

## Diploma in Food Processing & Technology Syllabus Structure and Details (July 2020 onwards)

Course No.	Course Name	L	T	P	C	Course No.	Course Name	L	T	P	C
<b>Semester I</b>						<b>Semester II</b>					
DHSS101	Communication in English	3	0	0	6	DHSS271	Communication in English Lab	0	0	2	2
DCH102	Chemistry-I (THEORY)	2	1	0	6	DCSE202	Computer Fundamentals & Programming	2	0	0	4
DCH172	Chemistry-I (PRACTICAL)	0	0	2	2	DCSE272	Computer Fundamentals & Programming Lab	0	0	2	2
DMA103	Mathematics-I	3	0	0	6	DECE203	Fundamentals of Electrical & Electronics Engineering	2	1	0	6
DME104	Engineering Drawing	2	0	0	4	DECE273	Fundamentals of Electrical & Electronics Engineering Lab	0	0	2	2
DME174	Engineering Drawing Lab	0	0	2	2	DMA204	Mathematics-II	3	1	0	8
DME176	Workshop Practice	0	1	4	6	DME205	Engineering Mechanics	3	0	0	6
DPH105	Applied Physics - I (THEORY)	2	1	0	6	DPH206	Applied Physics – II	2	1	0	6
DPH175	Applied Physics - I (PRACTICAL)	0	0	2	2	DPH276	Applied Physics - II (PRACTICAL)	0	0	2	2
<b>Contact Hours: 25</b>		<b>12</b>	<b>3</b>	<b>10</b>	<b>40</b>	<b>Contact Hours: 23</b>		<b>12</b>	<b>3</b>	<b>8</b>	<b>38</b>
<b>Semester III</b>						<b>Semester IV</b>					
DHSS302	ENGINEERING ECONOMICS & ACCOUNTANCY	3	1	0	8	DFET401	ELEMENTS OF FOOD ENGINEERING-II	3	0	0	6
DFET301	INTRODUCTION TO FOOD PROCESSING AND PRESERVATION TECHNOLOGY	3	0	0	6	DFET402	BASICS OF FOOD CHEMISTRY	3	0	0	6
DFET302	ELEMENTS OF FOOD ENGINEERING-I	3	0	0	6	DIE405	INSTRUMENTATION AND PROCESS CONTROL	3	0	0	6
DFET303	FOOD PRODUCT TECHNOLOGY-I	3	0	0	6	DME405	STRENGTH OF MATERIALS	3	0	0	6
DFET310	PROFESSIONAL PRACTICE-I	1	0	0	2	DFET410	PROFESSIONAL PRACTICE-II	1	0	0	2
DFET371	INTRODUCTION TO FOOD PROCESSING AND PRESERVATION TECHNOLOGY LAB	0	0	3	3	DFET471	ELEMENTS OF FOOD ENGINEERING-II LAB	0	0	3	3
DFET372	ELEMENTS OF FOOD ENGINEERING-I LAB	0	0	2	2	DFET472	BASICS OF FOOD CHEMISTRY LAB	0	0	3	3
DFET373	FOOD PRODUCT TECHNOLOGY-I LAB	0	0	3	3	DIE475	INSTRUMENTATION AND PROCESS CONTROL LAB	0	0	3	3
DFET374	PROFESSIONAL PRACTICE-I	0	0	2	2	DFET474	PROFESSIONAL PRACTICE-II	0	0	2	2
<b>Contact Hours: 24</b>		<b>13</b>	<b>1</b>	<b>10</b>	<b>38</b>	<b>Total Contact Hours 24</b>		<b>13</b>	<b>0</b>	<b>11</b>	<b>37</b>
<b>Semester V</b>						<b>Semester VI</b>					
DFET501	FOOD ENGINEERING OPERATION-I	3	1	0	8	DHSS601	INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP	3	0	0	6
DFET502	FOOD PRODUCT TECHNOLOGY-II	3	0	0	6	DFET601	FOOD ENGINEERING OPERATION-II	3	0	0	6
DFET503	FOOD STORAGE AND PACKAGING	3	0	0	6	DFET61_	ELECTIVES	3	0	0	6
DFET504	FOOD QUALITY CONTROL	3	0	0	6	DFET691	PROJECT	0	0	4	4
DFET510	PROFESSIONAL PRACTICE-III	1	0	0	2	DFET610	PROFESSIONAL PRACTICE-IV	1	0	0	2
DFET571	FOOD PRODUCT TECHNOLOGY-II LAB	0	0	3	3	DFET671	FOOD ENGINEERING OPERATION-II LAB	0	0	2	2
DFET572	FOOD QUALITY CONTROL LAB	0	0	2	2	DFET672	PROFESSIONAL PRACTICE-IV	0	0	2	2
DFET573	PROFESSIONAL PRACTICE-III	0	0	2	2						
<b>Total Contact Hours 21</b>		<b>13</b>	<b>1</b>	<b>7</b>	<b>35</b>	<b>Total Contact Hours 18</b>		<b>10</b>	<b>0</b>	<b>8</b>	<b>28</b>
<b>Total Mandatory Credits: 216</b>											

## Semester I

**Paper code: DCH102**

**Paper name: Chemistry-I (Theory)**

**Total contact hours: 40**

**Credit: 6**

**L-T-P: 2-1-0**

**Unit I: Periodic table, Atomic structure** (4L)

Electrons, protons, neutron, Atomic mass (A), atomic number (Z) isotopes, isobars, isotone, orbit and orbitals, electronic configuration (upto Z=30). Modern periodic table, groups and periods.

**Unit II: Electrochemistry** (5L)

Electrolytes, Faraday's law of electrolysis, Numerical problems, application of electrolysis, oxidation and reductions, Redox reactions.

**Unit III: Metallurgy** (5L)

General principles of metallurgy, minerals, ore, gangue, slag, flux, roasting, calcination etc. Metallurgy of iron and aluminium, Manufacture of steel by Bessemer process, open hearth process and LD process, alloys.

**Unit IV: Building materials** (3L)

Portland cement, Types of manufacturing, setting and hardening of cement, special cement. Glass, Bricks.

**Unit V: Lubricant** (3L)

Definition, classification of lubricants, important functions of lubricants.

**Unit VI: Polymer and polymerization** (4L)

Types of polymer, thermoplastic and thermosetting plastic, preparation and applications of PE, PVC, PP, Perspex, Teflon, Bakelite, nylon, Natural rubber, Synthetic rubber.

**Unit VII: Organic chemistry** (6L)

IUPAC nomenclature, Alkane, alkene, alkyne, alcohol synthesis and applications.

**Unit VIII: Environmental Chemistry** (6L)

Definition, Types of pollution, pollutants, Water quality measurements- D.O, B.O.D, C.O.D, hardness of water, removal of hardness, TDS, Green house effect, acid rain, Ozone layer depletion.

**Unit IX: Industrial chemistry** (4L)

Ethanol manufacture from starch by fermentation, Fuels- Classifications, calorific values, natural gas, water gas, producer gas, LPG, power alcohol. Petroleum- refining, octane number, cetane number.

### **Texts-Books / References:**

1. S. Chawla; *A Text Book of Engineering Chemistry*, Dhanpat Rai Publishing Co.
2. Jain and Jain; *Engineering Chemistry*, Dhanpat Rai Publishing Co.
3. S.V.R. Gowariker, N.V. Viswanathan, J. Sreedhar, *Polymer Science*, New Age International Publisher.
4. S.K. Ghosh *Advanced General Organic Chemistry (A Modern Approach) (Set I & II)* NCBA Publisher, New Delhi, 2009

5. B. Viswanathan, P. S. Raghavan; Practical Physical Chemistry, Viva
6. 6. Dr. S. Rattan; Experiments in Applied Chemistry, S. K. Kataria & Sons.
7. J.C. Kuriacose and J. Rajaram; *Chemistry in Engineering*, Tata McGraw-Hill Publishing Company Limited, New Delhi
8. Dr. S. Rabinra and Prof. B.K. Mishra ; *Engineering Chemistry*, Kumar and Kumar Publishers (P) Ltd. Bangalore-40
9. SS Kumar; *A Text Book of Applied Chemistry-I*, Tata McGraw Hill, Delhi
10. Dr. G.H. Hugar; *Progressive Applied Chemistry –I and II*, Eagle Prakashan
11. M. L. Sharma, P.N. Chaudhury, B. R, Khanal, D.R.Paudel; *Engineering Practical Chemistry*, Ekta Books Distributors.

**Paper code: DCH172**

**Paper name: Chemistry-I (Practical)**

**Total contact hours: N/A**

**Credit: 2**

**L-T-P: 0-0-2**

**Experiment-1:** Introduction to chemistry laboratory, precautions, name of common chemicals, apparatus, instruments etc.

**Experiment-2:** Volumetric analysis and study of apparatus used therein.

**Experiment-3:** Determine the degree of temporary hardness of water by EDTA titration.

**Experiment-4:** Determination of solubility of a solid at room temperature.

**Experiment-5:** To verify the first law of electrolysis (electrolysis of copper sulphate solution using copper electrode).

**Experiment-6:** Determination of pH of unknown solutions.

**Experiment-7:** To determine the coefficient of viscosity of the alcohol by using *Ostwald's* viscometer.

**Experiment-8:** To determine the surface tension of the given liquid with respect to water at room temperature by using *Stalagnometer*.

**Experiment-9** Preparation of standard solution of  $\text{Na}_2\text{CO}_3$

**Experiment-10** Determination of strength of NaOH by titrating with 0.1 N HCL

**Paper name: Applied Physics – I (Theory)**

**Paper code: DPH105**

**Total contact hours: 36 hours**

**Credit: 06**

**L-T-P: 2-1-0**

**Module 1: UNITS & DIMENSION**

**Contact hours: 2**

1.1. Need of measurement and Unit in Engineering and Science definition of unit, fundamental and derived quantities and their units, different system of units (CGS and SI), Illustrations.

1.2 Explanation of dimensions of physical quantities, dimensional equations of physical quantities and their uses with examples.

**Module 2: BASIC MECHANICS**

**Contact hours: 12**

2.1 Introduction to scalar and vector quantities, representation of vector, addition, subtraction and multiplication of vectors, parallelogram law of vector addition, resolution of vector, dot and scalar product of two vectors (details not required).

2.2 Newton's laws of motion: First law, explanation, definition of force, Concept of Inertia, types of inertia (inertia of rest and inertia of motion), Newton's second law, momentum, impulse, mass & weight, simple problems, Newton's third law, explanation and its examples, Principle of conservation of linear momentum, statement and simple examples (e.g. recoil of a gun), numerical problems.

2.3 Circular motion, time period and angular velocity, relation between angular velocity and

linear velocity, centripetal and centrifugal force, bending of a cyclist on a curved path, banking of roads and railway track, numerical problems.

2.4 Work, power and energy, its concept, units and dimension, Potential and Kinetic energy, its mathematical relations, Principle of conservation of energy, its proof in case of a free falling body under gravity, numerical problems.

2.5 Simple Harmonic Motion, its geometrical representations and derivation of its equations, definition of amplitude, time period, frequency, phase etc., mathematical relations and units, simple pendulum & second's pendulum, numerical problems.

### **Module 3: GRAVITY AND GRAVITATION**

**Contact hours:3**

3.1 Newton's law of gravitation, acceleration due to gravity, relation between 'G' and 'g', their units, variation of the value of g with altitude and depth, Centre of gravity and Centre of mass, Numerical problems

### **Module 4: ELASTIC PROPERTIES OF SOLID**

**Contact hours:3**

4.1 Deforming force, restoring force, Elastic and plastic bodies, explanation of stress and strain with their types, Hook's law, elastic limit, Young's modulus, Bulk modulus, Rigidity modulus, Poisson's ratio, their units and numerical problems.

### **Module 5: HEAT AND THERMODYNAMICS**

**Contact hours:10**

5.1 Concept of heat and temperature, thermometer, different scales of temperatures and their conversion formulae, numerical problems.

5.2 Thermal expansion: expansion of solid, linear, superficial and cubical expansion of solid, their coefficients & their relations; Expansion of liquid: co-efficient of Real and Apparent expansion, their relation, variation of density with temperature, Anomalous expansion of water (experimental determination not necessary). Concept of Absolute scale of temperature.

5.3 Calorimetry: Unit of heat, Joule and calorie, Specific heat, thermal capacity and water equivalent.

5.4 Change of state of a body, melting and freezing point, effect of pressure on melting point, latent heat, Evaporation, difference between vaporisation and evaporation, factors on which rate of evaporation depends.

5.5 Transmission of heat, three modes of heat transfer, conduction, convection and Radiation, good and bad conductor of heat, coefficient of thermal conductivity, its S.I. unit and dimension.

5.6 1st law and 2nd law of thermodynamics, Joule's law and Mechanical equivalent of heat.

### **Module 6: SOUND**

**Contact hours:6**

6.1 Wave Motion: amplitude, time period, frequency and wavelength, relation between velocity, frequency and wavelength. Transverse and longitudinal waves with examples.

6.2 Propagation of sound wave: Expression of velocity of sound in air, Newton's formula and Laplace's correction, Effect of temperature, and pressure on velocity of sound.

6.3 Audible range, ultrasonic and infrasonic sound, application of ultrasonic sound to calculate the depth of ocean.

6.4 Reflection of sound and its application, Echo and reverberation of sound, acoustic of building

6.5 Doppler's effect with Mathematical expressions.

### **Books / References:**

1. Modern Approach to Physics Part I & II, Dilip Sarma, N G Chakraborty, and K N Sharma,

- Kalyani Publisher, New Delhi.
- Applied Physics Part I & II, Manpreet Singh, Dr. Major Singh, and Mrs. Hitashi Gupta, S K Kataria & Sons- New Delhi.
  - Basic Applied Physics, R K Gaur, Dhanpat Rai Publication- New Delhi.

**Paper name: Applied Physics-I (Practical)**

**Paper code: DPH175**

**Total contact hours: 18 hours**

**Credit: 02**

**L-T-P: 0-0-2**

- Vernier Callipers: To determine the volume of a metallic/wooden cube.
- Screw Gauge: to determine cross sectional area of a wire/ thickness of a glass piece.
- Spherometer: To determine the radius of curvature of concave and convex mirrors.
- To determine the value of acceleration due to gravity (g) of a place with simple pendulum.
- To measure the velocity of sound in resonance tube.
- To determine the frequency of a tuning fork using Sonometer.
- Measurement of Specific gravity of solid, liquid, using Nicolson hydrometer, Hare's apparatus and specific gravity bottles.
- To determine the atmospheric pressure by using Boyle's law apparatus.
- To determine water equivalent of a calorimeter by method of mixture.

**Paper code: DMA103**

**Paper name: Mathematics-I**

**Total contact hours: 35**

**Credit: 6**

**L-T-P: 3-0-0**

**Module –I: ALGEBRA**

**(20 HOURS)**

- Vector and Scalar quantities – types of vectors, geometric representation of vectors, addition and subtraction of vectors, magnitude of a vector, product of a vector by a scalar, Module vectors i, j, k.
- Arithmetic and geometric progressions – nth term of A.P. and G.P., Geometric mean between two numbers.
- Complex numbers – origin, general form, polar form, examples. Simple problems.
- Binomial theorem – Factorials, positive integral values, binomial expansion, rules, calculation of appropriate value.
- Logarithm and exponential series.
- Determinants: Definition, operations and Cramer's rule for solving simultaneous linear equations.
- Basic concepts of permutation and Combinations.

**Module-II: TRIGONOMETRY**

**(15 HOURS)**

- Trigonometric functions and ratios.
- Trigonometric functions of allied angles – half, double, triple, compound angles.
- Addition and subtraction formulae.
- Solution of triangles using properties.
- Simplification of trigonometric expressions using different formulae.
- Basic concept of inverse trigonometric functions and hyperbolic functions.

**Reference Books:**

Sl. No.	Title	Author/ Publisher
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1	Mathematics for Polytechniques: Vol – I&II	TTTI, Bhopal
2	Mathematics for Polytechniques	S.P. Deshpande
3	Engineering Mathematics	I.B. Prasad
4	Engineering Mathematics	Grewal
5	Plain Trigonometry	Bansilal
6	College Algebra	Shah and Desai
7	Mathematics Textbook for class XI and XII	NCERT

**Paper code: DHSS101**  
**Paper name: COMMUNICATION IN ENGLISH**  
**Total contact hours:39**

**Credit: 6**  
**L-T-P: 3-0-0**

<p><b>Module 1:</b> Parts of Speech</p> <p>1.1 Recognition and review of Nouns, Pronouns, Verbs, Adverbs, Adjectives, Prepositions, Conjunctions, Interjections</p> <p>1.2 Knowledge of Subject, Object and Compliment of the Verb</p> <p>1.3 Herbals –Infinitival, Gerund and Preposition.</p> <p>.</p>	<b>Contact hours: 3</b>
<p><b>Module 2:</b> Prepositions of time and place</p> <p>2.1 Contextual teaching of prepositions of time - on, in , at, since, for, ago, before, to, past, to, from, till/until, by</p> <p>2.2 prepositions of place: in, at, on, by, next to, beside, near, between, behind, in front of, under, below, over, above, across, through, to, into, towards, onto, from.</p>	<b>Contact hours: 5</b>
<p><b>Module 3:</b> Clause, phrases and Relative Clauses</p> <p>3.1 Basic definitions of clauses and phrases</p> <p>3.2 Focus on Relative Pronouns and their use in sentences as relative clauses.</p>	<b>Contact hours: 2</b>
<p><b>Module 4:</b> Subject Verb Agreement</p> <p>4.1 Rules that guide the agreement of the subject to its verb</p>	<b>Contact hours: 5</b>
<p><b>Module 5:</b> Sentence types and Transformation of sentences</p> <p>5.1 Assertive sentences, Exclamatory sentences, Interrogative sentences, Negative sentences, Compound sentences, complex sentences, simple sentences, Degrees of Comparison.</p>	<b>Contact hours: 5</b>
<p><b>Module 6</b> Voice</p> <p>6.1 Change from Active Voice to Passive Voice and vice versa</p>	<b>Contact hours: 3</b>
<p><b>Module 7:</b> Punctuation</p> <p>7.1 Use of the comma, semi-colon, colon, apostrophe, exclamation mark, question mark and quotation marks</p>	<b>Contact hours: 5</b>
<p><b>Module 8:</b> Word formation</p> <p>8.1 Change of one part of speech to the other: from Verbs to Nouns, Nouns to Verbs, Adjectives to Nouns, Nouns to Adjectives, Verbs to adverbs, and Adverbs to Verbs</p>	<b>Contact hours: 2</b>
<p><b>Module 9:</b> Affixation</p> <p>9.1 Prefixes and Suffixes and new word formations</p>	<b>Contact hours: 2</b>
<p><b>Module 10:</b> Nominal Compounds</p> <p>10.1 Common nominal compound</p>	<b>Contact hours: 2</b>
<p><b>Module 11:</b> Paragraph Writing</p> <p>11.1 Descriptive Paragraph on various related topics.</p>	<b>Contact hours: 5</b>

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- BOOKS RECOMMENDED: 1. Essential English Grammar with Answers by Raymond Murphy (Cambridge University Press)  
2. English for Polytechnics by Dr Paporani Rani Barooah (Eastern Book House Publishers)  
3. English Grammar by Annie Brinda (Cambridge University Press)

**Paper codes: DME104 / DME174**

**Paper name: Engineering Drawing / Engineering Drawing Lab**

**DME104 → L-T-P-C: 2-0-0-4**

**DME174 → L-T-P-C: 0-0-2-2**

**Total contact hours = 48**

**Module 1. INTRODUCTION**

[Contact Hrs: 5 Hrs]

- i. Drawing as a medium of communication,
- ii. Use and care of Drawing Instruments Assignments:  
Such as Drawing of Horizontal and Vertical Lines, Square, Rectangle, Mosaic Pattern, Angular Pattern, Stamping with circular pattern.
- iii. Types of Lines and Dimensioning as per 15696/72

**Module 2. GEOMETRICAL CONSTRUCTIONS**

[Contact Hrs = 8 Hrs.]

- i. Freehand curves, free hand Drawing
- ii. Construction of triangles, Perpendicular and angles of 30°, 45°, 60°, 90°
- iii. Construction of Regular Polygons. .
- iv. Regular Polygons inscribed in circles.
- v. Regular figures by using T – square and Set – square.

**Module 3. LETTERING, SCALES**

[Contact Hrs = 5 Hrs.]

- i. Single Stroke Lettering Straight and Inclined by graph and Free hand Letters and digits as per 15696/72
- ii. Scale- Representative Fraction, Types or Scales
- iii. Simple problems on Plain and Diagonal Scale

**Module 4. PROJECTION OF POINTS**

[Contact Hrs = 5 Hrs.]

- i. Position / location of Points, Horizontal plane, Vertical plane .
- ii. Assignments of Simple problems on different quadrants and Find the distance between two points.
- iii. Position/ Location of Points.

**Module 5. PROJECTION OF LINES**

[Contact Hrs = 5 Hrs.]

- i. Position / location of Points, Horizontal plane, Vertical plane .
- ii. Assignments of Simple problems on different quadrants and Find the distance between two points.
- iii. Position/ Location of Lines.

**Module 6. ORTHOGRAPHIC PROJECTION**

[Contact Hrs = 5 Hrs.]

- i. Top View, Front View and Side View of Simple objects, block and machine parts with dimensional scale.
- ii. Sectional Front ,Top and Side Views As per IS – 696 for simple parts and blocks.

**Module 7. RIVET HEADS AND JOINTS**

[Contact Hrs = 5 Hrs.]

- i. Different types of Rivet Heads and Joints.
- ii. Top and Sectional Front views of Lap and Butt Joints with single double cover plates.

**Module 8. ISOMETRIC PROJECTION**

[Contact Hrs = 5 Hrs.]

- i. Isometric Projection to true scale and isometric scale.

### **Module 9. THREAD/ SCREWED**

[Contact Hrs = 5 Hrs.]

- i. Thread Profiles ( REF IS 2043 IS – 554 ETC. )
- ii. Screwed Fastenings
- iii. Representation of external and internal threaded assembly symbolic .
- iv. Representation of threads.
- v. Representation of Screws, Bolts, Nuts and Cutter.

Reference Books :

1. Elementary Engineering Drawing [Plane and Solid Geometry] By N.D. Bhatt, V.M. Panchal.
2. Geometrical and Machine Drawing By N.D. Bhatt

**Paper code: DME176**

**Paper name: Workshop Practice**

**L-T-P-C: 0-1-4-6**

**Total contact hours = 60**

### **Module 1: Carpentry shop**

(Theory and Practice: 12hrs)

- 1.1 Introduction with the shop
- 1.2 Various structure of wood and types of wood
- 1.3 Different types of tools, machine and accessories used in Carpentry shop
- 1.4 Safety Precautions in workshop
- Details of Practical Contents (3+3 hrs)
- Demo of different wood working tools and machines
- Demo of different wood working processes
- Simple joints like T joints etc.
- One simple utility job.

### **Module 2: Fitting Shop**

(Theory and Practice: 12hrs)

- 2.1 Introduction with the fitting shop
- 2.2 Various marking, measuring, cutting, holding and striking tools
- 2.3 Different Operations like chipping, filing, marking drilling etc.
- 2.4 Working principle of drilling machine, lapping dies etc.
- Details of Practical Contents (3+3 hrs)
- Demo of different fitting tools and machines and power tools
- Demo of different processes in fitting shop
- Squaring of a rectangular metal piece
- One simple utility job.

### **Module 3: Welding Shop**

(Theory and Practice: 12hrs)

- 3.1 Introduction
- 3.2 Types of Welding, Arc Welding, Gas Welding, Gas Cutting
- 3.3 Welding of dissimilar materials, selection of welding rod material, size of rod and work piece
- 3.4 Different types of flames
- 3.5 Elementary symbolic Representation
- 3.6 Safety and precautions
- Details of Practical Contents (3+3 hrs)
- Demo of different welding tools and machines
- Demo of Arc Welding, Gas Welding, Gas Cutter and rebuilding of broken parts with welding
- Any one Composite job involving lap joint welding process.

### **Module 4: Machine Shop**

(Theory and Practice: 12hrs)

4.1 Introduction

4.2 Study of Different types of Lathe machine, shaping machine, Drilling machine

4.3 Study of Different types of hand tools and machine tools and parts

4.4 Safety & precautions

Details of Practical Contents (3+3 hrs)

Demo of different machines and their operations

Preferably prepare a simple job.

**Module 5 Turning shop**

(6 hrs)

Demo of lathe machine, drilling machine

One job related to plane and taper turning , threading and knurling

One job related to drilling and tapping

**Module 6 Electrical Shop**

(6 hrs)

Demo of simple house wiring and use of tools

One job related to simple house wiring

Fittings of cut outs, fuses and other simple fittings etc.

Difference between Single phase wiring and three phase wiring

**Suggested Text/Reference Books:**

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(ii) Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.

(iii) Gowri P. Hariharan and A. Suresh Babu, ”Manufacturing Technology – I” Pearson Education, 2008.

(iv) Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998

(v) Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGraw Hill House, 2017

# Semester II

**Paper name: Applied Physics – II (Theory)**

**Paper code: DPH206**

**Total contact hours: 36 hours**

**Credit: 06**

**L-T-P: 2-1-0**

## **Module 1: LIGHT**

**Contact hours: 5**

- 1.1 Reflection, Reflection on spherical mirror, idea of real and virtual image, mirror formula, sign conventions (mirror formula to be assumed), nature size and position of images of different positions of objects, numerical problems.
- 1.2 Refraction, refractive index, critical angle, total internal reflection, between critical angle and refractive index, Prism, refraction through prism, minimum deviation, numerical problems. Lens, refraction through lens (lens formula to be assumed of a lens), numerical problems.

## **Module 2: ELECTROSTATICS**

**Contact hours: 3**

- 2.1 Concept of Electric charge according to modern electron theory, unit of charge, Inverse square law, electric field, Electric line of force, electric intensity
- 2.2 Potential at a point due to a point charge, relation between intensity and potential with deduction of the formula
- 2.3 Capacity of a condenser, series and parallel combination, different type of condenser, numerical problems.

## **Module 3: CURRENT ELECTRICITY**

**Contact hours: 11**

- 3.1 potential difference and electric current with their units.
- 3.2 Difference between emf. and potential difference; internal resistance of cell. Voltaic cell; defects of cell: local action and polarization and their removal.
- 3.3 Difference between primary and secondary cells with examples, grouping of cells, series, parallel and mixed combinations of cells.
- 3.4 Basic D.C. Circuits: Ohm's Law and its verification, mathematical expression, Kirchoff's Law, numerical problems.
- 3.5 Definition of resistance, conductance, effects of temperature on resistance, Series and parallel combination of resistance, resistance per unit length, numerical problems.
- 3.6 Heating Effect of Current: Joule's law, electricity energy and power, numerical problems
- 3.7 Thermoelectric effect: Thermocouple, Seebeck effect, Peltier effect and Thomson effect.
- 3.8 Chemical effect of current: electrolysis, Faradays's laws of electrolysis.

## **Module 4: MAGNETISM**

**Contact hours: 5**

- 4.1 Nature and artificial magnets theories, different types of magnets, induced magnetism, nature of polarities.
- 4.2 Inverse square law, magnetic intensity at end – on and broad – side on position, uniform and non – uniform field, magnetic moment, couple on a magnet in a uniform field, Tangent law.
- 4.3 Elements of terrestrial magnetism

**Module 5: ELECTROMAGNETISM****Contact hours: 4**

- 5.1 Magnetic effect of current, nature of magnetic field due to straight and circular conductor, due to solenoid, Fleming's left and right hand rules, effect of current following through two parallel conductors.
- 5.2 Electro Magnetic induction: e. m. f. induced in a coil due to magnet, Faraday's laws of electro – magnetic induction, Lenz Law, self and mutual induction.

**Module 6: MODERN PHYSICS****Contact hours: 4**

- 6.1 Photo Electric Emission: explanation and demonstration of photo electric current, photo electric equation with its physical signification.
- 6.2 Nuclear Energy: Atomic mass unit, mass energy equivalence, mass defect
- 6.3 X- rays: Properties and its application in industry (Production apparatus not necessary)
- 6.4 Radio – activity: Natural and artificial radioactivity, emission of alpha, beta and gamma radiation, their properties and uses.

**Module 7: ELECTRONICS****Contact hours: 2**

- 7.1 Thermionic emission: vacuum tube, diode and triode, their working principle, concept of rectifier and amplifier, use of diode as rectifier.

**Module 8: SEMI – CONDUCTOR PHYSICS****Contact hours: 2**

- 8.1 Concept of semiconductors, properties and basic principle, intrinsic and extrinsic semiconductor, p-type and n-type semiconductor.

**Suggested Reference books.**

1. Modern Approach to Physics Part I & II, Dilip Sarma, N G Chakraborty, and K N Sharma, Kalyani Publisher, New Delhi.
2. Applied Physics Part I & II, Manpreet Singh, Dr. Major Singh, and Mrs. Hitashi Gupta, S K Kataria & Sons- New Delhi.
3. Basic Applied Physics, R K Gaur, Dhanpat Rai Publication- New Delhi

**Paper name: Applied Physics-II (Practical)****Paper code: DPH276****Total contact hours: 20 hours****Credit: 02****L-T-P: 0-0-2**

1. To verify the laws of reflection using a plane mirror and to study the characteristics of image formed.
2. To determine the refractive index of the material of the glass slab by pin method.
3. To determine the focal length of a convex lens by U-V method.
4. To determine the focal length of a convex lens by plane mirror method.
5. To draw I-D curve and to determine the refractive index of the material of a prism.
6. To locate the poles of a bar magnet and to measure the magnetic length.
7. To plot magnetic lines of force of a bar magnet with north pole pointing north and to locate the neutral point/to plot magnetic lines of force of a bar magnet with south pole pointing north and to locate the neutral point.
8. To verify Ohm's law by Ammeter-voltmeter method.
9. To find equivalent resistance using voltmeter with I. Three resistances connected in series II. Three resistances connected in parallel.
10. To measure the unknown resistance of the material of a wire by meter bridge using Wheatstone bridge principle.

**Paper name: Mathematics – II**

**Paper code: DMA204**

**Total contact hours: 40 hours**

**Credit: 08**

**L-T-P: 3-1-0**

**MODULE I: CALCULUS-I**

**(16 HOURS)**

**a. Differential Calculus**

- Sets: Definition, types and operation on Sets.
- Relation: Definition, domain and range, equivalence relation.
- Functions: definition, types of functions.
- Limits: Concept and evaluation of limits, indeterminate forms, L'Hospital's Rule.
- Differentiation: Differentiation by first principle. Differentiation of sum, product and quotient, function of function, Chain rule. Differentiation of trigonometric, inverse trigonometric, hyperbolic, logarithmic and parametric functions, applications.
- Basic concepts of partial differentiation.

**b. Integral Calculus**

- Integration: Definition and fundamental properties.
- Methods of integration – integration by substitution, by parts, partial fractions
- Applications

**MODULE-II: STATISTICS**

**(10 HOURS)**

- Measures of Central Tendency: Mean, Median and Mode and empirical relationship between them and related problems.
- Measures of Dispersion: Range, Mean Deviation, Standard Deviation, Quartile deviation.
- Correlation

**MODULE-III: CO-ORDINATE GEOMETRY**

**(14 HOURS)**

- Co-ordinate Systems, Cartesian and polar co-ordinates, distance between two points, section formula, area of triangle, collinearity and co-planarity.
- Straight Line: Definition, general and standard form of equations, intersection of straight lines: angle between them, bisector of angle between them.
- Change of co-ordinate axes, shifting of origin and rotation of axes.
- Circle: Standard equations and simple problems, tangent and normal.
- Basic idea of parabola, ellipse and hyperbola, their standard equations and basic properties.

**Books for Reference:-**

Sl. No.	Name of the books	Author/Publisher	Edition/Year
1.	Mathematics for Polytechniques	TTTI, Bhopal	Latest
2.	Mathematics for Polytechniques	S. P. Deshpande	Latest
3.	Engineering Mathematics	I.B. Prasad	Latest
4	A text Book Matrices	Shanti Narayan, S. Chand & Co. New Delhi	1998
5	Introduction to Statistics	L. Choudhury, KitapGhar, Guwahati.	Latest
6	Fundamental of Statistics	Kapoor & Gupta	Latest
7	Mathematics Textbook for class XI and XII	NCERT	Latest

**Paper code: DME 205**

**Paper name: Engineering Mechanics**

**Total hours : 41 hours**

**L-T-P-C: 3-0-0-6**

**Module 1: Forces and Moments**

**( 12 hrs)**

Force, Moment and Couple, Resultant of forces, Forces in space. Equilibrium, FBD, General equations of equilibrium,

**Module 2: Friction**

**(8 hrs)**

Introduction to dry friction. Laws of friction, friction of simple machines- inclined planes, Screw jacks.

**Module 4: Center of gravity and moment of inertia**

**(8 hrs)**

Center of gravity of axes, volume and composite bodies: Area moment of inertia and mass moment of inertia for plane figures and bodies.

**Module 5: Motion**

**(5 hrs)**

Linear and circular motion, Linear and angular velocities and acceleration, Units relation in between centrifugal force, Its uses in Engineering problems. Angle of banking super elevation problems. Bodies moving on a level circular path, skidding, overturning.

**Module 6: Work, Power and Energy**

**(3hrs)**

Work, power and Energy definition and application, Potential and kinetic energy-definition and Units and their Engineering problems.

**Module 7: Simple Lifting Machines**

**(5 hrs)**

Definition and importance of Simple Machines. Law of Machine, problems. Simple lifting Machines –simple Wheel and axle, differential wheel and axle and screw jack(simple) problems. Definition M.A, V.R and efficiency and their relationship. Simple problems

**Reference books:**

1. Engineering Mechanics: S Timoshenko & D H Young. McGraw Hill Int.
2. Engineering Mechanics: R S Khurmi. S Chand & Co.
3. Engineering Mechanics: R K Bansal. Laxmi Publication (P) Ltd
4. Engineering Mechanics: K L Kumar. McGraw Hill Publishing Co.
5. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
6. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I – Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
7. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press

**Paper code: DEE203**

**Paper name: Fundamentals of Electrical & Electronics Engineering**

**Total contact hours: 34**

**Credit: 6**

**L-T-P: 2-1-0**

**Module 1:**

**Contact hours: 2L**

Introduction: Sources of energy; General structure of electrical power systems, Power transmission and distribution via overhead lines and underground cables.

**Module 2:**

**Contact hours: 8L**

DC circuits: Definitions of active, passive, linear, non-linear circuits elements and networks, Kirchoff's laws, Nodal and mesh analysis, voltage and current sources, network theorems, superposition. Thevenin's, Norton's, maximum power transfer, Millman's, and reciprocity theorems, analysis of simple circuits with DC excitation.

**Module 3:**

**Contact hours: 10L**

Single phase AC circuits: generation of single phase sinusoidal EMF, instantaneous, average and effective value, form and peak factor, examples of other alternating waveforms and average and effective value calculations, concept of phasor and phasor diagrams, lagging and leading of phasors, pure resistive, inductive and capacitive circuits, power factor, complex power, R-L, R-C and R-L-C series circuits, parallel AC circuits, series and parallel resonance.

**Module 4:**

**Contact hours: 4L**

Semiconductor Devices:

Review of atomic structure, Intrinsic and Extrinsic semiconductors, current carriers in semiconductors, P-type and N-type materials, P-N junction, biasing, characteristic curve, load line, Zener diode.

Special semiconductor devices (Qualitative only) – tunnel diode, backward diode, varactor and PIN diode, their construction, operation and applications.

**Module 5:**

**Contact hours: 3L**

Bipolar transistor (Qualitative only): Construction and schematic representation of PNP and NPN transistors, formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors.

**Module 6:**

**Contact hours: 2L**

Bipolar transistor (Qualitative only):

Different types of biasing system, bias stabilisation, analysis of CE, CB & CC configuration, their I/P & O/P characteristics, transistor rating and specifications.

**Module 7:**

**Contact hours: 3L**

Rectifier Circuits:

Half wave and full wave rectifier (Qualitative only): ripple factor, rectification efficiency, Peak Inverse Voltage.

Filtering (passive) and voltage regulation (Qualitative only): Capacitor filter, Inductor filter, 'T' filter, 'π' filter. Zener as voltage regulator.

**Module 8:**

**Contact hours: 2L**

Cathode Ray Oscilloscope: Construction features of cathode ray tube, concept of dual beam CRO; application of CRO for different electrical measurements: amplitude frequency and phase of sine wave, Lissajous figure.

**Books / References:**

1. D.P. Kothari & I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. B.L. Thereja, A.K. Thereja, "A Textbook of Electrical Technology", S.Chand
4. Jacob Millman, "Electronics Devices & Circuits", McGraw Hill Education; 4 edition (2015).
5. Boyestad & Nashelsky, "Electronics Devices and circuit theory", Pearson Education India; 11<sup>th</sup> edition (2015).
6. S. Salivahanan & N. Suresh Kumar, "Electronic Devices and Circuits", McGraw Hill Education; Fourth edition (2017).
7. Albert Malvino & David Bates, "Electronic Principles", Tata McGraw Hill Publication, 2010.
8. A.K. Maini, "Analog Circuits", Khanna Publishing House, Ed. 2018.

**Paper code: DEE273**

**Paper name: Fundamentals of electrical & electronics engineering lab**

**Total contact hours: 16**

**Credit: 2**

**L-T-P: 0-0-2**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, rheostat and wattmeter.
2. Make a measured resistance from a given rheostat
3. Verification of Kirchhoff's laws
4. Verification of Superposition theorem
5. Verification of Thevenin's theorem
6. P-N Junction
6. Half-wave rectifier circuit
7. Full-wave rectifier circuit
8. V- I characteristics of transistors
9. Wiring

**Paper code: DHSS271**

**Paper name: COMMUNICATION IN ENGLISH LAB**

**Total contact hours:39**

**Credit: 2**

**L-T-P-C: 0-0-2-2**

<p>Module 1: Speaking and Listening practices</p> <ol style="list-style-type: none"> <li>1.1 Practices of sounds of English</li> <li>1.2 Proper Body language while speaking</li> <li>1.3 Presentation and public speaking practices</li> <li>1.4 Practicing to enhance listening skills</li> <li>1.5 Different types of listening</li> <li>1.6 Good listening practices</li> <li>1.7 Overcoming barriers to effective listening</li> </ol>	
<p><b>Module 1: Business Writing</b></p> <ol style="list-style-type: none"> <li>1.1 Letter Writing Formal letter formats,</li> <li>1.2 practice of letter writing in different situations: Order letter, Complaint letter, Letter of Adjustment, Quotation letter , Letter to the Editor, Application for leave of absence</li> <li>1.3 Job Application and Cover Letter, format of a job application</li> <li>1.4 Resume, Curriculum Vitae, bio data.</li> </ol>	<b>Contact hours: 3</b>
<p><b>Module 2: Paragraph Writing and Summary Writing</b></p> <ol style="list-style-type: none"> <li>2.1 Definition, Cohesion and Linkage using Transition words on everyday topics</li> <li>2.2. Practicing how to compose coherent passages.</li> <li>2.3 Definition, Use of Transition words, important points to remember while summarizing</li> <li>2.4 Explain and practicing how to arrive at a summary of a paragraph / text</li> </ol>	<b>Contact hours: 5</b>
<p><b>Module 4 Email Writing</b></p> <ol style="list-style-type: none"> <li>4.1 writing the perfect e-mail,</li> <li>4.2 steps to the perfect e-mail, formal and informal greetings, requests through an e-mail, writing an apology, complaint and seeking help and information in an e-mail,</li> <li>4.3 informing about a file attached in in an email, writing the formal ending of an e-mail</li> <li>4.3 Explaining and practicing how to write formal and informal emails</li> </ol>	<b>Contact hours: 5</b>
<p><b>Module 3: Report writing</b></p> <ol style="list-style-type: none"> <li>3.1 Definition, types of reports with a focus on annual report, non-profit annual report, technical and academic report,</li> <li>3.2 necessity and purpose of writing a report, qualities of a good report,</li> <li>3.3 language used in a report,</li> <li>3.4 different formats of reports and sample reports</li> </ol>	<b>Contact hours: 2</b>
<p><b>Module 5: Facing an interview</b></p> <ol style="list-style-type: none"> <li>5.1 How to approach, what to speak, how to speak in an interview and answer interview questions, the business etiquettes to maintain</li> <li>5.2 body language, negative body language, handling an awkward situation in an interview, the dress code</li> <li>5.3 Successful job interview practices</li> <li>5.4 Perfect handshake, points to remember while applying for a job</li> </ol>	<b>Contact hours: 5</b>

<b>Module 6</b> British English and American English	<b>Contact hours: 3</b>
6.1 Difference between American and British English words – vocabulary and spelling 6.2 Pronunciation and accents	

**BOOKS RECOMMENDED:**

1. Student’s handbook of Written English and Phonetics by Dr Papori Rani Barooah (Eastern Book House Publishers)
2. Strengthening your writing -V.R. Nayaranswami (Orient Longman)

**Paper Code: DCSE202**

**Paper Name: Computer Fundamentals and Programming**

**Total Contact Hours:35**

**Credit: 4**

**L-T-P: 2-0-0**

**Module 1: Computer Fundamentals**

**Contact hours:10**

- 1.1 Brief history
- 1.2 Block diagram and different components
- 1.3 Memory & it’s different types
- 1.4 I/O devices
- 1.5 Introduction to Operating System, Types and Role of OS
- 1.6 Computer languages, translator software, editor.
- 1.7 Data, different types of data, information and its characteristics
- 1.8 Introduction to computer network and the Internet

**Module 2: Number System and codes**

**Contact hours:10**

- 2.1 Different number systems - decimal, binary, octal, hexadecimal number system
- 2.2 Number Conversions
- 2.3 1’s and 2’s Complement, subtraction using complements.
- 2.4 Different codes- ASCII, BCD, Ex-3, Gray
- 2.5 Conversion from Gray to binary and vice-versa
- 2.6 BCD Addition.

**Module 3: Introduction to C programming**

**Contact hours:15**

- 3.1 Fundamentals of programming-Algorithm & Flowchart
- 3.2 Source code and object code
- 3.3 Basic structure of C programs
- 3.4 Executing a C program
- 3.5 C Tokens, Keywords and Identifier, Constants, Variables, Storage Class and Data types.
- 3.6 Operators and expression
- 3.7 Input Output function like printf, scanf, getchar, putchar, gets, puts
- 3.8 Decision making and branching using IF..Else, Switch
- 3.9 Looping using for, while, and do-while
- 3.10 Array

**Books / References:**

1. Computer Fundamentals Paperback by Priti Sinha Pradeep K.Sinha (Author), BPB Publication
2. Byron Gottfried, “Programming with C”, Tata McGraw Hill.
3. Herbert Schildt, “The complete Reference C”, TMH
4. Balagurusamy, E. (2019). *Programming in ANSI C, 8/e*. McGraw-Hill Education.
5. YashwantKanetkar, “Let us C”, BPB Publication
6. Henry Mulish, Herbert L. Cooper, “The Spirit of C: An Introduction to Modern Programming”, Jaico Books.
7. Brian W. Kenigham and Dennis Ritchie, “C Programming language”, Prentice Hall of India.

**Paper Code: DCSE272**

**Credit: 2**

**Module 1: Basic Commands for Computer System** **Contact hours:2**

**Module 2: Preparation of Documents** **Contact hours:6**

2.1 Introduction to Word processing: Opening a document, preparing documents, inserting diagrams and tables

2.2 Editing document- (a) Character, word and line editing, (b) Margin Setting, Paragraph alignment, (c) Block Operations, (d) Spell Checker, (e) Saving a document, (f) Mailmerge.

**Module 3: Information Presentation through SpreadSheet** **Contact hours:8**

3.1 Application of SpreadSheet

3.2 Structure of spreadsheets

3.3 Preparing table for simple data and numeric operations

3.4 Using formulae and functions in excel operations, Creation of graphs, Pie charts, bar charts.

**Module 4: Preparation of presentation** **Contact hours:6**

4.1 Creation of electronic slides on any topic

4.2 Practice of animation effect

4.3 Presentation of slides

**Module 5: Programming in C** **Contact hours:10**

5.1 Editing a C program

5.2 Defining variables and assigning values to variables

5.3 Arithmetic and relational operators, arithmetic expressions and their evaluation

5.4 Practice on input/output functions like getchar, putchar, gets, puts, scanf, printf etc.

5.5 Programming exercise on simple if statement, If..else statement, switch statement

5.6 Programming exercise on looping with do-while, while, for loop and array.

**Books / References:**

1. Foundations of Information Technology Coursebook 9: Windows 7 and MS Office 2007 (With MS Office 2010 Updates)-*Sangeeta Panchal,Alka Sabharwal*
2. Microsoft Office 2016 Step by Step by Joan Lambert and Curtis Frye
3. Herbert Schildt, "The complete Reference C", TMH
4. YashwantKanetkar, "Let us C", BPB Publication
5. Balagurusamy, E. (2019). *Programming in ANSI C, 8/e*. McGraw-Hill Education.
6. Henry Mulish, Herbert L. Cooper, "The Spirit of C: An Introduction to Modern Programming", Jaico Books.
7. Brian W. Kenigham and Dennis Ritchie, "C Programming language", Prentice Hall of India.

# Semester III

**Paper code: DHSS302: (Engineering Economics and Accountancy)**  
**Total contact hours: 52**

**Credit: 08**  
**L-T-P: 3-1-0**

## **Part-A Engineering Economics**

### **Module 1: Introduction to Economics**

**Contact hours: 4**

1.1 Definition of Economics, Its utility and scope of the Study.

1.2 Definition of Engineering Economics

1.3 Meaning and concepts of Utility, Consumption, value, price, Goods and National income, Inflation.

1.4 Wants, Definition and Characteristics

1.5 Wealth and Welfare – Definition, meaning and types.

### **Module 2: Demand and Supply**

**Contact hours: 6**

2.1 Meaning and types of Demand

2.2 The law of Demand, its limitations

2.3 Preparation of Demand Schedule

2.4 Meaning of Supply

2.5 The law of supply, its limitations

2.6 Preparation of supply schedule

### **Module 3: Production**

**Contact hours: 4**

3.1 Meaning and factors of Production

3.2 Factors determining efficiency of labour

3.3 Saving, investment and capital formation

3.4 Meaning of Production Function

### **Module 4: Money**

**Contact hours: 3**

4.1 Meaning of Money

4.2 Types of Money

4.3 Functions of Money

### **Module 5: Banking Organisation**

**Contact hours: 3**

5.1 Central Bank – its functions

5.2 Commercial Banks – its functions

### **Module 6: Pricing**

**Contact hours: 4**

6.1 Objective of Pricing Policy

6.2 Price determinants

6.3 Price discrimination

## **Part-B: Accountancy**

### **Module 7: Introduction to Book Keeping and Accountancy**

**Contact hours: 5**

7.1 Definition and objectives of Book Keeping

7.2 Need and Advantages of Book Keeping

7.3 Definition of Accounting

7.4 Difference between book keeping and accounting

7.5 Double Entry Systems – main features

7.6 Advantage and disadvantages of Double Entry System

### **Module 8: Introduction to Computerised Accounting System**

**Contact hours: 3**

8.1 Components of Computerised Accounting Software

8.2 Need for Computerised Accounting

### 8.3 Difference between computerised Accounting and Manual Accounting

#### **Module 9: Transaction**

**Contact hours: 3**

9.1 Definition

9.2 Meaning of Account

9.3 Classification of Accounts: Traditional Approach and Modern Approach

9.4 Meaning of Debit and Credit

9.5 Rules of Debit and Credit

#### **Module 10: Journal and Ledger**

**Contact hours: 5**

10.1 Meaning of Journal

10.2 Recording of Transaction in Journal

10.3 Meaning of Ledger

10.4 Objective and Utility of Ledger

10.5 Posting and Balancing of Ledger

10.6 Distinction between Journal and Ledger

10.7 Names of Different Books of Accounts

#### **Module 11: Cash Book**

**Contact hours: 5**

11.1 Meaning and Importance of Cash Book

11.2 Characteristics and Advantages of Cash Book

11.3 Discount – Trade Discount and Cash Discount

11.4 Different Types of Cash Book: Single column cash book, Double column Cash Book and Triple column Cash book

11.5 Bank Reconciliation Statement – Basic Idea

#### **Module 12: Trial Balance and Error in Accounting**

**Contact hours: 3**

12.1 Meaning and Objects of Trial Balance

12.2 Main features and Advantage of Trial Balance

12.3 Preparation of Trial Balance

12.4 Types of Error in Accounting

#### **Module 13: Components of Final Accounts**

**Contact hours: 4**

13.1 Meaning and objectives of Trading Account

13.2 Contents of Trading Account

13.3 Meaning and objectives of Profit and Loss Account

13.4 Contents of Profit and Loss Account

13.5 Meaning of Depreciation, revenue expenditure and capital expenditure

13.6 Contents of Balance Sheet

#### **Books / References:**

1. Introductory Micro Economics- Sandeep Garg- Dhanpat Rai Publication Pvt. Ltd. New Delhi.
2. Introductory Macro Economics- Sandeep Garg- Dhanpat Rai Publication Pvt. Ltd. New Delhi.
3. Theory and Practice of Accountancy-B.B. Dam, R.A. Sarada, R. Barman, B. Kalita-Capital Publishing Company, Guwahati-5.
4. Book-Keeping & Accountancy- Juneja. Chawla & Saksena- Kalyani Publisher, New Delhi-110002.
5. Tally. ERP 9 for Beginners- Tally Solutions Pvt. Ltd.- Sahaj Enterprises, Bangalore.

**Paper code: DFET301**

**Paper name: INTRODUCTION TO FOOD PROCESSING AND PRESERVATION TECHNOLOGY**

**Total contact hours: 40L**

**Credit: 06**

**L-T-P: 3-0-0**

**Module 1:**

Introduction to Food constituents, viz. carbohydrates, lipids, proteins, vitamins and minerals. Types and Causes of food spoilage

**Contact hours: 10L**

**Module 2:**

Food preservation principles and methods; Physical, Chemical and Biological; Physical: Drying, evaporation, canning and process time evaluation, irradiation, refrigeration and freezing.

**Contact hours: 10L**

**Contact**

**Module 3:**

Chemical and Biochemical means of preservation viz. by addition of salt, sugar, oil spices and preservative; fermentation etc.

**Contact hours: 10L**

**Module 4:**

Introduction to food packaging, Introduction to hygienic aspect in food handling and processing

**Contact hours: 10L**

**Books / References:**

1. Food Science, N. N. Potter, CBS Publisher & Distributors
2. Foods, Facts & Principles, N. S. Many & M. Shadaksharaswamy, New Age International (p) Ltd., New Delhi.
3. Technology of food preservation, Desrosier&Desrosier, CBS Publishers & Distributors, New Delhi.
4. Food Science, B. Srilakshmi, New Age International (p) Ltd., New Delhi.

**Paper code: DFET302**

**Paper name: ELEMENTS OF FOOD ENGINEERING – I**

**Total contact hours: 40L**

**Credit: 06**

**L-T-P: 3-0-0**

**Module 1:**

Laws of thermodynamics: Zeroeth, first and second laws. Concepts of enthalpy, internal energy, entropy and absolute temperature. Reversibility and irreversibility, Carnot cycle and Carnot engine.

**Contact hours: 10L**

**Contact**

**Module 2:**

Introduction to heat, different methods of heat transfer, Fourier's Law, Steady State heat transfer through plain and composite slabs, cylindrical and spherical surfaces.

**10L**

**Contact hours:**

**Module 3:**

Natural and forced convection, concept of overall heat transfer coefficient, LMTD, Heat exchangers and its applications in food processing. Heat transfer by radiation.

**10L**

**Contact hours:**

#### **Module 4:**

Refrigeration and freezing: refrigeration cycles, heat pump. Application of refrigeration in food processing and preservation. Food freezing, freezing time calculation by Plank's equation. **Contact hours: 10L**

#### **Books / References:**

1. Brennan, J.G. et. Al.; Elsevier Applied Science, Amsterdam: Food Engineering Operations
2. Heldman, R.R. and R.P. Singh, CBS Publication: Food Process Engineering
3. Toledo, R.T., CBS Publication: Fundamentals of Food Engineering
4. D.G.Rao., PHI Publication: Fundamentals of Food Engineering
5. Akash Pare and B.L.Mandhyan: Food Process Engineering & Technology
6. Chandra Gopala Rao: Essentials of Food Process Engineering

**Paper code: DFET303**

**Paper name: FOOD PRODUCT TECHNOLOGY – I**

**Total contact hours: 45L**

**Credit: 06  
L-T-P: 3-0-0**

#### **Module 1:**

Production process of milled rice; Parboiling and Parboiled rice. Processing of wheat, pulses, corn/maize, and malting. **Contact hours: 8L**

#### **Module 2:**

Processing of oil seeds: Production and processing of edible vegetable oils and fat, hydrogenated fat, bakery and shortening fat and fat substitute products like Margarine. **Contact hours: 8L**

#### **Module 3:**

Principles of fruits and vegetables processing, Storage of fresh fruits and vegetables. Reception and preparation: Equipment, cleaning methods: sorting, grading, peeling and blanching **Contact hours: 9L**

#### **Module 4:**

Fruits and Vegetables Preservation Methods: drying and dehydration of fruits and vegetables, freezing of fruits and vegetables, thermal processing of fruits and vegetables; types of containers and spoilage of canned foods; effects of processing on the quality of fruits and vegetable products. **Contact hours: 10L**

#### **Module 5:**

Preservation by sugar and salt: ingredients and processes for manufacture of jam, jellies, marmalade, pickles and chutneys. Tomato ketchup, sauce, puree and paste. Preparation of Fruits beverages etc. FPO and FPO standards for specific fruits and vegetable products, Utilization of by-products of fruits and vegetable processing industry. **Contact hours: 10L**

#### **Books / References:**

1. Food Science - N.N. Potter, CBS Publisher and Distributor, New Delhi
2. Technology of Food Preservation - Desrosier and Desrosier, CBS Publisher and Distributor, New Delhi

3. Agricultural Process Engineering - Singh and Sahay, Vikash Publishing House, New Delhi.
4. Fruits and vegetable preservation - Girdhari Lal and Sidappa.

**Paper code: DFET371**

**Paper name: INTRODUCTION TO FOOD PROCESSING AND PRESERVATION TECHNOLOGY LAB**

**Total contact hours: 30**

**Credit: 03**

**L-T-P: 0-0-3**

**List of Experiments**

- |  |                  |
|--|------------------|
| 1. Determination of moisture content in food (fruits/vegetables) by hot air oven | Contact hours: 3 |
| 2. Determination of water activity of a given sample.                            | Contact hours: 3 |
| 3. Estimation of total carbohydrate content of a given sample.                   | Contact hours: 3 |
| 4. Estimation of crude fat content of a given sample.                            | Contact hours: 3 |
| 5. Estimation of protein content of a given sample.                              | Contact hours: 3 |
| 6. Estimation of crude fibre content of a given sample.                          | Contact hours: 3 |
| 7. Study the effect of blanching on dried fruits/vegetables.                     | Contact hours: 3 |
| 8. Study the effect of Class-I preservative (sugar/salt) on fruits/vegetables.   | Contact hours: 3 |
| 9. Preparation of potato chips and its quality analysis.                         | Contact hours: 3 |
| 10. Preparation of jam and its quality analysis.                                 | Contact hours: 3 |

**Paper code: DFET372**

**Paper name: ELEMENTS OF FOOD ENGINEERING-I LAB**

**Total contact hours: 16**

**Credit: 02**

**L-T-P: 0-0-2**

**List of Experiments**

- |   |                  |
|---|------------------|
| 1. To study the heat transfer in shell and tube heat exchanger.                   | Contact hours: 2 |
| 2. To study the heat transfer in plate type heat exchanger.                       | Contact hours: 2 |
| 3. Study of centrifugal pump characteristics.                                     | Contact hours: 2 |
| 4. Preparation of freeze-dried fruit products.                                    | Contact hours: 3 |
| 5. To study the drying characteristics of a solid material by using a tray dryer. | Contact hours: 3 |
| 6. To determine the Reynold's no. by Reynold's apparatus.                         | Contact hours: 2 |
| 7. To verify Bernoulli's Equation experimentally.                                 | Contact hours: 2 |

**Paper code: DFET373**  
**Paper name: FOOD PRODUCT TECHNOLOGY-I LAB**  
**Total contact hours: 27**

**Credit: 03**  
**L-T-P: 0-0-3**

### **List of Experiments**

1. Production of rice from paddy by rice Sheller and calculate the percentage of yield. Contact hours: 3
2. Polishing of rice by rice husker and calculate the percentage of yield. Contact hours:3
3. Preparation of jelly. Contact hours:3
4. Preparation of jam. Contact hours: 3
5. Preparation of marmalade. Contact hours: 3
6. Preparation of tomato ketchup. Contact hours: 3
7. Preparation of tomato puree. Contact hours: 3
8. Preparation of mixed pickle. Contact hours: 3
9. Preparation of chilli sauce. Contact hours: 3

## **Semester IV**



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Website: www.cit.ac.in

**Department of Food Engineering & Technology**

**Detail Syllabus (Diploma)**

**Semester-IV**

**Paper: ELEMENTS OF FOOD ENGINEERING – II**

**Code: DFET401**

**Total Contact Hours:40**

**Credit:6**

**L – T – P:3-0-0**

**Unit I** Physical Properties of fluids, classification of fluid flow, continuity equations, Bernoulli's equation & its application, Steady State flow equation, Concept of viscosity, Newtonian & non-Newtonian fluids. Poiseuille's equation. **Contact Hours:10**

**Unit II** Navier Stoke's equation, flow through parallel plates & circular pipes, Concept of Reynold's number & its application, Concept of fluid transportation, fluid transportation devices & accessories. Pipe & pipe flow, fitting, Pumps, types of pumps & their application and selection. Valves & joints. **Contact Hours:10**

**Unit III:** Fick's Law of diffusion & basic concepts of convective mass transfer, Simultaneous heat & mass transfer, Introduction to mass transfer operations in food processing. **Contact Hours:10**

**Unit IV:** Psychometrics: properties of air water vapour mixture; psychometric properties, charts & relations, & psychometric calculations. Principles of humidity control for food processing operations. Water relations of foods. **Contact Hours:10**

**References:**

1. Unit operations in Food Processing - Earle, R. L. Pergamon press, NY.
2. Food Engineering Operations - Brennan, J. G. et. Al. Elsevier Applied Science, Amsterdam.
3. Food Process Engineering - Held man, R. R. & R. P. Singh, CBS Publication.
4. Fundamental of Food Engineering - Toledo, R. T., CBS Publication.



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Website: [www.cit.ac.in](http://www.cit.ac.in)

**Paper: BASICS OF FOOD CHEMISTRY**

**Code: DFET402**

**Total Contact Hours:40**

**Credit:6**

**L – T – P:3-0-0**

**Unit I:** Introduction, role of food chemistry and chemist in food industries. Importance of different food constituent. Water: structure, properties, types of liquid water and ice, mineral water. Water activity and storage stability of food. **Contact Hours:10**

**Unit II:** Carbohydrate: nomenclature and classification, structure, physical and chemical properties of mono & Polysaccharides (cellulose, starch, fructose, galactans, hemi cellulose, pectic substances) and their functions. Proteins: Classification and properties of amino acids, chemical properties of proteins, structure of amino acids, essential and non-essential amino acid, isolation of amino acids. **Contact Hours:10**

**Unit III:** Lipids: structure, physical and chemical properties, acidity, reversion, introduction to hydrogenation and its importance. Vitamins: types (water and fat soluble), chemistry and functions, source and deficiency disease. Minerals in foods: calcium, phosphorus, iron, copper, lead, tin, zinc and arsenic. **Contact Hours:10**

**Unit IV:** Food Enzymes: classifications, nomenclature, activation energy, factors effecting enzymes actions. Food additives: Properties and function. Plant pigments: structure and properties of chlorophyll, anthocyanins and aryttenoids, chemical changes during processing. Emulsions and emulsifiers, mechanism of emulsification. **Contact Hours:10**

## References:

1. Food Chemistry - L.H. Meyer, CBS, New Delhi.
2. Food Chemistry - Fennama, CRC.
3. Principles of Biochemistry - Lehninger, CBS, New Delhi.



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Website: [www.cit.ac.in](http://www.cit.ac.in)

**Paper: INSTRUMENTATION AND PROCESS CONTROL**

**Code: DIE405**

**Total Contact Hours:40**

**Credit:6**

**L – T – P:3-0-0**

**Unit I:** Fundamental & Importance of Instrumentation, types of instruments, selection of instruments, performance of instruments, error in measurement, calibration & standard, Calibration of Instruments: Methods & analysis, Introduction to Transducer & types, Process Instrumentation, recording instruments, indicating & recording Instruments. **Contact Hours:10**

**Unit II:** Measurements of temperature, pressure, relative humidity, moisture content & velocity & flow. **Contact Hours:10**

**Unit III:** Miscellaneous measurement: force & torque, level, pH, gas analyzer, emissivity, refractive index, viscosity, surface tension, & color. Spectro-photo-metry, chromatography & NIR Introduction to biosensors. **Contact Hours:10**

**Unit IV:** Basic concept of process controls, types of control & their application. Concept of automatic control & its classification, Instrumentation & control of typical food processing units like reactor, evaporator, dryer etc. **Contact Hours:10**

**References:**

1. Experimental Methods - J. P. Holman McGraw Hill International, Auckland.
2. Engineering Metrology - R K Jain, Khanna Publishers, Delhi.
3. Mechanical Measurements - Thomos G. Beckwith & Lewis Back N. Adison Wesely Longman, Harlow.
4. Industrial Instrumentation - John Wiley Eastem Ltd, New Delhi.



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Website: [www.cit.ac.in](http://www.cit.ac.in)

**Paper: STRENGTH OF MATERIALS**

**Code: DME405**

**Total Contact Hours:45**

**Credit:6**

**L – T – P:3-0-0**

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**Unit I:** Concept of stress and strain, normal and shearing stresses and strains, stress-strain relationship, generalized Hooke's Law, plane stress and plane strain, Poisson's ratio, stress-strain diagrams for uni-axial loading. **Contact Hours:9**

**Unit II:** Deformation of axially loaded members and statically indeterminate problems, torsion of circular shafts; Stress and deflections in closed coiled helical springs subjected to axial forces, members subjected to flexural loads. **Contact Hours:9**

**Unit III:** Reactions for statically determinate beams, relationship between load, shearing force and bending moment, shear force and bending moment diagrams. **Contact Hours:9**

**Unit IV:** Theory of simple bending stresses in beams, shearing stresses in beams, members subjected to combined loads, principal stresses and principal planes, principal strains. Mohr's circle of stresses and strain, principal stresses in 3D, relation between elastic constants. **Contact Hours:9**

**Unit V:** Principal stresses for strain measurements, combined torsion and bending, pressure vessels, biaxial stresses, yield theories, deflection of beams, direct integration method, moment area method. **Contact Hours:9**

**References:**

1. Mechanics of Materials - J.M. Gera and S.P. Timoshenko, CBS Publishers & Distributors, New Delhi.
2. Strength of Materials & Mechanics of Structures, Vol. I&II: B.C. Punmia, Standard Publishers & Distributors, New Delhi.
3. Mechanics of Structures, Vol. I&II: S.B. Junnarkar, Charotar Publishing House, Anand.
4. Strength of Materials - F.L. Singer & A Pytel, Harper & Row Publisher, NY.



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Website: [www.cit.ac.in](http://www.cit.ac.in)

**Paper Code: DFET410**

**Paper Name: PROFESSIONAL PRACTICE-II**

**Total Contact Hours: 15**

**Credit:02**

**L-T-P:1-0-0**

## Activity

### 1.Group Discussion:

The students should discuss in group of six to eight students and write a brief report on the same as part of term work. The topic for group discussions may be selected by the faculty members. Some of the suggested topics are -

1. Polythene bags must be banned!
2. E – Books or Printed books – what's your choice?
3. Is Face book for the attention – seeking and lazy people?
4. Globalization and its impact on Indian Culture.
5. Global warming is caused more by developed countries
6. Rain forests help in maintaining the earth's ecosystem
7. Reservation for women would help the society
8. Water resources should be nationalized
9. Daughters are more caring than sons
10. NGOs - Do they serve people's interests?
11. India's growth rate is bridging gap between rich and poor.
12. Nuclear power is a safe source of energy
13. Electronic media vs. print media
14. Corruption is the price we pay for democracy
15. Advertising is a waste of resources.
16. Privatization will lead to less corruption.
17. China market - a threat to Indian market
18. Technology Creates Income Disparities
19. Smaller businesses and start-ups have more scope
20. Media is a mixed blessing/How ethical is media?
21. Computer viruses are good
22. India should practice "Swadeshi"
23. China - A threat to India?
24. Indian villages - our strength or our weakness?
25. Mobile phones - requirement of the day.
26. Cursing the weather is bad farming
27. Education is a progressive way of discovering your ignorance.
28. The medium of teaching in schools should be English
29. A room without books is like a body without soul.
30. E-Learning is good for the education system and society

### 2.Literature Survey

Student will be provided an emerging engineering topic for literature survey from Internet and other media. Based on inputs on the topics students will prepare a report and submit the sample for evaluation after due presentation before the faculty.



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**3. Lectures by Professional / Industrial Expert to be organized on any of the following suggested areas or any other suitable topics:**

- (i) Pollution control.
- (ii) Fire hazards due to short circuits
- (iii) Fire Fighting / Safety Precautions and First aids.
- (iv) Traffic Control System
- (v) Career opportunities as a Food Technologist
- (vi) Communication in Industry

## **4. Individual assignments**

1. Collecting Failure data for food processing equipments
2. For a given job write a sequence of operations performed by automated manufacturing system. Draw a block diagram of control system to perform above operations
3. Survey of types of different analytical instruments used in food industries
4. Prepare a trouble shooting chart for a cold storage system and suggest remedial measures to avoid failures
5. Wheat milling operation in a local wheat mill
6. Bread and biscuit manufacturing in a local bakery



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**Paper code: DFET471**

**Paper Name: ELEMENTS OF FOOD ENGINEERING-II LAB**

**Total contact hours: 24 Hours**

**List of Experiments:**

1. To study the use of Venturimeter as flow meter.
2. To study the types of flow.
3. To measure the velocity of flow at different points in a pipe.
4. To study the losses due to friction in pipe.
5. To study the flow of liquid through orifice and the mouth piece.
6. To verify the Bernoulli's equation experimentally.
7. To measure the discharge through Nozzle meter
8. Study of centrifugal pump characteristics.

**Credit: 03**

**L-T-P: 0-0-3**

**Paper Code: DFET472**

**Paper Name: BASICS OF FOOD CHEMISTRY LAB**

**Total contact hours: 30 Hours**

**List of Experiments:**

1. Determination of moisture in food sample.
2. Determination of protein in food sample.
3. Determination of ash in food sample.
4. Determination of crude fat in food sample.
5. Determination of titratable acidity of food and beverages.
6. Determination of pH in food and beverages.
7. Determination of total sugar of food samples.
8. Determination of non-reducing and reducing sugars of confectionary items.
9. Determination of vitamin C in food sample.
10. Determination of Crude fibre in food sample.

**Credit: 03**

**L-T-P: 0-0-3**



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Website: [www.cit.ac.in](http://www.cit.ac.in)

**Paper Code: DIE475**

**Credit: 03**

**Paper Name: INSTRUMENTATION AND PROCESS CONTROL LAB**

**L-T-P: 0-0-3**

**Total contact hours: 27 Hours**

**List of Experiments:**

1. Thermocouple Characteristics.

To Study and Plot the temperature versus Emf curves/characteristics for thermocouple. And determine Sensitivity of the Thermocouple.

2. Resistance-Temperature Characteristics of Thermistor.

To Study and plot the Temperature versus Resistance Characteristics of thermistors. And determine Sensitivity of the Thermistor.

3. RTD Characteristics.

To study and plot the temperature versus resistance characteristics of RTD. And determine the sensitivity of the RTD.

4. Displacement Measurement using Inductive Transducer (LVDT).

And

i) Plot Input-Output Characteristics of LVDT.

ii) Find out linearity range of LVDT.

iii) Finally observe  $180^\circ$  phase shift between two voltages of secondary windings.

5. Displacement Measurement using Inductive Transducer (LVDT).

And

i) Plot Input-Output Characteristics of LVDT.

ii) Find out Sensitivity of LVDT.

iii) Finally observe  $180^\circ$  phase shift between two voltages of secondary windings.

6. p-H Measurement of the given Solution using p-H Meter.

To calibrate the p-H Meter using the given standard buffer solution. And to measure the p-H of the given sample solution using the calibrated p-H Meter.

7. Strain Measurement using Strain gauge.

Study of Strain measurement using strain gauges and cantilever assembly. And determine (i) Linear Range of Operation and (ii) Sensitivity of Trainer.

8. To Study and plot the terminal characteristics of Light Dependent Resistor (Photoresistor). Also determine its i) Sensitivity and ii) Dark Resistance and Light Resistance of LDR.

9. To Convert change in resistance in thermistor due to change in temperature into change in voltage using voltage sensitive wheatstone bridge.

And

(i) Plot temperature versus output voltage.

(ii) Determine sensitivity of the bridge.



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**Paper Code: DFET474**

**Paper Name: PROFESSIONAL PRACTICE-II**

**Total Contact Hours: 15**

**Credit:02**

**L-T-P:0-0-2**

**Activity**

**1.Industrial Visits:**

Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work.

- i) Visit in small scale food processing industry
- ii) Visit in large scale food processing industry

**2.Presentation preparation and demonstration on socio economic and technical aspects.**

Students in batch of maximum 5 numbers are expected to prepare a powerpoint presentation on a topic with minimum of 20 slides.

The topics can be from the following:

- a. Rural vs urban divide
- b. Make in India
- c. Gender equality
- d. Satellite launching programs of India
- e. Global Stake in Economics of India
- f. Super power in making: India
- g. Bottom of the pyramid
- h. Social Responsibility of Individual
- i. Swachh Bharat Abhiyan
- j. Digital India