

**DIPLOMA (ICD) IN FOOD TECHNOLOGY  
&  
CERTIFICATE IN FOOD PROCESSING & PRESERVATION  
(CFP)**

(APPLICABLE FOR STUDENTS ADMITTED FROM THE ACADEMIC YEAR  
2014-2015 ONWARDS)

**SCHEME & SYLLABUS**



**DEPARTMENT OF FOOD ENGINEERING AND TECHNOLOGY  
SANT LONGOWAL INSTITUTE OF ENGINEERING AND TECHNOLOGY (SLIET)  
LONGOWAL-148 106  
SANGRUR, PUNJAB  
INDIA**

**VISION OF THE DEPARTMENT**

To be a Centre of excellence in training, research, outreach and consultancy services in food engineering and technology with emphasis on value addition of agricultural produce, food bioprocessing and technology, food nutrition, food quality and safety.

**MISSION OF THE DEPARTMENT**

1. To produce trained technical manpower of highest standard in the field of food engineering and technology
2. To re-orient and develop safe food products by applying fundamental and applied technologies
3. To provide solutions to the problem and leadership in the area of education, training and research

Department of Food Engineering and Technology

Semester-I (ICD)							
S.No	Sub	Subject Name	L	T	P	Hrs.	Credits
1	AM-111	Mathematics- I	4	1	0	5	5
2	PH-111	Physics-I	4	0	2	6	5
3	CY-111	Chemistry-I	4	0	2	6	5
4	HU-111	Communication Skills-I	2	0	0	2	2
5	WS-111	Workshop Practice-I	0	0	4	4	2
6	ME-111	Engineering Drawing	0	0	4	4	2
7	FT -111	Introduction to Food Technology	3	0	2	5	4
Total			17	1	14	32	25
Semester-II (ICD)							
S.No	Sub	Subject Name	L	T	P	Hrs.	Credits
1	AM-121	Mathematics- II	4	1	0	5	5
2	PH-121	Physics-II	4	0	2	6	5
3	CY-121	Chemistry-II	4	0	2	6	5
4	HU-121	Communication Skills-II	1	0	2	3	2
5	WS-121	Workshop Practice-II	0	0	4	4	2
6	CS-121	Computer Fundamentals	3	0	2	5	4
Total			16	1	12	29	23
Semester-III A (ICD)							
	TP-201	Two Weeks Practical Training during summer vacations				80	S/US
Semester-III B (ICD)							
S.No	Sub	Subject Name	L	T	P	Hrs.	Credits
1	AM-211	Applied Mathematics	3	1	0	4	4
2	EE-211	Fundamental of Electrical Engineering	3	0	2	5	4
3	EC-211	Fundamentals of Electronics Engineering	3	0	2	5	4
4	FT -211	Food Microbiology	3	0	2	5	4
5	FT -212	Food Chemistry	3	0	2	5	4
6	FT -213	Principles of Food Processing and Preservation	3	0	2	5	4
Total			18	1	10	29	24
Semester-IV (ICD)							
S.No	Sub	Subject Name	L	T	P	Hrs.	Credits
1	FT-221	Technology of Food Beverages	3	0	2	5	4
2	FT-222	Technology of Fruits and Vegetable Processing	3	0	2	5	4
3	FT-223	Technology of Milk and Milk Processing	3	0	2	5	4
4	FT-224	Technology of Meat, Fish and Poultry Processing	3	0	2	5	4
5	FT-225	Technology of Cereal Processing	3	0	2	5	4
6	FT-226	Food Quality	3	0	2	5	4
7	MC-221	Moral values and Professional ethics	1	0	0	1	0
Total			19	0	12	31	24
Semester-V A (ICD)							
	TP-301	Four Weeks Industrial Training during summer vacations				160	

Semester-V B							
S.No	Sub	Subject Name	L	T	P	Hrs.	Credits
1	FT-311	Food Laws and Quality Assurance	3	0	2	5	4
2	FT-312	Unit operations in Food Processing	3	0	2	5	4
3	FT-313	Post Harvest Technology	3	0	2	5	4
4	FT-314	Food Biochemistry and Nutrition	3	0	2	5	4
5	FT-315	Technology of Bakery and Confectionery	3	0	2	5	4
6	FT-316	Technology of Pulses and Oilseed Processing	3	0	2	5	4
7	TP-301E	Industrial Training (Evaluation only--SUS)					S/US
		Total	18	0	12	30	24
Semester-VI							
S.No	Sub	Subject Name	L	T	P	Hrs.	Credits
1	HU-321	Entrepreneurship	2	0	0	2	2
2	MC-321	Environmental Studies	2	0	0	2	2
3	FT-321	Elements of Food Engineering	3	0	2	5	4
4	FT-322	Technology of Spices, Herbs and Condiments	3	0	2	5	4
5	FT-323	Food Byproducts and Waste Utilization	3	0	2	5	4
6	FT-324	Technology of Food Packaging	3	0	2	5	4
7	FT-325	Project (SUS)			4	4	2
		Total	16	0	12	28	22

<b>Title of the course</b>	: CHEMISTRY-I	LTP	4-0-2
<b>Subject Code</b>	: CY-111		
<b>Weekly load</b>	: 6		
<b>Credit</b>	: 5 (Lecture 4; Practical 1)		

Unit	Course Outlines	Lectures
<b>Unit I</b>	<b>Atomic Structure</b> Introduction to atom and its constituent particles, Bohr's model of atom, Line spectrum of hydrogen, Dual nature of radiation, de Broglie's relationship, Uncertainty principle, Quantum numbers, Shapes of orbitals, Pauli's exclusion principle, Aufbau Energy ranking rule, Hund's rule, Electronic configuration of atoms	08
	<b>Modern periodic table</b> Modern periodic table, Periodic properties (ionization potential, electron affinity, atomic and ionic radii), Variation of periodic properties along a period and group, Introduction to s and p-block elements	06
	<b>Chemical Bonding</b> Types of chemical bond (ionic, covalent, coordinate), Lewis structure, Valence bond theory, VSEPR theory, Hybridization, Molecular orbital theory of homonuclear diatomic molecules, Vanderwaal forces, Hydrogen bond, Metallic bond	08
	<b>Chemical and Ionic Equilibrium</b> Law of chemical equilibrium, Le Chatelier's principle, Law of mass action, Equilibrium constant, Ionic equilibrium – ionization of acids and bases, Strong and weak electrolytes, Degree of ionization, Concept of pH, Hydrolysis of salts, Common Ion effect and Solubility product, Concept of acids and bases, Buffer solutions	09
<b>Unit II</b>	<b>Chemical Thermodynamics</b> Concepts of extensive and intensive properties, State functions, First law of Thermodynamics: Internal energy, Enthalpy, Heat capacity and Specific heat, Applications of First law of thermodynamics, Hess's law of constant heat summation, Second law of thermodynamics: Entropy, Free energy, Spontaneity of a chemical reaction, Free-energy change and Chemical equilibrium	08
	<b>Organic Chemistry</b> Classification and IUPAC nomenclature of organic compounds, Inductive effect, Electromeric effect, Resonance and Hyperconjugation, Electrophiles and Nucleophiles Reaction Intermediates - carbocations, carbanions, free radicals, Types of organic reactions, Stereoisomerism: Optical, Geometrical and Conformational	14
	<b>Environmental chemistry</b> Environmental pollutants: soil, water and air pollution, Chemical reactions in atmosphere, Kinds of smog, Major atmospheric pollutants, Acid rain, Ozone and its reactions, Effects of the depletion of ozone layer, Green house effect and Global warming – Industrial air pollution, Green chemistry as an alternative tool for reducing pollution	07

#### Recommended Books:

Author	Title	Publisher
	Chemistry for class XI and XII	NCERT New Delhi
SP Jauhar	Modern ABC of Chemistry (class XI and XII)	MBD
S C Khetarpal et.al.	Pardeep's New Course of Chemistry (class XI and XII)	Prdeep
P D Sharma et.al.	Effectual Chemistry (class XI and XII)	JBD

#### LIST OF PRACTICALS

- To prepare the standard solution of oxalic acid or potassium dichromate.
- To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein indicator.
- To determine the total hardness of water sample in terms of CaCO<sub>3</sub> by EDTA titration method using EriochromeBlack-T indicator.
- To determine the pH of given sample.
- To analyse inorganic salt for acidic and basic radicals among the following.
  - Basic Radicals:  
NH<sub>4</sub><sup>+</sup>, Pb<sup>++</sup>, Cu<sup>++</sup>, Bi<sup>+++</sup>, Cd<sup>++</sup>, As<sup>+++</sup>, Sb<sup>+++</sup>, Sn<sup>++</sup>, Al<sup>+++</sup>, Fe<sup>+++</sup>, Cr<sup>+++</sup>, Mn<sup>++</sup>, Zn<sup>++</sup>, Co<sup>++</sup>, Ni<sup>++</sup>, Ba<sup>++</sup>, Sr<sup>++</sup>, Ca<sup>++</sup>, Mg<sup>++</sup>
  - Acid Radicals:  
CO<sub>3</sub><sup>2-</sup>, S<sup>-</sup>, SO<sub>3</sub><sup>2-</sup>, CH<sub>3</sub>COO<sup>-</sup>, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>

**Title of the course** : **Communication Skills-I**  
**Subject Code** : **HU-111**  
 Weekly load : 2  
 Credit : 2 (Lecture 2; Practical 0)

LTP 2-0-0

Unit	Course Description	Lecture(s)
Unit- I	<p><b>Prescribed Text -Following Chapters only:</b></p> <p><b>Chapter 1 ( The Judgement-seat of Vikramaditya )</b>  <b>Chapter 2 ( The Selfish Giant )</b>  <b>Chapter 8 ( J.C. Bose )</b>  <b>Chapter 9 ( The Story of the Sea )</b>  <b>Chapter 11 ( The Escape )</b>  <b>Chapter 15 ( Self- portrait )</b></p> <p>Intensive study of the chapters: Vocabulary-Understanding meanings of new words, Comprehension- Responding to the questions from the text, Summarizing the themes/ central ideas of the text, Composition Exercises</p>	16
Unit- II	<p><b>Application of Grammar</b></p> <p>Tenses, Translation from Vernacular to English, Do as directed (Active/ Passive Voice, Direct/ Indirect Narration, Affirmative/ Negative/ Assertive Sentences, Question Tag, Use of Articles, Prepositions, Conjunctions), Words often confused, Use of synonyms and antonyms, One word substitutes</p>	16

**Recommended Books:**

Author	Title	Publisher
<b>Text Book</b> Menon, K.P.K.	<i>Contemporary English Prose</i>	Oxford University Press
<b>Reference Books</b> Wren, P.C. & H. Martin	<i>High School English Grammar &amp; Composition</i>	S. Chand & Company Ltd.
Sinclair, John	<i>Collins Cobuild English Grammar</i>	Collins
Ghosh, R.N., K.W. Moody & S. R. Inthira	<i>A Course in Written English</i>	NCERT
Best, Wilford D	<i>The Students' Companion</i>	Rupa

**Title of the course** : **Mathematics - I**  
**Subject Code** : **AM - 111**  
 Weekly load : 5 Hrs. LTP 4-1-0  
 Credit : 5 (Lecture 4; Tutorial 1; Practical 0)

Unit	Course outlines	Lectures
Unit-I	<b>Trigonometry</b> Introduction to trigonometric formulas. Trigonometric ratios of multiple and sub-multiple angles (2A, 3A, A/2). Product formulae, conversion from sum or difference to product and vice-versa (without proof). Solutions of simple trigonometric equations. Inverse trigonometric functions and their properties.	10
	<b>Algebra</b> Arithmetic progression, geometric progression, arithmetico-geometric series. Special series: $\sum n$ , $\sum n^2$ , $\sum n^3$ . Binomial theorem for positive integral index (without proof), general and particular terms. Binomial theorem for any index (without proof), first and second approximation, simple problems.	12
	<b>Complex Numbers</b> Complex number in the form of a+ib, Argand diagram, polar form and exponential form, algebra of complex numbers, modulus and argument of a complex number, square root of a complex number, cube root of unity. De-Moivre's theorem (without proof) and simple problems.	8
Unit-II	<b>Straight Line</b> Distance and section formulae. Equation of straight line in various standard forms, intersection of two straight lines, angle between two lines, condition of parallelism and perpendicularity, perpendicular distance formula. Equations of angle bisectors of two intersecting lines.	10
	<b>Circle</b> General equation of a circle, diameter form, centre and radius of a circle, circle through three non-collinear points, tangent and normal to a circle at a given point on it. Intersection of a straight line and a circle. Orthogonal circles.	8
	<b>Conic Section</b> Parabola, ellipse and hyperbola. To find equation when directrix, focus and eccentricity are given. Estimating focus, directrix, latus-rectum, axes, eccentricity, vertex etc. when equation of the conic is given.	12

**Recommended Books:**

Author	Title	Publisher
Shanti Narayan	Text books on Mathematics for XI	NCERT New Delhi
S L Loney	Coordinate Geometry	S. Chand and Co.
	Coordinate Geometry	A. I. T.B.S.

**Title of the course** : PHYSICS- I  
**Subject Code** : PH-111  
 Weekly load : 6 LTP 4-0-2  
 Credit : 5 (Lecture 4; Practical 1)

**Theory**

Unit	Course outlines	Lectures
Unit-I	<b>UNITS AND MEASUREMENTS</b> Need for measurements, system of units, S.I. units, fundamental and derived units. Dimensional formula, dimensional equations and their applications. Error in Physical measurements-causes & types. Combination of errors (qualitative ideas). Numerical Problems	08
	<b>VECTOR ANALYSIS</b> Scalars and vectors, vectors in two and three dimensions, unit vector, laws of vector addition, Resolution of a vector in a plane, rectangular components, scalar and vector products. Numerical Problems	08
	<b>DESCRIPTION OF MOTION</b> Motion in two dimensions, projectile motion, uniform circular motion, qualitative concepts of torque, angular momentum, conservation of angular momentum, centripetal and centrifugal forces. Numerical Problems	08
	<b>LAWS OF MOTION</b> Laws of motion, conservation of linear momentum, qualitative concepts of rocket propulsion. Friction and its cause, Static and kinetic friction, self-adjusting nature of friction, laws of limiting friction, rolling friction, angle of friction and angle of repose, methods to reduce friction. Numerical Problems	08
Unit-II	<b>GRAVITATION</b> Universal law of gravitation, Inertial and gravitational mass, relation between g and G, variation of acceleration due to gravity (with altitude and depth), orbital velocity, escape velocity, elementary ideas of geo-stationary satellite. Numerical Problems	08
	<b>SIMPLE HARMONIC MOTION</b> Periodic motion, simple harmonic motion (S.H.M.) K.E. and P.E. in S.H.M., simple pendulum and oscillations of mass attached to vertical spring. Concepts of seconds pendulum, Wave motion, its kinds and properties, speed, frequency, amplitude, time period and displacement of wave, principle of superposition. Numerical Problems	08
	<b>PROPERTIES OF MATTER</b> Interatomic and intermolecular forces, elastic properties, Hooke's law, Three moduli of elasticity, Poisson's ration, surface tension and surface energy, angle of contact, examples of drops and bubbles, capillary rise, Viscosity, Stokes law (treatment by dimensional analysis), Streamline and turbulent flow, Bernoulli's theorem. Numerical Problems	08
	<b>HEAT AND THERMODYNAMICS</b> First law of thermodynamics, specific heat at constant volume and constant pressure of ideal gas, relation between Cp and Cv. Thermodynamic processes (reversible, irreversible, isothermal and adiabatic), second law of thermodynamics. Thermal conductivity, black body radiation, Wien's law, Stefan's law, Newton's law of cooling. Numerical Problems	08

**Recommended Books:**

Author	Title	Publisher
K L Gomber and K L Gogia	Fundamental Physics Class (XI)	Pardeep Publications
Holiday and Resnick and Walker	Fundamental of Physics	John Wiley & Sons
S. K. Gupta	abc of Physics, Class (XI)	Modern Publications

**List of Experiments**

- To measure the length, breadth and height of a geometrical body using Vernier Calipers and to find its volume.
- To measure the diameter of a wire by using a screw gauge and to find its area of cross-section.
- To measure the radius of curvature of a given lens / mirror by using Spherometer.
- To determine the density of a given body using physical balance.
- To determine the area of cross-section of a given small object using Travelling microscope.
- To determine the value of "g" by Simple Pendulum.
- To find the coefficient of friction between wood and glass using a horizontal surface.
- To determine the coefficient of viscosity of glycerin by Stokes method.
- To determine the surface tension of water using capillary rise method.
- To determine the force constant/spring constant using Hook's Law.
- To determine the Young's modulus of the material of a rectangular bar by bending.
- To determine the value of "g" at a place by using free fall apparatus.



<b>Title of the course</b>	<b>: Introduction to Food Technology</b>		
<b>Subject Code</b>	<b>: FT-111</b>	LTP	3-0-2
<b>Credit</b>	<b>: 4 (Lecture 3; Practical 1)</b>		

Unit	Detailed contents	Lectures
<b>Unit-I</b>	<b>Introduction</b> Definition, function and characteristics of foods; Nutrients and their functions; composition of common foods; present status of food industry in India	3
	<b>Microbiology</b> Microorganisms associated with foods, their classification, characteristics and their relevant properties	8
	<b>Food chemistry</b> Chemical composition of various foods; classification and properties of major food constituents; a brief review of post harvest and anti-mortem changes in foods and their relevance	8
	<b>Food processing technology (An-overview)</b> An overview of technology of processing of cereals, pulses, oilseeds, fruit, vegetables, milk and milk products, egg and poultry products, fish and fish products, meat and meat products; food laws and standards; sensory evaluation of foods.	9
<b>Unit-II</b>	<b>Introduction to food processing and preservation</b> Food spoilage agents; principles of food processing and preservation; effect of processing on the shelf life and food composition	5
	<b>Chemical preservatives</b> Importance of food additives; mechanism of action of class-I and class-II preservatives; factors affecting the choice of preservatives and their uses.	6
	<b>Food Packaging</b> Definition of packaging; functions of packaging materials; types of packaging materials e.g. paper, glass, metal, plastics; packaging forms	4

**Recommended books:**

Author	Title	Publishers
Potter	Food science	CBS
W.C. Frazier.	Food microbiology	TMH
Fennema, Kerrel	Principles of food preservation	Marcel Dekkar

**List of practicals:**

1. Preparation and verification of normality of standard solution
2. Determination of water content by hot air oven and IR moisture meter and comparison of results
3. Determination of nutritive values of different food
4. Determination of total soluble solid of different liquid foods
5. Determination of acidity of food products
6. Determination of pH of different liquid foods.
7. Determination of ash contents of food
8. Determination of fat content by Soxhlet method
9. Determination of salt content in milk sample
10. Study of compound microscope
11. Determination of microbial load of food products
12. Determination of external quality of egg
13. Determination of internal quality of egg by candling
14. Determination of meat quality

**Title of course** : **ENGINEERING DRAWING**  
**Subject Code** : **ME-111**  
 Weekly load : 04  
 Credit :02(Lecture 0, Practical 2)

LTP 0-0-4

Unit	Course Description	Lecture
<b>Unit-I</b>	<b>Introduction</b> Introduction, Objectives, applications. Fundamentals of engineering drawing, Use and handling of different drawing instruments, title block, sheet sizes, first and third angle projections, orthographic projections.	<b>06</b>
	<b>Lettering and Dimensioning</b> Free hand sketching of different types of lines in engineering drawing as per IS specifications, Free hand lettering (alphabet and numerals) - lower case and upper case, vertical and inclined at 75° in the ratio of 7:4, Notation of dimensioning, size and location dimensions, aligned and unidirectional systems of dimensioning, general rules for dimensioning, unit of dimensioning.	<b>08</b>
	<b>Scales</b> Uses of scales, sizes of scale, representative fraction, construction of plain and diagonal scales	<b>08</b>
	<b>Projection of points, line</b> Introduction on theory of projections and orthographic projections, projection of a point in different quadrants, projection of straight lines in different positions (all possible cases)	<b>10</b>
<b>Unit-II</b>	<b>Projection of Planes</b> Definition of plane, types of planes, traces of plane, projection of planes in different positions	<b>10</b>
	<b>Projection of Solids</b> Types of solids, projections of solids in simple positions, introduction on sectioning of solids	<b>10</b>
	<b>Development of surfaces</b> Introduction, Development of a right prism, cylinder, pentagonal prism, and a right pyramid	<b>12</b>

**Recommended Books**

<b>Title</b>	<b>Author(s)</b>	<b>Publisher</b>
Engineering Drawing	P S Gill	Kataria and Sons, New Delhi
Engineering Drawing	R.K.Dhawan	S. Chand & Co, New Delhi
Engineering Drawing	N.D, Bhatt	Charotar Publishing House

**Title of the course** : Workshop Practice-1

**Subject Code** : WS-111

**Weekly load** : 4

LTP 0-0-4

**Credit** : 2 (Lecture 0, Practical 2)

Practical: 10-14 jobs from the following list

#### **CARPENTRY SHOP**

1. Safety precautions in carpentry shop.
2. Introduction to wood and wood working operations.
3. Demonstration and use of carpentry shop tools and equipment.
4. Exercise on simple operations, viz. hand sawing, marking, planning and chiseling.
5. Cross lap joint, T-lap joint, Corner lap joint, Mortise and tenon joint, Dovetail joint

#### **FITTING SHOP**

1. Safety precautions in fitting shop.
2. Demonstration and use of fitting shop tools and equipment.
3. Study and use of instruments in fitting shop, like, vernier calipers, micrometer, height gauge and bevel protractor
4. Exercise on simple operation viz. cutting, chipping, sawing, filing, drilling

#### **FORGING SHOP**

1. Safety precautions in carpentry shop.
2. Familiarization with different tools used in forging.
3. Exercise on conversion of round to square with cold forging.
4. Exercise on conversion of round to square with hot forging.
5. Upsetting operation exercise.

#### **FOUNDRY SHOP**

1. Safety precautions in foundry shop.
2. Familiarization with different patterns and hand tools.
3. Preparations of green sand mould using single piece pattern three-four exercises.
4. Preparations of green sand mould using split pattern on bench moulding.
5. Preparations of green sand mould using solid pattern by bedded method.

#### **SHEET METAL SHOP**

1. Safety precautions in sheet metal shop.
2. Familiarization with different tools and processes in sheet metal shop.
3. Exercise on sheet cutting, development, folding, bending, piercing, punching, parting, notching and slitting.
4. Profile and circle cutting exercise.
5. Different types of joints exercise

#### **ARC WELDING SHOP**

1. To familiarize with safety aspects.
2. To familiarize with equipment and tools of the welding shop.
3. To learn about different positions of welding.
4. To practice of bead on plate in flat position
5. To practice making of a butt joint and lap joint on a flat piece

**Title of the course** : CHEMISTRY-II  
**Subject Code** : CY-121  
 Weekly load : 6 LTP 4-0-2  
 Credit : 5 (Lecture 4; Practical 1)

	Course Outlines	Lectures
UNIT-I	<b>Chemical Kinetics</b> Molecularity, Rate and order of reaction, Factors influencing rates of reaction, Rate equation for first and second order reaction, Pseudo-unimolecular reactions, Temperature dependence of rate of reaction, Activation energy, Arrhenius equation	08
	<b>Electrochemistry</b> Electrolysis, Arrhenius theory, Faraday's Laws, Applications of electrolysis such as Electroplating, Electrorefining Electronic concept of Oxidation and Reduction, Balancing chemical equations by Ion-electron method, Electrolytic conduction, Specific and molar conductance, Variation with concentration, Kohlrausch's Law, EMF of a cell, Standard electrode potential, Nernst equation and its applications to chemical cells. Relation between Gibbs energy change and EMF of a cell, Electrochemical series and its application. Electrochemical Cells, Primary Cell - Dry Cell, Secondary Cell - Lead storage cell	14
	<b>Surface Chemistry</b> Surfaces: physisorption and chemisorptions, Factors affecting adsorption of gases on solids, Preparation of colloids and its general properties-Tyndall effect, Brownian movement, Electrophoresis, Coagulation, Emulsions, Micelles, Catalysis- Homogeneous and heterogeneous	08
UNIT-II	<b>Transition Metals and Coordination Chemistry</b> General introduction, Electronic configuration, General trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation. Coordination compounds- Nomenclature and bonding	14
	<b>Organic Chemistry</b> General introduction to alkane, alkene, alkyne and aromatic compounds-preparation and properties, Halides and hydroxy compounds: Nomenclature of compounds containing halogen atoms and hydroxyl groups: haloalkanes, alcohols and phenols. physical, chemical properties and uses Aldehydes, ketones-Nomenclature, physical, chemical properties and uses, carboxylic acids and their derivatives-physical, chemical properties and uses Amines-Nomenclature of amino compounds and their methods of preparation, physical, chemical properties and uses	16

**Recommended Books:**

Author	Title	Publisher
	Chemistry for class XI and XII	NCERT New Delhi
SP Jauhar	Modern ABC of Chemistry (class XI and XII)	MBD
S C Khetarpal et.al.	Pardeep's New Course of Chemistry (class XI and XII)	Prdeep
P D Sharma et.al.	Effectual Chemistry (class XI and XII)	JBD

**LIST OF PRACTICALS**

- To determine Iron content in Mohr's salt by standard  $K_2Cr_2O_7$  solution.
- To study the adsorption of iodine from alcoholic solution by charcoal.
- To study hydrolysis of methyl acetate in presence of hydrochloric acid.
- To detect the extra elements (Nitrogen, Sulphur and Halogens) present in the given organic compound.
- To detect the functional group (any one) Carboxylic acid (-COOH), Phenol, Alcohol (-OH), Aldehyde and Ketone, Ester (-COOR), Acid amide (-CONH<sub>2</sub>), amino (-NH<sub>2</sub>) present in the given organic compound.

**Title of the course** : **Communication Skills-II**  
**Subject Code** : **HU-121**  
 Weekly load : 3  
 Credit : 2 (Lecture 1; Practical 1)  
**Theory**

LTP 1-0-2

Unit	Course Description	Lecture(s)
Unit- I	<b>Business Communication</b> Inviting Quotations, Letters of placing an order, Letters of cancelling an order, Letters of complaint, Drafting an application for job along with a Resume.	08
Unit- II	<b>Composition Writing</b> Paragraph Writing, Précis Writing, Reporting events	04
	<b>Correspondence Writing</b> Personal Letters, Official Letters, Invitations-Formal and Informal, Acceptance and Refusal	04

**Recommended Books:**

Author	Title	Publisher
Sinclair, John	<i>Collins Cobuild English Grammar</i>	Collins
Allan, W. Stannard	<i>Living English Structure</i>	Orient Longman
Ghosh, R.N., K.W. Moody & S. R. Inthira	<i>A Course in Written English</i>	NCERT
Bhatnagar, Nitin and Mamta Bhatnagar	<i>Communicative English for Engineers and Professionals</i>	Pearson

**List of Experiments (10-14):**

1. Introducing yourself.
2. Observing and analyzing your environment/ surroundings.
3. Paper Reading on a general topic.
4. Declamation/ Debates.
5. Learning Etiquettes in Social and Official Settings.
6. Summarizing newspaper reports.
7. Preparing a wall newspaper.
8. English Conversation Skills.
9. Translation from English to Vernacular.
10. Dialogue writing and delivery for the given situation.
11. Role Plays.
12. Grammar exercises.
13. Building of Vocabulary.
14. Watching videos/ movies and writing, presenting their summaries.

**Title of the course** : Mathematics - II  
**Subject Code** : AM - 121  
 Weekly load : 5 Hrs. LTP 4-1-0  
 Credit : 5 (Lecture 4; Tutorial 1; Practical 0)

Unit	Course outlines	Lecture
1	<b>Functions</b> Functions, types of functions, domain and range. Concept of limit. Standard limits. Continuity of a function.	8
	<b>Differentiation</b> Physical & geometrical meaning of derivative of a function, differentiation of $x^n$ , $\sin x$ , $\cos x$ , $\tan x$ , $\sec x$ , $\operatorname{cosec} x$ , $\cot x$ , $e^x$ , $a^x$ and $\log_a x$ from the first principle. Differentiation of sum, difference, product and quotient of functions. Differentiation of function of a function. (Chain rule), differentiation of inverse trigonometric and hyperbolic functions. Logarithmic and parametric differentiation. Differentiation of implicit functions.	10
	<b>Application of Differentiation</b> Expansion of functions using Taylor and Maclaurin's series (without proof). Maxima and minima of a function. Equations of tangent and normal (for explicit function only). Indeterminate forms, L'Hospital's Rule	12
2	<b>Integration</b> Integration as anti-derivative, fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions. Integration by substitution, by parts and by partial fractions. Integration of rational and irrational functions. Four standard cases.	16
	<b>Definite Integration</b> Definite integral. Evaluation of definite integral by substitution. Properties of definite integral (without proof) and simple problems.	6
	<b>Application of Integration</b> Area under a curve. Area between two curves (involving line, circle, parabola and ellipse only).	8

**Recommended Books:**

Author	Title	Publisher
	Text books on Mathematics for XII	NCERT, New Delhi
Shanti Narayan	Differential Calculus	S. Chand & Co.
Shanti Narayan	Integral Calculus	S. Chand & Co
Thomas & Finney	Calculus	Pearson Education

**Title of the course** : PHYSICS- II  
**Subject Code** : PH-121  
 Weekly load : 6  
 Credit : 5 (Lecture 4; Practical 1)

LTP 4-0-2

Unit	Course outlines	Lecture
Unit-1	<b>ELECTROSTATICS</b> Coulomb's law (scalar & vector forms), electric field, electric field due to a point charge, electric dipole and its moment, electric fields along the axial and equatorial lines, concept of dielectric and dielectric constant, Gauss's theorem and its application to find electric field due to an infinite wire and plane sheet of charge. Conductors and insulators, force and torque experienced by a dipole (in uniform electric field), capacitance, parallel plate capacitor with air/dielectric medium between the plates, series and parallel combinations of capacitors, energy of a capacitor. Numerical Problems	10
	<b>CURRENT ELECTRICITY</b> Resistance, resistivity, combination of resistances in series and parallel, Kirchhoff's laws, principle of potentiometer and its application for comparing e.m.f. of two cells Numerical Problems	06
	<b>MAGNETISM</b> Magnetic lines of force and magnetic dipole, earth's magnetic field and its source (elementary ideas), concepts and properties of Para, Dia and Ferro-magnetic substances with examples. Numerical Problems	08
	<b>ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT</b> Electromagnetic induction, Faraday's laws, Induced e.m.f., Lenz's law, Lorentz magnetic force, self and mutual inductance, alternating current & e.m.f., elementary idea of working of transformer. Numerical Problems.	08
Unit-2	<b>THERMAL AND MAGNETIC EFFECTS OF CURRENT</b> Electric energy and power, Joule's law of heating, thermoelectricity (Seebeck effect), Biot-Savart's law, magnetic field due to a straight wire and a circular loop. Definition of Ampere, elementary idea of moving coil galvanometer and its conversion into ammeter and voltmeter. Numerical Problems	08
	<b>WAVE OPTICS</b> Wave front and Huygen's principle, interference of light, Young's double slit experiment, coherent sources of light, diffraction of light, diffraction due to a single slit, polarization of light (general idea). Numerical Problems	06
	<b>MOMENT OF INERTIA</b> Centre of mass, moment of inertia of rigid body, radius of gyration, theorem of parallel and perpendicular axes, moment of inertia of a straight rod, circular ring, circular disc, cylinder (solid and hollow) sphere, relation between torque and moment of inertia, Kinetic energy and angular momentum, motion of cylinder and sphere rolling without slipping on an inclined plane. Numericals	10
	<b>RAY OPTICS AND OPTICAL INSTRUMENTS</b> Lens and curved mirrors, lens and curved mirror formula, linear magnification, total internal reflection and its application in optical communication (elementary ideas) Numerical Problems	08

**Recommended Books:**

Author	Title	Publisher
K L Gomer and K L Gogia	Fundamental Physics Class (XII)	Pardeep Publications
Haliday and Resnick and Walker	Fundamental of Physics	John Wiley & Sons
S. K. Gupta	abc of Physics, Class (XII)	Modern Publications

**List of Experiments**

- To draw magnetic field lines of a bar magnet placed in magnetic meridian with the North Pole towards the south of the earth and to locate the position of the neutral points.
- To measure the value of resistance by using multimeter and to compare with those written in colour code.
- To establish current – voltage relationship and to verify Ohm's Law by using an ammeter and voltmeter and find the value of resistance.
- a) To study the laws of combination of series and parallel for resistances by using a meter bridge.  
b) To find an unknown resistance by using a meter bridge.
- To determine the resistance of a galvanometer by half deflection method and find its figure of merit.
- To determine the focal length of a concave lens by a telescope using the relation:  

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$
- To find the angle of prism and refractive index of prism by using Spectrometer.
- To study the transverse nature of light using sodium light.
- To find the height of an accessible object using Sextant.
- To verify the Newton's law of cooling.
- To study the seebeck effect of metal coupling.
- To find the moment of inertia and torque of given flywheel.
- To draw the Voltage-current characteristics of P-N junction diode.
- To draw the characteristics of photo cell.
- To determine the frequency of AC by electrically maintained tuning fork (Melde's method).
- To determine the bandgap of a semiconductor diode.
- To observe the transistor characteristics using transistor apparatus kit.
- To study the Peltier effect of metal coupling.

<b>Title of the course</b>	: <b>Computer Fundamentals</b>		
<b>Subject Code</b>	: <b>CS-121</b>		
Weekly load	: 5	LTP	3-0-2
Credit	: 4 (Lecture 3, Practical 1)		

Unit	Course outlines	Lecture
Unit-1	<b>Introduction</b> Definition of electronic Computer, Generations, Characteristic and Application of Computers, Block diagram of computer.	06
	<b>Input/output Devices</b> Various I/O devices like keyboard, mouse etc. Plotter, Scanner, Printer and its types (Inkjet, Dot matrix, Laser printer etc).	04
	<b>Memory</b> Primary and secondary memory, RAM, Types of RAM,ROM & types of ROM, cache, Registers ,Memory Hierarchy.	06
	<b>Basics of Computer</b> Bootting process, introduction to concepts-bit, nibble, byte, word, hardware, software, operating system, system software, application software.	06
Unit-2	<b>Computer Languages</b> Generation of Language, Translators, Interpreters, Assemblers, Compilers.	06
	<b>Number System</b> Various codes, decimal, binary, octal, hexadecimal, conversion from one number system to another.	06
	<b>Internet and its Applications</b> Internet, Connecting to the internet, Internet services, Applications like E-commerce, entertainment, education etc Threats: - Firewall, Virus, Worm, Trojan Horses.	06
	<b>Web Technologies</b> World Wide Web, URL, Search engines, Web Browsers, Hypertext , Hypertext Marks Language, Gopher, FTP.	08

**Recommended Books:**

Author(s)	Title	Publisher
Yadav DS	Foundations of IT	New Age, Delhi
Curtin	Information Technology: Breaking News	TMH
Rajaraman V	Introduction to Computers	Prentice-Hall India

**LIST OF PRACTICALS**

**Perform the following Practicals in MS-Word**

1. Create a document using functions: Save as, page number, Bullets and numbering.
2. Create a document using fonts, styles and Formatting options.
3. Create a document using Fill effects, Printed water mark under background option and also use Header and Footer.
4. Create a document, using the function page set up, page preview, and then print that document.
5. Use the concept of Mail Merge in MS Word.
6. Use the concept of Macro in MS Word
7. Create a document using table & perform various operations like Insert, delete, select and Table auto Format in it.

**Perform the following Practicals in MS-Excel**

8. Create Line, XY, Bar and Pie chart in excel sheet and compare the given data using these charts.
9. Implement all formula like addition, subtraction, Multiplication and division etc. in excel.
10. Use the concept of Macro in MS Excel.
11. Use the concept of Sorting, filter and hyperlink in Excel.
12. Use the concept of paste special and paste as hyperlink in Excel
13. Create a excel sheet using fonts, styles, Formatting options, Text wrap different row, column, and cell width.
14. Create a formulae using function to compare the values of two Rows or Columns.

**Perform the following Practicals in MS-PowerPoint**

15. Create a Power point presentation using slide designing and use Design Templates, Color schemes, and Animation schemes.
16. Create a Presentation using functions: Save as, page number, Bullets and numbering, pagesetup and take print in layout form.
17. Create a power point presentation using clipart, Word art gallery & then add transition &Animationeffects.
18. Use the concept of Macro in Power Point.
19. Use chart, diagram and table in Power Point.
20. Create a Power point presentation and use View show, Setup show, rehearse timing in presentation.

**Perform the following Practicals in MS-Access**

21. Create forms in MS-ACCESS.
22. Create reports in MS-ACCESS.
23. Create table and queries in MS-ACCESS using design view.
24. Create Data Access page in design view and by using wizard in MS-ACCESS.

**Apply different modification schemes using picture manager.**

**Organize different types of Data available using clip organizer.**

**Create Resume using various features of Microsoft Word.**



<b>Title of the course</b>	<b>: Workshop Practice-II</b>		
<b>Subject Code</b>	<b>: WS-121</b>		
Weekly load	: 4	LTP	0-0-4
Credit	: 2 (Lecture 0; Practical 2)		

Practical: 10-14 jobs from the following list

#### **CARPENTRY SHOP**

1. Safety precautions in carpentry shop.
2. Introduction to wood and wood working operations.
3. Demonstration and use of carpentry shop tools and equipment.
4. Exercise on simple operations, viz. hand sawing, marking, planning and chiseling.
5. Cross lap joint, T-lap joint, Corner lap joint, Mortise and tenon joint, Dovetail joint

#### **FITTING SHOP**

1. Safety precautions in fitting shop.
2. Demonstration and use of fitting shop tools and equipment.
3. Study and use of instruments in fitting shop, like, vernier calipers, micrometer, height gauge and bevel protractor
4. Exercise on simple operation viz. cutting, chipping, sawing, filing, drilling

#### **FORGING SHOP**

1. Safety precautions in carpentry shop.
2. Familiarization with different tools used in forging.
3. Exercise on conversion of round to square with cold forging.
4. Exercise on conversion of round to square with hot forging.
5. Upsetting operation exercise.

#### **FOUNDRY SHOP**

1. Safety precautions in foundry shop.
2. Familiarization with different patterns and hand tools.
3. Preparations of green sand mould using single piece pattern three-four exercises.
4. Preparations of green sand mould using split pattern on bench moulding.
5. Preparations of green sand mould using solid pattern by bedded method.

#### **SHEET METAL SHOP**

1. Safety precautions in sheet metal shop.
2. Familiarization with different tools and processes in sheet metal shop.
3. Exercise on sheet cutting, development, folding, bending, piercing, punching, parting, notching and slitting.
4. Profile and circle cutting exercise.
5. Different types of joints exercise

#### **ARC WELDING SHOP**

1. To familiarize with safety aspects.
2. To familiarize with equipment and tools of the welding shop.
3. To learn about different positions of welding.
4. To practice of bead on plate in flat position
5. To practice making of a butt joint and lap joint on a flat piece

Department of

Title of the course : **Applied Mathematics**  
 Subject Code : **AM - 211/AM-221**  
 Weekly load : 4 Hrs. LTP 3-1-0  
 Credit : 4 (Lecture 3; Tutorial 1; Practical 0)

Unit	Course outlines	Lecture(s)
<b>Unit-1</b>	<b>Determinants</b> Determinants, minors, cofactors, expansion of a determinant, properties of determinants, solution of linear simultaneous equations upto three variables by Cramer's rule.	7
	<b>Matrices</b> Introduction to matrices; addition; subtraction and multiplication of matrices. Inverse of a matrix by adjoint method. Solution of linear simultaneous equations upto three variables.	7
	<b>Rank, eigenvalues</b> Elementary transformations. Row reduced Echelon forms. Rank of a matrix. Normal form. Linearly dependent and independent vectors. System of linear equations. Linear transformations. Eigen values and eigenvectors. Properties of eigenvalues. Verification of Cayley-Hamilton Theorem and its use for finding inverse of a matrix.	8
<b>Unit-2</b>	<b>Solid Geometry</b> Cartesian co-ordinate system. Distance formula. Section formulae. Direction ratios and direction cosines. Equation of a plane. Equations of a straight line. Condition for a line to lie in a plane. Coplanar lines. Shortest distance between two lines. Intersection of three planes. Equation of a sphere. Tangent plane to a sphere.	14
	<b>Differential equations</b> Ordinary differential equations, its order and degree. Linear and non-linear differential equations. Formation of differential equation. General and particular solution of a differential equation. Solution of a differential equation of first order and first degree - variable separable method, homogeneous differential equation, Solution of linear differential equation.	9

**Total=45**

**Recommended Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd.
2. Thomas & Finney, Calculus, Pearson Education.
3. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill.

**Title of the course : Fundamentals of Electronics Engineering**

**Subject Code : EC-211/EC-221**

Weekly load : 5

LTP 3-0-2

Credit 4

Unit	Course outlines	Lecture(s)
<b>Unit-1</b>	<b>Introduction</b> Classification of materials into conducting and insulating materials through a brief reference to atomic structure, Conducting Materials, Insulating Materials, Semi-conductor Materials	6
	<b>Active And Passive Components</b> Introduction to active and passive components; fixed and variable resistances, their various types fixed and variable capacitors, their various types and important specifications and colour codes	4
	<b>Voltage and current sources</b> Concept of constant voltages and constant current sources, symbol and graphical representation, characteristics of ideal and practical sources.	6
	<b>Semiconductor Diode</b> Atomic structure of Germanium and Silicon semi-conductors; intrinsic and extrinsic semiconductors, PN junction, basic principles of operation and VI characteristics of PN junction diode, static and dynamic resistance of a diode.	8
<b>Unit-2</b>	<b>Applications of Diode</b> Use of a diode in rectifiers, half wave, full wave and bridge rectifier with shunt capacitor filter, series inductor filter, zener diode and its applications, as a voltage regulator, light emitting diode (LED), liquid crystal display (LCD).	6
	<b>Transistor</b> Introduction to a transistor, working of a PNP and NPN transistor, input and output characteristics, transistor configurations	6
	<b>Biasing and Configuration of Transistor</b> Biasing of a transistor, amplifying action of a transistor, comparison of different configurations,	6
	<b>Field effect transistor</b> FET, JFET, MOSFET, their characteristics and applications, unijunction transistor (UJT)	6

**Total=48**

### **RECOMMENDED BOOKS**

1. Basic Electronics by: VK Mehta , S. Chand
2. Electronic Components and Materials by: Grover, Jamwal , Dhanpat Rai
3. Electronic Components & Materials by: SM Dhir , McGraw Hill
4. Electronic Devices & Linear Circuits by: Bhargava & Gupta , McGraw Hill

### **List of Experiments: (EC-211/EC-221)**

1. To study the various passive components.
2. To study various active components.
3. To study the front panel control of CRO.
4. To test various electronic components using multimeter.
5. To find the value of a resistor using color coding scheme.
6. To plot the V-I characteristics of a diode.
7. To study zener diode as a voltage regulator.
8. To study the use of a diode as a half wave rectifier.
9. To study the use of a diode as a full wave rectifier.
10. To show the amplifying action of a transistor.

<b>Title of the course</b>	:	<b>Fundamentals of Electrical Engineering</b>	
<b>Subject Code</b>	:	<b>EE-211/EE-221</b>	
Weekly load	:	5	L T P: 3 0 2
Credit	:	4	

Unit	Course outlines	Lecture(s)
<b>Unit-1</b>	<b>Basic Concepts</b> Electric Charge, Current and Electromotive force, Potential and Potential Difference; Conductor, Semiconductor Insulator and dielectric; Electrical Power and Energy; Ohm's Law, Resistance and color coding; Capacitance and Inductance, their ratings; Effects of Temperature on Resistance, Series and Parallel connection, Kirchoff's Laws and Their Applications	06
	<b>AC Fundamentals</b> Concept of Alternating Voltage and Alternating Current, Difference between AC and DC, Various Terms Related with AC Waves; RMS and Average Values, Concept of Phase and Phase Difference, Single Phase and Three Phase Supply; 3-ph Star-Delta connections, Inter-Relation between phase voltage/current & line voltage/current; Alternating Voltage applied to Pure Resistance, Pure Inductance, Pure Capacitance and their combinations, Concept of Power and Power Factor in AC Circuit.	08
	<b>Measuring Instruments</b> Principle and Construction of Instruments used for Measuring Current, Voltage, Power and Energy, Concept and applications of digital multimeters, oscilloscopes, signal generators	03
	<b>Electrical Safety</b> Electrical Shock, Safety practices to prevent Electric Shock; Concept of Fuses-Classification, Selection and Application; Concept of Earthing ,Types of Earthing, MCBs, ELCBs and their Applications.	04
<b>Unit-2</b>	<b>Electromagnetic Induction</b> Concept of Magnetic Field, Magnetic Flux, Reluctance, Magneto Motive Force (MMF), Permeability; Self and Mutual Induction, Basic Electromagnetic laws, Effects on a Conductor Moving in a Magnetic Field, various losses in magnetic circuits;	04
	<b>Electrical Machines &amp; Transformers</b> Elementary concepts and classification of electrical machines, Common features of rotating electrical machines, Basic principle of a motor and a generator, Need of Starters and their classifications. Transformer- Classification, Principle of operation, Construction, Working and applications.	10
	<b>Utilization of Electricity</b> Concepts of Electricity for electrolysis process e.g., Electroplating, Electro refining etc., Electrochemical Cells & Batteries; Application of Electricity for Heating, Ventilating and air-conditioning, Welding and illumination.	04
	<b>Basic Troubleshooting</b> Basic Testing and faults diagnosis in electrical systems, various tools and their applications, replacement of different passive components e.g. fuses, lamps and lamp holders, switches, cables, cable connectors, electromagnetic relays.	04

**Total=43**

#### Recommended Books:

1. Edward Hugh, Electrical Technology, Pearson Education.
2. D P Kothari & I J Nagrath, Basic Electrical Engineering, TMH.
3. D P Kothari & I J Nagrath, Electrical Machines, TMH.
4. S K Bhattacharya Electrical Machines, TMH.

#### List of Practical's ( EE-211/EE-221)

1. Study of various passive components and measuring instruments and their connections in electrical circuits.
2. Verification of Ohm's Law.
3. Verification of Kirchoff's laws (KCL & KVL).
4. Verification of equivalent resistances in series and parallel connections.

5. Measurement of various characteristic values of a Sinusoidal waveform with the help of CRO.
6. Measurement of voltage, current and power in RL and RLC circuits and Verification of phase angle and power factor concept.
7. Study of various types of earthings.
8. Study of various types of protection devices e.g. fuses, MCBs and ELCBs
9. Verification of Faraday's laws and Lenz's law.
10. Study of various types of DC motors and their starters.
11. Study of various types of AC motors and their starters.
12. Study of various types of transformers and Verification of turns ratio.
13. Starting and reversing various AC and DC motors.
14. Fault diagnosis and removal in general electrical connection /apparatus.


Department of Food Engineering and Technology

**Title of the course** : Food Microbiology  
**Subject Code** : FT-211  
 Weekly load : 5 LTP 3-0-2

Credit 4

Unit	Detailed contents	Lectures
Unit-1	<b>Introduction</b> Definition; historical developments in food microbiology and their significance; concept of prokaryotes and eukaryotes.	8
	<b>Morphology of bacteria and reproduction</b> Morphology and Reproduction of Bacteria: cell structure, shapes, types, structure and chemical composition of cell wall; Gram staining: difference between Gram positive and Gram Negative bacteria; endospore formation; different methods of reproduction.	12
Unit-2	<b>Morphology of fungi and reproduction</b> Types; cell structure; composition of cell wall; methods of reproduction: asexual and sexual, importance of fungi; comparative physiology of bacteria and fungi	11
	<b>Microbiology of food and food products</b> Incidence of micro-organisms on foods, factors affecting growth of microbes, microbiology of milk and milk products, fruit, vegetable and their products, meat, fish, and poultry products, cereals and cereal products	12

**Total=43**

#### Recommended books

1. Michal J Pleczer, Basic Food Microbiology, Chapman and Hall.
2. W.C. Frazier, Food Microbiology, TMH.
3. James M. Jay, Modern Food Microbiology, CBS.
4. Casida, Industrial Microbiology, Wiley Eastern.

#### List of practical's (Food Microbiology Lab)

1. Study of different parts of microscope.
2. Study of different types of bacteria.
3. Study of structure of yeast and mold.
4. To observe the reproduction in yeast under microscope
5. To perform the simple staining techniques of bacteria
6. To perform the gram's staining of microorganisms.
7. To perform the capsule staining of bacteria.
8. To perform the spore staining of mold.
9. To carry the bacterial cell count using heamocytometer.
10. Study of growth of microorganism on the petri plates.
11. To study the microbiology of curd.
12. To measure the dimension of given microorganism.
13. Preservation of microbial culture by agar slant.
14. To determine the total cell count by plate method

Title of the course	: Food Chemistry		
Subject Code	: FT-212		
Weekly load	: 5	<b>LTP</b>	3-0-2
Credit	4		

Unit	Detailed contents	Lectures
<b>Unit- 1</b>	<b>Introduction</b> Food Chemistry	7
	<b>Water</b> Structure, properties of water, water as reactant	5
	<b>Carbohydrates</b> Definition and classification; structure, physical and chemical properties of mono-saccharides, disaccharides and polysaccharides	7
	<b>Proteins</b> Definition, classification, structure, functions of amino acids, proteins and their importance in food	8
<b>Unit- 2</b>	<b>Lipids</b> Definition, structure, classification, functions, physical and chemical properties, rancidity and reversion	8
	<b>Pigments</b> Their occurrence, importance, types	5
	<b>Vitamins and minerals</b> Classification and sources	4

**Total=44**

#### Recommended books

1. A V. V. S Ramarao , A text book of biochemistry, AVI.
2. L. Mayor, Food Chemistry, CBS.

#### List of Practical's FT-212 (Food Chemistry Lab)

1. Preparation of standard solution for Acid base titration
2. Study of analytical equipments
3. Qualitative analysis of water sample
4. Determination of water hardness
5. Analysis of marketed samples for moisture
6. Analysis of market butter for its constituents
7. Analysis of flour for moisture/ash
8. Determination of moisture/volatile matter of given oil/fat
9. Cut out analysis of canned food
10. Determination of saponification value of fat sample
11. Determination of wet/dry/gluten in maida/whole wheat flour
12. Determination of starch content in maida
13. Determination of Vitamin C by titrimetric method
14. Determination of protein content in milk by formal titration
15. Determination of water soluble/insoluble ash

<b>Title of the course</b>	<b>: Principles of Food Processing and Preservation</b>		
<b>Subject Code</b>	<b>: FT-213</b>		
Weekly load	: 5	LTP	3-0-2
Credit	4		

Unit	Detailed contents	Lectures
<b>Unit-1</b>	<b>Introduction</b> Importance of food processing and preservation; classification of foods on the basis of shelf life, pH, origin	6
	<b>Food spoilage</b> Different types of food spoilage viz. microbiological, enzymatic, chemical and physical and their effects on food quality	6
	<b>Low Temperature Preservation</b> Low temperature requirement for different foods — Refrigeration, slow and fast freezing, freezing process; Types of freezer, their advantages and limitations; Storage and thawing of frozen food	8
<b>Unit-2</b>	<b>High Temperature Preservation</b> Canning: Definition, advantages and disadvantages; Can formation; Unit operations in canning: Selection of raw material, peeling/coring, blanching, filling, brining/syruping, exhausting, sealing, processing, cooling, labeling and storage	8
	<b>Low Moisture preservation</b> Drying and dehydration methods- Solar, cabinet, tray and drum	6
	<b>Chemical preservation</b> Introduction, classification and applications.	4
	<b>Radiation preservation</b> Introduction, sources, and applications.	4

**Total=42**

### Recommended books

1. Desrosier, Technology of food preservation, CBS.
2. Fennema. Karrel, Principles of Food Science Vol-I, AVI.

### List of practical's FT-213 (Principles of Food Processing and Preservation Lab)

1. Proximate analysis of food products
2. Identification of foods based on pH
3. To perform can reforming.
4. To perform can flanging and seaming
5. To examine the can seam
6. Selection of raw material like fruits/vegetables for canning.
7. Preparation of brine and syrup for canning
8. Peeling of fruit and vegetables
9. Dehydration of onion, potato and bottle-gourd
10. Dehydration of apple and grapes
11. Examination of canned food
12. Chemical preservation of foods viz., preparation of squash, RTS
13. Visit to Fruits and Vegetable industry to see above operations



Title of the course : **TECHNOLOGY OF FOOD BEVERAGES**

Subject Code : **FT-221**

Weekly load : 5

**LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
I	<b>Introduction</b>	Status and scope of beverage industry in India, classification of beverages and their nutritional significance	<b>11</b>
	<b>Technology of Carbonated and Non-Alcoholic Beverages</b>	Definition of soft drinks, different ingredients for soft drinks and their functions, methods of preparation, related equipments and machinery,  Malted beverages	<b>11</b>
II	<b>Tea and Coffee Processing</b>	Tea types, nutritional significance, methods and processing of tea and coffee, related equipment and machinery	<b>10</b>
	<b>Alcoholic Beverages</b>	Ingredients and their role in beer and wine preparation, methods of manufacturing of Wine, Beer, Scotch, Whiskey, Brandy, Rum, Vodka and Gin; related equipment.	<b>11</b>

### **RECOMMENDED BOOKS**

Authors	Title	Publishers
Potter and Hotchkiss	Food Science	CBI publication
Ashurst Press	Chemistry and Technology of  Soft Drinks and Fruit Juices	Sheffield Academic

Technology of Food Beverages Lab

LIST OF PRACTICAL

1. Determination of alkalinity of potable water
2. Determination of chloride content of potable water
3. Determination of hardness of potable water by EDTA method
4. Study the process of fermentation
5. Study the process of distillation
6. Estimation of alcoholic content of alcoholic beverages
7. Estimation of caffeine content of tea
8. Estimation of caffeine content of coffee
9. Preparation of grape wine
10. Preparation of cider
11. Study the process of malting
12. Study the process of carbonation
13. Visit to bottling plant
14. Visits to beverages plants

Department of

Title of the course : **TECHNOLOGY OF FRUITS AND VEGETABLE PROCESSING**

Subject Code : **FT - 222**

Weekly load : 5 **LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	History and need of processing, reasons of spoilage, method of processing, classification of fruits and vegetables	<b>4</b>
	<b>Physiology</b>	Respiration, transpiration, ripening, senescence, climacteric and non-climacteric fruits	<b>6</b>
	<b>Fresh fruits and vegetables technology</b>	Cleaning methods, sorting, grading, Techniques of extension of shelf life of fruits and vegetables, waxing, chilling	<b>6</b>
<b>II</b>	<b>Thermal processing of fruits and vegetables</b>	Selection of fruits and vegetables, canning, factors affecting the process- time and temperature, containers of canning, lacquering, syrups and brines for canning, spoilage in canned foods	<b>6</b>
	<b>Preservation by sugar</b>	Ingredients and processes technology for the manufacture of jam, jellies, marmalade, preserve	<b>6</b>
	<b>Preservation by salt</b>	Concept of fermented and non-fermented pickles	<b>4</b>
	<b>Drying and dehydration</b>	Drying of selected fruits and vegetables, changes during drying and spoilage of dehydrated fruits and vegetable	<b>5</b>
	<b>Tomato products</b>	Selection of tomatoes, pulping & processing of tomato juice, tomato puree, paste, ketchup, sauce and soup	<b>6</b>

#### **BOOKS RECOMMENDED:**

<b>Authors</b>	<b>Title</b>
Girdhari lal and Sidappa	Preservation of Fruits and Vegetable
Shrivastava and Kunal	Fruit and Vegetable Preservation
N Shakuntala manay	Foods, Facts and Principles
Luh and Wudruf	Commercial Fruit Processing
Wills, Lee Vegetables	Post-Harvest Physiology & Handling of Fruits &

**LIST OF PRACTICALS**

1. Familiarization with Laboratory Equipment
2. Preparation of different normal solutions
3. Determination of Brix (TSS), pH and acidity
4. Extraction and preservation of juice by different methods
5. Preparation of squash
6. Preparation of RTS
7. Preparation of Cordial
8. Preparation of Mixed Fruit Jam
9. Preparation Jelly
10. Preparation of Citrus Marmalades
11. Preparation of Tomato Ketchup/Soup
12. Preparation of Lime Pickle
13. Preparation of Mango or fruit Chutney
14. Dehydration of fruits and vegetable
15. Preparation of fruits preserves and candies

Department of Food Engin

Title of the course : **TECHNOLOGY OF MILK & MILK PROCESSING**

Subject Code : **FT- 223**

Weekly load : 5

**LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
I	<b>Introduction</b>	Milk composition, factors affecting composition of milk; Physico-chemical properties of milk; milk procurement and pricing pattern in Indian.	<b>8</b>
	<b>Milk processing</b>	Handling, transportation and reception (unloading, weighing, testing,) of milk, grading of milk. Platform tests Filtration and clarification, cream separation: by gravity and centrifugation, standardization: milk and cream (toned, double toned, skimmed); homogenization: mode of operation; pasteurization: LTLT, HTST and other methods, filling, storage and distribution. Cleaning and sanitization of dairy equipment.	<b>14</b>
II	<b>Special milks</b>	Manufacturing process of sterilized, flavoured, condensed and evaporated milks.	<b>6</b>
	<b>Milk products</b>	Methods of manufacturing of butter, kulfi, softy, ice cream, spray and drum dried milk powder. chhanna/ paneer, khoa, lassi, butter oil, desi ghee, dahi.	<b>12</b>

**RECOMMENDED BOOKS:**

<b>Authors</b>	<b>Title</b>	<b>Publishers</b>
Su Kumar De	Outlines of Dairy Technology	Oxford
Lampart Hill	Dairy products	Tata McGraw

**Technology of Milk and Milk Processing**

**LIST OF PRACTICALS**

1. Performing plate form test of raw milk viz. COB test, Alcohol test
2. Analysis of raw milk by Determination of Acidity of Milk
3. Determination of Fat of Milk by Gerber Method
4. Determination of SNF & TS of Milk
5. Determination Specific Gravity of Milk by Pycnometer & Lactometer
6. Evaluation of milk quality by MBR Test and phosphatase test
7. Evaluation of milk quality by Phosphate Test
8. Determination of Neutralizers in the Milk
9. Determination of efficiency & capacity of cream separator
10. Ghee adulteration
11. Determination of viscosity of Milk
12. Preparation of flavoured Milk
13. Preparation of paneer
14. Preparation of Ice Cream
15. Preparation of Fermented Milk products like Dahi & Lassi
16. Effect of adulteration with water on Milk fat & SNF
17. Visit to Dairy industry.

Department of Food & Nutrition

Title of the course : **TECHNOLOGY OF MEAT, FISH AND POULTRY PROCESSING**

Subject Code : **FT-224**

Weekly load : 5 **LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Definition; sources of meat, fish and poultry	<b>5</b>
	<b>Animal Tissues and its conversion to meat</b>	Anti-mortem inspection, slaughtering methods, evisceration, postmortem changes and meat cuts	<b>8</b>
	<b>Meat preservation</b>	Curing, smoking, chilling, freezing, canning and pickling	<b>8</b>
<b>II</b>	<b>Egg Processing</b>	Structure and composition of egg; egg quality; grading; preservation by pickling and storage	<b>4</b>
	<b>Poultry Processing</b>	Kind of poultry; different types of slaughtering methods; singeing; evisceration; washing; cooling and storage	<b>6</b>
	<b>Fish processing</b>	Classification of fishes; composition, processing, preservation and spoilage of fish	<b>8</b>

**RECOMMENDED BOOKS:**

Authors	Title	Publishers
Lawrie	Meat Science	CBS
Stadelman	Egg Science and Technology	
Borgstron	Fish as Food. Vol. I to IV	AP

**Technology of Meat, Fish and Poultry Processing Lab**

**LIST OF PRACTICAL**

1. Preparation of ready to cook poultry
2. Retail cuts of dressed chicken
3. Preparation of fried chicken
4. Cooking of chicken in microwave oven
5. Determine the quality of eggs
6. Determine the effect of temperature on coagulation of egg protein
7. Determination of moisture and solid content of different egg constituent
8. Determination of specific gravity of eggs
9. Preparation of fish, meat and eggs pickle
10. Fish filleting and steaking
11. Preparation of fish patties
12. Preparation of tandoori chicken
13. Iron sulphide formation in cooked eggs
14. Preservation of shell eggs
15. Slaughter and dressing of animals

Department



Title of the course : **TECHNOLOGY OF CEREAL PROCESSING**

Subject Code : **FT-225**

Weekly load : 5 **LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Importance of cereal grains in human nutrition; structure and composition of cereals	<b>6</b>
	<b>Wheat</b>	Types of wheat; traditional and modern methods of wheat milling (an overview); wheat milling products- whole wheat flour (Atta), wheat flour (maida), semolina, wheat germ, bran	<b>12</b>
	<b>Barley</b>	Milling; products and malting	<b>4</b>
<b>II</b>	<b>Rice</b>	Types of rice; paddy parboiling (concept, advantages, disadvantages); milling of paddy; milling products- head rice, broken, rice husk and rice bran.	<b>12</b>
	<b>Maize</b>	Types of maize; milling of corn (an overview); milling products and uses.	<b>6</b>

**RECOMMENDED BOOKS:**

Authors	Title	Publishers
RL Kent	Cereal Technology	AVI
A Chakravorty	Post harvest Technology of Cereals, Pulses and Oil Seeds	Oxford and IBH
SB Arora	Hand Book of Bakery Products	SIRI

**LIST OF PRACTICALS**

1. Determination of vitreousness / mealiness of wheat grains
2. Determination of Zeleny's sedimentation value of flour
3. Determination of Pelshenke value of wheat flour
4. Determination of maltose figure of wheat flour
5. Estimation of free fatty acids of wheat flour
6. Determination of Pearling index of wheat grain
7. Determination of wheat grain hardness using texture analyzer.
8. Determination of milling yield of paddy.
9. Grading of rice grain on the basis of shape and size.
10. Effect of pressure parboiling of paddy on the yield of head rice and breakage.
11. Preparation and quality evaluation of beaten rice
12. Estimation of gluten content from wet milling of corn
13. Preparation and quality evaluation of popped corn
14. Preparation and quality evaluation of cookies
15. Preparation and quality evaluation of cake.
16. Industrial visit to flour and rice mills, and bakery

Department of Food

Title of the course : **FOOD QUALITY**

Subject Code : **FT-226**

Weekly load : 5

**LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURE S
<b>I</b>	<b>Introduction</b>	Food quality, Importance and basic criteria	<b>4</b>
	<b>Quality characteristics</b>	Characteristics of raw and processed products based on physical, chemical, microbiological and sensory parameters	<b>10</b>
	<b>Food analytical techniques</b>	pH meter, spectrophotometry, colorimetry, gravimetry, titrimetry	<b>8</b>
<b>II</b>	<b>Physico-chemical analysis</b>	pH, moisture, crude fiber, ash content, specific gravity, protein, fats, acidity, sugar, TSS etc	<b>6</b>
	<b>Microbiological analysis</b>	Total plate count, yeast and mould count, coliform count	<b>4</b>
	<b>Sensory analysis</b>	Criteria for selection of panelist, classification of panel and methods of evaluation	<b>3</b>
	<b>Food adulteration</b>	Definition, types, different types of adulterants in various foods and their harmful effects. Methods of their detection	<b>8</b>

**RECOMMENDED BOOKS:**

Author	Title	Publisher
M. Swarninathan	Food Science Chemistry and Experimental Food	Bappco
PFA Rule Book		AIFOA New Delhi
Quality Control lab manual		

**LIST OF PRACTICALS**

1. Detection of Argemone Oil
2. Detection of oil soluble coal tar dyes in oil
3. Detection of extraneous sand and silica in ground spices
4. Detection of extraneous sand and silica in atta/maida.
5. Detection of metanil yellow in sweets, ice-cream and pulses
6. Detection of roasted chicory in coffee powder
7. Analysis of the milk using organoleptic tests
8. Detection of preservatives in milk
9. Detection of stabilizers in milk
10. Detection of khesari dhal in pulses/Besan
11. Detection of non-tender stalk and stems in tea
12. Observation of rancidity in Biscuits
13. Detection of coal tar dyes in spices containing fast natural colour (like turmeric)
14. Detection of papaya seeds in black pepper
15. Detection of powdered bran and sawdust in spices (ground)
16. Detection of brick powder, sand dirt in chilies

Department of Food Engineering and Technology

Title of the course : **Food Laws and Quality Assurance**

Subject Code : **FT-311**

Weekly load : 3

**LTP 3-0-2**

Credit : 3 (Lecture 3; Practical 0)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Food laws and regulations: Needs, Benefits, Objectives, requirements. Mandatory and optional food laws/standards	<b>8</b>
	<b>Quality control</b>	Concept of quality and quality control; Principles and functions of quality control, quality attributes (qualitative, hidden and sensory), Subjective and objective quality control	<b>6</b>
	<b>Food regulations and Certifications</b>	Implementation, regulations of FSSAI, BIS, AGMARK	<b>6</b>
<b>II</b>	<b>Sampling techniques and food analysis</b>	Definition of sampling, purpose, sampling techniques, requirements and sampling procedures for liquid, powdered and granular material  Objective and purpose of food analysis; food adulteration; purpose, classification, kinds	<b>10</b>
	<b>Physico-chemical and mechanical properties</b>	Colour, gloss, flavour, consistency, viscosity, texture and their relationship with food quality	<b>6</b>
	<b>Sensory quality control</b>	Definition, objectives, panel selection, sensory techniques, Interpretation of sensory results in statistical quality control.	<b>6</b>

**RECOMMENDED BOOKS:**

Title	Authors	Publishers
Food Analysis: Theory and Practices	Pomeranz and Meloan	CBS
Food Analysis and Quality Control	M. Jacob	
Handbook of Analysis of Fruit and Vegetable Products	Ranganna	Tata Mc Graw-Hill

Title of the course	: <b>UNIT OPERATIONS IN FOOD PROCESSING</b>	
Subject Code	: <b>FT-312</b>	
Weekly load	: 5	<b>LTP 3-0-2</b>
Credit	: 4 (Lecture 3; Practical 1)	

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Definition and application in food processing.	<b>1</b>
	<b>Size reduction</b>	Size reduction equipment used in food industry e.g grinders, crushers and pulverizers, their working, advantages and limitations	<b>8</b>
	<b>Sieving</b>	Separation based on size, types of screens, their working, advantages and limitations. Factors affecting the sieving process.	<b>6</b>
	<b>Mixing</b>	Equipment for liquid and solid mixing, their working, advantages and limitations.	<b>6</b>
<b>II</b>	<b>Leaching and Extraction</b>	Equipment for leaching and extraction, their working, advantages and limitations.	<b>5</b>
	<b>Distillation</b>	Equipment for distillation, their working, advantages and limitations	<b>4</b>
	<b>Filtration</b>	Filtration equipment, their working, advantages and limitations.	<b>6</b>
	<b>Sedimentation and Centrifugal Separation</b>	Equipments for sedimentation and centrifugal separation, their working, advantages and limitations.	<b>6</b>

### **RECOMMENDED BOOKS**

<b>Authors</b>	<b>Title</b>	<b>Publishers</b>
<b>P. Fellows</b>	Food Processing Technology	Woodhead Pub
<b>R. L. Earle</b>	Unit operations in food processing	

**Unit Operations in Food Processing Lab**

**LIST OF PRACTICALS**

1. To study the constructional and working features of ball mill.
2. To study the constructional and working features of hammer mill.
3. To study the constructional and working features of burr mill.
4. To study the constructional and working features of seed grader.
5. To study the constructional and working features of indented cylinder.
6. To study the constructional and working features of planetary mixer.
7. To study the constructional and working features of a bed extractor.
8. To study the constructional and working features of distillation equipment.
9. To study the constructional and working features of plate & frame filter press.
10. To study the constructional and working features of rotary drum vacuum filter.
11. Determination of sedimentation rate of a slurry.
12. To study the constructional and working features of disc bowl centrifuge

Title of the course : **POST HARVEST TECHNOLOGY**

Subject Code : **FT-313**

Weekly load : 5 **LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Importance of handling and storage of food and food products; Post-harvest losses of fruits, vegetables and grains in India; prevention of losses; storage and its benefits.	<b>10</b>
	<b>Handling Equipment</b>	Types and operational principles of handling equipment: conveyors (belt, screw and pneumatic), elevators, pumps; weighing, packaging and sealing machines for granular and powdered materials.	<b>12</b>
<b>II</b>	<b>Post harvest handling of fruits and vegetable</b>	Low temperature storage of fruits and vegetables; storage requirements and types of storages structures e.g. modified atmospheric storage; controlled atmospheric storage, spoilage during storage of fruits and vegetables and their prevention.	<b>12</b>
	<b>Post harvest handling of food grains</b>	Factors affecting quality of grain during storage; types of storage structures for small, medium and large quantities; causes of spoilage during storage and their prevention.	<b>9</b>

**BOOKS RECOMMENDED:**

Authors	Title
Hall, C.W.	Handling and Storage of Food grains in Tropical and Subtropical Areas
Sinha R.N. and W.E. Muir	Grain storage - Part of a System
Volkind and Roslov	Modern Potato and Vegetable storage



**LIST OF PRACTICALS**

1. Determination of density of the food products
2. Determination of thousand kernel weight of grains.
3. Determination of impurities present in the grains
4. Studies on the storage of a fruit.
5. Studies on the storage of a grains.
6. Applications of belt conveyor.
7. Applications of screw conveyor.
8. Applications of pneumatic conveyor.
9. Classification of the foods on the basis of their perishability.
10. Visit to food industry to see various equipment
11. Visit to warehouse and cold store

Title of the course : **FOOD BIOCHEMISTRY AND NUTRITION**

Subject Code : **FT-314**

Weekly load : 5

**LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Biochemistry and basic concepts</b>	Role of enzymes in biochemical reactions, coenzymes and cofactors, coenzymes as a electron carrier, enzymes in relation to rate of reaction, Free energy change and standard free energy change in relation to biochemical reactions, outline of generation of ATP in cells. Hormones; Elements of immunology.	<b>13</b>
	<b>Biological membrane and transport</b>	Molecular constituents of membranes, Different mechanisms of solute transport across membranes (Passive diffusion, facilitated diffusion, active transport).	<b>8</b>
<b>II</b>	<b>Introduction to Nucleic acids</b>	Structure of DNA and RNA, replication, transcription.	<b>8</b>
	<b>Food Nutrition</b>	Importance of biomolecules in body, Process of digestion and absorption of food nutrition; Malnutrition and health; role of dietary fiber and other unavailable carbohydrate in the body, protein efficiency ratio, digestibility coefficient, biological value, net protein utilization and net protein ratio, balanced diet, inadequate/excessive intake of nutrients and common health problems, nutrition label, Minimum nutritional requirement and RDA. Deficiency diseases and its prevention. Food as allergens, Food allergy and its classification, characteristic of allergic reactions. Effect of processing on nutrients.	<b>13</b>

**BOOKS RECOMMENDED:**

Author	Title
Lehninger, A.L.; Nelson, D.L. and Cox, M. M.	Principals of Biochemistry
Strayer. L.	Biochemistry
Handler, P.: Smith E.I.; Stelten, D. W.	Principals of Biochemistry
Sunetra Roday	Food Science & Nutrition

## LIST OF PRACTICALS

1. Qualitative analysis of common amino acids.
2. Spectrophotometric method for protein estimation biuret and Lowry method
3. Qualitative analysis of sugars.
4. Qualitative analysis of reducing and non reducing sugars.
5. To study the bomb calorimeter.
6. To study the principle of spectrophotometer.
7. To determine the pH of different food samples.
8. To study the osmosis of using different solutions.
9. Formal titration technique for protein estimation.
10. To study the paper chromatography.

Department of Food Engineering and Technology

Title of the course : **TECHNOLOGY OF BAKERY AND CONFECTIONERY**

Subject Code : **FT-315**

Weekly load : 5

**LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Definition of bakery products; Raw materials for bakery products and their functions in bread, biscuits, cake, pastry, buns and traditional products	<b>12</b>
	<b>Bakery Products</b>	Flow sheet with brief description of common bakery products. Related equipments.	<b>14</b>
<b>II</b>	<b>Confectionery products</b>	Flow diagram and brief description of hard boiled candies, fruit candies, toffees and chocolates, packaging of confectionery products, related confectionery making equipment	<b>8</b>
	<b>Hygiene Practices</b>	Importance of hygiene in bakery and confectionery plants, various cleaning agents and disinfectants	<b>8</b>

**RECOMMENDED BOOKS:**

Authors	Title	Publishers
SB Arora	Hand Book of Bakery Products	SIRI
Matz	Bakery Technology and Engineering	AVI

**LIST OF PRACTICALS**

1. Determination of moisture content of flour using hot air method
2. Determination of dry and wet gluten content of flour
3. Determination of water absorption power of flour
4. Determination of ash content of flour
5. Determination of dough raising capacity of yeast
6. Preparation of cakes (with egg)
7. Preparation of cakes (without egg)
8. Preparation of buns
9. Preparation of pastry
10. Preparation of sweet biscuits
11. Preparation of salted biscuits
12. Preparation of hard-boiled sweets
13. Preparation of fruit peel candy
14. Preparation of toffees
15. Visit to Bakery and Confectionery Industries

Title of the course : **TECHNOLOGY OF PULSES AND OILSEED PROCESSING**

Subject Code : **FT-316**

Weekly load : 5 **LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 2)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Structure, chemical and nutritional composition of major pulses and oil seeds.	<b>9</b>
	<b>Milling of Pulses</b>	Classification of pulses; Pre-treatments; Traditional milling methods (dry and wet milling); Modern milling methods (CFTRI, Pantnagar, CIAE Processes); Advantages and disadvantages of these methods; Byproducts of pulse milling.	<b>11</b>
<b>II</b>	<b>Oilseed Processing</b>	Selection and pre-treatment of raw materials; traditional and modern oil extraction methods and equipment involved: Mechanical and Solvent extractions; Extraction of cottonseed, safflower, coconut, ground nut, sunflower, soybean and palm oil.	<b>11</b>
	<b>Refining and Hydrogenation of Oils</b>	Physical and chemical oil refining process; Winterization and hydrogenation and their importance; Shortening– types, manufacture and use; Production of peanut butter; Byproducts of oil milling and refining and their utilization.	<b>10</b>

#### RECOMMENDED BOOKS:

Authors	Title	Publishers
Chakrabarty M M. Chakrabarty A. Kay DE. Inst	Chemistry and Technology of Oils and Fats Post Harvest Tech of Cereals, Pulses & Oilseeds Food Legumes	Prentice Hall. Oxford & IBH. Tropical Products
Mathews RH. Swern D. EIRI Board	Legumes Chemistry, Tech and Human Nutrition Bailey's Industrial Oil and Fat Products Hand Book of Oils, Fats & Derivatives	Marcel Dekker. InterSci. Publ. EIRI

with Refining and Packaging Technology

**Technology of Pulses and Oilseed Processing**

**LIST OF PRACTICALS**

1. Determination of theoretical yield of different pulses
2. Estimation of protein content in the deoiled meal
3. Effect of moisture content on the dehusking efficiency and breakage of pulses during milling
4. Effect of alkali treatment on the milling characteristics of pulses
5. Effect of wet method of milling on the dehusking efficiency and breakage of pigeon pea
6. Effect of oil application on the milling characteristics of pulses
7. Effect of water application on the milling characteristics of pulses
8. Comparison between milling characteristics of different group of pulses
9. Preparation and sensory evaluation of peanut butter
10. Effect of pre-treatment on the oil recovery from different oil seeds
11. Industrial visit to pulse / oil milling / solvent extraction plants

Department of Food Engineering and Technology

Title of the course : **ELEMENTS OF FOOD ENGINEERING**

Subject Code : **FT-321**

Weekly load : **5**

**LTP 3-0-2**

Credit : **4 (Lecture 3; Practical 1)**

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Concept of food engineering, unit conversion, mass and energy balance.	<b>6</b>
	<b>Fluid flow operations</b>	Physical properties of fluid, Type of fluid- Newtonian and non-Newtonian fluids, concept of Reynold's number and its determination, Classification of fluid flow working features of different type of pumps like centrifugal and rotary pumps.	<b>7</b>
	<b>Basics of heat transfer</b>	Different methods of Heat transfer, concept of conduction, convection and radiation, its application in food processing.	<b>6</b>
	<b>Heat exchangers</b>	Heat exchanger, different types, their working principle advantages and limitations.	<b>5</b>
	<b>Psychrometry</b>	Definition, psychometric properties and charts.	<b>4</b>
	<b>Drying</b>	Bound and unbound water, moisture content on dry and wet basis, equilibrium moisture content, critical moisture content, drying rate, working of different type of driers used in food industry.	<b>5</b>
<b>II</b>	<b>Evaporation</b>	Basic principle of evaporation, different type of evaporators, their working principle advantages and limitations.	<b>5</b>
	<b>Refrigeration systems</b>	Refrigeration cycle, types of refrigerants and components of a refrigerator.	<b>5</b>

**RECOMMENDED BOOKS:**

Authors	Title	Publishers
Heldman & Singh	Introduction to Food Engg,	Academic Press
Smith	Introduction to Food Process Engg,	Springer
R.T. Toledo	Fundamentals of Food process Engg,	CBS



**LIST OF PRACTICALS**

1. Determination of critical velocity and type of fluid flow
2. Verification of Bernoulli's Equation.
3. To study the constructional and working features of centrifugal pump.
4. To study the constructional and working features of rotary pump.
5. To determine the thermal conductivity of a given food sample
6. To determine the thermal conductivity of composite slab
7. To determine the heat transfer coefficient in natural convection over a vertical cylinder
8. To determine the average heat transfer coefficient in a pipe under forced convection.
9. To study the constructional and working features of double pipe heat exchanger.
10. To study the constructional and working features of plate heat exchanger.
11. To determine the dry and wet bulb temperature using sling psychrometer
12. To determine the various properties of air-water-vapour mixture using psychrometric chart
13. To draw the drying rate curve of a given food material.
14. Determination of the elevation in boiling point using thermometer.
15. To study the constructional and working features of open pan evaporator.
16. To study the constructional and working features of rising/falling film evaporator.
17. To study the constructional and working of refrigeration tutor.

Title of the course : **TECHNOLOGY OF SPICES, HERBS & CONDIMENTS**

Subject Code : **FT-322**

Weekly load : 5 **LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Importance and role of spices, herbs and condiments in food processing and food products.	<b>6</b>
	<b>Classification and properties</b>	Classification and properties of spices, herbs and condiments– their products, including health benefits and medicinal properties	<b>8</b>
	<b>Processing steps</b>	Cleaning, grading, milling, blending, formulating and packaging of spices and spice mixes.	<b>5</b>
<b>II</b>	<b>Processing of spices and herbs</b>	Rhizome: Ginger, turmeric Bulb: Onion and garlic Bud spices: Clove. Fruit spices: Nutmeg, chilli and cardamom Leafy spices: bay, oregano, basil (tulsi), mint, thyme and curry leaves. Seed spices: pepper fenugreek, mustard, dill and coriander. Common aromatic herbs: mint, lemon grass.	<b>10</b>
	<b>Spice products</b>	Introduction of oleoresins and essential oils.	<b>6</b>
	<b>Application</b>	Spices and spice products.	<b>6</b>

**RECOMMENDED BOOKS :**

Title	Authors
Medicinal Plants	NS Chauhan
Spices and Condiments	JS Pruthy
Food and Beverage Service	Dennis & Lilly Crap

**Technology of Spices, Herbs & Condiments**

**LIST OF PRACTICALS**

1. Demonstration of process of essential oil extraction and oleoresin of different spices
2. Study of detection of adulteration in spices
3. Study of constituents and sensory characteristics of essential oils and oleoresins
4. Demonstration of actual processing of different spices, herbs and plantation products
5. Practical related to:
  1. cleaning,
  2. grading,
  3. milling,
  4. blending,
  5. formulating and preparing of spices and spice mixes.
6. Visit to relevant industries

Title of the course : **FOOD BYPRODUCTS AND WASTE UTILIZATION**

Subject Code : **FT-323**

Weekly load : 3

**LTP 3-0-0**

Credit : 3 (Lecture 3; Practical 0)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Definition, origin and type of waste and by-products, their identification.	<b>8</b>
	<b>By-products</b>	Classification, composition and characterization, need for treatment and utilization, impact on environment; Types and availability of by-products of cereals, legumes, oilseeds, fruits and vegetables processing, meat, poultry, fish processing industries.	<b>12</b>
<b>II</b>	<b>Utilization</b>	Waste utilization into value added products; pectin, food colorants, antioxidants from fruit peels (citrus, mango, pomegranate), Lycopene from tomato peels. Utilization of mango, citrus, apple, guava, grape waste in vinegar production. Utilization of plant by products for the recovery of proteins, dietary fibers, anti-oxidants and their use as nutraceuticals and colorants.	<b>12</b>
	<b>Disposal</b>	Storage and disposal of solid waste in land-filling, burial, incineration, recycling.	<b>4</b>
	<b>Treatments</b>	Storage and disposal of liquid waste. Effluent treatment basic unit operations and treatment of effluents by physical, chemical and biological methods	<b>6</b>

### **RECOMMENDED BOOKS**

1. Ioannis S. Arvanitoyannis, Waste Management for the Food Industries, Elsevier Inc, USA.
2. Sean X. Liu, Food and Agricultural Wastewater Utilization and Treatment, Blackwell Publishing, USA.
3. Robert R. Zall, Managing Food Industry Waste, Blackwell Publishing, USA.
4. Green J.H., Food Processing Waste Management, AVI Publications.
- A. Chakravarthy & De, Agricultural Waste and By Product Utilisation.
5. K. Waldron, Handbook of waste management and co-product recovery in food processing. CRC Press
6. Ioannis S. and Arvanitoyannis, Waste Management in Food Industry, Academic Press
7. Vasso Oreopoulou and Winfried Russ, Utilization of byproducts and treatments of waste in Food Industry, Springer.
8. Lawrence K. Wang, Waste Treatments in Food Industry, Taylor and Francis.

Title of the course : **TECHNOLOGY OF FOOD PACKAGING**

Subject Code : **FT-324**

Weekly load : 5

**LTP 3-0-2**

Credit : 4 (Lecture 3; Practical 1)

UNIT	MAIN TOPIC	DETAILED CONTENTS	LECTURES
<b>I</b>	<b>Introduction</b>	Definition; origin and types of packaging materials; function of packaging	<b>4</b>
	<b>Packaging materials</b>	Paper, polymeric films, laminates, plastics, glass, metal, biodegradable materials; package forms	<b>10</b>
	<b>Package evaluation</b>	WVTR; GTR; bursting strength; tensile strength; tearing strength; drop test	<b>6</b>
	<b>Applications</b>	Meat, fish, poultry, eggs; Milk and dairy products; Fruits and Vegetables; Cereal grains and baked foods	<b>8</b>
<b>II</b>	<b>Packaging machinery</b>	Bottling; canning; form-fill-seal machines; bags, their manufacturing and closing	<b>6</b>
	<b>Packaging environment</b>	Inert gas; vacuum; aseptic; CAP and MAP	<b>4</b>
	<b>Package labeling</b>	Labeling types; functions and regulations	<b>4</b>

**Books Recommended:**

Author	Title
Frank A. Paine	A Handbook of Food Packaging
N.T. Crosby	Food Packaging Materials
Calvin J. Bening	Plastic Films for Packaging

**LIST OF PRACTICALS**

1. Study of various equipments present in packaging lab
2. Analysis wax coating of wrap cover
3. Determination of the tensile strength of the cardboard
4. Determination of compression strength of wooden box using compression strength tester
5. To check the resistance of given packaging material using drop-test
6. To check the thermal resistance of glass bottles
7. To check the uniformity of packaging material
8. To check different packaging material
9. To perform vacuum packaging using vacuum sealing machine
10. To check heat seal-ability of different packaging materials
11. Study of the seal and shrink packaging machine
12. Determination of water transmission rate of packaging material
13. Determination of the puncture resistance by using puncture resistance machine
14. Determination of grease resistance of packaging material.
15. Determination of water vapor transmission rate

Department of Food