

# **SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR ( M.P.)**



## **SYLLABUS**

**For**  
**Bachelor of Technology (Food engineering)**  
**Course Code : BTFTE**

Department of Food Technology Engineering  
Faculty of Engineering

Duration of Course	:	4 Year
Examination Mode	:	Semester
Examination System	:	Grading

Swami Vivekanand University, Sironja Sagar (M.P.)  
2015-2016



## Mathematics - I (BTFTE-101)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		Max	Min	(d) = (a+c)	Max	Min	(h) = (e+f)								
		(a)	(b)		(c)	(e)		(f)	(g)	(i) = (d+h)					
BTFTE-0101	Mathematics - I	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

### UNIT – I

**Marks :16**

MATRICES Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties of eigen values – Caley – Hamilton theorem – Orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

### UNIT – II

**Marks :16**

DIFFERENTIAL CALCULUS Curvature – Cartesian and polar coordinates – Circle of curvature – Involutives and Evolutives – Envelopes – Properties of envelopes.

### UNIT – III

**Marks :16**

FUNCTIONS OF SEVERAL VARIABLES Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangean Multiplier method – Jacobians

### UNIT – IV

**Marks :16**

ORDINARY DIFFERENTIAL EQUATIONS Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form

### UNIT – V

**Marks :16**

THREE DIMENSIONAL ANALYTICAL GEOMETRY Direction cosines and ratios – Angle between two lines – Equation of a plane – Equation of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere – Orthogonal spheres.

### Text Books

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 38th Edition.,
2. Dr.V.Ramamurthy & Dr. Sundarammal Kesavan," Engineering Mathematics" – Vol I & II Anuradha Publications, Revised Edition 2006.
3. Veerajan, T., Engineering Mathematics, Tata McGraw Hill Publishing Co., New Delhi,2000.

### Reference Books

1. Kreyszig.E, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons. Singapore,2001.
2. Kandasamy P etal. "Engineering Mathematics", Vol.I (4th revised edition), S.Chand &Co., New Delhi,2000.
3. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "Advanced Mathematics for Engineering students", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.



## Fundamentals of Physics (BTFTE-0102)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam	
						Theory		MST	Total	Practical		TW	Total			
		L	T	P	C	Max	Min	(c)	(d) =	Max	Min	(g)	(h) =			(i) =
		(a)		(b)		(a+c)	(e)		(f)	(e+f)	(d+h)					
BTFTE-0102	Fundamentals of Physics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs	

### UNIT – I

**Marks :16**

WAVE OPTICS-I Interference- definition, types, explanation of interference, Interference by division of wave front: Fresnel's biprism, fringe width, Interference in thin films  
Wedge shaped films, Interference by division of amplitude: Newton's rings, Michelson's Interferometer and its applications.

### UNIT – II

**Marks :16**

WAVE OPTICS-II Diffraction :- Introduction - Differences between Fresnel and Fraunhofer diffractions Single slit diffraction ( Qualitative and quantitative treatment) – Differences between interference and diffraction, resolving power of optical instruments (prism and grating). Polarization:- Introduction – double refraction –Negative crystals & Positive crystals - Nicol's prism – Quarter wave plate and half wave plate – Production and detection of circularly and elliptically polarised light.

### UNIT – III

**Marks :16**

QUANTUM PHYSICS De Broglie's hypothesis, De Broglie's wave length, Davisson and Germer's experiment, Compton Effect, concept of wave packet & their properties, wave function & probability interpretation, Heisenberg's Uncertainty Principle, its elementary proof and applications, energy and momentum operators, time dependent and time independent Schrödinger wave equation. Application of time independent Schrödinger wave equation to particle trapped in a one dimensional square potential well.

### UNIT – IV

**Marks :16**

#### NUCLEAR PHYSICS

General properties of nucleus, Nuclear model (liquid drop model and shell model), accelerator, linear particle accelerator, cyclotron, general betatron, Counters and particle detectors Geiger-Muller Counter, nuclear fission, nuclear fusion, nuclear reaction, nuclear reactors.

### UNIT – V

**Marks :16**

#### LASER AND FIBER OPTICS

Laser: Stimulated and spontaneous processes, main part of laser, laser action population inversion, pumping, Optical resonators, characteristics of laser beam, Principles and working of Ruby, Nd:YAG, He-Ne & with energy level diagram and Applications of lasers Fiber Optics - Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number, propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses, various uses, and application of optical fibers.

### Text Books

1. Gaur and Gupta "Engineering Physics"
2. Tiwari and Navneet Gupta "Engineering Physics"
3. Vikram Yadav "Engineering Physics"



## Reference Books

1. Beiser, "Modern Physics", McGraw-Hill Inc., New Delhi.
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Jenkins and White: "Optics", McGraw-Hill Book Company.
4. Sanjeev Puri: Modern Physics, Narosa Pub.Co. 2004.
5. Kaplan: Nuclear Physics, Narosa Publishing, 1987.
6. Tyagrajan and Ghatak: Lasers, Macmillan, 2001.

## List of Experiments

1. Keiser: G Optical fiber Communication, McGraw-Hill, 2000.
2. Fresnel Biprism,
3. Newton's Rings,
4. Michelsons Interferometer.
5. Resolving Powers –Telescope,
6. Spectrometers-R.I., Wavelength, using prism and grating
7. Optical polarization based experiments: Brewster's angle, polarimeter etc.
8. Measurements of wavelength of LASER
9. To study the CRO.
10. Charging and discharging of capacitor
11. Other conceptual experiments related to theory syllabus



## Chemistry (BTFTE-0103)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks							Grand Total	Duration of Exam	
						Theory		MST	Total	Practical		TW			Total
		L	T	P	C	Max	Min			Max	Min		(h) =	(i) =	
BTFTE-0103	Chemistry	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

### UNIT – I

**Marks :16**

#### TECHNOLOGY OF WATER

Source of water, Impurities in water, Analysis of water- Hardness of water, Estimation of Hardness, Alkalinity of water, Determination of alkalinity, Disadvantages of using hard water in boiler- sludge and scale formation, Boiler corrosion, Water softening techniques (Internal and External treatment), treatment of water for domestic purposes.

### UNIT – II

**Marks :16**

#### CORROSION AND ITS CONTROL

Corrosion: Basic concept- Principles, Mechanism of Dry or Chemical Corrosion and Wet or Electrochemical Corrosion, Pilling Bedworth rule, Types of corrosion- Galvanic corrosion, Concentration cell corrosion, Pitting corrosion, Stress corrosion, Microbiological corrosion, Factors influencing corrosion, Corrosion control.

### UNIT – III

**Marks :16**

#### A. FUELS

Definition & Classification of fuels, Calorific values, Analysis of coal, Carbonization of coal, Manufacturing of coke & recovery of by-products. Cracking, Knocking, Anti-knocking, Octane & Cetane number, Gaseous fuels.

#### B. LUBRICANTS

Introduction, functions & classification of lubricants, Mechanism of lubrication, Properties and Testing of lubricants.

### UNIT – IV

**Marks :16**

#### POLYMERS

Introduction and classification of polymers, Types of polymerization: addition or chain polymerization, condensation polymerization, Mechanism of addition polymerization -Free radical and Ionic polymerization, Ziegler Natta polymerization, Vulcanization of rubbers, Preparation, Properties and Applications of important polymers- Polyethylene, PVC, PMMA, Nylons, Terylene, Glyptal, Bakelite, Urea-formaldehyde, Silicone resin, Neoprene, Buna S, Buna N.

### UNIT – V

**Marks :16**

#### INSTRUMENTATIONAL METHODS OF CHEMICAL ANALYSIS

Introduction to Spectroscopy, Electromagnetic spectrum, Introduction, Principle, Instrumentation and Application of IR, UV- Visible, NMR, Basic Principle and Instrumentation of Potentiometry, Flame photometry and Chromatography.

### Text Books

1. Jain.P.C and Monika Jain, Engineering Chemistry, Danpat Raj publishing company (P) Ltd, New Delhi – 2002.
2. Dara.S.S, Text book of Engineering Chemistry, S. Chand & Company Ltd, New Delhi
3. Sharma B.K., "Instrumental methods of chemical analysis" 24th Edition Krishna Prakashan Media Pvt. Ltd, Meerut, 2005.

### **Reference Books**

1. Kuriacose J.C. and Rajaram J. Chemistry in Engineering and Technology, Volume II, Tata McGraw Hill p.b. Co., 1988.
2. Jeyalakshmi.R & Ramar. P, Engineering Chemistry, 1st Edition, Devi Publications, Chennai 2006.
3. Rattan S., Text book of Engineering Chemistry, S.K. Kataria and Sons, Publication, 1st Edition, New Delhi, 2012

### **List of Experiments**

1. Preparation of standard solutions.
2. Conductometric titration-determination of strength of an acid.
3. Determination of alkalinity, hydroxyl, carbonate and bicarbonate in water.
4. Determination of total hardness in water using EDTA titrations.
5. Estimation of iron by potentiometer.
6. Estimation of Copper in Ore
7. Determination of viscosity of lubricating oil with change of temperature by
  - a. Red Wood Viscometer Number 1
  - b. Red Wood Viscometer Number 2
8. Determination of Flash and Fire point of liquid fuel and lubricants by
  - a. Cleaveland's Open Cup Method
  - b. Abel's Flash Point Apparatus
  - c. Pensky Martin's Flash Point Apparatus.
9. Determination of Cloud and Pour point of lubricants by Cloud and Pour point Apparatus.
10. Determination of carbon residue of lubricants by Conradson's Apparatus.

### **REFERENCE BOOKS FOR PRACTICAL**

1. Chemistry department manual, Edition, 2008.
2. Chawla S., Theory and Practicals of Engineering Chemistry, Dhanpat Rai & Co. (Pvt.) Ltd. 6th Edition, New Delhi – 2011.



## Basic Engg.- I (BTFTE-0104)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min				
BTFTE-0104	Basic Engg.- I	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

### UNIT – I

**Marks :16**

#### AC & DC CIRCUITS

Circuit parameters, Ohms law, Kirchhoff's law. Average and RMS values, concept of phasor representation, RLC series circuits and series resonance, RLC parallel circuits (includes simple problems in DC & AC circuits) Introduction to three phase systems – types of connections, relationship between line and phase values.

### UNIT – II

**Marks :16**

#### MAGNETIC CIRCUITS

Definition of mmf, flux and reluctance, leakage flux, fringing, magnetic materials and B-H relationship. Problems involving simple magnetic circuits. Faraday's laws, induced emfs and inductances, brief idea on Hysteresis and eddy currents.

### UNIT – III

**Marks :16**

#### ELECTRICAL MACHINES

Working principle, construction and applications of DC machines and AC machines (single phase transformers, single phase induction motors – split phase, capacitor start and capacitor start & run motors).

### UNIT – IV

**Marks :16**

#### DIGITAL ELECTRONICS

– Number system, Boolean Theorems, DeMorgan's Theorem, Logic gates, Implementation of Boolean expression using logic gates, Half adder, Full adder. Electronic Components – Resistors, Inductors and Capacitors and their types. CRO.

### UNIT – V

**Marks :16**

SEMICONDUCTOR – Energy band diagram, Intrinsic and Extrinsic semi conductors, PN Junction diode, Zener diode and their V-I characteristics, Zener diode used as a Voltage regulator, Light emitting diode and Photo diode. Rectifier – Half wave and full wave Rectifier and their efficiency and ripple factor, Filters.

### Text Books

1. Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
2. S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
3. Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
4. Nagrath & Kothari, Basic Electrical Engineering, III Edition TMH.
5. Mehta V.K., Principals of Electronics, S. Chand & Co.
6. Moris Mano, Digital Electronics, PHI Pub.
7. Kalsi H.s., Electronics Instrumentation, ISTE Pub.

### **Reference Books**

1. Kothari D. P and Nagrath IJ, Basic Electrical Engineering, Tata McGraw- Hill, 1991.
2. Thomas L.Floyd Electronic devices, Addison Wesley Longman (Singapore) Pvt . Ltd., 5th Edition.
3. Nagrath & Kothari, Basic Electrical Engineering, III Edition TMH.
4. Mehta V.K., Principles of Electronics, S. Chand & Co.

### **List of Experiments**

1. Study of KVL and KCL.
2. Study of Transformer, name plate rating, determination of ratio and polarity.
3. Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
4. Identification and testing of different Electronics components.
5. Observing input and output waveforms of rectifiers.
6. Verification of truth table for various gates.
7. To study the V-I characteristics of PN diode and Zener Diode.
8. To implement basic logic gate by using universal gate(NAND & NOR).
9. Measurement of frequency and time period of a signal using CRO.





## Computer Lab(BTFTE-0105)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks							Grand Total	Duration of Exam	
						Theory		MST	Total	Practical		TW			Total
		L	T	P	C	Max	Min	(c)	(d) =	Max	Min	(g)	(h) =	(i) =	
		(a)	(b)	(a+c)	(e)	(f)	(e+f)		(d+h)						
BTFTE-0105	Computer Lab	-	-	2	2	-	-	-	-	-	-	50	50	50	

### PURPOSE

This Lab Course will enable the students to understand the basics of computer and to know the basics of MSOffice.

### INSTRUCTIONAL OBJECTIVES

1. To learn the basics of computer, Computer Peripherals and its application in real world.
2. Demonstration on Ms-Word, Ms-Excel, Ms-Power Point and Ms-Access

### Text Books

1. Introduction to Information Technology ITL Education Solutions Ltd., Pearson 2nd Edition, 2006.

### List of Experiments

1. Study experiment on evolution of computer programming languages.
2. Suggest some of the Network Topologies that can be incorporated in your campus. Justify your choice.
3. Experiments to demonstrate directory creation and file creation.
4. Create a document with all formatting effects.
5. Create a document with tables.
6. Create labels in MS word.
7. Create a document to send mails using mail merge option.
8. Create an Excel File to analyze the student's performance. Create a chart for the above data to depict it diagrammatically.
9. Create Excel sheet to use built-in-function like sum, count, countif, if, etc.
10. Create Excel sheet to maintain employee information and use this data to send mails using mail merge.
11. Create a Power Point presentation for your personal profile with varying animation effects with timer.
12. Consider student information system which stores student personal data, mark information and non-academic details.
  - \* Use MS Access to create Tables and execute SQL queries to do this following
  - \* Display all student records.
  - \* Display student details with respect to his identity.
  - \* Delete some records from the table.
  - \* Find total marks obtained by student in each list.



## Workshop Practice (BTFTE-0106)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		Max	Min	Max	Min	(h) =									
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)	(g)	(e+f)	(i) = (d+h)					
BTFTE-0106	Workshop Practice	-	-	2	2	-	-	-	-	50	15	50	100	100	

### PURPOSE

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

### INSTRUCTIONAL OBJECTIVES

To familiarize with

1. The basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy.
2. The production of simple models in the above trades.

### Text Books

1. Gopal, T.V., Kumar, T., and Murali, G., A first course on workshop practice – Theory, practice and work book, Suma Publications, 2005.

### Reference Books

1. Kannaiah, P. & Narayanan, K.C. Manual on Workshop Practice, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy, V.S., First year Engineering Workshop Practice, Ramalinga Publications, Madurai, 1999.

### List of Experiments

1. EMPHASIS TO BE LAID ON REAL LIFE APPLICATIONS WHEN FRAMING THE EXERCISES.
2. FITTING  
Tools & Equipments – Practice in Filing and Drilling.  
Making Vee Joints, Square, dovetail joints, Key Making.
3. CARPENTRY  
Tools and Equipments- Planning practice. Making Half Lap, dovetail, Mortise & Tenon joints, a mini model of a single door window frame.
4. SHEET METAL  
Tools and equipments - Fabrication of a small cabinet, Rectangular Hopper, etc.
5. WELDING  
Tools and equipments - Arc welding of butt joint, Lap Joint, Tee Fillet.  
Demonstration of Gas welding, TIG & MIG.
6. SMITHY  
Tools and Equipments – Making simple parts like hexagonal headed bolt, chisel.



## English (BTFTE-0107)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks							Grand Total	Duration of Exam	
						Theory		MST	Total	Practical		TW			Total
		Max	Min	(d) =	Max	Min	(h) =			(i) =					
BTFTE-0107	English	L	T	P	C	(a)	(b)	(c)	(a+c)	(e)	(f)	(g)	(e+f)	(d+h)	
		-	-	2	2	-	-	-	-	-	-	50	50	50	03 Hrs

### UNIT – I

**Marks :16**

#### LANGUAGES AND SKILLS OF COMMUNICATION

Linguistic Techniques, Reading Comprehension, Phonetic symbols/signs, Oral Presentation, Process of communication, Verbal and non-verbal Communication, Barriers of communication

### UNIT – II

**Marks :16**

#### APPLICATION OF LINGUISTIC ABILITY

Definitions of Engineering terms, objects, processes & principles ,Paragraph Writing on topics of General Interest, Importance of Listening Skills, Unseen Passage, Conversational Dialogues

### UNIT – III

**Marks :16**

#### LETTER WRITING

Applications, Enquiry & Complaint letters, Calling & Sending quotations, Placing orders, Tenders.

### UNIT – IV

**Marks :16**

#### PRECISE WRITING

Slogan – Writing, Technical Description of Simple engineering objects & processes, Note – making.

### UNIT – V

**Marks :16**

#### REPORT WRITING

Observation Report, Survey Report, Report of Trouble, Laboratory Report, Project Report, Telephonic Etiquettes, Debate, Speech.

### Text Books

1. Abraham Benjamin Samuel Practical Communication Communicative English LSRW2000 – SRMEC –June 2006 Revised Edition.
2. Staff of the Department of Humanities and Social Science, Anna University, “English for Engineers /Technologist Vol.-I”. Orient Longman, 1990.

### Reference Books

1. Herbert. A. J. The structure of Technical English Orient Longman 1995.
2. Pickett and Laster, ‘Technical English, Writing, Reading and Speaking’, New York Harper and Row Publications, 1997.
3. Interactive course in phonetics and spoken English published by Acoustics Engineers (ACEN) 2002.



## Project - I (BTFTE-0108)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks							Grand Total	Duration of Exam	
						Theory		MST	Total	Practical		TW			Total
		Max	Min	Max	Min										
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)	(g)	(h) = (e+f)	(i) = (d+h)					
BTFTE-0108	Project - I	-	-	4	4	-	-	-	-	-	-	50	50	50	

The objectives of the course 'Project work' are

1. To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
2. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
3. To give students an opportunity to do something creative and to assimilate real life work situation in institution.
4. To adapt students for latest developments and to handle independently new situations.
5. To develop good expressions power and presentation abilities in students.

The faculty and student should work according to following schedule:

- i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.
- ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty
- iii) At all the steps of the project, students must submit a written report of the same.



## Mathematics-II(BTFTE-0201)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min				
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)	(g)	(h) = (e+f)	(i) = (d+h)					
BTFTE-0201	Mathematics - II	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

### UNIT – I

**Marks :16**

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

### UNIT – II

**Marks :16**

Fourier Series: Introduction of Fourier series, Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform.

### UNIT – III

**Marks :16**

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method.

### UNIT – IV

**Marks :16**

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation. Separation of variable method for the solution of wave and heat equations.

### UNIT – V

**Marks :16**

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem.

### Text Books

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 38th Edition., Veerajan, T., Engineering

### Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
2. Higher Engineering Mathematics by BS Grewal, Khanna Publication
3. Advance Engineering Mathematics by D.G.Guffy



**Material Physics (BTFTE-0202)**

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		Max	Min	Max	Min	(d) =	(h) =								
		(a)	(b)					(c)	(a+c)	(e)	(f)	(g)	(e+f)		
BTFTE-0202	Material Physics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

**UNIT – I**

**Marks :16**

**STRUCTURE OF MATERIALS**

Type of solids, Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Bragg's law X-ray diffraction for crystal structure.

**UNIT – II**

**Marks :16**

**SEMICONDUCTING MATERIALS**

Introduction, intrinsic and extrinsic semiconductors, carrier concentration in intrinsic semiconductors, carrier concentration in n type semiconductors, carrier concentration in p-type semiconductors, Hall effect and its applications - variation of carrier concentration with temperature, conductivity of extrinsic semiconductor, P-N junction – forward bias – reverse bias –V-I characteristics of a p-n junction. Basic introduction of transistors.

**UNIT – III**

**Marks :16**

**DIELECTRIC MATERIALS**

Introduction, Fundamental definitions, Local field, Clausius- Mossotti relation, different types of electric polarization (dipolar, ionic and electronic polarizations), frequency and temperature effects on polarization, dielectric loss, dielectric breakdown, determination of dielectric constant, properties and different types of insulating materials, ferroelectric materials, spontaneous polarization in BaTiO<sub>3</sub>, electrets.

**UNIT – IV**

**Marks :16**

**MAGNETIC & SUPERCONDUCTING MATERIALS**

**MAGNETIC MATERIALS** Concept of magnetism- Dia, para, ferro magnetic materials · Hysteresis loop· Soft and hard magnetic material· magnetic Storages application of magnetic materials

**SUPERCONDUCTING MATERIALS** Introduction – basic theories for superconductivity Meissner effect - Properties of superconductors - Type-I and Type-II superconductors – High T<sub>c</sub> superconductors – application.

**UNIT – V**

**Marks :16**

**NANO MATERIALS**

Introduction to nano science, nano materials synthesis of nano materials (using different routes) properties of nano materials, carbon nano tubes, application of nano materials.

**Text Books**

1. Gaur and Gupta "Engineering Physics"
2. Tiwari and Navneet Gupta "Engineering Physics"
3. Vikram Yadav "Engineering Physics"
4. Materials Science'. By Dr. M. Arumugam.



**Reference Books**

1. Beiser, "Modern Physics", McGraw-Hill Inc., New Delhi.
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Azroff: Solid State Physics, Tata McGraw-Hill, 2004.
4. Materials Science'. By Dr. M. Arumugam.
5. Science of Engg. Materials and Carbon Nano tubes- C. M. Shrivastava and C. Srinivasan

**List of Experiments**

1. Uses of Potentiometers and Bridges (Electrical)
2. Experiments connected with diodes
3. Experiments connected with transistor.
4. Measurement of energy band gap of semiconductor.
5. To study Hall effect.
6. To study Solar cell.
7. To study the LED
8. Other conceptual experiments related to theory syllabus.



## Energy & Environment Science (BTFTE-0203)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			(d) =	(a+c)				
BTFTE-0203	Energy & Environment Science	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

### UNIT – I

**Marks :16**

#### ENERGY

Energy, Energy scenario in world and India, Sources of energy, Renewable and nonrenewable sources of energy, Advantages and disadvantages of different sources of energy- Fossil fuel, Coal, Oil, Gas, Nuclear, Solar, Wind, Geothermal, Hydel, Hydrogen and Ocean energy.

### UNIT – II

**Marks :16**

#### ENVIRONMENT AND ECOSYSTEM

Ecology and ecosystem, Structure and types of an ecosystem, Food chain and food web, segment of Environment-Atmosphere, Hydrosphere, Lithosphere, Biosphere, Cycles in ecosystem-Gaseous, Sedimentary and Water.

### UNIT – III

**Marks :16**

#### ENVIRONMENTAL POLLUTION-I

Introduction, Air Pollution, Lapse Rate and Inversion Temperature, Air Pollutants, Classification of Air Pollutants, Causes of air pollution, Adverse effect of air pollution, Acid rain, Global warming, Chemical & photochemical smog and Ozone layer depletion, Control of Air Pollution.

### UNIT – IV

**Marks :16**

#### ENVIRONMENTAL POLLUTION-II

Water Pollution, Classification of water pollutants, Characteristics of waste water, Waste water treatment- Primary, Secondary and Tertiary, Eutrophication, Soil or and Pollution, Radioactive Pollution, Noise Pollution

### UNIT – V

**Marks :16**

#### ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT

Solid waste management, Treatment and disposal methods, important environmental protection act in India- water, air (prevention and control of pollution) act, Wild life conservation and forest act, Functions of central and state pollution control boards, Environmental impact assessment.

### Text Books

1. Sharma.B.K. and Kaur, Environmental Chemistry, Goel Publishing House, Meerut, 1994.
2. De A.K., Environmental Chemistry, New Age International Pvt. Ltd., New Delhi, 1996.
3. Kurian Joseph & R. Nagendran, Essential of Environmental Studies, Pearson Education, 2004.

### Reference Books

1. Dara S.S., A Text Book of Environmental Chemistry and pollution contro, S.Chand & Company Ltd., New Delhi, 2004.
2. Jeyalakshmi.R, Principles of Environmental Science, 1st Edition, Devi Publications, Chennai 2006.
3. Kamaraj.P & Arthanareeswari.M, Environmental Science – Challenges and Changes, 1st Edition,Sudhandhira Publications, 2007.





## Basic Engg.- II (BTFTE-0204)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		Max	Min	Max	Min										
		(a)	(b)			(c)	(a+c)	(e)	(f)	(g)	(h) = (e+f)	(i) = (d+h)			
BTFTE-0204	Basic Engg.- II	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

### UNIT – I

**Marks :16**

Building Materials & Construction Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

### UNIT – II

**Marks :16**

Surveying & Positioning:

Introduction to surveying Instruments – levels, theodolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

### UNIT – III

**Marks :16**

Engineering Mechanics

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non concurrent Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems. Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia.

### UNIT – IV

**Marks :16**

Measurement

Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainly analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set; introduction to lath, drilling, milling and shaping machines.

### UNIT – V

**Marks :16**

Reciprocating Machines

Thermodynamics: First and second law of thermodynamics; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, Steam engines, hypothetical and actual indicator diagram; Carnot cycle and ideal efficiency; Otto and diesel cycles; working of two stroke & four stroke petrol & diesel IC engines.

### Text Books

1. Raju K.V.B., Ravichandran P.T., Basics of Civil Engineering, Ayyappa Publications, Chennai, 2000.
2. Ramesh Babu, Civil Engineering, VRB Publishers, Chennai, 2000.



3. Kumar, T., Leenus Jesu Martin., and Murali, G., Basic Mechanical Engineering, Suma Publications, Chennai, 2007.
4. Prabhu, T. J., Jai Ganesh, V., Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.

**Reference Books**

1. Rangwala,S.C., Engineering Materials, Charotar Publishing House, Anand,
2. National Building Code of India, Part V, Building Materials, 2005
3. Surendra Singh, Building Materials, Vikas Publishing Company, New Delhi
4. Prabhu, T. J., Jai Ganesh, V., Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.
5. Palanichamy, M.S., Basic Civil & Mechanical Engineering, Tata McGraw-Hill , New Delhi 1991.
6. Nagpal G. R., Power Plant Engineering, Khanna Publisher, Delhi,2004



**Computer Science (BTFTE-0205)**

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam	
						Theory		MST	Total	Practical		TW	Total			
		L	T	P	C	Max	Min	(c)	(d) =	Max	Min	(g)	(h) =			(i) =
		(a)		(b)		(a+c)	(e) (f)		(e+f)	(d+h)						
BTFTE-0205	Computer Science	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs	

**UNIT – I**

**Marks :16**

**PROGRAMMING FUNDAMENTALS**

Computer Basics; Program Development Life Cycle: Flow Chart, Algorithm, Compilation and Execution; Introduction to C Language: program structure, variables, keywords, data types; Input / Output functions: scanf, printf; simple programs.

**UNIT – II**

**Marks :16**

**DECISION AND LOOP CONTROL STRUCTURE**

Logical operators; Decision statements: if/else, switch/case statements; Loop control statements – for, while, do/while.

**UNIT – III**

**Marks :16**

**ARRAYS AND FUNCTIONS**

Arrays: Introduction to arrays; One dimensional array: declaration, reading and printing array elements, sorting and searching. Functions: Definition; declaration of functions; return statement; recursion.

**UNIT – IV**

**Marks :16**

**INTRODUCTION TO OOP CONCEPTS**

OOP concepts: classes and objects, encapsulation, inheritance, overloading, polymorphism, constructor and destructor, data hiding, simple program in C++.

**UNIT – V**

**Marks :16**

**INHERITANCE AND OVERLOADING**

Inheritance – single, multiple, multilevel; Overloading – Function overloading, Operator overloading.

**Text Books**

1. Kanetkar P.Yashwant, “Let us C”, BPB publications, 2002.
2. Ashok N.Kamthane, “Programming with ANSI and Turbo C”, Pearson Education, 2006.
3. Herbert Schildt, “The Complete Reference C++”, TataMcGrawHill, 2001, 3rd Edition.
4. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.

**Reference Books**

1. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.



### **List of Experiments**

Note to the Instructors: Design exercise problems to demonstrate the use of C and C++ in the area of specialization.

1. Programs to demonstrate the use of scanf( ) and printf( ) functions
2. Programs to evaluate arithmetic expressions
3. Programs using conditional statements
4. Programs using for,while , do...while
5. Programs on arrays
6. Programs to perform matrix addition and multiplication
7. Programs to implement functions
8. Programs to illustrate recursion
9. Program to create classes and objects using C++
10. Program to implement Constructor and Destructor in C++
11. Program to implement single inheritance in C++
12. Program to implement Function overloading in C++
13. Program to implement Operator overloading in C++



## Engg. Graphics Lab (BTFTE-0206)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		Max	Min	(d) = (a+c)	Max	Min	(h) = (e+f)								
		(a)	(b)		(c)	(e)		(f)	(g)	(d+h)					
BTFTE-0206	Engg. Graphics Lab	-	-	2	2	-	-	-	-	50	15	50	100	100	

### UNIT – I

#### FUNDAMENTALS OF ENGINEERING GRAPHICS

Lettering, two dimensional geometrical constructions, conics, representation of three-dimensional objects – principles of projections – standard codes – projection of points.

### UNIT – II

#### PROJECTION OF LINES AND SOLIDS

Projection of straight lines, projection of solids – auxiliary projections

### UNIT – III

#### SECTIONS AND DEVELOPMENTS

Sections of solids and development of surfaces.

### UNIT – IV

#### PICTORIAL PROJECTIONS

Conversion of projections: Orthographic projection, isometric projection of regular solids & combination of solids.

### UNIT – V

#### BUILDING DRAWING

Building Drawing – plan, elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course).

### Text Books

1. Jeyapooan, T., Engineering Drawing and Graphics using AutoCAD 2000, Vikas Publishing house Pvt Ltd, NewDelhi, 2005.
2. Narayanan, K.L & Kannaiyah, P., Engineering Graphics, Scitech Publications, Chennai, 1999.

### Reference Books

1. Bhatt, N.D., Elementary Engineering Drawing (First Angle Projection), Charotar Publishing Co., Anand, 1999.
2. Venugopal, K. Engineering Drawing & Graphics, New Age international Pvt. Ltd., 2001.
3. Natarajan, K.V. Engineering Drawing & Graphics, Private Publication, Chennai, 1990.



**Seminar/GD/Lang. Lab (BTFTE-0207)**

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam	
						Theory		MST	Total	Practical		TW	Total			
		L	T	P	C	Max	Min	(c)	(d) =	Max	Min	(g)	(h) =			(i) =
		(a)	(b)	(a+c)	(e)	(f)	(e+f)		(d+h)							
BTFTE - 0207	Seminar/GD/Lang. Lab	-	-	2	2	-	-	-	-	-	-	50	50	50		

**UNIT – I**

**Marks:16:**

Topics to be covered in the Language Lab Sessions:

Introduction session: Introduce oneself, Family background, Educational qualification, Hobbies and interest, Expertise, Experience (If any), Strength and weaknesses.

**UNIT – II**

**Marks:16:**

Body language: Importance of body language, Dressing sense, Walking sense, Talking and communication, Dining and eating sense.

**UNIT – III**

**Marks:16**

Telephonic etiquettes: How to receive calls, How to respond, How to make a call, Common expressions for calling.

PPTs presentations:

Improving speaking skills: Speech practices, Role plays (on stage), GD and Debate, Extempore speech, Word games, JAM (Just a minute) session, Describing objects and situations.

**UNIT – IV**

**Marks:16**

Reading skills: Improving reading skills, Paragraph reading, Storytelling and reading, Audio and video sessions.

**UNIT – V**

**Marks:16**

Writing skills: Paragraph writing, Word power/ vocabulary building, Article writing, Translations from Hindi to English and vice-versa.

Presentation skills: Oral presentations, on all the learning sessions. Seminar on given topics.



**Project work-II (BTFTE-0208)**

Paper Code	Title of the paper	Period Per Week				Distribution of Marks						Grand Total	Duration of Exam	
						Theory		MST	Total	Practical				TW (g)
		Max	Min	(d) =	Max	Min	(h) =							
		(a)	(b)	(c)	(e)	(f)	(i) =							
BTFTE-0208	Project work-II	-	-	4	4	-	-	-	-	-	50	50	50	

The

objectives of the course 'Project work' are

1. To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
2. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
3. To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.
4. To adapt students for latest developments and to handle independently new situations.
5. To develop good expressions power and presentation abilities in students.

The faculty and student should work according to following schedule:

- i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.
- ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.
- iii) At all the steps of the project, students must submit a written report of the same.

## BTFTE-0301 - MATHEMATICS-III

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFT E-0301	Mathematics-III	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT – 1

**Marks-16**

Fourier series Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd Functions, half range series, Harmonic analysis.

### UNIT – 2

**Marks-16**

Laplace Transform Definition, Transform of elementary functions, Properties of Laplace transform, Transform of Derivatives & integrals, Multiplication by  $t$ , Division by  $t$ , Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

### UNIT - 3

**Marks-16**

Partial Differential Equation Formation, Solution by direct integration method, Linear equation of first order, Homogeneous Linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

### UNIT – 4

**Marks-16**

Complex Variable Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, and Evaluation of real definite integrals.

### UNIT - 5

**Marks-16**

Statistics Random variables, Discrete & continuous probability distributions, Expectation, Mean & Standard Deviation, Moments & moment generating function, Distributions- Binomial, Poisson and Normal distributions

### TEXT BOOKS: -

1. Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.
2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.

### REFERENCE BOOKS: -

1. Advanced Engg. Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
2. Applied Mathematics by P.N. Wartikar & J.N. Wartikar. Vol- II– Pune Vidyarthi Griha Prakashan, Pune
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.



# BTFTE-0302 INTRODUCTION OF FOOD SCIENCE

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE-0302	Introduction of food science	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

## UNIT 1:

**Marks: 16**

Introduction to food science and technology, Nutritive value of foods, Food in health and disease. , Importance of water in food, water activity and shelf life of food, Loss of vitamins and minerals during processing.

## UNIT 2:

**Marks: 16**

Basic terms used in study of food science and nutrition, Understanding relationship between food, nutrition and health.

## UNIT 3:

**Marks: 16**

Types of microorganisms normally associated with foods: mould yeast, and bacteria. Extrinsic and Intrinsic parameters, Food-borne diseases.

## UNIT 4:

**Marks: 16**

Biotechnology in relation to food industry, Important enzymes in food and feed industry, food flavours, food additives, food preservatives, food toxics, Nutraceuticals, and Oriental fermented products, SCP, Probiotics, prebiotic and synbiotics.

## UNIT 5:

**Marks: 16**

**NUTRIENTS** – Macronutrients and micronutrients, **BALANCED DIET**, RDA, Essential amount and, Deficiency & disorder of Energy , Carbohydrates, lipids and proteins , Fat soluble vitamins-A, D, E and K , Water soluble vitamins –B and vitamin C , Minerals for human health. Balance diet chart for different age groups ( Child , women, men, old age man)

## RECOMMENDED BOOKS:

1. Food Safety and Standards Authority of India portal, Government of India
2. ICAR recommendation for balance diet
3. Portter
4. Srilakshmi (2007). *Food Science*, 4th Edition. New Age International Ltd.

# BTFTE-0303 Sensory Evaluation

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE-0303	Sensory evaluation	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

## UNIT 1:

**Marks-16**

### INTRODUCTION TO QUALITY ATTRIBUTES OF FOOD (Potter)

Introduction to sensory analysis; general testing conditions, Requirements of sensory laboratory; organizing sensory evaluation programme, Appearance, flavor, textural, sanitary, nutritional and other quality attributes of food in food quality evaluation, Different tests for sensory evaluation– discrimination, descriptive, affective; Flavour profile and tests; Ranking tests; Methods of sensory evaluation of different food products. Computer-aided sensory evaluation of food & beverage, statistical analysis of sensory data.

## UNIT 2:

**Marks-16**

### GUSTATION (Amerine, Rao)

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 quality, reaction time, taste modification, absolute and recognition threshold; Taste abnormalities; Taste measurement. Selection of sensory panelists; Factors influencing sensory measurements; Sensory quality parameters -Size and shape, texture, aroma, taste, color and gloss; Detection, threshold and dilution tests.

## UNIT 3:

**Marks-16**

### OLFACTION (Amerine, Rao)

Introduction, definition and importance of odor and flavor; Anatomy of nose, physiology of odor perception; Olfactory abnormalities; Mechanism of odor perception; Odor classification, chemical specificity of odor; Odor measurement using different techniques – primitive to recent techniques; Merits and demerits of each method.

## UNIT 4:

**Marks-16**

### COLOR ( DeMan, Rao)

Introduction and importance of color, Dimensions of color and attributes of color; gloss, appearance etc., Physiology of color perception, Color abnormalities, Measurement of color; Munsell color system, CIE color system, Hunter color system, spectrophotometry and Colorimetry etc.

## UNIT 5:

**Marks-16**

### TEXTURE (DeMan, Rao) (14 Lectures)

Introduction, definition and importance of texture, Physiology of touch in texture perception, receptors involved in texture perception, Phases of oral processing; Rheology of foods, viscosity, plasticity; Texture classification; Texture Measurement – basic rheological models, forces involved in texture measurement, Application of texture measurement in cereals, fruits and vegetables, dairy, meat and meat products.

#### RECOMMENDED BOOKS:

1. Rao E. S. (2013). Food Quality Evaluation, Variety Books.
2. DeMan J. (2007). Principles of Food Chemistry, 3<sup>rd</sup> ed., Springer.
3. Meilgard (1999). Sensory Evaluation Techniques, 3<sup>rd</sup> ed. CRC Press LLC,
4. Potter, N. and Hotchkiss, J.H.1995. Food Science, 5<sup>th</sup> Ed., Chapman & Hall.
5. Amerine, Pangborn & Roeissler (1965). Principles of Sensory Evaluation of food, Academic Press, London.

#### List of experiments:

1. Selection and training of sensory panel; Detection and threshold tests;
2. Ranking tests for taste, aroma colour and texture;
3. Sensory evaluation of various food products using different scales, score cards and tests;
4. Estimation of color and texture; Relationship between objective and subjective methods.

# BTFTE- 304 Food Chemistry-I

## UNIT 1:

**Marks-16**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 304	Food Chemistrey – I	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

**Definition and importance;** major food constituents and their physicochemical properties; role of water in food.

## UNIT 2:

**Marks-16**

**Carbohydrates, proteins and lipids:** classification, physical, chemical, nutritional, and functional properties and their structural correlations; auto-oxidation of lipids and rancidity.

## UNIT 3:

**Marks-16**

**Properties** of minerals, vitamins, pigments, anti-oxidants, flavour components, allergens, toxins and anti-nutritional factors in foods; Interaction of constituents in food systems; Changes during storage and processing; Browning reactions in foods.

## UNIT 4:

**Marks-16**

Food groups and their typical composition, Human digestive system: digestion, absorption, transport and metabolism of nutrients in human system;

## UNIT 5:

**Marks-16**

Physical, chemical, biological changes occur in food during processing, preservation, Effects of physical, chemical, biological factors on food.

### RECOMMENDED BOOKS:

- a. Meyer LH. 1987. *Food Chemistry*. CBS.
- b. Swaminathan M. 1974. *Essentials of Foods and Nutrition*. Vol. II. Ganesh

### List of Experiment (Expandable):-

1. Proximate analysis of foods; calorific value of foods; testing of TSS; pH; acidity; estimation of browning intensity of food items.
2. Determination of vitamin C and betacarotene, sugars in food items ; estimation of calcium, phosphorus and iron in food items.

# BTFTE- 305 Food Microbiology-1

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 305	Food Microbiology– I	3	1	2	6	80	25	20	100	50	17	50	100	200	3hrs

## UNIT 1:

**Marks-12**

Growth and survival of microorganisms in foods; spoilage organisms of milk, fruits, vegetables, grains and oilseeds, meat and poultry; Physical and chemical methods to control microorganisms.

## UNIT 2:

**Marks-12**

Factors influencing microbial growth in food: extrinsic and intrinsic factors, Microbial spoilage of food. Chemical changes caused by microorganisms during spoilage. Spoilage of fish, meat, poultry, eggs, fruits and vegetables, Detection of spoilage and characterization.

## UNIT 3:

**Marks-12**

Classification of food borne diseases, Food borne infections: Burcellla, Bacillus, Clostridium perfringens, Vibrio, Yersinia, Escherichia, Salmonella, Shigella, Food adulteration and prevailing food standards in India.

## UNIT 4:

**Marks-16**

Microbiology of Milk: Sources of microorganism in milk and types of microorganisms in milk, Microbial examination of milk (SPC, direct microscopic count, reductase and phosphatase test), Dehydration and pasteurization of milk, Dairy products from microorganisms: butter, yoghurt and cheese, Applications of microbial enzymes in dairy industry [Protease, Lipases]. Utilization and disposal of dairy by-product – whey, Biosensors in food,

## UNIT 5:

**Marks-16**

Microorganisms as source of food: Single Cell Protein, Mushrooms and food values of mushrooms, Food conversions, Microbiological estimation of food: Sample collection, preparation and analysis techniques.

## UNIT6:

**Marks-12**

Food Fermentations; Traditional fermented foods of India and other Asian countries; Probiotics and prebiotics; Fermented foods based on milk, meat and vegetables; Fermented beverages.

**References:**

- a. Banawart GJ. 1989. *Basic Food Microbiology*. 2<sup>nd</sup> Ed. AVI Publ.
- b. Frazier J & Westhoff DC. 1988. *Food Microbiology*.

**List of Experiment:-**

Experiment 1.

Microscopic examination of bacteria, and yeast and molds

Experiment 2.

Standard plate count; Yeast and mould count

Experiment 3.

MPN of coli



## BT FTE- 306 COMPUTER PROGRAMMING

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BT FTE - 306	Computer Programming	-	-	2	2	-	-	-	-	50	17	50	100	100	3 hrs

### Unit 1

**Marks-16**

Basic Java Features – C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes.

### Unit 2

**Marks-16**

Java Collective Frame Work – Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees,

### Unit 3

**Marks-16**

Advance Java Features – Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, and Oracle.

### Unit 4

**Marks-16**

Advance Java Technologies – Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, animating a Series of Images, Loading and playing Audio clips.

### Unit 5

**Marks-16**

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

### RECOMMENDED BOOKS:

- a.E. Balaguruswamy, “Programming in Java”; TMH Publications
- b.The Complete Reference: Herbert Schildt, TMH
- c.Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
- d.Peter Norton, “Peter Norton Guide To Java Programming”, Tec media.
- e.Merlin Hughes, et al; Java Network Programming, Manning Publications/Prentice Hall



**List of Program to be perform (Expandable)**

- a. Installation of J2SDK
- b. Write a program to show Concept of CLASS in JAVA
- c. Write a program to show Type Casting in JAVA
- d. Write a program to show How Exception Handling is in JAVA
- e. Write a Program to show Inheritance
- f. Write a program to show Polymorphism
- g.. Write a program to show Interfacing between two classes
- h. Write a program to add a Class to a Package
- i. Write a program to demonstrate AWT.
- j. Write a program to hide a Class
- k. Write a Program to show Data Base Connectivity Using JAVA
- l. Write a Program to show “HELLO JAVA” in Explorer using Applet
- m. Write a Program to show Connectivity using JDBC
- n. Write a program to demonstrate multithreading using Java.
- o. Write a program to demonstrate applet life cycle.





**BTFTE-307 SEMINAR / GROUP DISCUSSION  
(INTERNAL ASSESSMENT)**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE -307	Seminar / Group Discussion	-	-	2	2	-	-	-	-	50	17	-	50	50	3 hrs

**Objective of GD and seminar** is to improve the MASS COMMUNICATION and CONVINCING/Understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

**Evaluation** will be done by assigned faculty based on group discussion and power point Presentation.



## BTFTE-0401 Principles of Food Science

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 301	Principles of Food Science	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT- I

**Marks: 16**

Historical evolution of food processing technology.

### UNIT II

**Marks: 16**

Scope and importance of food processing. National and international perspectives.

### UNIT III

**Marks: 16**

**Bioreactors:** Introduction to Bioprocesses, Outline of an integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses, Bioreactor & its parts, Functions, Design, Aeration and Agitation Technology, Types of fermentation: sub-merged/solid state, Batch fermentation, Continuous fermentation, Chemostat, Turbidostat. Synchronous culture and its applications, Sterilization, Media Formulation and Medium optimization.

### UNIT IV

**Marks: 16**

**Downstream processing:** Recovery and purification of fermentation products: Cell removal by precipitation, filtration and centrifugation, Cell disruption: Physical and Chemical methods, Product extraction by liquid - liquid extraction, Solvent recovery process, Chromatography: Adsorption, Ion exchange; Drying & crystallization.

### UNIT IV

**Marks: 16**

Principles and methods of food preservation-freezing, heating, dehydration, canning, additives, fermentation, irradiation, extrusion cooking, hydrostatic pressure cooking, dielectric heating, microwave processing, aseptic processing, hurdle technology, Juices and concentrates/membrane technology. Storage of food, modified atmosphere packaging. Refrigeration, freezing and drying of food, minimal processing, radiation processing.



**Swami Vivekanand University, Sagar(M.P.)** 

**RECOMMENDED BOOKS:**

Principles of Fermentation Technology, P.F. Stanbury and A. Whitaker, Pergamon Press

Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley and Sons Inc.

Bioprocess Technology: Fundamentals and Applications, KTH, Stockholm.

Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill.



**BTFTE- 402 Food chemistry-II**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFT E-402	Food chemistry-II	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

**UNIT 1:**

**Marks 16**

Introduction to different food groups and importance of food chemistry; Water in foods and its properties. Carbohydrate: Sources of food carbohydrates; Physico-chemical and functional properties; chemistry and structure of homosachharides and heterosachharides.

**UNIT 2:**

**Marks 16**

: **Proteins** : Sources and physico-chemical and functional properties; Purification of proteins; common food proteins.

**UNIT 3:**

**Marks 16**

**Fats:** Sources and physico chemical and functional properties; PUFA [Poly-unsaturated Fatty Acids]

hydrogenation and rancidity; Saponification number, iodine value, Reichert-Meissl number, Polenske value;

Lipids of biological importance like cholesterol and phospholipids.

**UNIT 4:**

**Marks 16**

Sources and structures of minerals & vitamins; Effect of processing and storage of vitamins; Pro vitamins A & D; Vitamins as antioxidants. Nutritional parameter measurement- Moisture % by weight, Ash % by weight, Protein % by weight, Carbohydrate % by weight, Energy % by weight. Bomb method, Kjeldahl method, Moisture content determination in weaning food, Acid Insoluble ash determination in weaning food, Fat determination methods.

**UNIT 5:**

**Marks 16**

Enzymes in foods, and food industry, bio-deterioration of foods, food contaminants, additives and toxicants. Food Preservatives, Pigments & Flavouring Agents: Classification, Importance, types and sources of pigments — their changes during processing, packaging & storage.

**RECOMMENDED BOOKS:**

- Essentials of Food & Nutrition by Swaminathan, Vol. 1 & 2
- Food Chemistry by L. H. Moyer
- Hand Book of Analysis of fruits & vegetables by S. Ranganna
- Bio Chemistry by Linhinger



**BTFTE- 403 Food Microbiology-II**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 403	Food Microbiology-II	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

**UNIT 1:**

**Marks 16**

Microorganisms important in food microbiology: molds, yeast, bacteria-general characteristic, Classification and importance, Principles of food preservation.

**UNIT 2:**

**Marks 16**

Growth and survival of microorganisms in foods; spoilage organisms of milk, fruits, vegetables, grains and oilseeds, meat and poultry; Physical and chemical methods to control microorganisms.

**UNIT 3:**

**Marks 16**

Biochemical changes caused by microorganisms; Microbes in foodfermentation, putrefaction, lipolysis; Antagonism and synergism in microorganisms; Food poisoning and food borne infections; Microbial toxins.

**UNIT 4:**

**Marks 16**

Food hygiene and sanitation: Contamination during handling and processing and its control; indicator organisms; Rapid methods in detection of microorganisms.

**UNIT 5:**

**Marks 16**

Food Fermentations; Traditional fermented foods of India and other Asian countries; Probiotics and prebiotics; Fermented foods based on milk, meat and vegetables; Fermented beverages.

**RECOMMENDED BOOKS:**

1. Banawart GJ. 1989. *Basic Food Microbiology*. 2<sup>nd</sup> Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. *Food Microbiology*. 4<sup>th</sup> Ed. McGraw Hill.
3. Garbutt J. 1997. *Essentials of Food Microbiology*. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. *Modern Food Microbiology*. 7<sup>th</sup> Ed. Springer.

**List of experiment**

1. Detection and enumeration of pathogenic and indicator organisms in food
2. Testing of drinking water under IS- 10500
3. Enumeration of total plate count in animal feed.
4. Detection of salmonella in water sample, food sample.
5. Dtection of shiegella in food sample
6. Food poisoning related microbes testing- TPC, E.Coli, Yeast & Mold, Coliform.



## BTFTE- 404 Food Engineering-I

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 404	Food Engineering-II	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

### UNIT 1:

**Marks 16**

Introduction to food engineering & processes: principles of thermodynamics and heat transfer applied to food engineering; fundamentals of heat and analogy to mass transfer in food processing. Scope of food processing; historical developments; principles of food processing and preservation.

### UNIT 2:

**Marks 16**

Kinetics of biological reactions - kinetics of reactions occurring in processed foods, reaction velocity constant, order of reaction; quality changes during storage of foods; application of Arrhenius equation to biological reactions.

### UNIT 3:

**Marks 16**

Method for thermal process evaluation - Commercial sterility, pasteurization and sterilization methods based on slowest heating region; determination of the process time based on region of greatest temperature lag; the process equivalence in terms of minutes at 121.1°C; calculation of process time for fluids on stream line flow and turbulent flow heated in heat exchangers; general introduction to aseptic canning process, hydrostatic sterilizer and aseptic packaging practices and design problems.

### UNIT 4:

**Marks 16**

Process Heat Transfer - Modes of heat transfer and overall heat transfer; thermal properties of foods such as specific heat and thermal conductivity; Fourier's law, steady state and unsteady state conduction; heat exchange equipment; energy balances; rate of heat transfer; thermal boundary layer; heat transfer by forced convections; heat transfer to flat plate and in non Newtonian fluids; heat transfer in turbulent flow; heating and cooling of fluids in forced convection outside tubes; natural convection. Processing and preservation by drying, concentration and evaporation-types of dryers and their suitability for different food products; ultra-filtration, reverse osmosis.

### UNIT 5:

**Marks 16**

Processing and preservation by non-thermal methods, irradiation, high pressure, pulsed electric field, hurdle technology. Use and application of enzymes and microorganisms in processing and preservation of foods; food fermentations, pickling, smoking etc;

## **RECOMMENDED BOOKS:**

1. Fellows PJ. 2005. *Food Processing Technology: Principle and Practice*. 2<sup>nd</sup> Ed. CRC.
2. Jelen P. 1985. *Introduction to Food Processing*. Prentice Hall.
3. Potter NN & Hotchkiss 1997. *Food Science*. 5<sup>th</sup> Ed. CBS.
4. Potty VH & Mulky MJ. 1993. *Food Processing*. Oxford & IBH.
5. Brennan JG, Butter JR, Corell ND & Lilly AVE. 1990. *Food Engineering Operations*. Elsevier.
6. Charm SE, McCabe WL, Smith JC & Harriott P. 1993. *Unit Operations of Chemical Engineering*. McGraw Hills.
7. Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
8. Fellows P. 1988. *Food Processing Technology*. VCH Ellis Horwood.

## **Food Processing Lab.**

1. Seaming and testing of cans; Tin coating measurement and tests for sulphide stain and crystal size of tin plates;
2. Determination of thermal inactivation time of enzymes;
3. Effect of thermal processing on food products
4. Effect of dehydration on food products
5. Effect of refrigeration freezing on foods
6. Use of chemicals in preservation of foods
7. Visit to a food processing plant.



**BTFTE- 405 Food Plant Sanitation and Waste Management**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 405	Food Plant Sanitation and Waste Management	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

**UNIT 1:**

**Marks 16**

Types of food processing wastes & their present disposal methods, Terms and definitions- contamination, contaminant, disinfection, CIP (Cleaning in place), COP (Cleaning out place), sanitation, COA (Certificate of analysis), FEFO (First expired first out), FIFO (First in first out).

**UNIT 2:**

**Marks 16**

Treatment of plant waste by physical, chemical and biological methods, Effluent treatment plants, Use of waste and waste water

**UNIT 3:**

**Marks 16**

**.WATER DISPOSAL AND SANITATION:** Waste water ,hardness of water, break point chlorination, physical and chemical nature of impurities, BOD, COD, waste water treatment, milk plant sanitation, CIP system, sanitizers used in food industry.

**UNIT 4:**

**Marks 16**

Biomethanation and biocomposting technology for organic waste utilization, incineration & efficient combustion technology, Integration of new and renewable energy sources for waste utilization.

**UNIT 5:**

**Marks 16**

.Sanitary aspects of waste disposal. Establishing and maintaining sanitary practices in food plants, role of sanitation, general sanitary consideration and sanitary evaluation of food plants.

**RECOMMENDED BOOKS:**

1. ISO 22000-FSMS manual
2. PRP (Prerequisite programme) manual
3. FSSC 22000 manual
4. GMP, GHP, GLP manual
5. FSS- ACT-2011



**List of Experiments to be performed:**

1. Study of waste utilization processes
2. Various treatments in use for waste Disposal
3. Practices with cleaning sanitization related agents and tools
4. Pest control practices
5. Personal hygiene related practices
5. Warehouse maintenance related practices
6. Equipment and machines cleaning related practices



**BTFTE- 406 TOUR REPORT & VIVA-VOCE**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 406	Tour Report & Viva-Voce	-	-	2	2	-	-	-	-	50	17	50	100	100	3 hrs

**Course Objective:**

Whatever may be the research and developments in Rock Mechanics, the behaviour of rock is less predictable accurately. Mining Engineering is hence said to be an art more than engineering and the knowledge gained through experience is more valuable.

**Instructional Objective:**

The training enables the students to experience with the practical applications of the theoretical learning. The outcome at the place of work is always much more than what can be learned in the class room.

**Teaching Scheme:**

The industrial training phase I will be organized during summer vacation after IV semester examinations for a minimum duration of four weeks. The class shall be divided into batches of 4 or 5 students and sent to pre-determined mines from where the permissions are obtained. Students may camp at the mines or elsewhere and undergo training as per the direction of mine management. Notional teaching scheme: 4 hrs /week Practical for guidance of students.

**Essential Contents of Tour Report:**

- Name of the mine along with names of owner, agent, manager and other senior officials.
- Location and a brief history of the mine.
- Brief geological description along with characteristics of the ore and its marketing scenario.
- The surface features including mine entries, loading & transport arrangement of ore, disposal of waste, ore beneficiation.
- Method of working including strata control in underground mines and dump management in opencast mines.
- Sampling, survey, training and rescue sections.
- Acknowledgements.



## BTFTE-0407 SELF STUDY (INTERNAL ASSESSMENT)

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 407	Self Study (Internal Assessment)	-	-	2	2	-	-	-	-	-	-	50	50	50	

**Objective of Self Study:** is to induce the student to explore and read technical aspects of his Area of interest / hobby or new topics suggested by faculty.



**BTFTE-0408 SEMINAR / GROUP DISCUSSION  
(INTERNAL ASSESSMENT)**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 408	Seminar / Group Discussion (Internal Assessment)	-	-	2	2	-	-	-	-	-	-	50	50	50	

**Objective of GD and seminar** is to improve the MASS COMMUNICATION and CONVINCING/ Understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

**Evaluation** will be done by assigned faculty based on group discussion and power point Presentation.



## BTFTE- 501 Food Quality and Sensory Evaluation

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 501	Food Quality and Sensory Evaluation	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT I

**Marks 16**

#### INTRODUCTION TO QUALITY ATTRIBUTES OF FOOD (Potter)

Appearance, flavor, textural, sanitary, nutritional and other quality attributes of food in food quality evaluation, Factors influencing sensory measurements, Methods of sensory evaluation of different food products.

### UNIT II

**Marks 16**

**GUSTATION (Amerine, Rao)** 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 quality, reaction time, taste modification, absolute and recognition threshold; Taste abnormalities; Taste measurement

### UNIT III

**Marks 16**

#### OLFACTION (Amerine, Rao)

Introduction, definition and importance of odor and flavor; Anatomy of nose, physiology of odor perception; Olfactory abnormalities; Mechanism of odor perception; Odor classification, chemical specificity of odor; Odor measurement using different techniques – primitive to recent techniques; Merits and demerits of each method

### UNIT IV

**Marks 16**

#### COLOR ( DeMan, Rao)

Introduction and importance of color, Dimensions of color and attributes of color; gloss, appearance etc., Physiology of color perception, Color abnormalities, Measurement of color; Munsell color system, CIE color system, Hunter color system, spectrophotometry and Colorimetry etc.

### UNIT V

**Marks 16**

#### TEXTURE (DeMan, Rao)

Introduction, definition and importance of texture, Physiology of touch in texture perception, receptors involved in texture perception, Phases of oral processing; Rheology of foods, viscosity, plasticity; Texture classification; Texture Measurement – basic rheological models, forces involved in texture measurement, Application of texture measurement in cereals, fruits and vegetables, dairy, meat and meat products

### RECOMMENDED BOOKS:

1. Rao E. S. (2013). Food Quality Evaluation, Variety Books.
2. DeMan J. (2007). Principles of Food Chemistry, 3<sup>rd</sup> ed., Springer.
3. Potter, N. and Hotchkiss, J.H.1995. Food Science, 5<sup>th</sup> Ed., Chapman & Hall.



## BTFTE -502 Food formulation and Preservation

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 502	Food formulation and Preservation	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT I

**Marks 16**

**Introduction of food preservation :** History and evaluation of preservation methods, Introduction of food preservatives and types of food preservatives, Method of food preservation: traditional methods of food preservation, modern methods of food preservation.

### UNIT II

**Marks 16**

**Preservation method and factors cause of food preservation:** Factors responsible for cause of food preservation: physical factors, chemical factors (browning, spoilage), biological factors. Types of food preservation: Physical methods, chemical methods, biological methods.

### UNIT III

**Marks 16**

**Preservation technology:** Methods of drying and concentration, types of dryers, factors affecting drying process, Heat processing : sterilization, pasteurization, blanching, canning. Cold preservation ; refrigeration, freezing, freeze drying, refrigerated gas storage. Food irradiation: technology, application and safety assessments. Types of chemicals used in food preservation, Methods of safety of preserved foods.

### UNIT IV

**Marks 16**

**Preservation of food items:** Method of fruit Preservation, Method of vegetable preservation, Method of candy product preservation, Method of beverage product preservation, Method of cereal and oil products preservation, Method of meat and egg products preservation, Method of dairy product preservation.

### UNIT V

**Marks 16**

**Fruit products, drinks preservation:** Fruit juices: Squash (Orange squash, mango squash), Synthetic drinks, Nectar, Cordial, Barley water, **Carbonated beverages**, Jam (Guava), Jelly(Guava), Marmalade (Orange), Fruit toffees, Ketchup & Sauce (Tomato), Pickles (Mango, Citrus fruits), **RECOMMENDED**

#### BOOKS:

1. DeMan J. (2007). Principles of Food Chemistry, 3<sup>rd</sup> ed., Springer.
2. Potter, N. and Hotchkiss, J.H.1995. Food Science, 5<sup>th</sup> Ed., Chapman & Hall.



**BTFTE – 503 Techniques for Food Analysis**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 503	Techniques for Food Analysis	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

**UNIT I**

Sampling techniques; Water activity, its measurements and significance in food quality; Calibration and standardization of different instruments.

**Marks 16**

**UNIT II**

Spectroscopic techniques using UV/Vis, fluorescence, IR, FTIR, NIR, NMR, atomic absorption, ICP, polarimetry, refractometry, microscopic techniques in food analysis (light microscopy, SEM, TEM, XRD, particle size analysis, image analysis etc.).

**Marks 16**

**UNIT III**

Chromatographic techniques: Adsorption, column, partition, affinity, ion exchange, size exclusion, GC, GLC, HPLC, HPTLC, GCMS, LCMS.

**Marks 16**

**UNIT IV**

Separation techniques: Gel filtration, dialysis, electrophoresis, sedimentation, ultrafiltration and ultracentrifugation, solid phase extraction, supercritical fluid extraction, isoelectric focusing, isotopic techniques

**Marks 16**

**UNIT V**

Special techniques: Immunoassay techniques; Isotopic, non-isotopic and enzyme immunoassays; surface tension; enzymatic methods of food analysis; thermal methods in food analysis (Differential scanning colorimetry and others).

**Marks 16**

**Text books:**

1. Instrumentation KEITH WILSON AND JOHN WALKER .
2. AOAC International. 2003. *Official methods of analysis of AOAC International*. 17<sup>th</sup> Ed. Gaithersburg, MD, USA, Association of Analytical Communities.

## **LIST OF EXPERIMENTS:-**

1. Measuring water activity in any hygroscopic food material (for instance - biscuits/potato chips/coffee powder)
2. Separation of amino acids/coal tar dyes by two dimensional paper chromatography
3. Separation and identification of sugars in fruit juices
4. Separation and identification of carotenoids by column chromatography
5. fatty acid analysis using GC
6. Identification and determination of organic acids by HPLC
7. Heavy metal analysis using atomic absorption spectrometry





**BTFTE – 504 Technology of Fruits, Vegetables and Plantation Crops**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 504	Technology of Fruits, Vegetables and Plantation Crops	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

**UNIT I**

**Marks 16**

Importance of fruits and vegetable, history and need of preservation, reasons of spoilage, method of preservation (short & long term). (**Chapter 1–Girdharilal**).

**UNIT II**

**Marks 16**

**CANNING AND BOTTLING OF FRUITS AND VEGETABLES (8 Lectures)**

Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning,spoilage in canned foods. (**Chapter 2 – 7–Girdharilal**) .

**UNIT III**

**Marks 16**

Introduction, Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes, cordials, nectars, concentrates and powder. (**Chapter 9–Girdharilal**) .

**UNIT IV**

**Marks 16**

Introduction, Jam: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents( Role of pectin, ratio), Theory of jelly formation, Processing & technology, defects in jelly, Marmalade : Types, processing & technology, defects. (**Chapter 11–Girdharilal**) . .

**UNIT V**

**Marks 16**

Pickles: Processing, Types, Causes of spoilage in pickling.( **Chapter 14–Girdharilal**), Selection of tomatoes, pulping& processing of tomato juice, tomato puree, paste, ketchup, sauce and soup.( **Chapter 13–Girdharilal**) , fruits and vegetables, packing and storage.( **Chapter 16–Girdharilal**) . Method of preparation of vinegar.

**RECOMMENDED BOOKS:**

1. Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & Vegetables, ICAR, New Delhi
2. W B Crusess. Commercial Unit and Vegetable Products, W.V.2003. Special Indian Edition, Pub: Agrobios India
3. Barret DM, Somogyi LP &Ramaswamy H. 2005. *Processing of Fruits*. CRC Press

## **LIST OF EXPERIMENTS:**

- a. Preparation of fruit juices, squashes, syrups and ready-to-serve beverages
- b. Canning of fruits and vegetables. Preparation of jams, jellies, marmalade, preserves, and candies
- c. Preparation of pickles, chutneys, and tomato products ketchup, sauce
- d. Visit to fruit and vegetables processing factories



## BTFTE -505 Technology of Cereals, Pulses and Oilseeds

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 505	Technology of Cereals, Pulses and Oilseeds	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

### UNIT: 1

**MARKS: 16**

#### UNIT 1 TECHNOLOGY OF CEREALS

Introduction ( chap 1,2&3, Kent ) (2 lectures)

General introduction and production and utilization trends; Structure and composition of common cereals, pulses and oilseeds.

### UNIT: 2

**MARKS:16**

Wheat --Types , milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, Products and By-products. factors affecting quality parameters; physical, chemical and rheological tests on wheat flour ( Chap 4,6,7,8&9, Kent).

Rice: Classification, physicochemical characteristics; cooking quality; rice milling technology; by- products of rice milling and their utilization;

Parboiling of rice- technology and effect on quality characteristics; aging of rice - quality changes; processed products based on rice. utilization of by products. ( Chap 15, Kent) (6 lectures)

### UNIT: 3

**MARKS:16**

#### TECHNOLOGY OF PULSES (Chap 13, Chakraverty)

Milling of pulses, Dry milling, Wet milling, Improved milling method , processing of pulses, fermented and traditional products.

### UNIT: 4

**MARKS: 16**

#### TECHNOLOGY OF OILSEEDS (Chap 14, 15, 16, Chakraverty)

Introduction, Extraction of oil and refining, Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, Study of iodine value, acid value, saponification value or number, Polenske value, RM value of oil and fat products.

### UNIT: 5

**MARKS: 16**

Corn – Milling (wet & dry) , cornflakes, corn flour (Chap 16,Kent)

Barley- Milling(pearl barley, barley flakes & flour) (Chap 12, Kent)

Oats – Milling ( oatmeal,oatflour & oatflakes ) (chap 13, Kent)

#### RECOMMENDED BOOKS: Text Books:

1. Kent, N.L. 2003. Technology of Cereal, 5th Ed. Pergamon Press.

2. Chakraverty. 1988. Post Harvest Technology of Cereals, Pulses and Oilseeds, revised Ed., Oxford & IBH Publishing Co. Pvt Ltd.
3. Marshall, Rice Science and Technology. 1994. Wadsworth Ed., Marcel Dekker, New York.
4. Manay, S. and Sharaswamy, M. 1987. Food Facts and Principles. Wiley Eastern Limited.

## **Laboratory**

### *List of Experiments:*

1. Physical-tests on wheat: Physicochemical and rheological properties; Determination of gluten content in wheat flour
2. Test on rice: Quality tests of rice; Amylose content determination in rice
3. Test on oil: Extraction of oil using expeller and solvent extraction methods
4. Determination of saturated and unsaturated fat
5. Determination of iodine value, acid value, saponification value or number, Polenske value, RM value of oil
6. visit to related processing industries.



## BTFTE – 0601 Food Safety and Regulations

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 0601	Food Safety and Regulations	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT I

**MARKS:16**

**INTRODUCTION TO FOOD SAFETY) :** Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods.

### UNIT II

**MARKS:16**

**FOOD HAZARDS OF PHYSICAL, CHEMICAL ORIGIN AND BIOLOGICAL ORIGIN :** Introduction, Physical Hazards with common examples, Chemical Hazards(naturally occurring ,environmental and intentionally added ), Impact on health, Control measures , Introduction, Indicator Organisms, Food borne pathogens: bacteria, Food borne pathogens: viruses, Food borne pathogens: eukaryotes, Seafood and Shell fish poisoning, Mycotoxins.

### UNIT III

**MARKS:16**

#### Food safety related practices

General Principles of Food Hygiene- Basic concept Prerequisites Prerequisite programme (PRP), SSOPs etc,

### UNIT IV

**MARKS:16**

**Food safety related best practices:** Good hygiene practices (GHP), Good manufacturing practices (GMP), Good laboratory practices (GLP).

### UNIT V

**MARKS:16**

#### FOOD LAWS AND STANDARDS

Indian Food Regulatory Regime, Global Scenario, Other laws and standards related to food: ICAC- International Codex Alimentarius Commission, FAO, FSSAI-INDIA, FPO-Fruit Product Order, MPO- Meat Product Order, PFA-Prevention of Food Adulteration Act, BIS- Bureau of Indian Standard, Agmark, NFSA-2013, NFPM (National Food Processing Mission) , ADI- Acceptable Daily Intake of Pesticide, Permitted food additives, Permitted food flavor, Permitted food color, Permitted food antioxidants, Permitted metals and their amount in food product, FSS (Food Safety Standard) Act-2011 of India.

#### RECOMMENDED BOOKS:

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



**BTFTE -0602 Food Packaging Technology –I**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 0602	Food Packaging Technology –I	3	1	-	4	80	25	20	100	50	17	50	100	200	3 hrs

**UNIT I**

**MARKS:16**

**Introduction to Food Packaging (Chapter 1,2 Paine & Paine, 1992)**

History, Packaging Functions and Requirements- Historical background, importance and scope of food packaging, functions of food packaging and requirements for effective food packaging Graphics, Package Design, Printing and Labeling- Function of packaging graphics, main printing processes, printing inks, varnishes, adhesives and labels

**UNIT II**

**MARKS:16**

**Food Packaging Materials (Chapter 6,7,8 Robertson, 2012 and Chapter7 Coles *et al*,**

Paper and paper-based materials, corrugated fiber board (CFB); injection molding, blow molding types of plastics and their properties, co-extrusion, lamination, Biodegradable plastics, edible packaging and bio-composites. Environmental Concerns- recycling and disposal of packaging waste Metal and Glass packaging- Metals: Tinplate, tinning process, components of tinplate, tin free can (TFC) types of can, metallic films, lacquers, Glass: composition, properties, methods of bottle making, types of closures.

**UNIT III**

**MARKS:16**

**Package Designing for Foods (Chapter 7,8,9,10,11,13 Paine and Paine, 1992)** Package design for fresh horticultural produce and animal foods, dry and moisture sensitive foods, frozen foods, fats and oils, thermally processed foods and beverages

**UNIT IV**

**MARKS:16**

**Testing and Regulatory Aspects of Food Packaging (Chapter 22 Robertson, 2012)**

Testing Procedures for Packaging Materials- thickness, tensile strength, puncture resistance, bursting strength, seal strength, water vapor permeability, CO<sub>2</sub> permeability, oxygen permeability, grease resistance, Testing Procedures for Packaged Foods - Compatibility and shelf life studies, evaluation of transport worthiness of filled packages. Food Packaging Laws and Regulations

**UNIT V**

**MARKS:16**

**Packaging Machinery and Systems (8 lectures) (Chapter 4 ,Paine & Paine, 1992)**

Bottling machines, seal and shrink packaging machine; form, fill and sealing machine (FFS); vacuum, controlled and modified atmosphere packaging systems; Aseptic packaging systems; Retort packaging, Active and Intelligent packaging systems

**RECOMMENDED BOOKS:**

1. Robertson GL, Food Packaging – Principles and Practice, CRC Press Taylor and Francis Group, 2012
2. Paine FA and Paine HY, A Handbook of Food Packaging, Blackie Academic and Professional, 1992



## BTFTE -0603 Introduction of, Dairy Science

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 0603	Introduction of, Dairy Science	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

### UNIT I

**MARKS:16**

#### Introduction

Present status of milk & milk products in India and Abroad; market milk- Composition of milk of various species, quality evaluation and testing of milk, procurement, transportation and processing of market milk, cleaning & sanitization of dairy equipments. Special milks such as flavoured, sterilized, recombined & reconstituted toned & double toned.

### UNIT II

**MARKS:16**

#### MILK PRODUCTS

Condensed milk, milk powder, cheese, ice-cream, butter, ghee, malted products, evaporated and dried products, other fermented milk products..

### UNIT III

**MARKS:16**

Indigenous milk products - Present status, method of manufacture of *yoghurt, dahi, khoa, burfi, kalakand, gulabjamun, rosogolla, srikhand, chhana, paneer, ghee, lassi* etc; probiotic milk products.

### UNIT IV

**MARKS:16**

Ice cream & cream- Definition, classification, composition, standards, nutritive value, Of ice-cream and cream.

### UNIT V

Cheese: Definition, composition, classification, methods of manufacture, cheddar, Gouda, cottage and processed cheese, evaluation, defects in cheese.

#### Text Books:

1. *Technology of Indian Milk Products*. Dairy India Publ. De S.1980.
2. *Outlines of Dairy Technology*. Oxford Univ. Press. Henderson JL. 1971.
3. *Fluid Milk Industry*. AVI Publ. Rathore NS *et al.* 2008.
4. *Fundamentals of Dairy Technology - Theory & Practices*. Himanshu Publ Spreer E. 1993.
5. *Milk and Dairy Products*. Marcel Dekker.

#### List of Practical to be Performed

1. Study on basics of reception of milk at the plant.
2. Organoleptic test
3. Ph test
4. platform tests in milk; estimation and fat and SNF in milk.



## BTFTE 0604 Processing of dairy product

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 0604	Processing of dairy product	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

### UNIT I

**MARKS:16**

**Fluid Milk :** Composition of milk and factors affecting it; Physico-chemical characteristics of milk and milk constituents, production and collection, cooling and transportation of milk. Packaging storage and distribution of pasteurized milk: whole, standardized, toned, double toned and skim milk. Test for milk quality and adulteration; UHT processed milk, flavored, sterilized milk. Cleaning and sanitation of dairy equipments.

### UNIT II

**MARKS:16**

**Condensed milk-** Definition, methods of manufacture, evaluation of condensed & evaporated milk; dried milk- Definition, methods of manufacture of skim & whole milk powder, instantiation, physiochemical properties, evaluation, defects in dried milk powder.

### UNIT III

**MARKS:16**

#### MILK PRESERVATION & MILK SUBSTITUTES

Methods of milk preservation. Substitutes for milk and milk products. Casein , lactose and other by-products.

### UNIT IV

**MARKS:16**

**Ice cream, Cream-** methods of manufacture, sampling, neutralization, sterilization, pasteurization, cooling, evaluation, defects in ice cream, cream.

### UNIT V

**MARKS:16**

**Cheese, Paneer, Curd, Yoghurt other fermented dairy product:** methods of manufacture, sampling, neutralization, sterilization, pasteurization, cooling, evaluation, defects in **Cheese, Paneer, Curd, Yoghurt other fermented dairy product.**

#### RECOMMENDED BOOKS:

1. *Technology of Indian Milk Products.* Dairy India Publ. De S.1980.
2. *Outlines of Dairy Technology.* Oxford Univ. Press. Henderson JL. 1971.
3. *Fluid Milk Industry.* AVI Publ. Rathore NS *et al.* 2008.
4. *Fundamentals of Dairy Technology - Theory & Practices.* Himanshu Publ Spreer E. 1993.
5. *Milk and Dairy Products.* Marcel Dekker.

#### List of Experiments to be performed:

1. Operation of LTLT & HTST Pasteurization.
2. Preparation of special milks; Cream separation & standardization of milk
3. Preparation and evaluation of table butter, icecream, cheese and indigenous milk product such as *khoa, chhana, paneer, ghee, shrikhand, lassi, burfi* etc.
4. Visit to dairy plants.





## BTFTE -0605 Techniques for Dairy product Analysis

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE - 0604	Techniques for Dairy product Analysis	3	1	2	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT I

**MARKS:16**

#### QUALITY PARAMETERS

Judging and grading of milk; National and international standards of milk and milk products, in plant sanitation and hygiene.

### UNIT II

**MARKS:16**

**Milk adulteration and detection of adulterants of milk:** Methods of milk adulteration, Detection of adulteration in milk: Detection of water adulteration in milk, Detection of added skim or separated milk, Detection of removal of partial complete fat, Detection of buffalo milk adulteration in cow milk, Detection of thickening substances in milk, Detection of added sucrose.

### UNIT III

**MARKS:16**

**Dairy products adulteration and detection of adulterants of dairy products:** Ghee Adulteration: Method of ghee adulteration, Detection of ghee adulteration (RM value, Iodine value, Acid value, Plenske value). Curd adulteration and detection of adulterants, Cream adulteration and detection of adulterants, Other fermented dairy products adulteration and detection of adulterants.

### UNIT IV

**MARKS:16**

**Different tests related milk: In Coming Milk** -Organoleptic Tests, COB test IS-1479(Part 1):1997, Alcohol test, MBRT test, Acidity test:-Conventional & by Titrator IS-1479(Part 1):1997, Starch test IS-1479(Part 1):1997 Boric acid test IS-1479(Part 1):1997, Cane sugar test IS-1479(Part 1):1997, Neutralizer test IS-1479(Part 1):1997, Formaldehyde test, Salt test IS-1479(Part 1):1997, Urea test, Glucose test, H<sub>2</sub>O<sub>2</sub> test, Hypochloride test , FAT/SNF test: IS-1224/IS10083:1997, pH test. **Test on Milk Powder** Moisture test IS:11623:1992, FAT test (Milk Powder) IS:696(Part II):1989, Bacteria test IS:5402:1969-Reaffirmed August'97 (for SPC), IS:5401:1969-Reaffirmed August'97 (for coli). **Test of milk on pasteurization** Phosphatase test IS-1479(Part II):1997, MBRT test, FAT test, SNF test, Bacteria test SPC/ml & Coli/ml test

### UNIT V

**MARKS:16**

**Test on Cream and Butter** Acidity test, FAT test, Phosphatase test IS-479(Part II):1997, Moisture test IS:3507:1996, Acidity test IS:3507:1996, Salt test IS:3507:1996, FAT % test IS:3507:1996, Yeast & Mold test IS:5403:1999, Coli test IS:3507:19966-Reaffirmed Feb.'1997, **Test on Ghee** Moisture % test, FFA test IS:3508:1966, RM test, BR test IS:3508-1997, Baudin test, OL test, Residue (P.A.) test, P.O. value of Ghee (for Butter Oil) test, **Test on Paneer** Moisture % test, FAT % test, Acidity % test, OL test, Yeast & Mold test IS:5403:1999, Coli test IS:3507:19966-Reaffirmed Feb.'1997, **Test on Yogurt** FAT/SNF% test, Acidity %

test, OL test, Yeast & Mold test IS:5403:1999, Coli test IS:3507:19966-Reaffirmed Feb.'1997 **Test on Chhachh** FAT/SNF% test, Acidity % test, Coli test IS:3507:19966-Reaffirmed Feb.'1997,salt test

### **RECOMMENDED BOOKS:**

1. *Technology of Indian Milk Products*. Dairy India Publ. De S.1980.
6. *Outlines of Dairy Technology*. Oxford Univ. Press. Henderson JL. 1971.
7. *Fluid Milk Industry*. AVI Publ. Rathore NS *et al.* 2008.
8. *Fundamentals of Dairy Technology - Theory & Practices*. Himanshu Publ Spreer E. 1993.
9. *Milk and Dairy Products*. Marcel Dekker.

### **List of Experiments to be performed:**

1. Phosphatase test
2. Coli test
3. Yeast & Mold test
4. MBRT test
5. Detergent test
6. Neutralizer test



## BTFTE-0701 Food Quality Management

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE -0701	Food Quality Management	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT-I

**Marks 16**

**National organization and laws for food quality management:** National organizations- FSSAI (Food Safety and Standards Authority of India ), NDRI (National Dairy Research Institute), CFTRI (Central Food Technological Research Institute), NIFTEM ( National Institute of Food Technology Entrepreneurship and Management), ICAR ( Indian Council of Agricultural Research), BARC (BHABHA ATOMIC RESEARCH CENTRE ), MoFPi (Ministry of Food Processing Industries of India), BIS (Bureau of Indian Standard), QCI (Quality Council of India) etc National laws-Dairy industry act, Milk and milk product order-1992, ,Food product order-1955.

### UNIT-II

**Marks16**

**International laws for food quality management:** International organization: FAO (Food and Agriculture Organization), ISO (International Organization for Standardization ), WHO (World Health Organization ), Codex Alimentarius Commission, IAF (International Accreditation Forum) etc. International laws: FSMS-ISO 22000-Food Safety Management System 22000, FSSC 22000 (Food Safety System Certification), Codex Alimentarius Commission guidelines, FAO guidelines, WHO guidelines.

### UNIT-III

**Marks16**

**FOOD SAFETY TOOLS: HACCP:** Preliminary steps to enable hazard analysis, The Seven Steps of Hazard Analysis Critical Control Points (HACCP), Establishing the HACCP Plan. HALAL Certification, Kosher Certification, Agmark.

### UNIT-IV

**Marks16**

**Quality analysis related tools:** ISO series, TQM - concept and need for quality, components of TQM, Kaizen, Risk Analysis, Accreditation and Auditing .

### UNIT-V

**Marks16**

**Current Food law of India:** Food safety standard act 2006 & 2011

### RECOMMENDED BOOKS:

1. HACCP Manual
2. FSMS manual
3. FSSC 22000 manual



## BTFTE-0702 Food Packaging Technology -II

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE -0702	Food Packaging Technology -II	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT-I

**Marks 16**

**Properties of materials for packaging:** such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, their methods of testing and evaluation; Barrier properties of packaging materials: Theory of permeability, factors affecting permeability, permeability coefficient, gas transmission rate (GTR) and its measurement, water vapour transmission rate (WVTR) and its measurement, prediction of shelf life of foods, selection and design of packaging material for different foods.

### UNIT-II

**Marks 16**

Food packaging systems, product characteristics and package requirements: Different forms of packaging such as rigid, semirigid, flexible forms and different packaging system for (a) dehydrated foods (b) frozen foods (c) dairy products (d) fresh fruits and vegetables (e) meat, poultry and sea foods.

### UNIT-III

**Marks 16**

Types of packaging materials (metals, glass, paper and plastics), their characteristics and uses.

Paper: pulping, fibrillation and beating, types of papers and their testing methods;

Glass: composition, properties, types of closures, methods of bottle making;

Metals: Tinsplate containers, tinning process, components of tinsplate, tin free steel (TFS), types of cans, aluminum containers, lacquers;

Plastics: types of plastic films, laminated plastic materials, co-extrusion.

### UNIT-IV

**Marks 16**

Advance in Food packaging - Advances in packaging technology (active packaging, modified atmosphere packaging, aseptic packaging, packages for microwave ovens, biodegradable plastics, edible gums and coatings). Need and role in extending shelf life of foods. Design and testing of package materials, package performance. Principles in the development of safe and protective packing, safety assessment of food packaging materials.

### UNIT V Support Systems:

**Marks 16**

Packaging equipment and machinery: Vacuum, CA and MA packaging machine; gas packaging machine; seal and shrink packaging machine; form and fill sealing machine; aseptic packaging systems; retort pouches, bottling machines; carton making machines, package printing.

### RECOMMENDED BOOKS:

1. Crosby NT.1981. *Food Packaging: Aspects of Analysis and Migration Contaminants*. App. Sci. Publ.
2. Kadoya T. (Ed). 1990. *Food Packaging*. Academic Press.



**BTFTE-0703 Fermentation technology**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE -0703	Environment Management In Mine	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

**UNIT-I**

**Marks 16**

**Introduction to fermentation :** Rate of microbial growth and death. Fermentation kinetics, mass transfer diffusion, membrane transport, dialysis, nutrient uptake. Fermenter design, operation, measurement and control in fermentation. Aeration and agitation in fermentation: Oxygen requirement, measurement of adsorption coefficients, bubble aeration, mechanical agitation, correlation between mass-transfer coefficient and operating variables.

**UNIT-II**

**Marks 16**

**Bioreactors:** Introduction to Bioprocesses, Outline of an integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses, Bioreactor & its parts, Functions, Design, Aeration and Agitation Technology, Types of fermentation: sub-merged/solid state, Batch fermentation, Continuous fermentation, Chemostat, Turbidostat. Synchronous culture and its applications, Sterilization, Media Formulation and Medium optimization.

**UNIT-III**

**Marks 16**

**Fermentation process:** Rate of microbial growth and death: Fermentation kinetics, mass transfer diffusion, membrane transport, dialysis, nutrient uptake, Oxygen requirement, measurement of adsorption coefficients, bubble aeration, mechanical agitation, correlation between mass-transfer coefficient and operating variables.

**UNIT-IV**

**Marks 16**

**Types of fermentation:** sub-merged/solid state, Batch fermentation, Continuous fermentation, Chemostat, Turbidostat. Synchronous culture and its applications, scale up in fermentation. Product recovery. Biological waste treatment and inplant sanitation.

**Downstream processing:** Recovery and purification of fermentation products: Cell removal by precipitation, filtration and centrifugation, Cell disruption: Physical and Chemical methods, Product extraction by liquid - liquid extraction, Solvent recovery process, Chromatography: Adsorption, Ion exchange; Drying & crystallization.

**UNIT-V**

**Marks 16**

**Unit 3: Production of industrial metabolites:** Isolation, maintenance and development of microorganisms, strain improvement. Microbial production of industrial enzymes (glucose isomerase, cellulase, amylase, lipase, protease) and secondary metabolites (penicillins, cephalosporins and streptomycin). Biomass production from agro-residues (Distiller's yeast and SCP), Bioethanol production.

**RECOMMENDED BOOKS:**

1. Biotechnology. A Textbook of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Associates.
2. Principles of Fermentation Technology, P.F. Stanbury and A. Whitaker, Pergamon Press
3. Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley and Sons Inc.
4. Bioprocess Technology: Fundamentals and Applications, KTH, Stockholm.

**List of Experiments to be performed:**

1. Demonstration of working of laboratory scale fermenter.
2. Fermented dairy product production curd, paneer, ice-cream, butter, yoghurt etc in lab.
3. Fermented fruit products production in lab.
4. Production and estimation of alcohol through grape juice.
5. Comparison of aerobic and anaerobic process of fermentation.
6. Effect of pH and temperature on enzyme activity



**BTFTE-0704 Introduction of Non veg food product**

Course Code	Title of Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE -0704	Introduction of Non veg food product	3	1	2	4	80	25	20	100	50	17	50	100	200	3 hrs

**UNIT-I**

**Marks 16**

Poultry industry in India, measuring the yields and quality characteristics of poultry products, microbiology of poultry meat, spoilage factors; Lay-out and design of poultry processing plants, Plant sanitation; Poultry meat processing operations, equipment used – Defeathering, bleeding, scalding etc.; Packaging of poultry products, refrigerated storage of poultry meat, by products – eggs, egg products, Whole egg powder, Egg yolk products, their manufacture, packaging and storage.

**UNIT-II**

**Marks 16**

Meat composition from different sources; muscle structure and compositions; post-mortem muscle chemistry; meat colour and flavours; meat microbiology and safety.

**UNIT-III**

**Marks 16**

Modern abattoirs, typical layout and features, Ante-mortem handling and design of handling facilities; Hoisting rail and traveling pulley system; stunning methods; steps in slaughtering and dressing; offal handling and inspection; inedible by-products; operational factors affecting meat quality; effects of processing on meat tenderization; abattoir equipment and utilities

**UNIT-IV**

**Marks 16**

Chilling and freezing of carcass and meat; canning, cooking, drying, pickling, curing and smoking; prepared meat products like salami, kebabs, sausages, sliced, minced, corned; intermediate moisture and dried meat products; meat plant hygiene – GMP and HACCP; Packaging of meat products.

**UNIT-V**

**Marks 16**

Commercially important marine products from India; product export and its sustenance; basic biochemistry and microbiology; preservation of postharvest fish freshness; transportation in refrigerated vehicles; deodorization of transport systems; design of refrigerated and insulated trucks; grading and preservation of shell fish; pickling and preparation of fish protein concentrate, fish oil and other by products.

**RECOMMENDED BOOKS:**

1. Forrest JC. 1975. *Principles of Meat Science*. Freeman.
2. Govindan TK. 1985. *Fish Processing Technology*. Oxford & IBH.
3. Hui YH. 2001. *Meat Science and Applications*. Marcel Dekker.

**List of Practical to be Performed**

1. Slaughtering and dressing of meat animals in lab or slaughter house.
2. Study of post-mortem changes in slaughter house
3. Evaluation of meat quality
4. Preservation practices by dehydration, freezing, canning, curing, smoking and pickling of fish and Meat
5. Visit to meat processing plants.





**BTFTE-0705 Technology of Meat Fish and Egg**

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE -0705	Technology of Meat Fish and Egg	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

**UNIT-I**

**Marks 16**

**Introduction:** Popular meat products, Fish and poultry products, Egg products, Nutritional value of different non veg products. Multi dimension of meat & meat production, Livestock population, Meat proteins, Meat fats, Vitamins and minerals in meat.

**UNIT-II**

**Marks 16**

**MEAT AND POULTRY TECHNOLOGY**

Livestock and poultry population in India, Status of meat industry in India. Effects of feed, breed and environment on production of meat animals and their quality, Meat Quality - Marbling, Quantum of connective tissue, Firmness, color, flavor, texture, Water-Holding Capacity(WHC), Emulsification capacity of meat, Grading and Inspection of Meat.(**Chapter 13,14 Shai Barbut**) , Slaughter, Abattoir, Antemortem examination of meat animals, slaughter of buffalo, sheep/goat, poultry, pig, dressing of carcasses, post-mortem examination of meat, Generic HACCP model of Poultry slaughter (**Chapter 4,12 Shai Barbut**)

**UNIT-III**

**Marks 16**

**EGG SCIENCE AND TECHNOLOGY**

Status of egg industry in India, Structure and composition of egg, Nutritive value of Egg, Egg formation (**Chapter 3,6,7 Stadelman**) , Factors affecting egg quality and measures of egg quality. (**Chapter 3, Stadelman**) (**4 lectures**) , Functional properties of eggs in foods-Coagulation, Foaming, Emulsification, Crystallization control, Color, Flavor. (**Chapter16, Stadelman**)

**UNIT-IV**

**Marks 16**

**FISH TECHNOLOGY**

Status of fishery industry in India. Relationship between chilling and storage life, MAP, general aspects of freezing, changes in quality during chilled and frozen storage (**Chapter 4, Hall**) , Drying and salting of fish, water activity and shelf-life , salting process, salting methods (brining, pickling, kench curing, gaspe curing), types of salts, dried and salted fish products- pindang, fishwood, dried shrimp. Preservation by smoking, smoke production, smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, pre-smoking processes, smoking process control. Traditional chimney kiln, modern mechanical fish smoking kiln .(**Chapter 2, Hall**)

**UNIT-V**

**Marks 16**

**TECHNOLOGY OF MILK**

Status of Milk Industry in India, Color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat, OR, electrical conductivity. (**Chapter 1, Sukumar De**), Lactose, alpha and beta forms and their differences, Significances of lactose in dairy industry. (**Chapter 6, Webb & Johnson**), Composition and structure of Milk Fat, Factors affecting melting point, boiling point, solubility and Refractive Index. (**Chapter 4, Webb & Johnson**)

### **RECOMMENDED BOOKS:**

1. Forrest JC. 1975. *Principles of Meat Science*. Freeman.
2. Govindan TK. 1985. *Fish Processing Technology*. Oxford & IBH.
3. Hui YH. 2001. *Meat Science and Applications*. Marcel Dekker.

### **List of Practical to be Performed**

1. Meat cutting and handling in lab or slaughter house
2. Shelf-life studies on processed meat products
3. Evaluation of quality of eggs
4. Estimation of meat: bone ratios
5. Preparation of meat products- barbecued sausages, loaves, burger, fish finger
6. Preparation of egg products in lab.



**BTFTE-0706 DEPARTMENTAL ELECTIVE-I (B)**

**UNIT-I**

**Marks 16**

Present status of drilling and blasting practices in India and abroad: Methods of drilling for production of minerals from surface and underground mines, rotary, percussive and rotary –percussive drilling, different types of bits, bit wear, different types of machines, hydraulic drills, long hole drilling.

**UNIT-II**

**Marks 16**

Variables in drilling, optimization of drilling parameters, mechanics of drilling, drill-ability of rock, boring in rocks.

**UNIT-III**

**Marks 16**

Recent developments in explosives and blasting techniques. Explosives and Blasting Systems, Monitoring Blasting Results: Borehole pressure, transducer, V.O.D. Probe, vibration monitor, high speed video camera, blast design, mechanics of blasting. Computational models of blasting. Influence techniques, Overcasting with explosives. Nuclear blasting, Safety.

**UNIT-IV**

**Marks 16**

Explosives :

Classification and comparative properties of explosives, blasting devices, general application and uses; safety considerations. Blasting damages, ground vibrations and air blast. Impact of ground vibration and air blast on the neighboring structures and communities and mitigate measures, reinforcement and design alternatives.

**UNIT-V**

**Marks 16**

Blasting Systems:

Electric and non-electric methods, delay blasting techniques, priming, charge distribution, Mechanism of rock blasting. Alternative methods of rock fragmentation. Novel methods of drilling, choice of drills.

**RECOMMENDED BOOKS:**

1. A Study of Metalliferous Mining – Y.P.Chacharkar
2. Rock Fragmentation – B.Mohanty
3. Rock Fragmentation – Wayne S. Brown



## BTFTE- 0801 Introduction of Bakery and Confectionary

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE-0801	Introduction of Bakery and Confectionary	3	1	-	4	80	25	20	100	-	-	-	-	-	3 hrs

### UNIT I

**Marks 16**

#### BAKERY

Current status, growth rate, and economic importance of Bakery and Confectionary Industry in India. Product types, nutritional quality and safety of products, pertinent standards & regulations. Bakery Products: Ingredients & processes for breads, buns, pizza base, biscuits, cookies & crackers, cakes & pastries, doughnuts and rusks. Equipments used, product quality characteristics, faults and corrective measures for above bakery products. Defining and assessing quality of ingredients & products. Part I, (Chapter 1, 2, 3 & 4. Part II, Chapter 1 – 7, Dubey.)

### UNIT II

**Marks 16**

#### CONFECTIONARY

Sugars- Types and sources, methods of preparation of sugars, jaggery, khandsari, raw and refined sugar. Principles of sugar cookery, crystalline and non-crystalline candies. Chapter 26–Manay . Confectionary Products: Cake icings, hard-boiled candies, toffees, fruit drops, chocolates and other confections- ingredients, equipments & processes, product quality parameters, faults and corrective measures. ( Chapter 5, 7 & 8 – Minifie .)

### UNIT III

**Marks 16**

#### Breakfast related bakery products

Production & quality of breakfast cereals, macaroni products and malt. (Chapter 15–Manay .)

### UNIT IV

#### Quality analysis of Bakery and confectionary products

**Marks 16**

Bakery and confectionary industry; raw materials and quality parameters; dough development; methods of dough mixing; dough chemistry; rheological testing of dough-Farinograph, Mixograph, Extensograph, Amylograph / Rapid Visco Analyzer, Falling number, Hosney's dough stickiness tester and interpretation of the data.

### UNIT V

**Marks 16**

#### Technical approach for Bakery and confectionary products

Technology for the manufacture of bakery products-bread, biscuits, cakes and the effect of variations in formulation and process parameters on the quality of the finished product; quality consideration and parameters; Staling and losses in baking; machineries used in bakery industry. Quality characteristics of confectionery ingredients; technology for manufacture of flour, fruit, milk,

sugar, chocolate, and special confectionary products; colour, flavour and texture of confectionary; standards and regulations; machineries used in confectionery industry.

**Reference Books :-**

Dubey SC. 2002. *Basic Baking*. The Society of Indian Bakers, New Delhi.

Francis FJ. 2000. *Wiley*

**List of Practical to be Performed**

1. Effect of mixing method on the quality of baked product.
2. Effect of mixing time on the rheological characteristics of dough.
3. Effect of mixing time on the crispness and firmness of biscuits.
4. Effect of additives on the quality and textural characteristics of bakery products
5. Preparation and quality evaluation of cakes, croissant, doughnuts, and pizza base
6. Preparation and quality evaluation of chocolate
7. Visit to bakery and confectionery industries.



## BTFTE-0802 Management & Entrepreneurship

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE-0802	Management & Entrepreneurship	3	1	2	6	80	25	20	100	-	-	-	-	100	3 hrs

### UNIT I

**Marks 16**

**Management :**Theories of Management, Functions of Management, Planning, Organising, Staffing, Directing, Coordinating, Motivation. Managerial role and skills. Concept and functions of marketing; concepts and scope of marketing management; concepts and elements of marketing mix.

### UNIT II

**Marks 16**

**Types of Organizational structure:** Management practices, Management styles: Indian, Western, Japanese. Concept of market structure, micro and macro environments; Consumer behaviour; consumerism; Marketing opportunities- Analysis, marketing research and marketing information systems.

### UNIT III

**Marks 16**

**Entrepreneurship:** Entrepreneurship and Entrepreneurial decision: Meaning and concept, Preparing for a new venture: opportunity scanning, Innovation, creativity and entrepreneurship, Entrepreneurship and Intrapreneurship, Business planning and evaluation, Business plan preparation, Financial strategy and sourcing.

### UNIT IV

**Marks 16**

**Advertising;** how advertising works? Deciding advertising objectives, advertising budget and advertising message, Media Planning, Personal Selling, Publicity; Sales Promotion, Food and Dairy Products Marketing.

### UNIT V

**Marks 16**

**International Marketing and International Trade:** Salient features of International Marketing, Composition & direction of Indian exports; International marketing environment; Deciding which & how to enter international market; Exports- Direct exports, indirect exports, Licensing, Joint Ventures, Direct investment & internationalization process, Deciding marketing Programme; Product, Promotion, Price, Distribution Channels. Deciding the Market Organization; World Trade Organization (WTO).

### RECOMMENDED BOOKS:

1. Principles of Management by Koontz
2. International Management by Fred Luthans
3. Management by Freeman, Stones



## BTFTE-0803 Beverage technology

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE-0803	Beverage technology	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

### UNIT I

**Marks 16**

Types of beverages and their importance; status of beverage industry in India; 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.

### UNIT II

**Marks 16**

Specialty beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, dairy and imitation dairy-based beverages.

### UNIT III

**Marks 16**

Alcoholic beverages- types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process, equipments used for brewing and distillation, wine and related beverages, distilled spirits.

### UNIT IV

**Marks 16**

Packaged drinking water- definition, types, manufacturing processes, quality evaluation and raw and processed water, methods of water treatment, BIS quality standards of bottled water; mineral water, natural spring water, flavoured water, carbonated water.

### UNIT V

**Marks 16**

Fruit beverages, Fruit product order, General feature of fruit beverages, Preservation principle of fruit beverages, carbonation, Classification of fruit beverages, Fruit juices, squash, synthetic drinks, evaluation of fruit beverages.

### RECOMMENDED BOOKS:

1. Hardwick WA. 1995. *Handbook of Brewing*. Marcel Dekker.
2. Hui YH. et al 2004. *Handbook of Food and Beverage Fermentation Technology*. Marcel Dekker.
3. Priest FG & Stewart GG. 2006. *Handbook of Brewing*. 2<sup>nd</sup> Ed. CRC.
4. Richard P Vine. 1981. *Commercial Wine Making - Processing and Controls*. AVI Publ.



## **List of Practical to be performed:**

1. Chemical and microbiological analysis of raw water quality
2. Preparation of regional fruit juices; Preparation of whey-based beverages
3. Preparation of iced and flavoured tea beverage
4. Preparation of carbonated and noncarbonated soft drinks
5. Preparation of wine and beer; Preparation of soy
6. Milk, fruit milkshakes, herbal beverages; visit to relevant processing units.





## BTFTE-0804 SUGAR TECHNOLOGY

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE-0804	SUGAR TECHNOLOGY	3	1	2	6	80	25	20	100	50	17	50	100	200	3 hrs

### UNIT I

**Marks 16**

#### SUGAR MANUFACTURING & MAINTENANCE

General introduction to Process Sugar Manufacture from sugar cane, General description of the process: Extraction of juice from Cane, Purification of Juice, Evaporation, Crystallization, Centrifugation, Packing. Importance of effective maintenance, Preventive Maintenance, Factors affecting Off-season and seasonal maintenance in Sugar Industry, Guide lines for maintenance of Boiling house Equipment, Cleaning day, Cleaning day schedule, Closing the process on cleaning day, Break down and stoppages

### UNIT II

**Marks 16**

#### SUGAR CHEMISTRY

Biosynthesis of sugar in sugar cane plant, Chemical Formula for Sucrose, Composition of Cane Juice, Sugars and Non-sugars in juice, Reducing Sugar Working Principle of Polarimeter,

### UNIT III

**Marks 16**

#### CLARIFICATION OF JUICE

Effect of Heat, Acid and Alkali treatment on Cane Juice, Various Methods of Clarification, Chemical Reaction involved in Clarification of Juice, Raw Sugar, Refined Sugar, Khandasari Sugar, Jaggery, etc,(Process Flow Chart Only)

### UNIT IV

**Marks 16**

#### CHEMICAL CONTROL

Basic definitions of Brix, Pol, Purity of various intermediate products, Boiling house Recovery, ICUMSA Color Index and Grades (L, S, M) of Sugar, By products of Sugar Industry, Various Sources of waste water in Sugar Industry, Effluent Treatment (Flow Chart Only)

## **UNIT V**

**Marks 16**

### **EQUIPMENTS**

Chronological order of various major Unit Operations involved in the process of sugar manufacture, Principles and uses of major equipments, Constructional aspects of the major equipments involved in Sugar Manufacture Process, Difficulties encountered during operation of these equipments.

### **RECOMMENDED BOOKS:**

- 1. SUGAR TECHNOLOGY MAHARASTRA GOVERNMENT GUIDELINES**
- 2. National sugar institute guidelines**

### **List of Practical to be performed:**

1. To determine pH, Hardness of water.
2. To industrial visit of sugar factory
3. To determine Brix of the Sugar Solution.
4. To Determine Grade & Color of Sugar
5. To Determine Moisture % Sugar.
6. To Determine Ash % Sugar.
7. To Determine Reducing Sugar in Final Molasses



## BTFTE-0806 Departmental Elective II

### (A) Company laws & IPR (Intellectual Property Rights)

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g )		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFTE-0806	Company laws & IPR	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

#### UNIT I

**Marks 16**

Objectives of Intellectual Property Rights, origin and evolution of IPR, tangible and intangible property; concept and classification of intellectual property: Copyrights and related rights, Patent, Industrial Design, Trademarks and Geographical indications.

#### UNIT II

**Marks 16**

**Patent:** Basic criterion for patentability, patentable subjects, patentable inventions, patent acquisition, infringement of patent, discovery Vs invention, product patenting Vs process patenting, special issue in biotechnology patent, Patenting laws in Indian and international perspective, Case study: Basmati case, Neem controversy, Turmeric Case.

#### UNIT III

**Marks 16**

**Biosafety:** Concept and issues; biosafety in relation to human health, environment, transgenic research and applications, biosafety laws, prudent safety practices, guidelines and conventions, biosafety regulation: principles and practices in microbial and biomedical labs, guidelines for research involving DNA molecule ; Regulation bodies at National and International level. Biohazards, genetically modified organisms (GMO), living modified organisms.

#### UNIT IV

**Marks 16**

**Advance IPR:** Industrial design, Products can be protected as industrial designs, Importance of industrial design, Patent Cooperation Treaty (PCT), International Patent System, International Trademark System, Process to select a trade mark, Function of a trade mark, Different types of trade marks, Benefits from a trade mark.

#### UNIT V

**Marks 16**

Company and employee matter: Company or organization definition, Types of company, Types of organizations, NGO, Company registration process, NGO registration process, FSSAI license process for new food entrepreneurship, Banks laws for loan granting for new interpreneurship, Central and state government policies for food parks, new food interpreneurship, Laws of export of agriculture fruit products by APEDA, Labor laws for employee recruitment, resignation, suspension, compensation and harassment matter, PPF ( Public provident fund), EPF (Employee provident fund).

#### RECOMMENDED BOOKS:

1. Website of ministry of corporate affairs
2. WIPO (World Intellectual Property Right) website.



**BTFTE-0806 DEPARTMENTAL ELECTIVE II**  
**(B) Fundamentals of Biotechnology (BT102)**

**UNIT I**

**Marks 16**

Introduction to biotechnology, scope and importance of biotechnology, Application of biotechnology (Agriculture, food industry and medicine).

**UNIT II**

**Marks 16**

**Unit 2:** Structure and function of cell & cellular organism (Prokaryotes & Eukaryotes), Cell cycle (mitosis and meiosis), Mendelian law of genetics, Linkage and crossing over, Mutation.

**UNIT III**

**Marks 16**

Nucleic acid, Carbohydrates, Lipids and Protein, Enzymes and Hormones (Structure & Function).

**UNIT IV**

**Marks 16**

Fundamentals of gene cloning, Cloning vectors, Restriction enzymes, Polymerase chain reaction, cDNA library, Applications of recombinant DNA technology.

**UNIT V**

**Marks 16**

Introduction and over review of immune system, Antigen, antibody (Structure and function), Allergy and inflammation, Cellular and Humoral immunity, Human digestion system.

**RECOMMENDED BOOKS:**

1. Biotechnology-BD Singh
2. Immunology-Kube
3. Zoology-Ramesh Gupta 12<sup>th</sup>