes- Students will be able to…

1. choose the non-thermal preservation techniques for food preservation.
2. apply non-thermal preservation techniques as dielectric heating and Microwave processing.
3. explain thermal preservation techniques as high-pressure processing and ultrasound.
4. elaborate the preservation techniques-plasma and bio-preservation.

REFERENCE BOOKS:

1. Man. M., John. F., Hurst. W. J., 2018. Chang Lee Principles of Food Chemistry, 4rd Ed., Springer International Publishing, New York.
2. Bawa. A. S., Chauhanetal. O. P., 2013. Food Science, New India Publishing agency, New Delhi.
3. Manual of method of analysis of food for microbial testing–Food Safety and
   Standard Authority of India, Ministry of family welfare, Government of India, New Delhi-2012
4. Rahman. M. S., 2007. Handbook of food preservation, CRC Press, New Delhi.
5. Ramaswamy H. and Marcotte M., 2005. Food Processing Principles and Applications, CRC Press,
6. Meyer, 2004. Food Chemistry**,** New Age Publishers, New Delhi.
7. Frazier W.C. and Westhoff D.C., 2004. Food Microbiology, TMH Publication, New Delhi.
8. B. Srilakshmi, 2002. Food science, New Age Publishers, New Delhi.
9. Manay N.S. and Shadaksharaswamy M., 1987. Food-Facts and Principles, New Age International Ltd. Publishers, New Delhi.
10. Marion L. F., 1983. Laboratory manual in food preservation, 4^{th} edition, Avi Publishing, New Delhi.

LAB V BFTP 126 (BASED ON BFPP 124 AND BFPP 125)

LAB BFTP 126: FOOD MICROBIOLOGY AND PRESERVATION-II

Course Objectives: Students should be able to…

1. recall the isolation of bacteria by streak plate technique, isolation of molds from foods.
2. know detection ability of bacteria to produce caseine enzyme and sugar fermentation.
3. illustrate use of natural and chemical preservatives in food preservation.
4. explain the effect of surface area of food on drying rate.

Credits (Total Credits 2)	BFFP 126 FOOD MICROBIOLOGY AND PRESERVATION-II	No. of hours (60 hours)
1	To study the isolation of bacteria by streak plate technique.	
2	To study the staining methods- (Mono chrome staining, Gram staining, Negative staining).	
3	To study the isolation of molds from foods.	
4	To determine SPC of food sample.	
5	To detect the ability of bacteria to produce casein as enzyme.	
6	To detect the ability of bacteria to ferment sugar	
7	To study the cultivation of anaerobic bacteria	
8	To determine quality characteristics of foods preserved by drying/dehydration/freezing	
9	To study the pasteurization of fluids using different methods	
10	To study the effect of surface area of food on drying rate.	
11	To study the preservation of food by using natural preservatives.	
12	To study the preservation of food by using chemical preservatives	
13	To study the preservation of food using sugar as a preservative	
14	To study the preservation of food by using oil as a preservative	
15	To study the preservation of food by using salt as a preservative	

Course Outcomes:- students will be able to…

1. recall techniques of isolation of bacteria by streak plate, isolation of molds from foods.
2. apply the staining methods.
3. examine the detection the ability of bacteria to produce caseins enzyme and sugar fermentation.
4. choose the method of food preservation to preserve the different types of food.

REFERENCE BOOKS

1. Ronald. A., 2013. Handbook of Media for Clinical and Public Health Microbiology, CRC Press, New Delhi.
2. Food Safety Standard Authority of India, 2012. Ministry of family welfare, Government of India, New Delhi.
3. Jayraman. J., 2011. Laboratory Methods in Biochemistry New Age International, New Delhi.
4. William G. W., 2011. Laboratory manual for food microbiology, 4th edition, I. K. Publishers, New Delhi.
5. Singh. R., Sawhney. S. K., 2009. Introductory Practical Biochemistry, Narosa,
6. Patel. R., 2009. Experimental Microbiology 5th edition, Vol. I and Vol. II, Aditya Book Centre, New Delhi.
7. Emanuel. G. and Lorrence. G., 2008. Practical Handbook of Microbiology, Taylor and Francis
8. Frazier W. C. and Westhoff D. C., 2004. Food Microbiology, TMH Publication, New Delhi,
9. Shafiur R. M., 2007. Handbook of food preservation, CRC Press, New Delhi.
10. Stanier. R. Y. Palgrave. M., 1987. General microbiology, 5th revised edition, Palgrave Macmillan, New York.
11. Wilson. K., Goulding. K. H., 1986. Principles and techniques of Practical biochemistry, 3rd edition, Edward Arnold, London.
12. Marion L. F., 1983. Laboratory manual in food preservation, 4th edition, Avi Publishing, New Delhi.
13. David T. P., 1978. An Introduction to practical biochemistry, 2nd edition, McGraw-Hill Book Company (U.K.) Ltd., London
14. Frobisher, Hinsdill, Crabtree, Good heart, 1974. Fundamentals of microbiology, 9th edition, W.B. Saunders. Company,
15. Dey and Dey, 1973. Medical bacteriology, 7th edition, Allied agency,
16. Baker F.J., 1967. Bacteriological techniques, Butterworth & Co-Publishers Ltd, New York.

SEMESTER II
OPEN ELECTIVE

SEMESTER –II

BFTTOE 127 Farm Management

Course Objectives: Student should be able to…

1. classify the system of Farm Management.
2. study the techniques of Risk Management in Agricultural Sector.
3. illustrate the management of farm resources.
4. understand different types of farming

Credits (Total 02 Credits)	**Agricultural Economics lll**	**No. of hours per unit/credits**
Unit-I	**Economics of Farm Management**	**15**
	1.1 Farm management: Scope- Objectives- 1.2 Farm management decisions 1.3 Types of Farming- Farm Size and Productivity - Farm Efficiency Measures 1.4 Management of farm Resources: Land, Labour and Capital.	
Unit-II	**Principles of farm management**	**15**
	2.1 Principles of farm management: Principles of Factor Substitution 2.2 Principles of Equi-Marginal Returns Opportunity Cost Principle 2.3 Minimum Loss Principle - Principle of Comparative Advantage 2.4 Comparison Principle	

Course Outcomes: Student will be able to…

1. make use of different techniques used in farm management.
2. adapt decision making in farm management.
3. utilize farm resources.
4. know different types of farming.

REFERENCE BOOKS:

1. Ghatak, S. and K. Ingerscent (1984), Agriculture and Economic Development, Select books, New Delhi.
2. GOI (2007), Report of The Working Group on Risk Management in Agriculture for the Eleventh Five Year Plan (2007-2012) , GOI, New Delhi
3. Kumar K N R (2015): Agricultural Production Economics, Volume-I, Daya Publishing House, A Division of Astral International Pvt. Ltd, New Delhi.
4. Lekhi R K & Singh Jogindar (2013): Agricultural Economics, Kalyani Publisher, New Delhi.
5. Reddy, Ram, Sastry & Devi (2010): Agricultural Economics Oxford & IBH publishing Co. Pvt. Ltd, New Delhi.
6. Sadhu A. N. & Singh Amarjit, Fundamentals of Agricultural Economics, (1996), Himalaya
7. Soni, R. N. (1995), Leading Issues in Agricultural Economics, Arihant Press, Jalandhar. Agriculture in Economic Development (1964), Carl 00Eicher and Lawrence Wit, McGraw Hill Book Company, New York

COURSE BFTTOE 128:- Agricultural Risk Management

Course Objectives: Students should be able to…

1. explain the nature of uncertainty in agriculture.
2. analyse risk management strategies.
3. illustrate market and management strategy.
4. understand crop insurance and risk mitigation tool

Credits (Total 02 Credits)	Agricultural Risk Management	No. of hours per unit/credits
Unit-I	**Agricultural Risk**	**15**
	1.1 Nature of Uncertainty in Agriculture: Price, Yield and Technological. 1.2Risks in Agriculture 1.3 Types of Risks: Climate, Drought, Production, Price, Financial 1.4 Market & Management Strategy	
Unit-II	**sk Management Strategies Periods)**	**15**
	2.1 Risk Management Strategies: National Agricultural Insurance 2.2 Scheme (NAIS), Pradhan Mantri Fisal Bima Yojana 2.2 Crop Insurance as Risk Mitigation Tool 2.3 Crop Insurance, Weather Insurance 2.4 Farm Income Insurance, Livestock Insurance and Package Insurance	

Course Outcomes: Student will be able to…

1. relate the risks in agriculture.
2. analyze risk management strategies
3. identify farm income insurance
4. estimate nature of uncertainty of agriculture

REFERENCE BOOKS:

1. Ghatak, S. and K. Ingerscent (1984), Agriculture and Economic Development, Select books, New Delhi.
2. GOI (2007), Report of The Working Group on Risk Management in Agriculture for the Eleventh Five Year Plan (2007-2012) , GOI, New Delhi
3. Kumar K N R (2015): Agricultural Production Economics, Volume-I, Daya Publishing House, A Division of Astral International Pvt. Ltd, New Delhi.
4. Lekhi R K & Singh Jogindar (2013): Agricultural Economics, Kalyani Publisher, New Delhi.
5. Reddy, Ram, Sastry & Devi (2010): Agricultural Economics Oxford & IBH publishing Co. Pvt. Ltd, New Delhi.
6. Sadhu A. N. & Singh Amarjit, Fundamentals of Agricultural Economics, (1996), Himalaya
7. Soni, R. N. (1995), Leading Issues in Agricultural Economics, Arihant Press, Jalandhar. Agriculture in Economic Development (1964), Carl 00Eicher and Lawrence Wit, McGraw Hill Book Company, New York

SEMESTER II

SEC

BFTTSEC- 103 ANALYTICAL TECHNIQUES – I

Course Objectives: Student should be able to…

1. Understand the methods of proximate analysis of food.
2. Know different types of solution

Credits (Total Credits 1)	SEC-103 ANALYTICAL TECHNIQUES – I	No. of hours (15 hours)
UNIT I	**Proximate Analysis of Food**	**8**
	Introduction, Preparation of sample, Methods for estimation of moisture, protein, fat, fiber, ash and carbohydrate.	
UNIT II	**Types of Solution**	**7**
	Molar Solution, Normal solution, Colloidal solutions, Buffer solutions, Measurement of pH, acidity.	

Course Outcomes: Students will be able to…

1. apply the methods of proximate analysis of food.
2. prepare different types of solution

Reference Books:

1. Morris B. Jacobs, The chemical analysis of foods and food products, CBS Publishers and distributors New Delhi, III Edition, 2000.
2. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, Tata McGraw Hill Publishing Co. NewDelhi.,3rd edition,2007.
3. D.T. Plummer, An introduction to practical biochemistry, Tata McGraw Hill Publishing Co. New Delhi, 3rd edition, 2004.
4. Pomeranz Y., Meloan, Food Analysis: Theory and practice, Clifton E. 1994. 3 Edn. IS: 6273 (Part- 1and Part-2). Chapman and Hall, 3rd edition, 2004.

LAB-I
ANALYTICAL TECHNIQUES –l

Course Objectives: Student should be able to…

1. Know the primary and secondary solution.
2. explain methods of the determination of moisture content, ash content, fat content, fiber content, protein content of indifferent food sample.

Credits (Total Credits 1)	ANALYTICAL TECHNIQUES – I	No. of hours (30 hours)
1	To estimate carbohydrates by phenol sulfuric acid method.	
2	To estimate protein by Biuret method.	
3	To estimate reducing sugar from food	
4	To estimate non- reducing sugar from food	
5	To study the preparation of primary solutions.	
6	To study the preparation of secondary solutions.	
7	To determine the pH of different food samples.	
8	To determine the acidity of given food samples	
9	To determine the moisture Content from given food samples	
10	To determine the ash content from given food samples.	
11	To determine the fiber content from given food samples.	
12	To determine the fat content from given food samples.	
13	To determine dietary fiber from food	
14	To study the preparation of Normal solution	
15	To study the preparation of Molar solution	

Course Outcomes: Students will be able to…

1. analyze the fat and acidity indifferent food sample.
2. determine moisture content, ash content, fat content, fiber content, protein content of indifferent food sample.

REFERENCE BOOKS:

1. Connie M. Weaver, James R. Daniel, The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists, 1996.
2. Morris B. Jacobs, The chemical analysis of foodsand food products, CBS Publishers and distributors New Delhi.3rd edition 2018.
3. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, (Tata McGraw Hill Publishing Co. New Delhi, 2003.
4. Dennis D. Miller, Food Chemistry: A Laboratory Manual, Wiley 2017.