

## Diploma In Civil Engineering Course Structure details (1<sup>st</sup> to 6<sup>th</sup> Semester) (July 2020 onwards)

Course No.	CourseName	L	T	P	C	Course No.	CourseName	L	T	P	C
<b>SemesterI</b>						<b>SemesterII</b>					
DHSS101	CommunicationinEnglish	3	0	0	6	DHSS271	CommunicationinEnglishLab	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 & ProgrammingLab	0	0	2	2
DMA103	Mathematics-I	3	0	0	6	DEE203	Fundamentals of Electrical & Electronics Engineering	2	1	0	6
DME104	EngineeringDrawing	2	0	0	4	DEE273	Fundamentals of Electrical & Electronics EngineeringLab	0	0	2	2
DME174	EngineeringDrawingLab	0	0	2	2	DMA204	Mathematics-II	3	1	0	8
DME176	WorkshopPractice	0	1	4	6	DME205	EngineeringMechanics	3	0	0	6
DPH105	AppliedPhysics-I (THEORY)	2	1	0	6	DPH206	AppliedPhysics-II(THEORY)	2	1	0	6
DPH175	AppliedPhysics-I(PRACTICAL)	0	0	2	2	DPH276	AppliedPhysics-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>SemesterIII</b>						<b>SemesterIV</b>					
DHSS302	Engineering Economics andAccountancy	3	1	0	8	DCE401	StructuralAnalysis	3	1	0	8
DCE301	ConstructionMaterials	3	1	0	8	DCE402	WaterSupply&SanitaryInstallation	3	0	0	6
DCE302	Surveying-I	3	0	0	6	DCE403	FluidMechanics	3	0	0	6
DCE372	Surveying-I Lab	0	0	2	2	DCE473	FluidMechanicsLab	0	0	2	2
DCE303	StrengthofMaterials	3	1	0	8	DCE404	Surveying-II	3	0	0	6
DCE304	EnvironmentalEngineering	3	0	0	6	DCE474	Surveying-II Lab	0	0	2	2
DCE374	EnvironmentalEngineeringLab	0	0	2	2	DCE405	Building Construction	3	0	0	6
						DCE475	Computer Aided Building Drawing	0	0	2	2
<b>Contact Hours:22</b>		<b>15</b>	<b>3</b>	<b>4</b>	<b>40</b>	<b>Total Contact Hours22</b>		<b>15</b>	<b>1</b>	<b>6</b>	<b>38</b>
<b>SemesterV</b>						<b>SemesterVI</b>					
DCE501	ConstructionTechnology	3	0	0	6	DCE601	Estimationandcosting	3	0	0	6
DCE502	ConcreteTechnology	3	0	0	6	DCE602	Designofsteelstructures	3	1	0	8
DCE572	ConcreteTechnologyLab	0	0	2	2	DCE603	ConstructionandprojectManagement	2	1	0	6
DCE503	GeotechnicalEngineering	3	0	0	6	DCE679	Project	0	0	10	10
DCE573	GeotechnicalEngineeringLab	0	0	2	2	DCE61*	Elective	3	1	0	8
DCE504	DesignofRCCStructures	3	1	0	8	DCE 605 (DCE 671)	Professional Practices-II	0	0	2	2
DCE505	TransportationEngineering	3	0	0	6	ElectivessubjectList					
DCE575	TransportationEngineeringLab	0	0	2	2	DCE611	ConstructionMethodsandMachinery				
DCE576	Professional Practices-I	0	0	2	2	DCE 612	WaterResourceEngineering				
						DCE 613	Computational Methods in CivilEngineering				
<b>Total Contact Hours24</b>		<b>15</b>	<b>1</b>	<b>8</b>	<b>40</b>	<b>Total Contact Hours26</b>		<b>11</b>	<b>3</b>	<b>12</b>	<b>40</b>
<b>TotalMandatoryCredits: 236</b>											

## Diploma Sixth Semester Syllabus

### Department of Civil Engineering

**Paper Code: DCE601 L – T – P : CR**

**Paper Name: Estimation and Costing**

**3- 0 – 0 : 06**

**Total contact hour: 36**

**Contact Hour**

Unit I	Procedure of estimating: Introduction, Measurements/works/payments. Types of estimates.	05
Unit II	Methods of building estimates: Long wall-short wall method, Centre line method. Estimate of single roomed/multi roomed buildings, estimate of masonry platform, and estimate of water tank.	09
Unit III	Estimate of earthwork: Methods of estimates for earthwork. Estimate of roadwork/irrigation work.	07
Unit IV	Analysis of rate: Overhead cost, Labour required for different works. Rate analysis of different items of works.	07
Unit V	Valuation: Incomes, Outgoings, Scrap value, Salvage value, Obsolescence, Year's purchase, sinking fund, Depreciation, Methods of valuation.	08

#### ***Text/ReferenceBooks:***

1. *Estimation and costing in civil engineering, B.N. Dutta, UBS Publishers'.*
2. *Estimation, Costing, Specification and valuation, M Chakraborty, Calcutta.*
3. *A textbook of estimation and costing (civil), D.D.Kohli& R.C. Kohli, S. Chand*

**Paper Code: DCE602L – T – P : CR**

**Paper Name: DesignofSteelStructures**

**3 - 1 – 0 : 08**

**Total Contact hour: 48**

**Contact Hour**

Unit I: Introduction	Types of Structural Steel, Mechanical Properties of Steel,Cold Work and Strain Hardening, Advantages of Steel asa Structural Materials, Types of Steel Structures, CodesandSpecifications: IS 800:2007. Factor of Safety, Permissible and Working Stresses, Elastic Method, Plastic Method, Introduction to Limit States method ofDesign.	09
Unit II: Connections	Type of Connections, Riveted, Bolted and Welded Connections, Strength, Efficiency and Design of Joints, Modes ofFailure of a Riveted Joint, Advantages	09

	and Disadvantages of Welded Joints, Design of Fillet and Butt Welds, Design of Eccentric Connections.	
Unit III: Tension Members	Net Sectional Area, Permissible Stress, Design of Axially Loaded Tension Member, Design of Member Subjected to Axial Tension and Bending.	10
Unit IV: Compression Members	Modes of Failure of a Column, Buckling Failure: Euler's Theory, Effective Length, Slenderness Ratio, Design Formula: I.S. Code Formula, Design of Compression Members, Design of Built-Up Compression Members: Laced and Battened Columns.	10
Unit V: Beams	Design Procedure, Built-Up Sections, Plate Thickness, Web Crippling, Web Buckling, Connections and Curtailment of Flange Plates.	10

***Text/Reference Books:***

1. *N. Subramanian, Design of Steel Structures, Oxford University Press, 2008.*
2. *S. K. Duggal, Limit State Design of Steel Structures, McGraw-Hill, 2014.*
3. *S. S. Bhavikatti, Design of Steel Structures by Limit State Method, I.K. International Publishing House, 2014.*
4. *Design of Steel Structures, L.S. Negi, Tata McGraw Hill, New Delhi, 1996.*
5. *Steel Structures, A S Arya and J L Azmani, Nem Chand & Brothers, Roorkee, India*
6. *Design of Steel Structures, P Dayaratnam, Wheeler Publishing, Allahabad*
7. *Design of Steel Structures Vol. I, Ram Chandra, Standard Book House, Delhi*
8. *Design of Steel Structures, Kazmi and Jindal, Prentice Hall of India, New Delhi*

**Paper code: DCE 603**

**Paper Name: Construction and Project Management**

**Total contact hour: 36**

**L – T – P : CR**

**2 - 1 - 0 : 06**

**Contact Hour**

Unit I	Scientific management, Need of management, function and application of management, organization, site and construction management.	06
Unit II	Control and monitoring of progress, Cost control, Inspection and quality control: quality control daily report, Equipment checks, Activity schedule, Safety manual.	06
Unit III	Construction contracts: Definition, types, suitability, advantages and disadvantages, contract document, conditions of contract, specifications, arbitration.	06
Unit IV	The Elements of Project Management: Network analysis, PERT and CPM, Critical path activities, Project network, Normal distribution, Times: Optimistic, Most likely, Pessimistic,	10

Unit V	Crashing, resource allocation, Engineering economy. Labour welfare and labour law. Departmental procedure and accounts, PWD accounts. Stores and material management: Store accounts, Materials issue and receipt, Inventory Management and Quality Control.	08
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**Text/Reference Books:**

1. *Construction Management and Accounts*, Harpal Singh, Tata McGraw Hill, New Delhi.
2. *Construction Management Practices*, V K Raina, Tata McGraw Hill, New Delhi.
3. *Management in Construction Industry*, P. P. Dharwadker, Oxford & IBH, New Delhi
4. *Construction Planning & Management*, P.S. Gahlot & B.M Dhir, New Age International, New Delhi.

<b>Paper Code: DCE 611</b>	<b>L – T – P : CR</b>
<b>Paper Name: Construction Methods and Machinery</b>	<b>3 - 1 - 0 : 08</b>
<b>Total contact hours: 48</b>	<b>Contact Hour</b>
Unit I	Various stages involved in construction project, schedules in construction project, construction economy and job layout of a construction project. 10
Unit II	Quality control of concrete, supervision of concreting in hot and cold climate, precautions to be taken in construction of high rise buildings 11
Unit III	Erection of steel structures. Use of compressed air in construction. 9
Unit IV	Standard and special equipments, Selection, operation and maintenance of equipments. 9
Unit V	Construction accidents; types and causes, effective preventive measures. 9

**Text/Reference Books:**

1. *Construction Equipment, Job Planning*, S.V. Deodhar, Khanna Publishers, New Delhi, 1988.
2. *Construction of Structures & Management of Works*, S.C.Rangawala, Charotar Publishing House, Anand, India, 1985.
3. *Construction Planning Equipments and Methods*, R.L. Peurifoy, W B Ledbetter and C J Schexnayder, McGraw Hill, NY, 1996.

<b>Paper Code: DCE 612L – T – P : CR</b>	<b>L – T – P : CR</b>
<b>Paper Name: Water Resource Engineering3 - 1 – 0 : 08</b>	<b>3 - 1 - 0 : 08</b>
<b>Total Contact hours:48</b>	<b>Contact hour</b>
Unit I	Hydrological cycle - precipitation, measurement of precipitation, preparation and presentation of data, mass curve, hydrograph, point rainfall, depth-area-duration relationships, maximum precipitation. Evapotranspiration and Infiltration. 12
Unit II	Stream flow measurement, measurement of stage and velocity, Rainfall - runoff characteristics, rainfall runoff correlation, flow 12

	duration curve, flow mass curve.	
Unit III	Hydrographs - definition, influencing factors and components of a hydrograph, base flow separation, effective rainfall, unit hydrograph, use and limitations.	12
Unit IV	Groundwater - forms of surface water, aquifer, aquitard, aquiclude, aquifuse; Aquifer properties, specific yield and specific retention, Darcy's law, hydraulic conductivity, transmissibility - steady flow in a well.	12

***Text/Reference Books:***

1. *Engineering Hydrology*, Subramanya, K., Tata McGraw Hill, New Delhi, 1994.
2. *Hydrology, Principles, Analysis and Design*, Raghunath, H.M., New Age International, New Delhi, 1985.
3. *Applied Hydrology*, Chow, VT, D R Maidment and L W Mays, McGraw Hill Book Company, New York, 1988.
4. *Elementary Hydrology*, Singh, V.P., Prentice-Hall India, New Delhi, 1994.
5. *A Text Book of Hydrology*, Rani Reddy, P.J., Laxmi Publications, New Delhi, 1999.

**Paper Code: DCE 613**

**L – T – P : CR**

**Paper Name: Computational Methods in Civil Engineering**

**3 - 1 - 0 : 08**

**Total Contact hours: 48**

**Contact hour**

Unit I	Computing, computer programming, basic matrix algebra, Data type, Arrays, input/output, Branching, loops, plotting and graphics.	8
Unit II	Examples from RCC structures (Design charts for singly and doubly reinforced beams, design of slabs).	8
Unit III	Examples from Geotechnical Engineering. (Design of footings, settlement analysis, flow nets)	8
Unit IV	Examples from Fluid Mechanics (Critical depth calculations in trapezoidal, circular and rectangular channels, pipe network analysis)	8
Unit V	Examples from Environmental Engineering (Application to treatment systems and their modelling).	8
Unit VI	Examples from Highway Engineering (Design of super elevation, transition curves etc.)	8

***Text/Reference Book:***

1. *Application of Computational Techniques in Civil Engineering*, Kamal Bd. Thapa, Heritage Publishers & Distributors Pvt. Ltd.



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**DEPARTMENT OF FOOD ENGINEERING & TECHNOLOGY**

**6<sup>th</sup> SEMESTER**

FOOD PROCESSING TECHNOLOGY						
A. THEORY						
S. No.	Code	Subject	L	T	P	Credits
1	DHSS601	INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP	3	0	0	6
2	DFET601	FOOD ENGINEERING OPERATION-II	3	0	0	6
3	DFET61_	ELECTIVES	3	0	0	6
4	DFET691	PROJECT	0	0	4	4
5	DFET610	PROFESSIONAL PRACTICE-IV	1	0	0	2
B. PRACTICAL						
6	DFET671	FOOD ENGINEERING OPERATION-II LAB	0	0	2	2
7	DFET672	PROFESSIONAL PRACTICE-IV	0	0	2	2

**List of Electives**

1. DFET611: DAIRY TECHNOLOGY AND ENGINEERING
2. DFET612: TEA, COFFEE AND COCOA PROCESSING
3. DFET613: FERMENTED AND NON-FERMENTED BEVERAGES
4. DFET614: BAKERY & CONFECTIONARY TECHNOLOGY
5. DFET615: CEREALS, PULSES AND OILSEEDS PROCESSING



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**Paper Name: INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP Credit: 06**

**Paper Code: DHSS601**

**L – T – P: 3 – 0 – 0**

**UNIT - I** Meaning and concept of Management, Principles and functions of Management, Labour turnover, Payment of wages – factors determining the wage, Methods of payment of wages.

**UNIT - II:** Leadership and Decision Making, qualities and styles of Leadership, decision making process.

**UNIT - III:** Elements of costs, Analysis and classification of expenditure for cost accounts, preparation of cost sheet, Marginal costing and Break-Even Analysis.

**UNIT - IV:** Factories Act -1948, Definitions, Main Provisions regarding Health, Safety and welfare of workers.

**UNIT - V:** Industrial Dispute Act – 1947, Definitions, Preventive measure, Machinery for settlement of Industrial Dispute in India.

**UNIT - VI:** Trade Union Act - Meaning and function of Trade Union.

**ENTREPRENEURSHIP**

**UNIT - VII:** Meaning and function of Entrepreneurship

**UNIT - VIII:** Forms of Business organization: Sole Trader, Main features, merits and demerits, Partnership – main features, merits and demerits. Joint stock company – main features, difference between private and public limited companies. Introduction to co-operative and public undertaking.

**UNIT - IX:** Small scale industries: Definitions, scope with reference to self-employment, procedure to start small scale industries, Sources of finance - Bank, Government and Financial institutions etc. Selection of site for factories, Industrial Estate, Growth Centre, Ancillary Industries.

**UNIT - X** System of Distribution – Wholesale and Retail Trade.

**References:**

1. General Principle and Practice of Management – L M Prasad
2. Management Concepts and Practice – Kanchan Bhatia and Shweta Mittal
3. Micro Economics – Sandeep Garg
4. Self-Employment through Entrepreneurship – J.C. Kalita
5. Entrepreneurship Development & Small Business Management – Dr. Bhawna Bhatnagar and Ankur Budhiraja.
6. Labour and Industrial Law of India – S.K. Mishra
7. Industrial Safety and Health for Administrative Services---Charles D. Reese
8. Entrepreneurship –D D Mali and J.C. Kalita.
9. Entrepreneurship Development and Management- Dr. R.K. Singhal.

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**Paper Name: FOOD ENGINEERING OPERATIONS – II**

**Credit: 06**

**Paper Code: DFET601**

**L – T – P: 3 – 0 – 0**

- UNIT – I** Preparatory heat processing operations: Food conversion by heat processing, blanching, baking, frying & cooking. Thermal processing of foods: Concept of heat processing; processes & Equipments for pasteurization, appetizing, aseptic processing etc.
- UNIT – II** Food concentration: Evaporation, equipment, their selection & calculation. Freeze concentration. Drying & dehydration methods, different kinds of dryers, their selection & design
- UNIT – III** Heating by Irradiation & Microwave radiation, Extrusion cooking.
- UNIT – IV** Other food operations: crystallization, extraction, distillation, absorption, humidification & dehumidification etc.

**References:**

1. **Unit operation in processing-** Earle, R. L., Pergamon press, NY, 3rd Ed. 1990.
2. Food Engineering Operations- Brennan, J. G. et. Al. Elsevier Applied Science, Amsterdam.
3. Food Process Engineering- Heldman, R. R. & R. P. Singh, CBS publication, 2003.
4. Fundamentals of Food Engineering- Toledo, R. T., CBS Publication, 1999.
5. Unit Operations in Chemical Engineering- McCabe, Smith & Harroit, 5<sup>th</sup> Ed. 1993.
6. Transport processes & Unit Operations- C.J.G. Geankopolis, Prentice Hall of India, New Delhi, 3<sup>rd</sup> Ed. 1999.

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**Paper Name: DAIRY TECHNOLOGY AND ENGINEERING**

**Credit: 06**

**Paper Code: DFET611**

**L – T – P: 3 – 0 – 0**

- Unit I** Introduction: Status and scope of dairy industry in India, definition of milk, composition of milk, factors effecting composition of milk, energy value of milk, Handling, transportation and reception of milk, grading of milk. Physico-Chemical properties of milk Density, boiling and freezing point of milk, refractive index, Acidity and pH, viscosity, surface tension, thermal conductivity.
- Unit II** Fluid milk processing: Filtration and clarification, cream separation: by gravity, centrifugal and construction of separator, homogenization: mode of operation, effects of homogenization, pasteurization: LTLT, HTST Pasteurizers and sterilization.
- Unit III** Milk Products: Coagulated milk products: Chhanna, paneer, Classification and manufacturing process of cheese, cheese spread. Manufacture of butter and ghee. Condensed and evaporated milk: Dry milk products Methods of drying milk (Drum-Spray drying), instant non-fat dry milk. Frozen products: Kulfi, softy, ice cream.
- Unit IV** Plant layout, Cleaning and sanitizing of dairy equipment and plant.

## Reference Books:

1. Outline of Dairy Technology- S. Ray: Oxford University Press Oxford, 1997.
2. Milk and Milk Products- Eckles, Comb and Macy, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1998.
3. Indian Dairy Products- K.S. Rangana and KT Acharya, Asia Publishing House, New Delhi, 1974.
4. Dairy Plant Engineering and Management- Ahmed, T., Kitab Mahal, 1997.

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**Paper Name: TEA, COFFEE AND COCOA PROCESSING**

**Credit: 06**

**Paper Code: DFET612**

**L – T – P: 3 – 0 – 0**

- Unit I** Introduction: Status and scope of tea, coffee and coco. Classification, composition and nutritive value of tea, coffee and coco, factor influencing composition and quality of tea, coffee and coco.
- Unit II** Principles of tea, coffee and coco processing. Reception and preparation: Equipment, cleaning methods, sorting grading and material handling.
- Unit III** Processing and production of finished tea, coffee and coco products. Different processes and machineries.
- Unit IV** Storage and packaging of tea, coffee and coco. Cleaning and hygiene of processing plants. By product utilization.

**References:**

1. Science and Practice in Tea Culture- D.N. Baruah, Tea Research Association, 1<sup>st</sup> Ed, 1987.
2. Tea in India- Bala Subramaniam, Wiley Eastern Ltd., New Delhi.
3. Tea Culture Processing & Marketing- M.J. Mulky & V. S. Sharma, 1993.
4. Tea Production & Processing- Barundeb Banerjee, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, 1996.

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**Paper Name: FERMENTED AND NON-FERMENTED BEVERAGES** **Credit: 06**

**Paper Code: DFET613** **L – T – P: 3 – 0 – 0**

**Unit I:** Introduction: Definition of beverage, study of ingredients like sweeteners, emulsifier, colouring agent, flavouring agent, stabilizer, acidulants etc. Scope and status of beverages in North East region, India and Global market.

**Unit II:** Non-alcoholic beverages: Raw materials, equipments and machinery, production technology for non-alcoholic beverages and carbonated beverages, water treatment, syrup preparation, containers and closures, carbonation, packaging and quality control.

**Unit III:** Non-carbonated beverages: Raw materials, equipments and machinery, production technology for instant tea and coffee, fruit juice based beverages, milk and whey based beverages.

**Unit IV:** Alcoholic beverages: Raw materials quality and handling, production technology for wine, beer, whiskey, brandy, rum etc.

**Unit V:** Sanitation in beverage industry; waste utilization of beverage industries.

**Recommended Books:**

1. Sivasankar, B. Food processing and preservation, PHI learning private limited, 2014.
2. Brewing Yeast and Fermentation- David Quain & Chris Boulton, 2006.
3. Principles of Brewing Sciences- George J., Brewers Publications, 2000.
4. Principles of Fermentation Technology- Whitaker et. al. Butterworth-Heinemann, 1999.

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**Paper Name: BAKERY & CONFECTIONARY TECHNOLOGY**

**CREDIT: 06**

**Course Code: DFET614**

**L – T – P: 3 – 0 – 0**

**Unit I:** Introduction: Status and scope of Bakery and confectionary industries in North East region and in India. Ingredients for Bakery and confectionary industry and their role in baking and techniques. Quality, handling and storage of raw materials.

**Unit II:** Unit operations: Different unit operations involved in bakery and confectionary industry. Machinery and their mechanism.

**Unit III:** Products: Manufacturing of different bakery products. Packaging of bakery and confectionary products. Packaging materials and machineries. Quality parameters of finished bakery and confectionary products.

**Unit IV:** Confectionary Technology Definition of Confectionary, Icing Technology, wafer manufacture, Fondant and Fudge Manufacture of chocolate, production of chocolate mass, chocolate candy, chocolate based confectionary product, Milk based confectionary products, Different Sugar boiled stage, Sugar confectionaries, Sweet candy. Government licensing policy. PFA specification of these raw materials.

**Reference Books:**

1. Bakery Engineering and Technology Vol. I & II. Matz, CBS, New Delhi. 2003.
2. Cereal Technology- Kent, CBS, 1994.
3. Wheat Chemistry & Technology- Pomeranz, AMERICAN ASSN OF CEREAL CHEMIST, 1988.



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**Paper Name: CEREALS, PULSES AND OILSEEDS PROCESSING**

**CREDIT: 06**

**Course code: DFET615**

**L – T – P: 3 – 0 – 0**

- Unit I** Introduction: Status, production and major growing areas of cereals, pulses and oilseeds in India and world. Structure and Chemical and nutritional Composition of cereals, pulses and oilseeds Processing.
- Unit II** Cereals: Wheat: Types of wheat, conditioning and tempering, types of wheat milling and their processes products. Rice; Varieties of rice, Factors affecting the nutritional quality of rice, Classification of rice based on various parameters, parboiling, milling of rice, different equipments involved and rice products.
- Unit III** Maize: Classification of maize, milling of corn and corn products, Millets: Different millet & pearling of millets, Pulses: Pretreatments for milling of pulses. Oilseeds: Different oilseeds and their utility, processing of major oilseeds refining process.
- Unit IV** Snacks foods based on cereals and pulses, their production technology and machinery required by products utilization of different of milling industries.

## Reference Books:

1. Agricultural Process Engineering- Singh and Sahay, Vikash Publishing House, New Delhi, 2001.
2. The Technology of Food Preservation- N.W. Desrosier and J.N. Desrosier, CBS Publishers & Distributors, New Delhi, 1987.
3. Principles of Food Service Part-II (Physical principles of food preservation), Karel, Fennema and Lund, Marul Pekkar Inc. 1975.
4. Technology of Cereals- N.L. Kent, Oxford Pergamen, U.K. 1975.



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**Paper Name: PROFESSIONAL PRACTICE-IV**  
**Paper Code: DFET610**

**Credit: 02**  
**L-T-P: 1-0-0**

1. Information Search and Data collection in different areas of food technology.
2. A lecture from field/industry experts, professionals to be arranged. A brief report to be submitted on the guest lecture by each student as a part of Term work
3. Individual assignment
4. Seminar presentation
5. Group discussion



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

**Paper Name: FOOD ENGINEERING OPERATION-II LAB**

**Credit: 02**

**Paper Code: DFET671**

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

**Total contact hours: 20 Hours**

**List of Experiments:**

1. To study the blanching, drying and frying technique of a vegetable products.
2. To study the process of making bread/cake using bakery oven.
3. To study the juice concentration process of different fruit using vacuum evaporator.
4. To study the process of making freeze dried fruits and vegetable using freeze dryer.
5. To study the process of extruded product from cereal using single or double screw extruder.
6. To study the homogenization and pasteurization of milk using homogenizer and pasteurizer.
7. To study the dried fruit and vegetable products using tray drier.
8. To study the effect of microwave radiation for making cake using microwave oven.
9. To study the extraction of oil from mustard seed using solid liquid extraction unit.
10. To study the drying rate characteristic using of any vegetable sample using hot air oven.

**Paper Name: PROFESSIONAL PRACTICE-IV**

**Credit: 02**

**Paper Code: DFET672**

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

Total contact hours: 15 Hours

1. Industrial Visit.  
Industrial tour may be planned, to make students acquaint with different sectors of Food Processing Industries (viz. Bakery, fruits and vegetables, snacks, meat processing, etc). Different hazards and risks associated with the processing will also be explained. The students have to make a report, which shall include; the layout of the industry, different machineries and their uses, limitations in the processing line and suggestions.
2. Exposure to various aspects of entrepreneurship during the programme period.
3. Survey of opportunities available in thrust areas identified by the Government

## Diploma Instrumentation Engineering 6<sup>th</sup> semester Syllabus Details

**Course Name: Substation, Switchgear and Protection**

**Course Code: DEE611**

**Total contact hours:35**

**Credit: 06**

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

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### **Module1: Introduction to Switchgear (5 hours)**

Need of protective system, zones of protection, switchgear definition, essential features of switchgears, switchgear equipment and accommodations, difference between short-circuit and overload currents.

### **Module2: Circuit Breakers (4 hours)**

Introduction, operating principle, Arc extinction methods, classification, Vacuum and SF<sub>6</sub> circuit breakers: working principles, construction, advantages and disadvantages, applications etc.

### **Module3: Protective relaying (7 hours)**

Introduction, fundamental requirement of protective relays, basic relay principles, torque equation, relay timing, pick-up current, current setting, PSM and TSM, induction type overcurrent relay, directional power relay, distance relay, differential relay etc. primary and back-up protection.

### **Module4: Substation (4 hours)**

Introduction to electrical sub-stations, classification, civil and electrical works in substations, transformer substations: classifications, symbols of equipment, major equipment in transformer substations, Bus-bar arrangements etc.

### **Module5: Neutral Grounding (3 hours)**

Introduction, equipment and system grounding, ungrounded and grounded neutral system, methods of neutral grounding.

### **Module6: Apparatus Protection (7 hours)**

Alternator protection: alternator faults, differential protections, transformer protection: common faults, transformer protection schemes, Buchholz device protection, motor control and protection: fundamentals, industrial motors control and protection

### **Module7: LT Protection (5 hours)**

Fuses: desirable characteristics, material used, definition of current rating, fusing current, cut-off current, Prospective Current, breaking capacity etc. of fuse elements, classification, advantages and disadvantages, application of fuses etc. applications of MCB, MCCB, ELCB etc.

### **Reference books:**

1. PowerSystemProtectionandSwitchgearbyB.Ravindranath&M.Chander
2. Fundamentals of Power System Protection by Y.G. Paithankar& S.R. Bhide
3. Principles of power systems by V.K. Mehta &RohitMehta

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**Course Title: Industrial Management and Entrepreneurship**

**Course Code: DHSS601**

**Total contact hours: 42**

**Credit: 06**

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

<b>Part-A Management</b>	
<i>Unit -1:</i> Meaning and concept of Management, Principles and functions of Management, Labour turnover, Payment of wages – factors determining the wage, Methods of payment of wages.	<b>Contact hours: 4</b>
<i>Unit -2:</i> Leadership and Decision Making, qualities and styles of Leadership, decision making process.	<b>Contact hours: 3</b>
<i>Unit- 3:</i> Elements of costs, Analysis and classification of expenditure for cost accounts, preparation of cost sheet, Marginal costing and Break Even Analysis.	<b>Contact hours: 4</b>
<i>Unit -4:</i> Factories Act -1948, Definitions, Main Provisions regarding Health, Safety and welfare of workers.	<b>Contact hours: 3</b>
<i>Unit-5:</i> Industrial Dispute Act – 1947, Definitions, Preventive measure, Machinery for settlement of Industrial Dispute in India.	<b>Contact hours: 4</b>
<i>Unit- 6:</i> Trade Union Act - Meaning and function of Trade Union.	<b>Contact hours: 3</b>
<b>Part-B Entrepreneurship</b>	
<i>Unit-7:</i> Meaning, types, characteristics and function of Entrepreneur, Concept of Start up.	<b>Contact hours: 4</b>
<i>Unit-8:</i> Forms of Business organization: Sole Trader, Main features, merits and demerits, Partnership –main features, merits and demerits. Joint stock Company – main features, difference between private and public limited companies .Introduction to co-operative and public undertaking.	<b>Contact hours: 7</b>
<i>Unit-9:</i> Small scale industries: Definitions, scope with reference to self-employment, procedure to start small scale industries, Sources of finance—Bank, Government and Financial institutions etc. Selection of site for factories, Industrial Estate, Growth Centre, Ancillary Industries.	<b>Contact hours: 7</b>
<i>Unit-10:</i> System of Distribution – wholesale and Retail Trade and Modern Marketing Process	<b>Contact hours: 3</b>

**References:**

1. *General Principle and Practice of Management – L M Prasad*
2. *Management Concepts and Practice – Kanchan Bhatia and Shweta Mittal*
3. *Micro Economics – Sandeep Garg*
4. *Self-Employment through Entrepreneurship – J.C. Kalita*
5. *Entrepreneurship Development & Small Business Management – Dr.BhawnaBhatnagar and AnkurBudhiraja.*
6. *Labour and Industrial Law of India – S.K. Misra*
7. *Industrial Safety and Health for Administrative Services---Charles D. Reese*
8. *Entrepreneurship –D D Mali and J.C. Kalita*
9. *Industrial Management and Entrepreneurship – ArabindaDebnath*

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**Course Title: Industrial Instrumentation-II**

**Course Code: DIE601**

**Total contact hours:36**

**Credit: 06**

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

**Module 1: Flow Measurement**

**(7 Hours)**

Introduction, definitions and units, classification of flow meters, pitot tubes, orifice meters, venturi tubes, flow nozzles, positive displacement flow meters, variable area flow meters: Rotameter. Anemometers: Hot wire/hot film anemometer, electromagnetic flow meter, turbine flow meters, ultrasonic flow meters, vortex flow meters, Coriolis flow meters and Mass flow meters.

**Module 2: Level Measurement**

**(7 Hours)**

Level measurement: Introduction, selection criteria of level measurement needs, float level devices, bubbler displacer level detectors, diaphragm and differential pressure detectors. Radiation, conductivity, ultrasonic, guided wave, radar and vibrating type level sensors. Level switch, magnetostrictive level measurement, laser based level measurement, sight glass and remote tank gauging.

**Module 3: Viscosity and Density Measurement**

**(6 Hours)**

Definitions, units, Newtonian and Newtonian behavior, measurement of viscosity using laboratory viscometers, industrial viscometers. Viscometer selection and application. Density Measurement: definitions, units, liquid density measurement, gas densitometers, its application and selection.

**Module 4: Humidity and Moisture Measurement.**

**(5 Hours)**

Humidity and Moisture Measurement: Introduction, mechanical and electrical type humidity transducer, dew-point meter. Moisture Measurement techniques: Dean and Stark technique, thermal drying technique, resistive and capacitive Moisture sensor.

**Module 5: Analytical Instrumentation.****(6 Hours)**

Gas Analyzers: Thermal conductivity, heat of reaction, paramagnetic method, zirconia oxygen analyzer. Chromatography: gas and liquid. Spectroscopy: UV-Vis and IR. Measurement of gaseous and particle air pollutants.

**Module 6: Electro Magnetic Interference and Safety****(5 Hours)**

Introduction, interference coupling mechanism, basics of circuit layout and grounding, concepts of interfaces, filtering and shielding. Safety: Introduction, electrical hazards, hazardous areas and classification. Protection methods: purging, explosion proofing and intrinsic safety, explosion protection guidelines and earthing, enclosures, fuses and circuit breakers, fire and smoke detection system

**TEXT BOOKS:**

1. Doebelin E.O, Measurement Systems: Application and Design, McGraw Hill
2. Patranabis D., Principles of Industrial Instrumentation, Tata McGraw Hill.

**REFERENCE BOOKS:**

1. B.E.Noltingk, Instrumentation Reference Book, 2nd Edition, Butterworth Heinemann, 1995.
2. B.G.Liptak, Process Measurement and Analysis, 4th Edition, Chilton Book Company, Radnor, Pennsylvania, 2003.
3. Douglas M. Considine, Process / Industrial Instruments & Controls Handbook, 5th Edition, McGraw Hill, Singapore, 1999.

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**Course Title: Industrial Instrumentation-II Lab****Course Code: DIE671****Total contact hours: 2/week****Credit: 02****L-T-P: 0-0-2**

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**List of experiments to be performed by the students for Industrial Instrumentation-II Lab**

1. Study of Temperature conversion from Celsius to Fahrenheit.
2. Study of Temperature vs Resistance plot in RTD.
3. Study of Temperature vs Resistance plot in Thermistor.
4. Study of Pressure conversion from one unit to another.
5. Study of Pressure measurement in manometer.
6. Study of Capacitance vs Displacement plot in capacitive transducer.
7. Study of Weight measurement using strain gauge.
8. Study of Flow rate calculation.
9. Study of Volume flow rate for orifice and venturi tubes.
10. Study of Determination of range of flow in rotameter.
11. Study of Level measurement techniques and calculations.

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**Course Title: Biomedical Instrumentation**

**Course Code: DIE602**

**Total contact hours: 35 Hours**

**Credit: 06**

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

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**Module 1: Introduction to Biomedical Instrumentation (4 Hours)**

Basic concepts, Introduction to Man-Instrumentation System, Components of Man-Instrumentation System, Physiological systems of the body, Problems encountered in measuring a living system.

**Module 2: Human Cell – Action Potential (6 Hours)**

Cells and their structures, Characteristics of living organisms, General characteristics of a human cell, Resting and action potentials, Propagation of action potentials, The bioelectric potentials- ECG, EEG, EMG, EOG, ERG, EGG, Evoked potential and their applications.

**Module 3: Biopotential Electrodes and Amplifiers (6 Hours)**

Electrode Theory, The electrode – electrolyte interface, Electrode types- surface electrode, needle electrode, microelectrodes, Difference amplifier, Isolation amplifier, Instrumentation amplifier.

**Module 4: Transducers and its selection criteria in the biomedical application (6 Hours)**

Classification of transducer, selecting a transducer, general features of a biomedical instrumentation system, Working and biomedical applications : Displacement, Position and Motion transducer; Pressure transducer; Transducer for body temperature measurement; Photoelectric transducer; Optical fiber sensors; Biosensors; Smart sensors.

**Module 5: The Cardiovascular System and Cardiovascular Measurements (7 Hours)**

The heart and cardiovascular system, Blood pressure, Characteristics of blood flow, Heart sound, Electrocardiography - ECG waveform, Measurement of blood pressure, Measurement of blood flow and cardiac output, Plethysmography, Pulse oximetry, Measurement of heart sounds, Electrocardiograph – 12 standard lead configurations and its block diagram , ECG recorder.

**Module 6: Diagnostic and Therapeutic Equipment (6 Hours)**

Generation of ionizing radiation, X-rays and radiography, X-ray computed tomography, Defibrillators, Pacemakers, Ventilators, Diagnostic ultrasound, Physics of ultrasonic waves, Medical ultrasound, Basic pulse echo apparatus.

**Books / References:**

1. Rao, C. Raja, and Sujoy K. Guha. Principles of medical electronics and biomedical instrumentation. Universities press, 2001.
2. Khandpur, Raghbir Singh. Handbook of biomedical instrumentation. McGraw-Hill Education, 1987.
3. Cromwell, Leslie. "Biomedical Instrumentation and Measurements, 2 Education, Feb. 1980. Ed."
4. Singh, Mandeep. Introduction to biomedical instrumentation. PHI Learning Pvt. Ltd., 2014.

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**Course Title: Biomedical Instrumentation Lab**  
**Course Code: DIE672**  
**Total contact hours: 2/week**

**Credit: 02**  
**L-T-P: 0-0-2**

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**List of experiments to be performed by the students for Biomedical Instrumentation Lab**

1. Study of Band-pass/ Band-stop filter.
2. Study of ADC/DAC.
3. Study of Differential Amplifier.
4. Study of Instrumentation Amplifier.
5. Study of Temperature sensor calibration to measure human body temperature.
6. Study of Sphygmomanometer to measure human blood pressure.
7. Study of Photoplethysmography to measure heart rate/Oxygen saturation level.
8. Study of ECG signal.
9. To study Ultrasound sensor to measure human body height.
10. To study pressure sensor to measure human body weight.

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**Course Title: Industrial Automation**

**Course Code: DIE611**

**Total contact hours: 35**

**Credit: 06**

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

**Module 1:DCS and SCADA**

**(10 Hours)**

Distributed Control System (DCS): Hierarchical concept of automation, Components of process control system, DCS architecture. Industrial application with control loop schemes.

I and C Drawings and Documentation: Introduction to plant design, Process diagrams, Instrumentation documentation, Electrical documentation, SAMA diagrams.

Supervisory Control and Data Acquisition (SCADA): Introduction to SCADA, SCADA Architecture, Real Time Systems and SCADA Software, SCADA Hardware, SCADA Protocols, Deploying SCADA Systems, Security and Vulnerability of SCADA Systems.

**Module 2:Data Acquisition System (DAS)**

**(5 Hours)**

Computer based data acquisition system: Introduction, objective of DAS, process data acquisition, scanner type, comparative study of switches, signal conditioning, data validation, data base structure, data reduction, Alarm monitoring and system reporting, Sequence of events recording, Performance monitoring, Event oriented manager, Plant start-up guidance, Operation reports, Group review display (HMI), Plant pictorial graphic displays, Dynamic bar charts displays.

**Module 3: Programmable Logic Controller (PLC)**

**(10 Hours)**

Introduction to PLC, block diagram of overall PLC system, PLC scanning. PLC Programming-Ladder diagram, programming relation to digital logic gates, Boolean algebra-simple examples, PLC register basics. PLC timer-retentive and delay timer functions. PLC counter-up/down counters with examples. Basic number comparison functions. PID control of continues process with respect to PLC-PID.

**Module 4: Industrial Data Communication**

**(5 Hours)**

OSI model, RS 232 interface standards, Fibre optics, Modbus, HART, Device Net, Profibus, Foundation field bus, LAN, Token system, Industrial Ethernet, TCP/IP, wireless fundamentals, Industrial network security, Network threats, Vulnerabilities and risks.

**Module 5: Robotic System**

**(5 Hours)**

Types of Robot, Robotic arm terminology, Robotic arm configuration, Robot application, Basic robotic system, Robotic manipulator kinematics, Robotic arm processing concepts, Robot arm path planning, Actuators.

**Books / References:**

1. Industrial Instrumentation: Principles and Design, Tattamangalam R. Padmanabhan, Springer.
2. Instrumentation for Process Measurement and Control, Third Editon, Norman A. Anderson.
3. Mechatronics: principles and applications. Onwubolu, Godfrey. Elsevier, 2005.
4. Mechatronics, W. Bolton, Pearson.
5. Process Automation Handbook: A Guide to Theory and Practice.
6. Overview of Industrial Process Automation – KLS Sharma, Elsevier Publication.
7. Programmable Logic Controllers -Programming Methods and Applications, John R. Hackworth and Frederick D. Hackworth, Jr.
8. SCADA-Supervisory Control and Data Acquisition System – Stuart A. Boyer, ISA publication (3rd Edition).

9. Practical SCADA for Industry- David Bailey, Edwin Wright, Newnes, (an imprint of Elsevier), 2003.
10. Distributed Computer Control for Industrial Automation- DobrivojePopovic and Vijay Bhatkar, Marcel Dekker Inc., 1990.
11. Practical Distributed Control System for Engineers and Technicians- IDC Technologies.

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