

**B.Sc. Food Processing and Packaging (entire)(CBSC)  
syllabus w. e. f. june 2020**

**1. Structure of Syllabus: B.Sc.-III Semester-V**

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA						
COURSE STRUCTURE UNDER AUTONOMY						
B. Sc. Food Processing and Packaging(ENTIRE)						
B. Sc. III SEMESTER– V (Duration – 6 Months)						
Sr. No	SUBJECT CODE	TEACHING SCHEME				
		Theory		Practical		
		No. of lectures	Credits	Subject	No. of lectures	Cre dits
1	BFPT 501 Food Biotechnology	3	2	Lab XV BFPP 508: Food Biotechnology and Nutraceuticals and Functional Foods	10	4
2	BFPT 502 Nutraceutical and Functional Food	3	2			
3	BFPT 503 Human Physiology	3	2			
4	ELECTIVE PAPERS	3	2	Lab XVI BFPP 509: Human Physiology and Food Product Development and Computer Applications/ Food Plant Organization and Computer Applications/ Instrumentation, Process Control and Computer Applications	10	4
	BFPT 504 Food Product Development and Computer Applications					
	BFPT 505 Food Plant Organization and Computer Applications					
	BFPT 506 Instrumentation, Process Control and computer applications			Lab XVII BFPP 510 Project (Phase –I)	5	2
5	BFPT SECC 507- Numerical Skills	2	1	Lab XVIII BFPP 511 - Numerical Skills	3	1
6	AECC-5 English	3	2			
	<b>Total of SEM V</b>	<b>17</b>	<b>11</b>		<b>28</b>	<b>11</b>
<b>TOTAL NO OF CREDITS FOR SEMESTER V: 22</b>						

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA						
COURSE STRUCTURE UNDER AUTONOMY						
B. Sc. Food Processing and Packaging (ENTIRE)						
B. Sc. III SEMESTER- VI (Duration- 6 Months)						
Sr. No	SUBJECT CODE	TEACHING SCHEME				
		Theory		Practical		
		No. of lectures	Credit s	Subject	No. of lectures	Credits
1	BFPT 601 Food Quality and Sensory Evaluation	3	2	Lab XIX BFPP 608: Food Quality and Sensory Evaluation and Food Safety and Plant Sanitation	10	4
2	BFPT 602 Food Safety and Plant Sanitation	3	2			
3	BFPT 603 Food Fermentation Technology	3	2	Lab XX BFPP609: Food Fermentation Technology and Beverage Technology and Government Laws and Regulations/ Snack Food Processing and Government Laws and Regulations/ Extrusion Technology and Government Laws and Regulations	10	4
4	ELECTIVE PAPERS	3	2			
	BFPT 604 Beverage Technology and Government Laws and Regulations					
4	BFPT 605 Snack Food Processing and Government Laws and Regulations	3	2	Lab XXI BFPP 610 Project (Phase-II)	5	2
	BFPT 606 Extrusion Technology and Government Laws and Regulations					
5	SECCBFPT 607 Entrepreneurship Management	2	1	Lab XXII BFPP-611 Entrepreneurship Management/Industrial Training	3	1
6	AECC-6 English	3	2			
	<b>Total of SEM VI</b>	<b>17</b>	<b>11</b>		<b>28</b>	<b>11</b>
<b>TOTAL NO OF CREDITS FOR SEMESTER VI: 22</b>						
<b>TOTAL NO OF CREDITS FOR SEMESTER V+ VI: 44</b>						

**Titles of Papers:**

Sr. No.	Semester-V	Semester-VI
1	BFPT-501: Food Biotechnology	BFPT-601: Food Quality and Sensory Evaluation
2	BFPT-502: Nutraceutical and Functional Food	BFPT-602: Food Safety and Plant Sanitation
3	BFPT-503: Human Physiology	BFPT-603: Food Fermentation Technology
<b>Elective Papers (Anyone)</b>		
4	BFPT-504: Food Product Development and Computer Applications BFPT-505: Food Plant Organization and Computer Applications BFPT-506: Instrumentation, Process Control and computer applications	BFPT-604: Beverage Technology and Government Laws and regulations BFPT-605: Snack Food Processing and Government Laws and regulations BFPT-606: Extrusion Technology and Government Laws and regulations
5	BFPT SECC 507- Numerical Skills	SECC BFPT 607 Entrepreneurship Management
6	Lab XV BFPP-508: Food Biotechnology and Nutraceuticals and Functional Foods	<b>Lab XIX BFPP 608 :</b> Food Quality and Sensory Evaluation and Food Safety and Plant Sanitation
7	Lab XVI BFPP 509: Human Physiology and Food Product Development and Computer Applications/ Food Plant Organization and Computer Applications/ Instrumentation, Process Control and Computer Applications.	<b>Lab XX BFPP 609:</b> Food Fermentation Technology and Beverage Technology and Government Laws and Regulations/ Snack Food Processing and Government Laws and Regulations/ Extrusion Technology and Government Laws and Regulations.
8	Lab XVII BFPP 510 Project(Phase-I)	Lab XXI BFPP 610 Project (Phase -II)
9	Lab XVIII BFPP 511- Numerical Skills	Lab XXII BFPP -611 Entrepreneurship Management/Industrial Training

## Evaluation Structure B.Sc. III

## Semester V

Subject	Theory Course	ESE	Internal Exam		Total	Subject	Practical I	Submission		
			ISE- I	ISE- II (Online Test)				Exam	Case study/ Educational Tour/ Seminar/ Training / Scientific Writing	Day to Day Performance
1	BFPT-501	40	5	5	50	BFPT 508	40	5	5	50
2	BFPT-502	40	5	5	50					
3	BFPT-503	40	5	5	50	BFPT 509	40	5	5	50
4	BFPT-504	40	5	5	50					
	BFPT-505									
	BFPT-506									
5	SECC-507	20	0	0	20	BFPT 510	30	10	10	50
6	AECC-English	40	5	5	50	SECC 511	30	0	0	30
	TOTAL	220	25	25	270		140	20	20	180
<b>TOTAL T+P (Semester V) = 450</b>										

## Evaluation Structure B.Sc. III

## Semester VI

Subject	Theory Course	ESE	Internal Exam		Total	Subject	Practical I	Submission		
			ISE- I	ISE- II (Online Test)				Exam	Case study/ Educational Tour/ Seminar/ Training / Scientific Writing	Day to Day Performance
1	BFPT-601	40	5	5	50	BFPT 608	40	5	5	50
2	BFPT-602	40	5	5	50					
3	BFPT-603	40	5	5	50	BFPT 609	40	5	5	50
4	BFPT-604	40	5	5	50					
	BFPT-605									
	BFPT-606									
5	SECC-607	20	0	0	20	BFPT 610	30	10	10	50
6	AECC-English	40	5	5	50	SECC 611	30	0	0	30
	<b>TOTAL</b>	220	25	25	270		<b>140</b>	<b>20</b>	<b>20</b>	<b>180</b>
<b>TOTAL T+P (Semester V) = 450</b>										
<b>GRAND TOTAL (Semester V + VI) = 450+450=900 (Including English)</b>										

**BFPT 501: FOOD BIOTECHNOLOGY****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Define biotechnology, its advantages, disadvantages and applications.
2. Learn about genetic material, tools and techniques in molecular biology.
3. Understand production of genetically engineered foods and organisms and its risks.
4. Understand the applications of biotechnology in food.

**Unit I: Introduction to Biotechnology****(11 Lectures)**

Definition, Introduction, Milestones in history of biotechnology, Traditional and Modern Biotechnology, Advantages and Disadvantages of biotechnology, Basic Terminologies in biotechnology, ethical and legal concerns, safety aspects of foods produced by biotechnology, Applications.

**Unit II: Molecular Biology****(11 Lectures)**

Basic structure of DNA and RNA, Enzymes used in molecular biology, Gene cloning, cloning vectors, Polymerase Chain Reaction.

**Unit III: Genetic Engineering****(11 Lectures)**

Definition, Introduction, Production of genetically modified crops and micro-organisms with examples, Future trend of GM crops, Food ingredients derived from genetically modified organisms, Risk of GMOs and GM Foods to Human Health and Environment.

**Unit IV: Applications of Food Biotechnology****(12 Lectures)**

Improvement of plant nutritional and functional quality, biotechnology in enhancement of food production and quality, Plant based vaccines, milk proteins, Reconstitution of human milk proteins, manipulation of fruit ripening, Modern biotechnological regulatory aspects in food industries, Biotechnology and food- social appraisal.

**RECOMMENDED BOOKS:**

1. **Text book biotechnology**, Dubey, R.C, S.Chand and Co Ltd, New Delhi, 2014.
2. **Biotechnology**, U.Satyanarayana and U. Chakrapani, S. Chand Publications, 2005.
3. **Elements of biotechnology**, Gupta, P.K, Rostogi and Co, Meerut, 1996.
4. **Biotechnology Expanding Horizons**, Singh. B. D Kalyani Publishers, 2009.
5. **Protein Biotechnology**, Gary Walsh and Denis R. Headen, John Wiley and Sons England, 2005.
6. **Fundamentals of food biotechnology**, Lee, B.H., VCH publishers, Inc. New York, 1996.
7. **Food Microbiology**, Frazier and West Hoff, Tata McGraw Hill publishing company, Ltd, New Delhi, 1995.
8. **Food industry wastes, disposal and recovery**, Herzaka, A. and R.G, Applied Science Publishers, London. 2001.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Understand the general terminologies in biotechnology.
2. Explain advantages, disadvantages, and applications of biotechnology.

**Unit II: After completion of the unit, Students are able to:**

1. Understand the basics of molecular biology and cloning techniques.
2. Understand the competence of molecular biology techniques.

**Unit III: After completion of the unit, Students are able to:**

1. Learn production process of genetically engineered foods and organisms.
2. Understand the future trends of GMO's, its risks to human health and environment.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand the application of biotechnology in food.
2. Understand the modern biotechnological regulatory aspects in food industries.

**BFPT 502: NUTRACEUTICALS AND FUNCTIONAL FOODS****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Know the concept of nutraceuticals and functional foods.
2. Understand the importance of nutraceutical and its components.
3. Understand the role of nutraceutical in disease prevention.
4. Understand the concept of prebiotics and probiotics and their effect on gastro-intestinal health.

**Unit I: Concept on Nutraceuticals and Functional Foods. (11 Lectures)**

Nutraceutical and functional foods, Biological significance of nutraceuticals, Nutraceuticals and dietary supplement, World market for nutraceuticals, regulatory issues, Nutrigenomics: nutrigenomics an introduction and its relation to nutraceuticals.

**Unit II: Nutraceuticals and Functional Food Components. (12 Lectures)**

Natural pigments (Chlorophyll, Chlorophyllin, Carotenoids), Anthocyanins, Glucosinolates, Isoflavonoids, Phytoestrogens, Omega-3 and Omega-6 fatty acids, Antioxidants, Phytosterols, Dosage for effective control of disease or health benefit with adequate safety.

**Unit III: Role of Nutraceuticals in Disease Control. (11 Lectures)**

Nutraceuticals in disease prevention: angiogenesis and cardiovascular diseases, cancer, diabetes, cholesterol management, obesity and inflammation dosage levels.

**Unit IV: Prebiotic and Probiotics Foods. (11 Lectures)**

Concept and role of prebiotics and probiotics, types of prebiotics, effect of prebiotics and probiotics on Gastro intestinal health and other benefits, beneficial microbes; prebiotic ingredients in foods, Fructo- oligosaccharides as probiotic food components.



**RECOMMENDED BOOKS:**

1. **Food is Medicine- An introduction to Nutraceuticals**, Dr. Perkins Muredzi, 2013.
2. **Prebiotics and Probiotics**, Przemyslaw Jan Tomasik and PiotTomasik, 2003.
3. **Natural colorants for food and nutraceutical uses**, Fransico Delgado-Varges, Octavia Paredes- Lopez, 2003.
4. **Handbook of Nutraceuticals and Functional Foods**. Wildman, Robert EC., 2nd edition, 2006

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Define nutraceuticals and functional foods.
2. Understand the nutrigenomics: An introduction and its relation to nutraceuticals.

**Unit II: After completion of the unit, Students are able to:**

1. Understand the natural pigments.
2. Understand the dosage for effective control of disease or health benefit with adequate safety.

**Unit III: After completion of the unit, Students are able to:**

1. Understand the risk factors for chronic diseases.
2. Understand the role of nutraceuticals in disease prevention.

**Unit IV: After completion of the unit, Students are able to:**

1. Define prebiotics and probiotics and explain types of prebiotics.
2. Understand the effect of prebiotics and probiotics on gastrointestinal health and other benefits.

**BFPT 503 HUMAN PHYSIOLOGY****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Acquire knowledge of the structure and physiology of human body.
2. Understand the relationship between human physiology and health.
3. Understand the relationship between nutrition and human wellbeing.
4. Understand the functions and importance of nutrients for different ages.

**Unit I: Cell and Tissues****(11 Lectures)**

Structural components of cell and tissue, types of tissue (epithelial, connective, muscular and nervous tissue etc) and their functions. Human organs and their functions, Water and electrolytic balance in human body and associated disorders.

**Unit II: Human Digestive System****(11 Lectures)**

Structure and functions of Digestive system, Food digestion process and Organs of Digestion – Oesophagus, Stomach, Small intestine and Large intestine – Structure and functions Associated organs of digestion – Liver, Gall bladder, Pancreas (Digestive function) and Spleen etc – Structure and functions, Failure in digestive system and associated disorders.

**Unit III: Blood Circulation System****(12 Lectures)**

Structure and functions of circulation system and its components- Heart, Vein, Arteries etc, composition and role of blood, blood coagulation, blood groups and Rhesus factor, blood transfusion. Failure in circulation system and associated disorders- Blood Pressure, Factors affecting blood pressure, hypertension, Pulse etc.

**Unit IV: Human Excretory System****(11 Lectures)**

Structure and functions of Excretory system, Mechanism of urine formation, composition of urine, Micturition. Role of kidney in maintaining pH of blood, Acid-base balance, Fecal Matter and Sweat, Failure in Excretory system and associated disorders.

**RECOMMENDED BOOKS:**

1. **Human Physiology and Health** David Wright, published Heinemann publishing house.2007.
2. **Textbook of Medical Physiology**, Guyton and Hall, Elsevier Saunders 11<sup>th</sup> edition, 2006.
3. **Anatomy and Physiology in Health and Illness**, Waugh, A. and Grant, A Churchill Livingstone 9<sup>th</sup> edition, 2004
4. **Anatomy and Physiology**, J. Gordon Betts, Tyler junior college, Kelty A. Young, Openstax, 2013
5. **Fundamentals of human Physiology**, Lauralee Sherwood, Physiology, published BROOKS/COLE, CENGAGE Learning, 4<sup>th</sup> edition, 2010

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Understand the structural components of cell and tissue
2. Understand the functions human organs

**Unit II: After completion of the unit, Students are able to:**

1. Understand the structure and functions of digestive system
2. Understand the food digestion process

**Unit III: After completion of the unit, Students are able to:**

1. Understand the structure and functions of circulation system and its components
2. Understand the blood transfusion failure in circulation system and associated disorders

**Unit IV: After completion of the unit, Students are to:**

1. Understand the structure and functions of excretory system.
2. Understand the failure in excretory system and associated disorders.

**BFPT 504 FOOD PRODUCT DEVELOPMENT AND COMPUTER APPLICATIONS**

**Theory: 45 Lectures of 48minutes  
(36 Hours) Marks -50 (Credits: 02)**

**Course Objectives: Students should:**

1. Define new product, its classification, reasons, product development influences and NPD team.
2. Understand product development process, proximate analysis, shelf life study of new product in accordance with fssai standards.
3. Understand the basics of computer application.
4. Understand the application of MS excel to solve the problems of food technology.

**A. FOOD PRODUCT DEVELOPMENT****Unit I: Basics of Food Product Development (11 Lectures)**

Definition, Classification of new food product, Reason for new food, Product development– social concerns, Health concerns., Product development- Market place influences, Technological influences, Governmental influences, Product life cycle, New Product Development team, concept of market and marketing.

**Unit II: Steps in Food Product Development (11 Lectures)**

Idea Generation, Idea Screening, Concept testing, Business analysis, Product development, Test marketing, Commercialization., Market and literature survey to identify the concepts of new products, Development of prototype product and standardization of formulation process, proximate analysis, shelf life study of new product, Cost analysis and final project report.

**B. COMPUTER APPLICATIONS****Unit III: Basics of Computer Applications (11 Lectures)**

Introduction to various software for their application in food technology, Application of MS Excel to solve the problems of Food Technology-Mechanical transport of liquid food - Measuring viscosity of liquid food using a capillary tube viscometer, solving simultaneous equations in designing multiple effect evaporators while using matrix algebra available in excel.

**Unit IV: Application of MS Excel to Solve the Problems of Food****Technology (12 Lectures)**

Microbial distraction in thermal processing- Determining decimal reduction time from microbial survival data, Thermal resistance factor, Z-values in thermal processing of food, Sampling to ensure that a lot is not contaminated with more than a given percentage.

Sensory evaluation of food- Statistical descriptors of a population estimated from sensory data obtained from a sample- Analysis of variance One factor completely randomized design, for two factor design without replication, Use of linear regression in analyzing sensory data.

**RECOMMENDED BOOKS:**

1. **Food Product Development**, M Earle, R Earle, A Anderson, Woodhead Publishing, 2001.
2. **New Food Product Development: from Concept to Marketplace**, Gordon W Fuller, CRC Press, 3rd edition, 2011.
3. **Methods for Developing the New Food Products**, Fadi Aramouni, Kathryn Deschenes, Desteh Publications, 2nd edition, 2017.
4. **Strategies for Formulations Development: A step-by-step Guide using JMP**, Ronald D. Snee, Roger W. Hoeri, SAS Institute; revised edition, 2016.

5. **An Integrated Approach to New Food Product Development**, Howard R. Moskowitz, I. Sam Saguy, Tim Straus, CRC Press, 2009.
6. **Computer Applications in Food Technology: Use of Spread sheets in Graphical, Statistical and Process Analysis**, R.Paul Singh, 1996.
7. **Introduction to MATLAB for Engineers**, William J. Palm McGraw-Hill Companies, Inc., NY, USA. 3<sup>rd</sup> edition, 2011

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Define new product, its classification.
2. Understand the reasons, product development influences and NPD team.

**Unit II: After completion of the unit, Students are able to:**

1. Understand the product development process, proximate analysis.
2. Understand the shelf life study of new product in accordance with fssai standards.

**Unit III: After completion of the unit, Students are able to:**

1. Understand the various software for their application in food technology.
2. Understand the application of MS Excel to solve the problems of food technology.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand the application of MS excel to solve the problems of microbial distraction in thermal processing.
2. Understand the application of MS excel to solve the problems of sensory evaluation of food.

**BFPT 505 FOOD PLANT ORGANIZATION AND COMPUTER APPLICATIONS****Theory: 45 Credits: 2****Course Objectives: Students should:**

1. Understand food plant management, plant layout and regulatory requirements of food industries.
2. Understand structure, operation, management and planning of food plants.
3. Understand the basics of computer application.
4. Understand the application of MS excel to solve the problems of food technology.

**A. FOOD PLANT ORGANIZATION****Unit I: Introduction of Plant Organization. (11 lectures)**

Operation Research, definition and scope, techniques in operation research. Food plant management factors bearing on location and layout of food plants, Regulatory requirements of food industries.

**Unit II: Structure and Operation of Food Plant. (11 lectures)**

Structure and operation of food plants, Executive design making in a food plant, Decision protocols, Evolution and role of management planning, organizing and controlling, Decision processed for raising efficiency, productivity and quality in food plant operation, System analysis, its need and methodology.

**B.COMPUTERAPPLICATIONS****Unit III: Basics of Computer Applications. (11 Lectures)**

Introduction to various software for their application in food technology, Application of MS Excel to solve the problems of Food Technology-Mechanical transport of liquid food - Measuring viscosity of liquid food using a capillary tube viscometer, solving simultaneous equations in designing multiple effect evaporators while using matrix algebra available in excel.

**Unit IV: Application of MS Excel to Solve the Problems of Food Technology.****(12 Lectures)**

Microbial distraction in thermal processing- Determining decimal reduction time from microbial survival data, Thermal resistance factor, Z-values in thermal processing of food, Sampling to ensure that a lot is not contaminated with more than a given percentage. Sensory evaluation of food- Statistical descriptors of a population estimated from sensory data obtained from a sample- Analysis of variance One factor completely randomized design, for two factor design without replication, Use of linear regression in analyzing sensory data.

**RECOMMENDED BOOKS:**

1. **Operations Research.** Sivarethinamohan, R. Tata McGraw Hill Pub. Co. Ltd., 2005
2. **Managerial Economics- Analysis, Problems and cases,** Metha, P.L. 2003. Sultan Chand and Sons, New Delhi.
3. **Plant Layout and Design M Moor,** Mac Millan, Lames, New York.
4. **Milk Plant Layout,** H.S. Hall and Y.S. Rosen, FAO Publication, Rome.
5. **Dairy and Food Engineering,** F.W. Farrall, John Willy and Sons, New York.
6. **Food Plant Design,** Antonio López Gómez
7. **Food plant engineering systems,** Theunis C. Robberts, CRC Press, Washington
8. **Food Process Design, Zacharias,** B. Maroulis published by Marcel Dekker, Inc , Cimarron Road, Monticello, New York 12701, U SA
9. **Marketing Management Sherilaker,** Himalaya Publishing Company 2001.
10. **Computer Applications in Food Technology: Use of Spread sheets in Graphical, Statistical and Process Analysis,** R.Paul Singh, 1996
11. **Introduction to MATLAB for Engineers,** William J. Palm McGraw-Hill Companies, Inc., NY, USA. 3<sup>rd</sup> edition, 2011



**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Understand the food plant management.
2. Understand the plant layout and regulatory requirements of food industries.

**Unit II: After completion of the unit, Students are able to:**

1. Understand the structure and operation of food plants.
2. Understand the management and planning of food plants.

**Unit III: After completion of the unit, Students are able to:**

1. Understand the various software for their application in food technology.
2. Understand the application of MS Excel to solve the problems of food technology.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand the application of MS excel to solve the problems of microbial distraction in thermal processing.
2. Understand the application of MS excel to solve the problems of sensory evaluation of food.

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**BFPT 506 INSTRUMENTATION, PROCESS CONTROL AND COMPUTER APPLICATIONS****Course Objectives: Students should:**

1. Know the concept of pressure measurement
2. Understand the concept of temperature measurement
3. Understand the basics of computer application.
4. Understand the application of ms excel to solve the problems of Food Technology.

**A. INSTRUMENTATION, PROCESS CONTROL****Unit I: Pressure Measurement.****(11 Lectures)**

Functional Elements of an Instrument, Static characteristics of an Instrument: Calibration, Accuracy, Precision, Repeatability, Reproducibility, Sensitivity. Different Types of Pressure: Gauge Pressure, Absolute Pressure, Differential Pressure. Mechanical Transducer: C-type Bourdon Gauge for measurement of Pressure, Diaphragm, Bellows, Capsule. Electric Transducer for measurement of Pressure: LVDT, Capacitive Type Pressure Transducer, Piezoelectric, Type Pressure Transducer, Low Pressure Measurement by McLeod and Pirani Gauge.

**Unit II: Temperature, Flow and Thermal Conductivity Measurement. (11 Lectures)**

Temperature Scale, IPTS-20, Temperature Resistance relation with deduction, measurement by Bi-metal thermometers, resistance thermometer, thermistor, thermocouples, thermopile, radiation and optical pyrometer. Measurement by hot wire anemometer flow measurement and level under different parameters, magnetic flow meter, Visualization by shadow graph, Interferometer, level control, definition, Measurement of thermal conductivity of solid, liquid and gas, Definition under Different conditions of diffusivity, diffusivity of gas measurement.

**B.COMPUTERAPPLICATIONS****Unit III: Basics of Computer Application.****(11 Lectures)**

Introduction to various software for their application in food technology, Application of MS Excel to solve the problems of Food Technology-Mechanical transport of liquid food - Measuring viscosity of liquid food using a capillary tube viscometer, solving simultaneous equations in designing multiple effect evaporators while using matrix algebra available in excel.

**Unit IV: Application of MS Excel to Solve the Problems of Food Technology****(12 lectures)**

Microbial distraction in thermal processing- Determining decimal reduction time from microbial survival data, Thermal resistance factor, Z-values in thermal processing of food, Sampling to ensure that a lot is not contaminated with more than a given percentage. Sensory evaluation of food- Statistical descriptors of a population estimated from sensory data obtained from a sample- Analysis of variance One factor completely randomized design, for two factor design without replication, Use of linear repression in analyzing sensory data.

**RECOMMENDED BOOKS:**

1. **Process Instrumentation and Control**, A.P. Kulkarni, Nirali Publication, 2015
2. **Industrial Instrumentation**, K. Krishnamurthy, S Vijayachitra, Krishna Swamy New Age International, Jan 2005.
3. **Chemical Instrumentation and Process Control**, Mrs. P. D.Kulkarni, D.B.Dhone, Nirali Publication. Aug-2017
4. **Textbook of industrial Instrumentation**, S.K. Singh, July 2017
5. **Computer Applications in Food Technology: Use of Spread sheets in Graphical, Statistical and Process Analysis**, R. Paul Singh, 1996
6. **Introduction to MATLAB for Engineers**, J. Palm McGraw-Hill Companies, Inc., NY, USA. 3<sup>rd</sup> edition, 2012.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Define pressure measurement.
2. Understand the different types of pressure

**Unit II: After completion of the unit, Students are able to:**

1. Define temperature measurement.
2. Understand the measurement of thermal conductivity of solid, liquid and gas.

**Unit III: After completion of the unit, Students are able:**

1. Understand the various software for their application in food technology.
2. Understand the applications of MS Excel to solve the problems of food technology.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand the applications of MS excel to solve the problems of microbial distraction in thermal processing.
2. Understand the applications of MS Excel to solve the problems of sensory evaluation of food.

**BFPT SECC 507: NUMERICAL SKILLS (STATISTICAL QUALITY CONTROL)**

**Theory: 23 lectures, 48 minutes (18 Hours)**

**Course Objectives: Students should:**

1. Learn statistical quality control.
2. Understand about food quality system.
3. Understand the common measures of central tendency—mean, mode, median.
4. Understand the common measures of dispersion.

**Unit I: Statistic in Food Quality Control (12 Lectures)**

Introduction: The meaning of quality and quality improvement, quality control programs, quality control tools, problems with tool selection, Statistical methods for quality control and improvement. Food Quality System: The formalized quality system, quality system guidelines, Total quality management, team quality systems, computer network quality systems; The link between quality and productivity; Quality costs; Legal aspects of quality; implementing quality improvement.

**Unit II: Measures of Central Tendency and Dispersion. (11 Lectures)**

Measure of central tendency-Mean, Mode, Median, Measures of dispersion-Range  
Quartile deviation, Decile range, Mean deviation, standard deviation, methods of data  
collection, sampling methods.

**RECOMMENDED BOOKS:**

1. **Statistical Quality Control for the Food Industry**, Merton R.Hubbard, Springer  
US, 2003.
2. **Introduction to Statistical Quality Control**, D.C.Montgomery, John Wiley and  
Sons; 6th Revised edition, 2008.
3. **Introductory Statistics**, P.S.Mann, John Wiley and Sons, 7th Edition, 2010.
4. **Fundamentals of Statistical Quality Control**, Jerome D.Braverman, Brady  
publisher, 1981.
5. **Biostatics in theory and Practicals**, T.K. Saha, Emkkay Publication, New  
Delhi.1997.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Define statistical quality control.
2. Understand the food quality system.

**Unit II: After completion of the unit, Students are able to:**

1. Understand the common measures of central tendency–mean, mode, median.
2. Understand the common measures of dispersion.

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**LAB XV BFPP 508: FOOD BIOTECHNOLOGY AND NUTRACEUTICALS  
AND FUNCTIONAL FOODS.**

**SECTION A: FOOD BIOTECHNOLOGY**

**Course Objectives: Students should:**

1. Understand the colorimetric estimation of dna and rna.
2. Demonstrate the working of PCR, ELISA and agarose gel electrophoresis.
3. Understand the isolation of DNA from plant source, bacterial cell and food sample.
4. Study the effect of UV light and mutation on microorganisms.

**Experiments**

1. Colorimetric estimation of DNA by DPA method.
2. Colorimetric estimation of RNA by Orcinol method.
3. Isolation of genomic DNA from bacteria.
4. Isolation of DNA from plant by C-TAB method.
5. Restriction digestion of DNA by Restriction Endonucleases.
6. Demonstration of PCR.
7. Demonstration for detection of GM foods.
8. Isolation of DNA from food sample.
9. Introduction to ELISA.
10. Screening of auxotrophic mutants by using replica plate technique.
11. Demonstration of Agarose gel electrophoresis.
12. Study of effect of UV light on the microorganisms.

**RECOMMENDED BOOKS:**

1. **Practical Microbiology**, R.C. Dubey and D.K. Maheshwari, S. Chand, 2010.
2. **Manual of Microbiology Tools and Techniques**, Kanika Sharma, 2<sup>nd</sup> Edition, 2007.
3. **Laboratory Manual of Food Microbiology**, Neelima Garg, K.L. Garg, G. Mukerji, Dreamtech Press, February 2020.

4. [https://www.google.com/search?q=isolation+of+DNA+from+food+sample+and+rlz=1C1GGRV\\_enIN89](https://www.google.com/search?q=isolation+of+DNA+from+food+sample+and+rlz=1C1GGRV_enIN89)
5. 8IN898 andoq=isolation+of+DNA+from+food+sample+and+aqs=chrome.69i57.24864j0j8 and source id = chrome and ie= UTF - 8

**Course outcomes:****After completion, Student are able to:**

1. Estimate dna and rna.
2. Learn working of PCR, ELISA and agarose gel electrophoresis.
3. Isolate DNA from plant source, bacterial cell and food sample.
4. Understand the effect of UV light and mutation on microorganisms.

**SECTION B: NUTRACEUTICALS AND FUNCTIONAL FOODS****Course Objectives: Students should:**

1. Know the method for estimation of chlorophyll, lycopene, anthocyanine.
2. Know the estimation of chlorogenic acid from coffee.
3. Know the estimation method of total nitrogen of foods by kjeldahl and micro kjeldahl methods.
4. Know different preparation methods for preparing probiotic food/drink.

**Practicals**

1. Estimation of chlorophyll from suitable plant material.
2. Estimation of lycopene from suitable plant material.
3. Estimation of anthocyanine from suitable plant material.
4. TLC separation of Plant pigments- Chlorophyll, Carotene, Xanthophyll.
5. Extraction and estimation of total sugars from food products (dairy product, fruit juices, bread).
6. Estimation of crude fat contents of foods by Soxhlet method (Butter, Margarine, edible oil).
7. Estimation of total Nitrogen of foods by Kjeldahl and Micro Kjeldahl methods.

8. Estimation of chlorogenic acid from coffee.
9. Determination of total pectin in plant material
10. Estimation of crude fiber/dietary fiber content in cereals and their products.
11. Preparation of probiotic food
12. Preparation of probiotic drink.

**RECOMMENDED BOOKS:**

1. **Handbook of Analysis and Quality control for fruit and vegetable products**, S. Ranganna, Tata McGraw Hill Publishing Co. NewDelhi.,3<sup>rd</sup> edition,2007
2. **Probiotic Food Products classes, types and processing**, Saddam S. Awaishesh.
3. **The chemical analysis of foods and food products**, Morris B. Jacobs, CBS Publishers and distributors New Delhi, III Edition, 2000.

**Course outcomes:****After completion, Students are able to:**

1. Estimate of chlorophyll, lycopene, anthocyanine.
2. Estimate method of chlorogenic acid from coffee.
3. Estimate method of total nitrogen of foods by kjeldahl and micro kjeldahl methods.
4. Prepare probiotic food/drink.

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**Lab XVI BFPP 509: Human Physiology and Food Product Development and Computer Applications/ Food Plant Organization and Computer Applications/ Instrumentation, Process Control and Computer Applications**

**SECTION A: Human Physiology**

**Course Objectives: Students should:**

1. Understand the microscopic study of different systems in human body.
2. Understand the methods for testing of blood groups, coagulation time and bleeding time of blood.
3. Understand the method of measuring the blood pressure using sphygmomanometer, effect of exercise on pulse rate, and blood pressure.
4. Understand the anatomy of heart, kidney.

**Experiments**

1. Standardization of weights and measurements.
2. Testing of blood groups
3. Determination of coagulation time, bleeding time of blood.
4. Reading of pulse rate, body temperature.
5. Measurement of blood pressure at normal conditions and during exercise using sphygmomanometer.
6. Estimation of Haemoglobin by Sahli's Method.
7. Recording blood pressure using sphygmomanometer, effect of exercise on pulse rate, and blood pressure.
8. Anatomy of heart, kidney.
9. Microscopic study of different tissues - Epithelial, connective, muscular and nervous tissues
10. Microscopic study of digestive organs - Pancreas, stomach, small intestine, liver
11. Microscopic study of respiratory organs - Lung, trachea
12. Microscopic study of excretory system - Kidney, nephron
13. Microscopic examination of prepared slides - Fresh mount of blood and stained blood smear

**RECOMMENDED BOOKS:**

1. **A textbook of Practical Physiology**, V.G.Ranade, Dr.P.N.Joshi and Shalini Pradhan  
Published PVG Prakashan ,Pune.
2. **Practical Handbook of Human Physiology**, Vadivelan Ramachandran, Satish  
Mutthurreddy Natraj, elango Kannan by Lambert Academic Publishing

**Course outcomes:****After completion, Students are able to:**

1. Understand the different systems in human body.
2. Understand the methods for testing of blood groups, coagulation time and bleeding time of blood.
3. Understand the methods of measuring the blood pressure using sphygmomanometer, effect of exercise on pulse rate, and blood pressure.
4. Understand the anatomy of heart, kidney.

**SECTION B: Food Product Development and Computer Applications****Course Objectives: Students should:**

1. Know the methods of market survey, product idea screening.
2. Know the standardization of product formulation, proximate analysis and shelf life of new product.
3. Know the problem solving using spreadsheet.
4. Know the use of word processing software for creating reports.

**Practicals**

1. Market and literature survey to identify the concepts of new products.
2. Screening of product concept on the basis of techno-economic feasibility.
3. Standardization of formulation process.
4. Proximate Analysis of New Product
5. Packaging and labeling of the new food product.
6. Shelf life study of the new food product.
7. Introduction to Computer

8. Operating system practice using DOS commands
9. Problem solving using spreadsheet
10. Use of statistical package for analysis of data
11. Use of word processing software for creating reports
12. Introduction to MATLAB

**RECOMMENDED BOOKS:**

1. **Food Product Development**, M Earle, R Earle, A Anderson, Woodhead Publishing, 2001.
2. **New Food Product Development: from Concept to Marketplace**, Gordon W Fuller, CRC Press, 3rd edition, 2011.
3. **Methods for Developing the New Food Products**, Fadi Aramouni, Kathryn Deschenes, Desteh Publications, 2nd edition, 2017.
4. **Computer Applications in Food Technology: Use of Spread sheets in Graphical, Statistical and Process Analysis**, R. Paul Singh, AP.
5. **Introduction to MATLAB for Engineers**, William J. Palm 3<sup>rd</sup> Ed. McGraw Hill Companies, Inc., NY, USA. 2011

**Course outcomes:****After completion, Students are able to:**

1. Perform market survey.
2. Know product idea screening concept.
3. Solve problem using spreadsheet.
4. Use word processing software for creating reports.

**OR**

**SECTION B: Food Plant Organization and Computer Applications****Course Objectives: Students should:**

1. Understand designing plant layout and regulatory requirements of food industries.
2. Understand structure, operation, management and planning of food industries.
3. Know the problem solving using spreadsheet.
4. Know the use of word processing software for creating reports.

**Experiments**

1. Layout of Food storage wares and godowns
2. Layout and design of cold storage
3. Layout of pre-processing house
4. Design and layout of low shelf life product plant
5. Design and layout of fruits processing plants
6. Design and layout of vegetable processing plants
7. Layout of multi product and composite food plants
8. Evaluation of given layout
9. Waste treatment and management of food plant.
10. Introduction to computer.
11. Operating system practice using DOS commands.
12. Problem solving using spreadsheet.
13. Use of statistical package for analysis of data.
14. Use of word processing software for creating reports.
15. Introduction to MATLAB.

**RECOMMENDED BOOKS:**

1. **Plant Layout and Design** M Moor, Mac Millan, Lames, New York.
2. **Milk Plant Layout.** H.S. Hall and Y.S. Rosen, FAO Publication, Rome.
3. **Dairy and Food Engineering** F.W. Farrall, John Willy and Sons, New York.
4. **Food Plant Design**, Antonio López. Gómez
5. **Food plant engineering Systems**, Theunis C. Robberts, CRC Press, Washington
6. **Food Process Design**, Zacharias B. Maroulis published by Marcel Dekker, Inc , Cimarron Road, Monticello, New York 12701, USA
7. **Computer Applications in Food Technology: Use of Spread sheets in Graphical, Statistical and Process Analysis**, R. Paul Singh, A.P.
8. **Introduction to MATLAB for Engineers**, William J. Palm. McGraw Hill Companies, Inc., NY, USA, 3<sup>rd</sup> ed, 2011

**Course outcomes:****After completion, Students are able to:**

1. Understand the plant layout and regulatory requirements of food industries.
2. Understand the structure, operation, management and planning of food plants.
3. Solve problem using spreadsheet.
4. Use word processing software for creating reports.

**OR****SECTION B: Instrumentation, Process Control and Computer Applications****Course Objectives: Students should:**

1. Know all the instrumentation symbols.
2. Know the characteristics and real time study of pressure transducers.
3. Know the problem solving using spreadsheet.
4. Know the use of word processing software for creating reports.

**Practicals**

1. Study on instrumentation symbols.
2. Study of P&ID diagram and flow sheet diagrams in instrumentation.
3. Real-time study of Pressure transducers characteristics with PC.
4. Study of Pressure control by on/off Controller.
5. Study of characteristics of IC temperature sensor.
6. Study of Temperature controlled alarm system.
7. Introduction to computer.
8. Operating system practice using DOS commands.
9. Problem solving using spreadsheet.
10. Use of statistical package for analysis of data.
11. Use of word processing software for creating reports.
12. Introduction to MATLAB.

**RECOMMENDED BOOKS:**

1. **Caliberation: A technicians guide**, Mike Cable.
2. **Instrumentation and Process Control**, I.K. Sawhney, S. K. Chaudhary and Sunil Kumar Dairy Engineering Division NDRI, Karnal.
3. **Measurement and control basic**, Thomas A. Hughes.
4. **Computer Applications in Food Technology: Use of Spread sheets in Graphical, Statistical and Process Analysis**, R. Paul Singh, A.P.
5. **Introduction to MATLAB for Engineers**, WilliamJ. Palm, McGraw Hill Companies, Inc., NY, USA, 3<sup>rd</sup> ed, 2011.

**Course outcomes:****After completion, Students are able to:**

1. Understand the instrumentation symbols
2. Understand the characteristics and real time study of pressure transducers.
3. Solve problem using spreadsheet.
4. Use word processing software for creating reports.

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**Lab XVII BFPP 510– Project**  
**(Phase I)**

**General Information**

Student Project aims to motivate/encourage and to provide opportunity to take up challenges in identification and/or in solution of the problem of the surrounding society related to food technology and work for better utilization of resources. The project should be innovative and activity based, so that the students may develop their ability to solve a societal problem experienced locally using their skill and knowledge. The project will help in creative thinking, observation, ability to raise pertinent questions and predicting solution. This also helps the students how to make field work, to write a scientific report and to present the work.

**A Good Project should have:**

- i) Originality, Innovation and creativity and should commensurate with understanding the problem and finding solution.
- ii) Relevance of the project to the community and impact of the project on society.
- iii) Proper understanding of the subject, quality and quantity of the work and efforts to validate the data collected.

Food Technology is a dynamic field which requires continuous research and innovation in product. With this intention Research Project is included in course curriculum to promote the students towards research and innovation in the field. Research Project should be allotted to students based on their/ Guide's interest towards project. The Research Project is not supposed to be a formal dissertation, rather it should be objective based to make minor changes in existing products or product innovation based on consumer demand and market needs. Formal Training should be given to students to make them acquaint with basic research skills and writing skills.

During Research Project, student shall learn to collect the necessary research data and facts related to product and process and plan the product trials accordingly.

1. Selection of project title
2. Recommended work
3. Experimental work
4. Result
5. At the end of the semester the student will submit a typed Interim Report on his work.
6. Evaluation shall include an oral presentation followed by a brief viva
7. The same project extended for the 6th semester

**Lab XVIII BFPP 511 -Numerical skills (Statistical Quality Control)****Course Objectives: Students should:**

1. Understand common measures of central tendency–mean, mode, median.
2. Understand common measures of dispersion, mean deviation, standard deviation.
3. Understand measure of dispersion- coefficient of variation
4. Understand the simple random sampling and stratified sampling

**Experiments**

1. Determination of central tendency–Arithmetic
2. Determination of central tendency–Medium
3. Determination of central tendency–Mode
4. Determination of measure of dispersion –Mean deviation
5. Determination of measure of dispersion –Standard deviation
6. Determination of measure of dispersion –Coefficient of variation
7. Determination of measure of dispersion–Quartile, deviation
8. Simple random sampling and stratified sampling

**RECOMMENDED BOOKS:**

1. **Principles and Practicals of biostatics**, Dixit J.V, Bhanot; seventh edition, 2017.
2. **Methods of biostatics**, T. Bhaskarrao, Paras Medical Publisher; second edition, 2004.
3. **Biostatics in theory and Practicals**, T.K. Saha, Emkkay Publication, New Delhi.1997.
4. **General Microbiology**, Roger Y. Stanier, algrave Macmillan, 5th edition, 1999.

**Course outcomes:****After completion, Students are able to:**

1. Understand common measures of central tendency–mean, mode, median.
2. Understand common measures of dispersion. Mean deviation, standard deviation.
3. Understand measure of dispersion- coefficient of variation
4. Understand the simple random sampling and stratified sampling



## B.Sc.Part-III

## Semester-VI

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE,SATARA						
COURSE STRUCTURE UNDER AUTONOMY						
B. Sc. Food Processing and Packaging (ENTIRE)						
B. Sc. III SEMESTER– VI (Duration– 6 Months)						
Sr. No	SUBJECT CODE	TEACHING SCHEME				
		Theory		Practical		
		No. of lectures	Credits	Subject	No. of lectures	Credits
1	BFPT 601 Food Quality And Sensory Evaluation	3	2	Lab XIX BFPP608:		
2	BFPT 602 Food Safety and Plant Sanitation	3	2	Food Quality and Sensory Evaluation and Food Safety and Plant Sanitation	10	4
3	BFPT 603 Food Fermentation Technology	3	2	Lab XX BFPP609:		
4	ELECTIVE PAPERS	3	2	Food Fermentation Technology and Beverage Technology and Government Laws and Regulations/ Snack Food Processing and Government Laws and Regulations/ Extrusion Technology and Government Laws and Regulations	10	4
	BFPT604 Beverage Technology and Government Laws and Regulations					
	BFPT605 Snack Food Processing and Government Laws and Regulations					
	BFPT 606 Extrusion Technology and Government Laws and Regulations			Lab XXI BFPP 610 Project(Phase–II)	5	2
5	SECCBFPT 607 Entrepreneurship Management	2	1	Lab XXII BFPP-611 Entrepreneurship Management/Industrial Training	3	1
6	AECC-6 English	3	2			
7	<b>Total of SEM VI</b>	<b>17</b>	<b>11</b>		<b>28</b>	<b>11</b>
<b>TOTAL NO OF CREDITS FOR SEMESTER VI: 22</b>						
<b>TOTAL NO OF CREDITS FOR SEMESTER V+ VI: 44</b>						

**BFPT 601 FOOD QUALITY AND SENSORY EVALUATION****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Understand basic food taste.
2. Understand the relation between sensory attribute and food quality.
3. Understand the mechanism of perception taste, olfaction, color, texture.
4. Understand the role of food quality and sensory evaluation in food industry.

**Unit I: Introduction to quality attributes of food (10 Lectures)**

Food quality and its role in food industry need of quality control, Factors affecting quality control of food, Factors influencing food quality a) Soil b) field practices c) harvesting practice, processing, condition, packaging, storage condition of finished product, Appearance, flavor, textural factors and additional quality factor.

**Unit II: Olfaction and Gustation (13 Lectures)**

Introduction, definition and importance of odor and flavor, Mechanism of odor perception, Theories of odor classification, chemical specificity of odor, Odor Measurement Techniques and Electronic Nose, Olfactory abnormalities. Introduction and importance of gustation, Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands, Mechanism of taste perception, Chemical dimensions of basic tastes- sweet, salt, sour, bitter and umami, Factors affecting taste, reaction time, taste modification, absolute and recognition Threshold, Taste measurement Techniques and Electronic Tongue, Taste abnormalities

**Unit III: Color and Texture****(10 Lectures)**

Introduction and importance of color, Dimensions of color and attributes of color; gloss etc., Perception of color, Color Measurement: Munsell color system, CIE color system, Hunter color system, Color abnormalities Introduction, definition and importance of texture , Phases of oral processing, Texture perception, receptors involved in texture perception, Rheology of foods, Texture classification, Texture measurement – basic rheological models, forces involved in texture measurement recent advances in texture evaluation.

**Unit IV: Methods of Food Analysis****(12 Lectures)**

Affective tests , Specific test methods – paired preference test, ranking for preference, rating for preference, sensory evaluation in consumer testing, hedonic test, analytical sensory test – difference testing, simple difference testing, triangle test, duo- trio test, two out of five test, directional difference tests- paired comparison test, ranking test, rating test, statics for sensory – descriptive testing, difference testing.

**RECOMMENDED BOOKS:**

1. **Sensory Evaluation Technique**, Civillie and Carr, CRC Press, 2015.
2. **Handbook of Food Toxicology**, Deshpande S S, CRC Press, Woodhead Publishing, Cambridge, 2002
3. **Food Toxicology**, Helferich William and Winter Carl K, CRC Press, CRC Woodhead Publishing Ltd., Cambridge 2000.
4. **Food Additives: Characteristics, Detection and Estimation** Mahindru S.N., Tata McGraw Hill, New Delhi. .2000
5. **Food Standards and Safety in a Globalised World: The Impact of WTO and Codex**, Saxena Madhu and Khanna Sri Ram, New century Publications, New Delhi.2003.

6. **Fundamentals of Quality Control for Food Industry**, Krammer and Twigg, Avi publishing company 1966.
7. **Principles of Food Toxicology** Tõnu Püssa, CRC Press, Woodhead Publishing Ltd., Cambridge. 2007
8. **Essentials of Food Science**, Vaclavik V.A, 2nd Edition, Springer, New York. 2003

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Learn food sensory quality.
2. Understand relation between sensory attribute and food quality.

**Unit II: After completion of the unit, Students are able to:**

1. Learn basic food taste.
2. Understand taste measurement Techniques and Electronic Tongue, Taste abnormalities

**Unit III: After completion of the unit, Students are able to:**

1. Understand importance of color.
2. Know mechanism of perception taste, olfaction, color, texture.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand analytical sensory test.
2. Learn sensory evaluation in food industry.

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**BFPT 602 FOOD SAFETY AND PLANT SANITATION****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Understand food safety and food related hazards and risks.
2. Understand the food safety management tools.
3. Know the food laws and food safety standards.
4. Understand the food hygiene and sanitation of plant.

**Unit I: Introduction to Food Safety and Food related hazards (11 Lectures)**

Definition of food safety, Importance of food safety, Hazards-Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Food, microbiological considerations in food safety. Acute toxicity, Mutagenicity and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioral effect, immunotoxicity.

**Unit II: Food Safety Management Tools (11 Lectures)**

Basic concept of food safety, Prerequisites- GHPs, GMPs, HACCP, ISO series, TQM - concept and need for quality, components of TQM, Kaizen, Risk Analysis-Risk assessment and risk benefit Indices of human exposure, Accreditation and Auditing.

**Unit III: Food Laws and Standards (11 Lectures)**

AGMARK and Bureau of Indian standards, Additional food laws – Federal Poultry products Inspection Act of 1957, Federal Trade Commission act, Infant formula Act of 1986, Nutrition labeling and education act of 1990, Consumer protection Act, Food Safety and Standards 2006, Other laws and standards related to food.

**Unit IV: Food Plant Hygiene and Sanitation (12 Lectures)**

Waste disposal, control methods using physical and chemical agents, pest and rodent control, ETP design and layout, food storage sanitation, transport sanitation and water sanitation, by-products utilization obtained from dairy plant, egg and poultry processing industry and meat industry, wastewater and solid waste treatment: - Waste-types-solid and liquid waste characterization, physical, chemical, biological, aerobic, anaerobic, primary, secondary and tertiary (advanced) treatments.

**RECOMMENDED BOOKS:**

1. **Training manual for Food Safety Regulators**, Vol II- Food Safety Regulations and Food Safety Management, 2010.
2. **Food Quality and Safety Systems- A training manual on Food Hygiene and the Hazard Analysis and Critical Control Point(HACCP) system**, Food and Agriculture Organization of the United Nations, Rome, Publishing Management Group, FAO Information Division, 1998.
3. **Food Plant Sanitation: Design, Maintenance and Good Manufacturing Practices**, Michael M. Cramer, CRC Press, 3rd edition, 2013.
4. **Handbook of waste management and co- product recovery in food processing**, Vol I, Keith W Waldron, ELSEVIER, 2007.
5. **Food Hygiene and Sanitation**, Sunetra Roday, Mc Graw Hill Education (India) Private Limited, 2nd edition, 2017.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Understand the importance of food safety.
2. Know food related hazards and risks.

**Unit II: After completion of the unit, Students are able to:**

1. Learn food safety management tools.
2. Understand risk analysis and risk assessment.

**Unit III: After completion of the unit, Students are able to:**

1. Understand food laws.
2. Learn food safety standards.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand waste management system.
2. Learn food hygiene and sanitation of plant

**BFPT 603 FOOD FERMENTATION TECHNOLOGY****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Understand basics of fermentation.
2. Understand the microbial products.
3. Understand the traditional fermented products.
4. Understand the enzyme technology in food industry and fermentation economics.

**Unit I: Basics of Food Fermentation. (12 Lectures)**

Fermenter design, operation, measurement and control in fermentation, Media for Industrial Fermentation, Sterilization of air and media, inoculum Preparation, Scale up in fermentation, Batch and continuous process, Solid substrates fermentation, downstream processing and Product recovery.

**Unit II: Microbial Products. (11 Lectures)**

A. Primary, secondary metabolites - Organic acids (Citric Acid, Lactic acid), alcohol, Penicillin and Vitamin B12. B. Microbial biomass production- baker's yeast, single cell protein and mushroom.

**Unit III: Traditional fermented Foods and Beverage. (11 Lectures)**

Traditional fermented foods like idli, dosa, Soya-sauce, Miso, Sauerkraut. Beverage - vinegar, beer, wine, whisky, rum, vodka.

**Unit IV: Enzyme Technology in Food Industry and Fermentation Economic (11 Lectures)**

Enzyme technology in food industry- Industrial enzymes (with respect to food processing industry) Enzyme Immobilization. Fermentation economics- Market Potential, Fermentation and Product Recovery Costs, Process Appraisal.

**RECOMMENDED BOOKS:**

1. **Principles of Fermentation Technology**, Peter F Stanbury and Whitaker A., Elsevier, 2008.
2. **Industrial Microbiology**, L. E. J. R. Casida, New age international publishers, 2007.
3. **Bioprocess Technology**, Dr.H.A.Modi, Pointer Publishers.
4. **Microbial Technology Fermentation Technology**, Pepler, Perimam Volume II, 2<sup>nd</sup> edition, 2007.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Understand basics of food fermentation
2. Understand fermenter design, operation, measurement and control in fermentation.

**Unit II: After completion of the unit, Students are able to:**

1. Know primary, secondary metabolites.
2. Learn microbial biomass production

**Unit III: After completion of the unit, Students are able to:**

1. Learn traditional fermented foods
2. Know beverage production.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand enzyme technology in food industry.
2. Learn fermentation economics.



**BFPT 604- BEVERAGE TECHNOLOGY AND GOVERNMENT LAWS AND REGULATIONS****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Understand the various beverages and the products made out of them.
2. Learn technical view of beverages and the manufacturing processes in the context of technology.
3. Understand the ipr, patent, biopatent, copyright, trade secret, trademark, etc.
4. Understand the laws related to industrial regulation and taxation.

**A. BEVERAGE TECHNOLOGY****Unit I: Introduction to Beverage Industry and Packaged Drinking Water****(11 Lectures)**

Introduction to beverages, Types of beverages and their importance, status of beverage industry in India, Ingredients, manufacturing and packaging processes and equipment for different beverages, FSSAI specifications for beverages. Definition, types, manufacturing processes, quality evaluation and raw and processed water, methods of water treatment, BIS quality standards of bottled water; mineral water, carbonated water

**Unit II: Manufacturing Technology for Juice and Carbonated Beverage****(12 Lectures)**

Manufacturing technology for juice-based beverages, synthetic beverages; technology of still, carbonated, low-calorie and dry beverages, isotonic and sports drinks; role of various ingredients of soft drinks, carbonation of soft drinks. History and types of soft drink, role of various ingredients in soft drink ,carbonation of soft drink ,packaging aspects in soft drinks.

**B. GOVERNMENT LAWS AND REGULATIONS****Unit III: IPR, National and International Scenario.****(11 Lectures)**

IPR, National and International Scenario: -Patent(process patenting and recipe patenting), Biopatent, Copyright, Trade secret, Trademark, Geographical Indications Designs, its basic concepts and laws related to its infringement -IPR and WIPO, TRIPS

**Unit IV: Laws related To Industrial Regulation and Taxation. (11 Lectures)**

Laws related to industrial regulation and taxation: A) Industrial development and regulation act- Object -Licensing of industries -Circumstances when license not required  
B) Basic concept of taxation - -Principle of taxation -Direct and indirect tax -Excise, sales MVAT, GST.

**RECOMMENDED BOOKS:**

1. **Foods Facts and Principles**, Manay N. S., Shandakh, 2008.
2. **Food Science**, Potter N. N., Hotchkiss, J. H., CBS Publishers, 5th edition, 2007.
3. **Food Science**, Srilakshmi B., New Age International Private Ltd Publishers, 7th edition, 2018.
4. **Technology of Bottled Water**, Nicholas Dege, Wiley-Blackwell Publishing Ltd, 3rd edition, 2011.
5. **Intellectual Property Rights and the Law**, Dr. G B Reddy, Gogia Law Agency, 2020.
6. **Intellectual Property Rights**, Neeraj Pandey, Khushdeep Dharni, PHI Learning Private Limited, 1st edition, 2014.
7. **Indian Patent Law and Practice**, Kalyan C Kankanala, Oxford India Paperbacks, 2012.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Learn about beverage industry
2. Understand about packaged drinking water.

**Unit II: After completion of the unit, Students are able to:**

1. Know manufacturing technology for juice
2. Learn manufacturing technology for carbonated beverage

**Unit III: After completion of the unit, Students are able to:**

1. Understand ipr, patent, biopatent
2. Understand copyright, trade secret, trademark.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand laws related to industrial regulation.
2. Understand taxation.

**BFPT 605 SNACK FOOD PROCESSING AND GOVERNMENT LAWS AND REGULATIONS****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Understand importance and scope of snack food
2. Know the ingredients and current practices for preparation snacks.
3. Understand equipment in processing operations.
4. Understand ipr, patent, Biopatent, Copyright, Trade secret, Trademark.
5. Understand the Laws related to industrial regulation and taxation.

**A. SNACK FOOD PROCESSING****Unit I: Introduction and Snack Food Ingredients and Equipment. (11 Lectures)**

Importance and scope of snack food technology, Domestic and Global status of Snack food Industry, Ingredients commonly used in snack food, their attributes and functions. Equipment for frying, drying, baking, Equipment for popcorn processing, Packaging and storage of Snack Food – Packaging Material and Packaging techniques, Quality Evaluation of Snack Food

**Unit II: Products and Processing and Extruded Snack Foods. (12 Lectures)**

Potato Chips, Meat based snacks, Snacks based on popcorn, Puffed and flaked cereals, simulated potato chips, baked snacks, Nut based snacks (salted, spiced and sweetened) , Savory and Farsans, Processing of Papad, Chips and Wafers, Application of seasonings, Indian Savory Sweets .Extruded Snack Foods- Extrusion Process and Types of extrusion process, Single Screw and Twin Screw extruder, Hot and Cold Extrusion, Types of Extruded Snack food – First, Second and third generation snack food.

**B. GOVERNMENT LAWS AND REGULATIONS****Unit III: IPR, National and International Scenario. (11 Lectures)**

IPR, National and International Scenario: -Patent (process patenting and recipe patenting), Biopatent, Copyright, Trade secret, Trademark, Geographical Indications, Designs, its basic concepts and laws relating to its infringement -IPR and WIPO, TRIPS

**Unit IV: Laws Related to Industrial Regulation and Taxation. (11 Lectures)**

Laws related to industrial regulation and taxation: A) Industrial development and regulation act- - Object -Licensing of industries -Circumstances when license not required  
B) Basic concept of taxation -Principle of taxation -Direct and indirect tax -Excise, sales MVAT, GST.

**RECOMMENDED BOOKS:**

1. **Snack Foods Processing**, Edmud W Luaas, Lloyd W Rooney, CRC Press, 2001.
2. **Advances in Food Extrusion Technology**, Medeni Maskan, Aylin Altan, illustrated edition, 2016.
3. **Snack Foods**, R. Gordon Booth, Springer, 5th edition, 2011.
4. **The Complete Technology Book on Snack Foods**, Dr. Himatri Panda, NIIR Project Company Services, 2nd edition, 2013.
5. **Intellectual Property Rights and The Law**, Dr. G B Reddy, Gogia Law Agency, 2020.
6. **Intellectual Property Rights**, Neeraj Pandey, Khushdeep Dharni, PHI Learning Private Limited, 1st edition, 2014.
7. **Indian Patent Law and Practice**, Kalyan C Kankanala, Oxford India Paperbacks, 2012.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Learn importance and scope of snack food technology
2. Learn quality evaluation of snack food.

**Unit II: After completion of the unit, Students are able to:**

1. Learn ingredients and products of snack food.
2. Understand extruded snack foods.

**Unit III: After completion of the unit, Students are able to:**

1. Understand ipr, patent, biopatent
2. Understand copyright, trade secret, trademark etc.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand laws related to industrial regulation.
2. Understand taxation.

**BFPT 606 EXTRUSION TECHNOLOGY AND GOVERNMENT LAWS and REGULATIONS****Theory: 45 Lectures of 48 minutes (36 Hours)****Marks -50 (Credits: 02)****Course Objectives: Students should:**

1. Know the important of extrusion technology.
2. Know the principles and types, uses of extruders in the food industry.
3. Understand ipr patent, biopatent, copyright, trade secret, trademark etc.
4. Understand the laws related to industrial regulation and taxation.

**A. EXTRUSION TECHNOLOGY****Unit I: Introduction and Single Screw Extruder.****(11 Lectures)**

Extrusion: definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Single screw extruder: principle of working, net flow, factors affecting extrusion process

**Unit II: Twin Screw Extruder.****(12 Lectures)**

Twin screw extruder: counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder Pre-conditioning of raw materials used in extrusion process Use of dry extruders in extrusion. Chemical and nutritional changes in food during extrusion, Classification of Breakfast cereals.

**B. GOVERNMENT LAWS AND REGULATIONS****Unit III: IPR, National and International Scenario.****(11 Lectures)**

IPR, National and International Scenario: Patent (process patenting and recipe patenting), Biopatent, Copyright, Trade secret, Trademark, Geographical Indications, Designs, its basic concepts and laws related to in infringement –IPR, WIPO, TRIPS.

**Unit IV: Laws Related to Industrial Regulation and Taxation. (11 Lectures)**

Laws related to industrial regulation and taxation A)Industrial development and regulation act-Object- Licensing of industries-Circumstances when license not required B)Basic concept of taxation— Principle of taxation-Direct and indirect tax-Excise, sales MVAT, GST.

**RECOMMENDED BOOKS:**

1. **Textbook of Technology of Extrusion Cooking**, N D, Frame, Springer Science and Business Media, 4th edition, 2012.
2. **Extrusion of Foods**, Judson M. Harper, CRC Press, 1st edition, 2019.
3. **Advances in Food Extrusion Technology**, Medeni Maskan, AylinAltan, illustrated edition, 2016.
4. **Intellectual Property Rights and The Law**, Dr. G B Reddy, Gogia Law Agency, 2020.
5. **Intellectual Property Rights**, Neeraj Pandey, Khushdeep Dharni, PHI Learning Private Limited, 1st edition, 2014.
6. **Indian Patent Law and Practice**, Kalyan C Kankanala, Oxford India Paperbacks, 2012.

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Understand extrusion technology
2. Learn single screw extruder

**Unit II: After completion of the unit, Students are able to:**

1. Learn twin screw extruder.
2. Understand chemical and nutritional changes in food during extrusion.

**Unit III: After completion of the unit, Students are able to:**

1. Learn ipr, patent, biopatent
2. Understand copyright, trade secret, trademark.

**Unit IV: After completion of the unit, Students are able to:**

1. Understand laws related to industrial regulation.
2. Understand taxation.

**SECC FPT 607 -ENTREPRENEURSHIP MANAGEMENT****Theory: 24 lectures, 48 minutes (18 Hours)****Course Objectives: Students should:**

1. Understand the concept, scope and development of entrepreneurship.
2. Understand the edp and indian government policies for startups.
3. Understand the project formulation and management.
4. Understand the professional ethics Financial assistance from different financial institutions to SSI.

**Unit I: Entrepreneur and Entrepreneurship Concept (12 Lectures)**

Entrepreneur and entrepreneurship concept and definition, Need scope and development of entrepreneurship, EDP and Indian government policies for start ups, Business environment, case studies on entrepreneurship in different kinds of industries (especially food industries)

**Unit II: Project Formulation and Management (11 Lectures)**

Setting up of SSI unit, steps involve, Project formulation and management, Business management, principles of management overview of main streams of management like financial management, HRM, MM, materials and operation management  
Financial assistance from different financial institutions to SSI

**RECOMMENDED BOOKS:**

1. **Entrepreneurship of small scale food industries. Concept, Growth and Management**, Deshpande V., Deep and Deep Pub, New Delhi, 1984
2. **Personal efficacy in developing entrepreneurship** Parek U. and Rao T. V., Learning systems, New Delhi, 1978

3. **Developing Entrepreneurship. A Handbook**, Rao T. V. and Parekh L.U., Learning Systems, New Delhi, 1982
4. **Entrepreneurship development**, Khankas.S.S.Chand publication Reprint Edition 2006
5. **Entrepreneurship development**, K. Ramachandran , Tata McGraw Hill India 2008
6. **Developing Entrepreneurship. A Handbook**, Rao T. V. and Parekh L.U., Learning Systems, New Delhi, 1982

**Course outcomes:****Unit I: After completion of the unit, Students are able to:**

1. Understand concept, scope and development of entrepreneurship.
2. Learn EDP and Indian government policies for startups

**Unit II: After completion of the unit, Students are able to:**

1. Learn project formulation and management.
2. Understand professional ethics Financial assistance from different financial institutions to SSI

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**Lab XIX BFPP 608: Food Quality and Sensory Evaluation and Food  
Safety and Plant Sanitation**

**SECTION A: Food Quality and Sensory Evaluation****Course Objectives: Students should:**

1. Understand various tastes and setting up a sensory panel.
2. Understand the relation between sensory attribute and food quality
3. Understand the evaluation of various tastes.
4. Understand the role of food quality and sensory evaluation in food industry

**Practicals**

1. Training of sensory panel.
2. To perform recognition and sensitivity tests for four basic tastes.
3. Quality evaluation of product for colors.
4. Quality evaluation of product for size, shape
5. To perform analytical tests of sensory evaluation.
6. Recognition tests for various food flavors, flavor defects in milk
7. Sensory evaluation of milk and milk product
8. Texture evaluation of various food samples- crispies/ cookies/ biscuits/ snack foods
9. Measurement of color by using Tintometer/ Hunter Color Lab etc.
10. Qualitative tests for hydrogenated fats, butter, ghee
11. Quality evaluation of various food stuffs- cereals, pulses, honey, jaggery, sugar, tea, coffee, etc.
12. Simple difference test for sensory evaluation.

**RECOMMENDED BOOKS:**

1. **Food Quality Evaluation**, Rao E. S., Variety Books, 2013.
2. **Principles of Sensory Evaluation of food**, Amerine, Pang bornand Roessler, Academic Press, London, 1965.
3. **Sensory Evaluation Techniques**, Meilgard, 3rd ed. CRC Press LLC, 1999
4. **Principles of Food Chemistry**, deMan J. 3rd ed., Springer. 62, 2007

**Course outcomes:****After completion, Students are able to:**

1. Learn various tastes and able to set up a sensory panel.
2. Understand sensory and its role in food quality
3. Understand mechanism of perception taste, olfaction, color, texture.
4. Learn role of food quality and sensory evaluation in food industry.

**SECTION B: Food Safety and Plant Sanitation****Course Objectives: Students should able to-**

1. Understand bod and cod determination in industrial effluent.
2. Know the testing of sanitizers and disinfectants.
3. Understand physico-chemical estimation from sewage and industrial effluent.
4. Understand bacteriological analysis of water by qualitative and quantitative method.
5. Understand determination of acidity and alkalinity of water.

**Practicals**

1. Determination of BOD (Biological oxygen demand) of industrial effluent.
2. Determination of COD (Chemical oxygen demand) of industrial effluent.
3. Estimation of TS, TSS, TDS from sewage and industrial effluent.
4. Assessment of surface sanitation by swab/rinse method.
5. Bacteriological analysis of water by presumptive, confirmed and completed test.
6. Determination of oil and grease from industrial waste.
7. Evaluation for effectiveness of disinfectants (Detection of phenol coefficient of disinfectant).
8. Bacteriological Analysis of Water by MPN method.
9. Enumeration of aerial micro flora using PDA, NAD.
10. To determine acidity and alkalinity of wastewater.
11. Identification of Enteric Bacilli by IMViC test.
12. ISI specification for drinking water.

**RECOMMENDED BOOKS:**

1. **Food Quality Evaluation**, Rao E. S., Variety Books, 2013
2. **Principles of Sensory Evaluation of food**, Amerine, Pangborn and Roessler, Academic Press, London, 1965
3. **Sensory Evaluation Techniques**, Meilgard, 3rd ed. CRC Press LLC, 1999.
4. **Principles of Food Chemistry**, deMan J. 3rd ed., Springer.62, 2007.

**Course outcomes:****After completion, Students are able to-**

1. Learn bod and cod determination in industrial effluent.
2. Learn physico-chemical estimation from sewage and industrial effluent
3. Understand testing of sanitizers and disinfectants.
4. Learn bacteriological analysis of water by qualitative and quantitative method.
5. Determine acidity and alkalinity of water.

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**Lab XX BFPP 609: Food Fermentation Technology and Beverage Technology  
and Government Laws and Regulations/ Snack Food Processing and  
Government Laws and Regulations/ Extrusion Technology and Government  
Laws and Regulations**

**SECTION A: Food Fermentation Technology**

**Course Objectives: Students should:**

1. Understand the growth curve of bacteria.
2. Understand effect of temperature and pH on bacterial growth.
3. Understand the microbiological examination of food.
4. Understand the development of fermented products.

**Practicals**

1. Determination of Growth curve of bacteria.
2. Effect of temperature on bacterial growth.
3. Effect of pH on bacterial growth.
4. Microbiological Examination of food.
5. Identification of Molds by lactophenol blue staining.
6. Scheme for the detection of food borne pathogens.
7. Isolation of Antibiotic producing strain or species.
8. Immobilization of yeast cell by calcium-alginate entrapment method and determination of viability of immobilized cells by invertase activity.
9. Fermentative production of Amylase.
10. Development of a fermented food/drink utilizing plant products /animal products or by products as substrate.
11. Development of Vinegar by using different fruits.
12. Ion Exchange chromatography.

**Recommended books:**

1. Practical Microbiology, R.C.Dubey and D.K. Maheshwari, S Chand and Company, December 2010.
2. Manual of Microbiology Tools and Techniques, Kanika Sharma, 2nd Edition, Ane Books India, January 2007.
3. Laboratory Manual of Food Microbiology, Neelima Garg, K. I., Garg, K.G., Mukerji, Dreamtech Press, February 2020.
4. <https://ijpsr.com/bft-article/immobilization-and-estimation-of-activity-of-yeast-cells-by-entrapment-technique-using-different-matrices/?view=fulltext>
5. [https://link.springer.com/chapter/10.1007/978-3-642-67356-6\\_38](https://link.springer.com/chapter/10.1007/978-3-642-67356-6_38)
6. <https://thescipub.com/pdf/10.3844/ajbbasp.2018.191.199.pdf>[http://ijaerd.com/papers/finished\\_papers/A% 20 experimental % 20 study % 20 of % 20 vinegar % 20 production % 20 from % 20 different % 20 fruit % 20 products-IJAERDV04I0460188. pdf](http://ijaerd.com/papers/finished_papers/A%20experimental%20study%20of%20vinegar%20production%20from%20different%20fruit%20products-IJAERDV04I0460188.pdf)

**Course outcomes:****After completion, Students are able to-**

1. Understand growth curve of bacteria.
2. Learn effect of temperature and pH on bacterial growth.
3. Understand microbiological examination of food.
4. Learn development of fermented products.

**SECTION B: Beverage Technology and Government Laws and Regulations****Course Objectives: Students should-**

1. Study about quality of water.
2. Study about physical properties of various beverages.
3. Understand technical view of beverages.
4. Understand the manufacturing processes in the context of technology.
5. Understand the IPR

**Practicals**

1. Quality analysis of raw water
2. Determination of brix value, pH and acidity of beverages
3. Preparation of synthetic beverage
4. Determination of colors in soft drinks by wool technique
5. Preparation of iced and flavored tea
6. Preparation of instant tea
7. Preparation of carbonated beverages
8. Preparation of non-carbonated beverages
9. preparation of sports drink
10. Determination of caffeine in beverages
11. Case study: Intellectual Property
12. Case study: Patent Preparation
13. Basmati rice patent case study

**RECOMMENDED BOOKS:**

1. **Manual of methods of analysis of foods, Food Safety and Standards Authority of India Ministry of health and Family Welfare Government of India New Delhi, 2016**
2. <http://egyankosh.ac.in/bitstream/123456789/12106/1/Experiment-1.pdf>
3. <https://www.ijsr.net/archive/v6i5/ART20173280.pdf>
4. [https://www.ripublication.com/ijafst\\_spl/ijafstv5n3spl\\_12.pdf](https://www.ripublication.com/ijafst_spl/ijafstv5n3spl_12.pdf)
5. **Determination of Caffeine In Beverages: A Review** Igelige Gerald1 , David Ebuka Arthur1 , Adebisi Adedayo2 . 1Department of Chemistry, Ahmadu Bello University Zaria. 2 ShedaSci. and Tech. complex FCT, PMB 186 Garki Abuja ,American Journal of Engineering Research (AJER) e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-3, Issue-8, pp-124-137 ([http://www.ajer.org/papers/v3\(8\)/K03801240137.pdf](http://www.ajer.org/papers/v3(8)/K03801240137.pdf))
6. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=147601>
7. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=147633>
8. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=147625>

9. [file:///C:/Users/Shree/Downloads/Functional and speciality beverage techn.pdf](file:///C:/Users/Shree/Downloads/Functional_and_speciality_beverage_techn.pdf)
10. <https://www.researchgate.net/publication/265112584/Case-Study-Trademark-Infringement-Issues>
11. [https://www.wipo.int/ipadvantage/en/search.jsp?insprotection\\_id=534 and focus\\_id=](https://www.wipo.int/ipadvantage/en/search.jsp?insprotection_id=534&focus_id=)
12. [https://www.google.com/url?sa=t&source=web&drct=j&url=https://www.mondaq.com/india/patent/586384/traditional-knowledge-and-patent-issues-an-overview-of-turmeric-basmati-neem-cases and ved = 2ahUEwjy6 b 2kppAhXj4zqGHe0nB7wQFj AA eqQIARAB and usq = AOvVaw2y7m0mW5ZlpyS0 wcEcSagI](https://www.google.com/url?sa=t&source=web&drct=j&url=https://www.mondaq.com/india/patent/586384/traditional-knowledge-and-patent-issues-an-overview-of-turmeric-basmati-neem-cases&ved=2ahUEwjy6b2kppAhXj4zqGHe0nB7wQFjAAeqQIARAB&usq=AOvVaw2y7m0mW5ZlpyS0wcEcSagI)
13. **Intellectual Property Rights and The Law**, Dr. G B Reddy, Gogia Law Agency, 2020.
14. **Intellectual Property Rights**, Neeraj Pandey, Khushdeep Dharni, PHI Learning Private Limited, 1st edition, 2014.
15. **Indian Patent Law and Practice**, Kalyan C Kankanala, Oxford India Paperbacks, 2012.

### Course outcomes:

#### After completion, Students are able to-

1. Learn importance of quality of water.
2. Understand manufacturing characterizing of various beverages.
3. Learn production carbonated and noncarbonated drinks.
4. Learn manufacturing process for packaged drinking water and other beverages.
5. Understand IPR.

### SECTION B: Snack Food Processing and Government Laws and Regulations

#### Course Objectives: Students should-

1. Know the preparation of different cereal based snack products.
2. Understand the preparation of instant food premixes.
3. Study the quality evaluation of different snack products.
4. Know the preparation of savory snack product.
5. Understand the IPR.

**Practicals**

1. .Preparation of Papad and its quality evaluation.
2. Preparation of Chips and its quality evaluation.
3. Preparation of Flaked cereals (Poha) and its quality evaluation.
4. Preparation of Puffed cereals (Churmura) and its quality evaluation.
5. Preparation of Expanded snack and its quality evaluation.
6. Preparation of Roasted grains or nuts and its quality evaluation.
7. Preparation of Coated grains or nuts and its quality evaluation.
8. Preparation of instant food premixes and its quality evaluation.
9. Preparation of extruded snack food and its quality evaluation..
10. Preparation of popcorn and its quality evaluation.
11. Case study: Intellectual Property
12. Case study: Patent Preparation
13. Basmati rice patent case study

**RECOMMENDED BOOKS:**

1. **Snack Foods Processing**, Edmud W Luaas, Lloyd W Rooney, CRC Press, 2001.
2. **Advances in Food Extrusion Technology**, Medeni Maskan, Aylin Altan, illustrated edition, 2016.
3. **Snack Foods**, R. Gordon Booth, Springer, 5th edition, 2011.
4. **The Complete Technology Book on Snack Foods**, Dr. Himatri Panda, NIIR Project Company Services, 2nd edition, 2013.
5. <https://www.researchgate.net/publication/265112584> Case Study Trademark Infringement Issues
6. [https://www.wipo.int/ipadvantage/en/search.jsp?ins\\_protection\\_id=534andfocus\\_id=](https://www.wipo.int/ipadvantage/en/search.jsp?ins_protection_id=534andfocus_id=)
7. <https://www.google.com/url?sa=t&source=web&drct=j&url=https://www.mondaq.com/india/patent/586384/traditional-knowledge-and-patent-issues-an-overview-of-turmeric-basmati-neem-casesandved=2ahUKEwjy6b2 kp pAhXj4zqGHe0nB7wQFjAAeqQIARABandusg=AOvVaw2y7m0mW5ZlpyS0 wcEcSagI>
8. **Intellectual Property Rights and The Law**, Dr. G B Reddy, Gogia Law Agency, 2020.



9. **Intellectual Property Rights**, Neeraj Pandey, Khushdeep Dharni, PHI Learning Private Limited, 1st edition, 2014.
10. **Indian Patent Law and Practice**, Kalyan C Kankanala, Oxford India Paperbacks, 2012.

### **Course outcomes:**

#### **After completion, Students are able to-**

1. Learn preparation of different cereal based snack products.
2. Understand preparation of instant food premixes.
3. Understand quality evaluation of different snack products.
4. Learn preparation of savory snack product.
5. Understand the IPR.

### **SECTION C: Extrusion Technology and Government Laws and Regulations**

#### **Course Objectives: Students should-**

1. Understand the important physical properties of extruded foods (expansion, density, water absorption index).
2. Prepare the noodles/ vermicelli, spaghetti.
3. Understand the oil absorption capacity and water absorption capacity of extruded products.
4. Understand the IPR.

#### **Practicals**

1. Physical properties of extruded foods (expansion, density, water absorption index, etc)
2. Physicochemical properties of proteins.
3. Preparation of protein isolates and concentrate.
4. Preparation of noodles/vermicelli.
5. Preparation of spaghetti.
6. Studies on properties of texturized vegetable protein.
7. Determination of oil absorption capacity of extruded products.
8. Determination of water absorption capacity of noodles.
9. Preparation of noodles/ vermicelli, spaghetti.
10. Case study: Intellectual Property.
11. Case study: Patent Preparation.
12. Basmati rice patent case study.

**RECOMMENDED BOOKS:**

1. **Text Book of Extruded foods**, Matza S publisher-Springer, 2000.
2. **Text Book of Technology of Extrusion Cooking**, N.D. Frame publisher, Springer.
3. **Text Book of Extruders in Food Application**, Riaz M.N. publisher, CRC Press, 2000.
4. **Advances in Food Extrusion Technology**, Maskan and Altan publisher, CRC Press, 2000.
5. **Extrusion of Foods**, Harper J M, CRC Press, 2019
6. **Food Process Engineering and Technology**, Berk Z publisher- Academic Press, 2013.
7. [https://www.researchgate.net/publication/265112584\\_Case\\_Study\\_Trademark\\_Infringement\\_Issues](https://www.researchgate.net/publication/265112584_Case_Study_Trademark_Infringement_Issues)
8. [https://www.wipo.int/ipadvantage/en/search.jsp?ins\\_protection\\_id=534andfocus\\_id=](https://www.wipo.int/ipadvantage/en/search.jsp?ins_protection_id=534andfocus_id=)
9. <https://www.google.com/url?sa=t&source=web&drct=j&url=https://www.mondaq.com/india/patent/586384/traditional-knowledge-and-patent-issues-an-overview-of-turmeric-basmati-neem-casesandved=2ahUKEwjy6b2kppAhXj4zGHe0nB7wQFjAAegQIARABandusg=AOvVaw2y7m0mW5ZIpyS0wcEcSagl>
10. **Intellectual Property Rights and The Law**, Dr. G B Reddy, Gogia Law Agency, 2020.
11. **Intellectual Property Rights**, Neeraj Pandey, Khushdeep Dharni, PHI Learning Private Limited, 1st edition, 2014.
12. **Indian Patent Law and Practice**, Kalyan C Kankanala, Oxford India Paperbacks, 2012.

**Course outcomes:****After completion, Students are able to -**

1. Learn importance of physical properties of extruded foods expansion, density, water absorption index.
2. Prepare noodles/ vermicelli, spaghetti.
3. Understand oil absorption capacity and water absorption capacity of extruded products.
4. Understand the IPR.

**Lab XXI : BFPP 610 Project (Phase –II)**

1. Student shall continue to be carry out project works as assigned at the beginning of the Semester V.
2. Experimental work/Analysis
3. **Result:** At the end of the semester, the work shall yield some meaningful results that facilitate advancement of food science and technology
4. Each student shall submit a typed, hard-bound Final Project Report on his work and its findings
5. Evaluation of Project shall include an oral presentation followed by a brief viva.

**Project Report**

The structure of the project report shall be in the format is as follows:

- i) **The Cover Page** – It should have
  - Title of the project
  - Name and address of Group Leader and team members
  - Name and address of Supervisor/Guide teacher
- ii) **Abstract –500words**
- iii) **Contents**
- iv) **Introduction-** Description on background of the study
- v) **Aims and Objectives**
- vi) **Relevance of the project work**
- vii) **Methodology**
- viii) **Observations:** This shall include the observations during the experiment. Observation can be both qualitative as well as quantitative.
- ix) **Data analysis and interpretation:** The data generated/ obtained from the experiments/ observations should be processed for better understanding in a more structured manner. Tools and methods (e.g. statistical methods) may be used for analyzing data to understand the patterns that emerges from it to form results and conclusions.

- x) **Results:** Results are the output of compilation of the data into meaningful outcomes/ interpretations and sometimes, there is a need to redo the experiments to get consistent results. In case it is not possible to “repeat the experiments”, there should be adequate replicates so that adequate data is available for interpretation, and arriving at results.
- xi) **Conclusions:** This is the logical end of the project to arrive at specific conclusions from the observed phenomena. In a way, the whole objective of the project is to arrive at some conclusion, either positive or negative which would lead to a better understanding of the problem.
- xii) **Acknowledgement**
- xiii) **Recommendations**

### **Lab XXII : BFPP-611 Entrepreneurship Management/Industrial Training**

#### **Course Objectives: Students should:**

1. Understand the strategy making for solving business problem.
2. Study different documents needed in business.
3. Study advertisements making.
4. Study basic financial calculation.

#### **Practicals**

1. Search a successful entrepreneur and study his case and make presentation (Team work is expected).
2. Strategy making for solving business problem
3. Collection of different documents needed in business and study the same.
4. Advertisements Making.
5. Basic financial calculation like costing of product, in calculation etc.
6. Report on industrial visit.

**RECOMMENDED BOOKS:**

1. **Entrepreneurship of small scale food industries: Concept, Growth and Management**, Deshpande V., Deep and Deep Pub, New Delhi, 1984
2. **Personal efficacy in developing entrepreneurship** Parek U. and Rao T. V., Learning systems, New Delhi, 1978
3. **Developing Entrepreneurship. A Handbook**, Rao T. V. and Parekh L.U., Learning Systems, New Delhi, 1982.

**Course outcomes:****After completion, Students are able to:**

1. Understand the strategy making for solving business problem.
2. Learn different documents needed in business.
3. Understand advertisements making.
4. Understand basic financial calculation.

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