CURRICULUM FOR THREE YEAR
(SIX SEMESTER)
DIPLOMA COURSE IN

DAIRY ENGINEERING

Effective from Session

UNDER DEVELOPMENT

Semester System

Prepared By

Curriculum Development Cell

INSTITUTE OF RESEARCH DEVELOPMENT
& TRAINING, U.P., KANPUR

APPROVED BY

BOARD OF TECHNICAL EDUCATION
U.P. LUCKNOW,
CORRECTED AS SYLLABUS COMMITTEE OF:
B.T.E. MEETING HELD ON 27.05.2015

Corrected and Approved by B.T.E. On Dated 27.05.2015

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN DAIRY ENGINEERING

(Effective From)

I Semester

Curriculum							Scheme of Examination								
Periods Per Week						S U B J E C T	Theory			Practical			Grand Total
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks	
5	-	-	3	-	8	1.1 Professional Communication	2.5	50	20	70	3	20	10	30	100
3	1	-	-	-	4	1.2 Applied Mathematics-I(A)	2.5	50	20	70	-	-	-	-	70
3	1	-	-	-	4	1.3 Applied Physics-I	2.5	50	20	70	-	--	--	--	70
6	-	-	4	-	10	1.4 Applied Chemistry	2.5	50	20	70	3	40	20	60	130
-	-	14	-	-	14	1.5 Engineering Drawing	3.0	50	20	70	-	-	-	-	70
4	1		3	-	8	1.6 Applied Mechanics And Machines Components	2.5	50	20	70	3	60	30	90	160
17	2	14	7	-	40	<---------TOTAL---------->	--	300	120	420		120	60	180	600
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)															25
TOTAL															625

II Semester

3	1	-	-	-	4	2.1 Applied Mathematics-I(B)	2.5	50	20	70	-	-	-	-	70
3	1	-	4	-	8	2.2 Applied Physics-II	2.5	50	20	70	3	40	20	60	130
5	-	-	4	-	9	2.3 Introduction To Dairy Engineering & Technology	2.5	50	20	70	-	-	-	-	70
5	-	-	-	-	5	2.4 Elementary Workshop Tech.	2.5	50	20	70	-	--	--	--	70
-	-	-	-	14	14	2.5 Workshop Practice	--	--	--	--	4	60	30	90	90
						2.6 Field Exposure (Assessment at Instt. Level)	--	--	--	--	2	--	60	60	60
16	2	-	8	14	40	<---------TOTAL---------->	--	200	80	280		100	110	210	490
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)															25
TOTAL															515

NOTE:-
(1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) After the II Sem Exam.Student of II Sem Dairy Engg will go for a two week visit of a small/medium size industry. It will be structured and supervised by the institution. Purpose of the visit is to give students an exposure of industrial setup and that of simple tools, instruments and the skill there in day to day use. Every student will submit the institution a report of his visit. The report will invaribly contain the discription of his observations about (1) Products/Work (2) Tools and Equipments Used. He will be evaluated at the institution level for 30 marks--20 for viva and 10 for the reprot presented. See Annexure -I.

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STUDY & EVALUATION SCHEME
for
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III Semester

Curriculum							Scheme of Examination						
Periods Per Week						SUBJECT	Theory			Practical			Grand
Lec.	Tutorial	Draw	Lab.	Work Shop	Total		Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Total
5	2		4	--	11	3.1 Electrical Tech. & Electronics	2.5	50	20	70	3	40	20	60	130
5	1		--	--	6	3.2 Steam Engineering & Heat Engines.	2.5	50	20	70	--	--	--	--	70
5	2		--	--	7	3.3 Dairy Engineering-I	2.5	50	20	70	--	--	--	--	70
5	2		--	--	7	3.4 Dairy Technology-I	2.5	50	20	70	--	--	--	--	70
5	1		--	--	6	3.5 Dairy Chemistry.	2.5	50	20	70	--	--	--	--	70
--			10	--	10	3.6 Dairy Engineering-I And Dairy Technology -I Lab	--	--	--	--	3	40	20	60	60
25	8		14	-	47	<---------TOTAL---------->	--	250	100	350		80	40	120	470
						Games/NCC/Social and Cultural Activities + Discipline (15 + 10)									25
														TOTAL	495

IV Semester

5	2		--	--	7	4.1 Hydraulics and hydraulic machines	2.5	50	20	70	--	--	--	--	70
--	--		4	--	4	4.2 Heat Engine & Hydraulics lab	--	--	--		3	40	20	60	60
5	1		--	--	6	4.3 Dairy Microbiology	2.5	50	20	70	--	--	--	--	70
4	2		4	--	10	4.4 Refrigeration-I.	2.5	50	20	70	3	40	20	60	130
2	--		5	--	7	4.5 Introduction To Computer	--	--	--	--	3	60	30	90	90
--	--		12	--	12	4.6 Dairy Chemistry & Microbiology Lab.	----	--	--	--	3	40	20	60	60
--	--		--	--	--	4.7 In-plant Training-I (4 Weeks)	----	--	--	--	--	--	--	--	--
16	5	--	25		46	<---------TOTAL---------->	--	150	60	210	--	180	90	270	480
						Games/NCC/Social and Cultural Activity/Community Development+Discipline (15+10)									25
														Aggregate	505

NOTE:- (1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) Field visit and extension lectures are to be organised and managed
(6) 4 weeks structured and supervised, branch specific, task oriented In-plant training-I to be organised After IV Semester theory exam. Students will submit a report. There will be 60 marks for this Training.These marks will be awarded in VI Semester by the external examinar with In Plant Training-II.

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STUDY & EVALUATION SCHEME
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V Semester

Curriculum							Scheme of Examination								
Periods Per Week						S U B J E C T	Theory			Practical			Grand Total
Lec.	Tutorial	Draw	Lab.	Work Shop	Tot		Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Examination Dur.	Examination Marks	Sess. Marks	Total Marks	
6	2		--	--	8	5.1 Industrial Management & Enterprenurship Development	2.5	50	20	70	--	--	--	--	70
3	2		6	--	11	5.2 Dairy Engineering-II	2.5	50	20	70	3	40	20	60	130
5	2		7	--	14	5.3 Dairy Technology -II	2.5	50	20	70	3	40	20	60	130
3	2		5	--	10	5.4 Referigeration-II.	2.5	50	20	70	3	40	20	60	130
3	2		--	--	5	5.5 Instrumentation Process & Control	2.5	50	20	70	--	--	--	--	70
--	--		--	--	--	5.6 In-plant Training-I(4 Weeks)	--	--	--	--	VIVA	40	20	60	60
--	--		--	--	--	5.7 In-plant Training-II(4 Weeks)	--	--	--	--	--	--	--	--	--
20	10		18	-	48	<---------TOTAL---------->	--	250	100	350	--	160	80	240	590
Games/NCC/Social and Cultural Activity/Community Development+Discipline (15+10)															25
															615

VI Semester

4	-	-	-	-	4	6.1 Environmental Education * Disaster Management	2.5	50	--	--	-	--	--	--	--
3	2		6	--	11	6.2 Dairy Engineering-III	2.5	50	20	70	3	40	20	60	130
5	2	-	-	-	7	6.3 Design of Dairy Equipment	2.5	50	20	70	--	--	--	--	70
5	1		--	--	6	6.4 Dairy Plant layout, maintenance & Automation	2.5	50	20	70	--	--	--	--	70
5	1		-	--	7	6.5 M/c Tools Tech. & Maintenance	2.5	50	20	70	-	--	--	--	70
--	--		6	--	6	6.6 Project on Dairy Plant Layout & Design	--	-	--	--	VIVA	110	50	160	160
--	--		--	--	--	6.7 In-plant Training-II (4 Weeks)	--	--	--	--	VIVA	40	20	60	60
22	7		12	-	41	<---------TOTAL---------->	--	200	80	280	--	190	90	280	560
Games/NCC/Social and Cultural Activity/Community Development+Discipline (15+10)															25
															585
														30% Carry over of I & II Semester	342
														70% Carry over of III & IV Semester	700
														100% Carry Over of V & VI Semester	1200
														Grand Total	2242

NOTE:-
(1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) Field visit and extension lectures are to be organised and managed
(6) 4 weeks structured and supervised, branch specific, task oriented In-plant Training-II to be organised after V Semester Theory exam. Students will submit a report. There will be 60 marks for this training. These marks in VI Sem. will be awarded by the examiner. (Examination marks : 40, Sess. marks : 20).
(8) (*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks.

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C O N T E N T S

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MAIN FEATURES OF THE CURRICULUM

1.	Title of the Course	:	Diploma in Dairy Engineering
2.	Duration of the Course	:	Three Years(Six Semester)
3.	Type of the Course	:	Full Time Institutional
4.	Pattern of the Course	:	Semester System
5.	Intake	:	60
6.	Entry Qualification	:	Passed High School with 35% Marks
7.	Admission Criteria	:	State Joint Entrance Examination

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LIST OF EXPERTS

List of experts who contributed in the Semester System of the curriculum for Three Year (Six Semester) diploma in Dairy Engineering on dated 20-03-2015.

1.	Shri S. K. Vaish	Principal	Govt. Poly.,Bareilly
2.	Shri Atul Rai	Lect. Mech.	G. P., Kanpur
3.	Shri Lal Ji Patel	T.B.O.	I.R.D.T.U.P., Kanpur

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IV- NEED ANALYSIS

A sound health is an essential factor for a happy living. From ancient times people have been aware of maintaining good health. Milk and milk products played an important roll for maintaining good health for people of all age groups. Milk contents have nearly all the constituents of nutrition and therefore milk is said to be a complete food.

Due to technological advancement, improved methods for handling of milk products have come into practice. The duration of utility of such products can be increased by recent addition of preservatives and modren techniques of packaging.

Keeping in view the above factors, it was realised to revise the curriculum of three years diploma course in Dairy Engineering. To accomodate technological advancements such as application of computers, safety, entreprenurship development and pollution control are included in the curriculum.

It is hoped that the revised curriculum will be useful for the students to face the challanges of industry in the field of Dairy Engineering & Technology as well as they can also start his own entreprenural activity.

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V- PROFILE DEVELOPMENT

A tool in the form of a questionnaire was designed and sent to various organisations, industries, higher technological institutes and polytechnics for getting informations about job opportuntities, man power requirements and job activities of diploma holders in Dairy Engineering.

Feed back was taken from experts through questionnaire, personal interviews and workshops were organised and a draft structure of curriculum was prepared in the workshop held at I.R.D.T., U.P., Kanpur adopting the following procedure.

1. Listing job potential and job activities.
2. Analysing activities into knowledge and skill.
3. Deriving the course objectives.
4. Deriving subject areas from course objectives.
5. Planning horizontal and vertical organisation of subjects.
6. Developing detailed course contents and coverage time.
7. Determining resource input in terms of human and information resources.

Review of this draft of structure of curriculum was done in a workshop held at I.R.D.T., U.P., Kanpur through a group of experts from field , higher technological institutes and polytechnic.

It is hope that the revised curriculum of Diploma in Dairy Engg. will prove useful in producing the desired type of middle level trained man power for Dairy Engg. field.

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VI- JOB POTENTIAL/JOB OPPORTUNITES

Before taking up the assignment for revision of curriculum a preliminary survey regarding job potential and man power assessment was conducted. It was revealed that diploma passouts may have opportunities in the following field.

S.NO	DEPARTMENT/ORGANISATION	POSITION/DESIGNATION
1.	Pradashik Co-operative Dairy Faderation U.P.	Dairy Supervisor/ Senior Technician
2.	Pradashik Co-operative Dairy Faderation M.P.	Dairy Supervisor/ Senior Technician
3.	Pradashik Co-operative Dairy Faderation Rajasthan.	Dairy Supervisor/ Senior Technician
4.	Glaxo India Ltd.	Dairy Supervisor
5.	Dalmia Dairy, Bharatpur	Dairy Supervisor/ Shift Incharge
6.	R.M.I. Kotkapura, Punjab	Plant Supervisor
7.	Anand Dairy, Karnal Haryana	Dairy Supervisor
8.	H.M.T. Aurangabad, Maharashtra	Skilled Worker
9.	Kanpur Dugdh Utpadak Sahkeri Sangathan	Dairy Supervisor
10.	National Dairy Reaserch Institute, Karnal	Reaserch Asst.
11.	Aumul Dairy	Dairy Supervisor
12.	Dairy Milk Plant, Rampur	Dairy Supervisor

Self Employment:A diploma passout in dairy engineering can start his entrepreneural activities with following small scale dairy plant

1. Manufacturer of dairy products.
2. Ancillary unit for dairy plant.
3. Repair of airconditioners,coolers,fridges etc.
4. Small scale packaging industries.
5. Repair of pumps & compressors.

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VII. JOB ACTVITIES :

(A) GENERAL:

1. OPERATION OF DAIRY PLANT:

1.1 Supervises the operation of dairy plants.

1.2 Supervises the process control.

1.3 Training of crafts man.

1.4 Manages labour materials and utilities.

1.5 Safety of workers and equipments.

2. MICROBIOLOGICAL ANALYSIS :

2.1 Analysis of sample.

2.2 Interpretation of results of analysis.

3. ERECTION AND COMMISSIONING OF DAIRY PLANT :

3.1 Reading and inter-preting the sketches, drawings.

3.2 Preparing inventory control and costing.

4. INSPECTION AND TESTING OF DAIRY EQUIPMENT :

4.1 Inspection and testing performance of individual equipment.

4.2 Fault finding or trouble shooting and its rectification.

5. MARKETING :

5.1 Explaining the salient features and performance of the product and comparison with regard to other such available equipments in the market.

5.2 Preparing estimates and contract documents.

5.3 Booking of orders and making relevent documents and correspondence.

5.4 Servicing of equipments and instruments.

5.5 Inventory control and determination of material requirement.

5.6 Preparation of tender documents and inviting tenders.

5.7 Placing orders and receiving the supplies.

6. PROJECT PREPARATION AND EVALUATION :

6.1 To scrutinise the project reports for

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Dairy plants from the point of view of feasibility and finances involved.

7. TEACHING, RESEARCH AND TRAINING :

7.1 To assist the teachers in imparting instructions to students.

7.2 To set up laboratory equipments for experimental work.

7.3 Preparation of specifications of various equipments and instruments.

7.4 Preparing of tender.

7.5 Receipt of supplies and their inspection and testing according to specification.

7.6 Maintains the equipments and instruments in the laboratory.

(B)SELF EMPLOYMENT:

(a) Setting up of small scale dairy plant

(b) Setting up an ancillary industry for medium/large dairy plants.

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ACTVITY ANALYSIS:

S.No.	Activity	Knowledge Required	Skill Required
GENERAL:			
1.1	Supervisors / Technicians / Sr. Operators in Dairy Plants		
1.1.1	Supervises the Operation of Dairy Plants.	Knowledge of : - Inorganic and organic chemistry and part of physical chemistry. - Hydraulics & Hydraulic machines as fluid flow heat transfer, mechanical operation etc. - Process testing instrument- their principle of operation, working and constructional details.	Skill in operation of individual Dairy equipment and related instrument.
1.1.2	Supervise the process control.	- Knowledge of : - process of dairy tech. and microbiology of milk - Instruments used in process control, their principle of operation, working and constructional details. - Various types of break downs their causes and rectification. Effect of break down on the working of dairy plant	Skill in the use of instruments. Skill in attending the break downs.
1.1.3	Training of Crafts man	- Knowledge of subject matter of dairy plants i.e. equipments and processes. - Collection of feed data and effective communication methods.	Skill in planning and supervising of training, communication techniques.
1.1.4	Manages labour materials and utilities.	- Modern methods of labour management,labour welfare activities. - Labour laws and acts, workman compensation act,	Skill in leadership, Skill in communication techniques.

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		strikes and lock-outs etc.	
		- Principles of material management/	
		- Departmental purpose, rules and specification of materials.	
		- Inventory control.	
		- Stores management layout, method of storage, and stores maintenance i.e. bincards, ledger etc.	
		- Use of utilities in the plant.	
1.1.5	Safety of workers and equipments.	- Safety rules and other departmental precautions in this respect.	Skill in operation of plants and equipment.
		- Importance of safety in an industry.	Skill in conducting safety operations.
		- Knowledge of different safety procedures.	Skill in operating safety equipments.
		- Different safety equipment its principle of working, layout and operation.	Skill in first aid operations.
1.2	SUPERVISOR FOR MICROBIOLOGICAL ANALYSIS :		
1.2.1	Analysis of sample	- Knowledge of dairy microbiology	Skill in handling various instruments and requirements in the lab.
		- Knowledge of qualitative and quantitative analysis.	
		- Knowledge of analytical instruments.	
1.2.2	Interpretation of results of analysis.	- Knowledge to present the results in a quantative form.	Skill in reaching at conclusion.
		- Knowledge of basic calculations.	
1.3	SUPERVISOR FOR ERECTION AND COMMISSIONING OF DAIRY PLANTS:		
1.3.1	Reading and interpreting the sketches, drawings.	- Principle of projections first angle projection & third angle projection.	Skill in reading and interpreting drawing & sketches.
		- Descriptions, working and use of various drawing instruments & equipments.	Skill in use of drawing instrument and equipment.

		- Knowledge of various process and equipment.	Skill in reprography , preparations of detailed manufactur-ing drawings.
		- Methods of reading and interpreting the drawings and blue prints.	
		- Preparation of detailed manufacturing drawing from line diagrams.	
1.3.2	Preparing inventory control and costing.	- Inventory control methods	Skill in maintenance of stores and ordering procedures.
		- Store-keeping	
		- Cost estimation	
1.3.3	Preparation of working schedule.	- Realistic time estimates for various jobs.	Skill to handle labour.
1.3.4	Erection and commissioning of plant.	- Knowledge of plant and machinery and process.	Skill to handle labour.
		- Workshop Practice	Skill in workshop practice skill in demonstration.
		- Foundation practice	Skill in testing of commissioned equipments.
		- Handling equipment	
		- Transporation of equipment.	
		- equipments used for erection.	
		- Knowledge of safety of equipment	
		- Simple design calculations.	
1.4	Supervisor for equipment testing and inspection :		
1.4.1	Inspection & testing per-formance of individual equipment.	- Necessity of inspection at various stages of manufacture, operation and maintenance.	Skill in inspection techniques.
		- Modern methods of condu-cting inspections.	Skill in testing the equipment.
		- Various tests and testing procedures to determine the process-performance of the	

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		individual equipment.	
		- Importance of perofrmance test for equipment and to fix its periodicity.	
1.4.2	Fault finding or trouble shooting and its rectifi-cation.	- Knowledge of various process and equipment. - Various probable fault which are likely to occur in processes and equipments. - Techniques in fault investigation and trouble shooting. - Methods of repair and overhauling. - Importance of maintenance in running of a factory. - Preventive maintenance and preparation of its schedule.	Skill in conducting preventive maintenance and process monitoring. Skill in trouble shooting. Skill in repair and overhauling of equipment.
1.5	Sales representatives / purchase assistants or marketing / sales supervisors in various dairy products		
1.5.1	Explaining the salient features & performance if the product and comparison with regard to other such available equipments in the market.	- Knowledge of the manufacturing processes of the product & its utilities. - Description, principle of working and special features of the equipment. - Modern methods of sales promotion. - Knowledge of other similar products in the market. - Operation of the equipment and demonstrating the performance.	Skill in explaining the performance of the product. Skill in good Sales-manship. Skill in demonstrating the working of the equipment.
1.5.2	Preparing estimates & contract documents.	- Principle of estimation. - Various methods of estimation. - Knowledge of departmental rules and general sale/ purchase conditions such as earnest money, security deposits, warranty claims	Preparation of estimates. Preparation of contract documents. Skill in setting warranty claims.

		etc.	
		- Preparation of estimates and contract documents.	
1.5.3	Booking of orders and making relevant documents and correspondence.	- Knowledge of office procedures initiating a correspondence, putting the notes, drafting letters and coresspondence.	Skill in making official correspondence.
		- Techniques in procedure orders.	Skill in office procedure.
		- Knowledge of market demand and trend.	
		- Methods of conducting market survey to determine market trend.	
1.5.4	Servicing of equipment and instruments.	- Importance of service after sales in promotion of product sale.	Skill in handling and repair of dairy equipments.
		- Principle of working of various equipment and instruments manufactured.	
		- Various defects and its repair.	
		- Explaining the importance of preventive and routine maintenance to customer.	
1.5.5	Inventory control and determination of material requirement.	- Principle of inventory control.	Skil ot prepare inventory.
		- Knowledge for consolidating the requirement of material and lead time.	
1.5.6	Preparation of tender docu - ments and investing tenders.	- Detailed specification of materials.	Skill in praparing tender documents.
		- Preparation of tender documents with various conditions.	
		- Inviting tenders according to departmental rules and regulations.	
1.5.7	Placing orders and receiving the supplies.	- Method of making comperative statement.	Skill in preparing the supply orders.

		- Decision making for ordering the material on quality-cum-cost basis.	Skill in inspection of material for accepting and rejection.
		- Preparing the orders lay down clearly the various conditions of supply.	
		- Receipt of supplies and inspection of materials according to specification for accepting and rejecting.	
1.6	Technical assistants in financial corporation, banks for the secrutinising project reports for the purpose of loaning :		
1.6.1	To secrutinise the project reports for Dairy plants from the point of view of feas-ibility and finances involved.	- Specifications of various raw material used in dairy industry. - Knowledge of availability of man power in the area where industry is likely to be setup. - Various concessions provided by the govt. such as cheep electricity water, land on concessional rates etc. - Knowledge of processes and products its market availability. - To make comperative study and analysis of project report for its feasibility.	Skill in secruti-nising the report.
1.7	To work as a technician in teaching / research organisation and in training organisation of large dairy research institutes :		
1.7.1	To assist the teachers in imparting ins -tructions to students.	- Knowledge of the subjects. Communication Skill. - Teaching methodology. - Students psychology.	
1.7.2	To set up laboratory equipments for experi-mental work.	- Description and working of the equipment. - Method of setting the equipment. - Knowledge of the experiment.	Operation of equipment and conduct the experiments.

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1.7.3	Preparation of specifications of various equipments and instrumets.	- Principle of specifying the machines, equipments and instruments. - Methods of laying down specifications. - Knowledge of various machines, equipments and instruments.	Skill in preparing the specifications.
1.7.4	Preparing of tender.	- Specifications of various equipments and materials required. - Preparation of tender documents. - Knowledgge of various sources of availability of dairy equipments and material. - Preparation of comparative statement and recommending the item on quality-cum-cost basis.	Skill in inviting tenders Skill in preparation of tenders documents
1.7.5	Receipt of supplies and their inspec-tion &testing according to specification.	- Receipt of the material. - Method of inspection and testing the materials. - Conducting inspection and testing of materials according to specification for acceptance and rejection.	Skill in inspection and testing of the equipments and materials.
1.7.6	Maintenance of the equipments and instruments in the labora-tory.	- Importance of maintenance in institution and engi-neering industry. - Various maintenance methods. - Importance of preventive maintenance preparation of preventive maintenance, schedule for each machine, equipments & instrument. - Types of fault, its detection repair and overhauling. - Keeping the maintenance record of each machine equipment and instrument.	Skill in conducting preventive maintenance. Skill in repairing and overhauling of machines equipments and instruments.

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(B) SELF EMPLOYEMENT :

Self employment in small scale unit such as manufacturing of dairy products such as dry milk,casein,ghee, condensed milk etc:

(a)	Setting of small scale dairy industry.	- Methods of conducting market survey for the feasibility of the industry. - Factor affecting site selection. - Knowledge of various financial sources with their norms and conditions. - Knowledge of various concessions provided by government to young enterpreunures. - Knowledge of process - market trends for the sale of product. - Safety and waste treatment.	Skill in conducting market survey.
(b)	Setting up an ancillary industry for large dairy plants.	- Market survey to collaborate with big industry. - Various financial sources for financing ancillary industry. - Concessions provided by government. - Knowledge of manufacturing processes for the item. - Effective and efficient management of the industry.	Skill in setting up of unit.

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VIII - COURSE OBJECTIVE

At the end of course the students should be able to :

(A) KNOWLEDGE :

(1) Understand the various operation and processes and their application in different dairy plants

(2) Understand various instruments used in process control of dairy plants including use of computer.

(3) Understand the organisation and his place in it. Understanding the general procedures of stores, purchase and inventory etc.

(4) Understand the techniques of installation, erection and commissioning of equipments/instruments in dairy plants

(5) Understand, interpret and prepare plant layout.

(6) Understand, interpret and prepare project reports.

(7) Understand safety goals, waste control and waste treatment (effluent control)

(8) Understand the energy conservation and balance.

(9) Develop attitude for safety consciousness

(B) SKILL :

(10) Acquire skill in operation, testing and adjustment of dairy equipment/materials used in dairy plant.

(11) Acquire the skill in diagnosis of common faults and troubles in process, equipment and instrument and their rectification, repair and overhauling.

(12) Acquire skill in reading interpreting and prepare plant layout and flow diagrams.

(13) Acquire skill in preparing erection schedule/charts and knowledge of coordination of the organisation using CPM and PERT.

(14) Develop skill in operation of dairy plants.

(15) Develop skill in use of instruments in dairy plant.

(16) Develop skill in communication oral/written/through devices.

(17) Develop skill in repair and maintenance of dairy instruments and equipments.

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IX. CURRICULUM ANALYSIS FOR IDENTIFICATION OF SUBJECTS

SNo.	Course Objective	Subject(s) of study
(A)	KNOWLEDGE :	
(1)	To understand the various operations and processes and their application in different dairy plants.	- Dairy Technology - hydraulics & Hydraulic m/cs - Fluid flow - Heat transfer - Mechanical operations - Refrigeration
(2)	To understand various instruments used in process control of dairy plant including use of computers.	- Instrumentation & process control - Computer Application - Refrigeration
(3)	To understand the organisation and his place in it. Understanding the general procedure of stores, purchase and inventory etc.	- Industrial Management & Enterprenurship Development - Dairy Engineering
(4)	To understand the technique of installation, erection and commissioning of equipments/ instruments in dairy plants.	- Dairy engineering - Steam Engg. & Heat Engines. - Workshop Practice (Installation and commissioning)
(5)	To understand, interpret and prepare plant layout.	- Dairy plant layout & Design.
(6)	To understand, interpret and prepare project reports.	- Project on Dairy Plant Layout & Design
(7)	To understand safety goals, pollution control and waste treatment	- Pollution Control & Safety Engg. - Dairy microbiology
(8)	To understand the energy conservation and balance.	- Dairy chemistry
(9)	To develop attitude for safety consciousness.	- Safety Engg. - Dairy Microbiology
	SKILL :	
(1)	To acquire skill in operation, testing and adjustment of Dairy equipment / materials used in Dairy plant.	- Workshop Practice. - Summer in Plant training - Industrial Training/Field Exposure - Electrical Tech. & Electronics lab - Mechinacal Workshop (Workshop Practice
(2)	To acquire the skill in diagnosis of common faults	- Workshop Practice - Mechanical Workshop (workshop

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	and troubles in process - equipment and instrument and their rectification, repair and overhauling.	Practice) - Summer in plant Training - Instrumentation & Process control - Refrigeration
(3)	To acquire the skill in reading, interpreting and prepare plant layout and flow diagrams.	- Engineering Drawing - Dairy Engineering Lab - Project on Dairy Plant Layout & Design. - Dairy Technology Lab - Summer in Plant Training
(4)	To acquire skill in preparing erection schedule/ charts and knowledge of coordination of the organisation using CPM and PERT.	- Industrial Management - Summer in Plant Training - Instrumentation & Process Control - Mechanical Workshop (workshop Practice)
(5)	To develop skill in operation of Dairy plants.	- Summer in Plant Training - Refrigeration - Dairy Technology - Mechanical Workshop (workshop Practice)
(6)	To develop skill in use of industry.	- Instrumentation & Process Control - Dairy Engg. Lab - Summer in Plant Training
(7)	To develop skill in communication oral/ written/ through devices.	- Communication Techniques - Industrial Management
(8)	To develop skill in repair and maintenance of Dairy instruments and equipments.	- Advance Workshop Practice - Electrical Engg. & Electronics Lab - Summer in Plant Training. - Refrigeration lab

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I Semester

1.1 PROFESSIONAL COMMUNICATION

[Common to All Engineering/Non Engineering Courses]

L	T	P
5	-	3

Rationale:

Communication forms an important activity of diploma holder. It is essential that he/she should be in a position to communicate in writing and orally with superiors,equals and subordinates. This subject aims at providing working knowledge of languages like Hindi and English so as to train the students in the art of communication. It is suggested that maximum attention should be given in developing Communication abilities in the students while imparting instructions by giving maximum emphasis on practice.

Sr.No.	Units	Coverage time L	T	P
1.	Introduction to communication methods meaning,channels & media written and verbal.	5	-	-
2.	Development of comprehension of English & Hindi through study of text material& language exercises.	10	-	-
3.	Development of expression through			
	A. Letters(English & Hindi)	10	-	-
	B. Report writing (English) Note making and minutes writing	10	-	-
4.	Paragraph writing, Essey writing, Proposal writing	10	-	-
5.	Composition	10	-	-
6.	Remecial Grammer & Vocabulary Building	15	-	-
		70	-	42

1. PART I : COMMUNICATION IN ENGLISH (40 Marks)

1.1 Concept of communication, importance of effective communication, types of communucation, formal, informal, verbal and nonverbal, spoken and written. Techniques of communication, Listening, reading, writting and speaking, Barriers in communication, Modern tools of communication- Fax, e-mail, Telephone, telegram, etc.

1.2 Technical communication Vs. General Communication : Development of comprehension and knowledge of English through the study of text material and language exercises based on the prescribed text book of English.

1.3 Development of expression through:

1.3.1 Paragraph writing, Essay writing, Proposal writing.

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1.3.2 Business and personal correspondence (Letters) :
Kinds of letters:-
Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters. Application for a job, Resume.

1.3.3 Report writing and Note making and minutes writing.

1.4 Functional Grammer : Study of sentences and parts of speech (word class), Preposition, Verb, Articles, Abbreviations.

1.5 Vocabulary Building : Homophones, One word substitution, Idioms and Phrases.

1.6 Composition on narrative, descriptive, imaginative, argumentative, discussion and factual topics.

2. PART II : COMMUNICATION IN HINDI (10 Marks)

2.1 Development of comprehension and knowledge of Hindi usage through rapid reading and language exercises based on prescribed text material developed by IRDT.

2.2 Development of expression through ;

Letter writing in Hindi:
Kinds of letters:-
Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters, Application for a job, Press release in Hindi, Report writing.

Note: Paper should be in two parts, part I - English and part II Hindi.

REFERENCE BOOKS

1. Bookshelf worksheet of Professional Communication, New Delhi : Bookshelf 2008

2. Functional Skills in language and literature by R. P. Singh, New Delhi : Oxford University Press.

3. Oxford Engilsh Hindi English Dictionary, New Delhi : Oxford 2008

LANGUAGE LAB PRACTICE

For the practice/exercise the following is suggested :-

1.A. Phonetic transcription
B. Stress and intonation :
(At least 10 word for writting and 10 word for pronunciation)

2. ASSIGNMENT : (Written Communication)

Two assignment of approximately 400 word each decided by the teacher concerned.

THE FOLLOWING MODEL IS PROPOSED :

1. a picture/photograph
2. an opening sentence or phrase

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3. a newspaper/magzine clipping or report
4. factual writting which should be informative or argumentative.

(The students may refer to "Bookshelf worksheet" for technical communication)

3. Oral Conversation:

1. Short speeches/declamation : Bid farewell, Felicitate somebody, Celebrate a public event, Offer condolences
2. Debate on current problems/topics
3. MockInterview : Preparation, Unfolding of personality and Expressing ideas effectively
4. Group discussion on current topics/problems
5. Role Play/ general conversation : Making polite enquiries at Railway Station, Post Office, Banks and other Public places, Replying to such enquiries, enquiring about various goods sold in the market and discussing their prices. Complaining about service at Hotel, restaurant, Offering apologies in reply to such complaints, complain to a company about a defective product you have brought, reply to such complaints.
6. Presentation skill, Use of OHP and LCD.
7. Through drilling of model words involving different phonetic symbols (Vowels, Consonants, Difthongs).

4. Aural :

Listening to conversation/talk/reading of short passage and then writting down the relevant or main points in the specified number of words and answering the given questions

The assignments/project work are to be evaluated by the internal/ external examiner. The distribution of 30 marks e.g.

10 marks for assignment (Given by subject teacher as sessional marks)
10 marks for conversation and viva-voce
10 marks for phonetic transcription

STRUCTURE OF THE PAPER OF PROFESSIONAL COMMUNICATION

Distribution of Marks

Theory Paper : 50 Marks
Sessional : 20 Marks
Pratices : 30 Marks

Q1. Question based on the topics of the prescribed syllabus will be set for testing candidates ability to understand the content, explain words and phrases, making sentence of given words and ability to summarise will be included. All questions will have to be answered.

A.	from English Text Book	10 Marks
B.	from Hindi Text Book	5 Marks

Q2. Candidates will be required to write one letter (English) and one letter in (Hindi) from a choice of two -

A.	English Letters	5 Marks
B.	Hindi Letters	5 Marks

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Q3. Report Writting on given outlines 5 Marks

Q4. There will be a number of short answer questions to test the candidates knowledge of functional grammer, structure and usage of the language. All the items in this question will be compulsory. The grammar questions has four parts -

(Total Part: A For 5 Marks, B For 3 Marks, C For 3 Marks and D For 4 Marks)

A. This part of the question has to do with the transformation of sentences. English uses several patterns of sentence formation and the same meaning can be expresed by several patterns e.g. Active to Passive voice and vice versa, Direct to Indirect and vice versa, Reframing sentences by changing part of speech e.g Noune to Adjective, Interchanging degree of comparison.

Interchanging Moods - Affirmative to Negative, Assertive to Interrogative or to exclamatory

B. The second part usually requires blanks in a sentence to be filled in with a suitable preposition and articles.

C. The third part is usually an exercise on tenses.

D. The fourth part concerns with one word substitution and abbrevation, uses of idioms and Phrases, Homophones.

Q5. COMPOSITION : (About 300 Words) (5 marks)

Candidates will be required to select one composition topic from a choice of five. The choice will normally include narrative descriptive, argumentative, discussion and factual topics. The main ceteria by which the composition will be marked are as follows

A. the quality of the language employed, the range and appropriateness of vocabulary and sentence structure the correctness of grammatical construction, punctuation and spelling.

B. The degrees to which candidate have been successfully in organising both the composition as a whole and the individual paragraphs.

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1.2 APPLIED MATHEMATICS I(A)

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time L	T	P
1.	Algebra- I	8	3	-
2.	Algebra- II	8	3	-
3.	Trignometry	6	2	-
4.	Differential Calculus-I	10	3	-
5.	Differential Calculus-II	10	3	-
		42	14	-

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)

1.1 Series : AP and GP; Sum, nth term, Mean

1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. ALGEBRA-II:(10 Marks)

2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.

2.2 Complex number.

Complex numbers, Representation, Modulus and amplitud Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. TRIGONOMETRY :(8 Marks)

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relation ship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I : (12 Marks)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

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4.2 Methods of finding derivative, - Function of a function, Logaritimic differentiation, Differentiation of implicit functions.

5. DIFFERENTIAL CALCULUS -II :(10 Marks)

5.1 Higher order derivatives, Leibnitz theorem.

5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.

5.3 Application - Finding Tangants, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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1.3 APPLIED PHYSICS-I

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject,teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Units & Dimensions	3	1	-
2.	Errors in Measurement	3	1	-
3.	Circular Motion	4	1	-
4.	Motion of Planets	4	1	-
5.	Dynamics of rigid body (Rotational Motion)	5	1	-
6.	Fluid Mechanics and Friction	4	1	-
7.	Friction	4	1	-
8.	Harmonic Motion	5	2	-
9.	Heat & Thermodynamics	6	4	-
10.	Acoustics	4	1	-
		42	14	-

DETAILED CONTENTS:

1. Units and Dimensions (4 Marks)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogenity of dimensions and applications of homogenity principle to:

i) Checking the correctness of physical equations,

ii) Deriving relations among various physical quantities,

iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measuremnts, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement(Combination of erros in addition, substraction, multipication and powers). Significant figures, and order of accuracy in respect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizental and Vertical cases),angular velocity,angular acceleration and centripetal acceleration.Relationship between linear and angular velocity and acceleration. Centripetal and

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centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES :(5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kapler's Law, Escope and orbital velocity, Time period of satellite, Geo-stationary, Polar satellites (Concept Only)

5. Dynamics of Rigid Body (Rotational Motion) (6 Marks)

Rigid body,Rotational motion, Moment of inertia,Theorems(Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindercal),Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane . Concept of Fly wheel.

6. Fluid Mechanics :(5 Marks)

Surface tension, Capillary action and determination of surface tension from capilary rise method, Equation of continuity (A1V1=A2V2), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction :(4 Marks)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. Harmonic Motion (6 Marks)

Periodic Motion , characterstics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat & Thermodynamics: (6 Marks)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. Acoustics (5 Marks)
Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Accoustics of building defects and remedy.

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1.4 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L	T	P
6	-	4

Rationale:

Engineering Chemistry has profound and deep relationship with the industrial and environmental technology. This curriculum intends to impart technical knowledge alongwith productive practice to the students of the diploma engineering. The teachers are expected to guide the students in the classroom and the laboratories according to the curriculum by demonstrations and by showing relevant materials and equipments to inculcate interests in learning among students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Atomic Structure	4	-	-
2	Chemical Bonding	6	-	-
3.	Classification of Elements	4	-	-
4.	Electro Chemistry-I	7	-	-
5.	Electro Chemistry-II	8	-	-
6.	Chemical Kinetics	4	-	-
7.	Catalysis	4	-	-
8.	Solid State	4	-	-
9.	Fuels	4	-	-
10.	Water Treatment	6	-	-
11.	Colloidal State	4	-	-
12.	Lubricants	4	-	-
13.	Hydrocarbons	7	-	-
14.	Organic Reactions & Mechanism	8	-	-
15	Polymers	4	-	-
16	Synethetic Materials	6	-	-
		84	-	56

DETAILED CONTENTS:

1. ATOMIC STRUCTURE :(3 MARKS)

Basic concept of atomic structure, Matter wave concept, Quantum number, Haisenberg's Uncertainty Principle, Shaples of orbitals.

2. CHEMICAL BONDING :(4 MARKS)

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS :(3 MARKS)

Modern classification of elements (s,p,d and f blcok elements), Periodic properties : Ionisation potential electro negativity, Electron affinity.

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4. ELECTRO CHEMISTRY-I:(3 MARKS)

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II:(3 MARKS)

Redox reactions, Electrode potential(Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.

6. CHEMICAL KINETICS :(3 MARKS)

Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.

7. CATALYSIS :(2 MARKS)

Definition Characteristics of catalytic reactions, Catalytic promotors and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE :(2 MARKS)

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS :(3 MARKS)

Definition, its classification, high & low Calorific value.Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Disel and Petrol), Benzol and Power alchol. Knocking, Anti-knocking agents, Octane number and Cetane number.

Cracking and its type, Gasoling from hydrogenation of coal (Bergius process and Fischer tropsch's process)

Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.

Numerical Problems based on topics

10. WATER TREATMENT :(3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embritlement, primming and

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foarming in biolers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorinational, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER :(3 MARKS)

Concept of collidal and its types, Different system of colloids, Dispersed phase and dispersion medium.
Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, tyndal effect, Electro phoresis and coagulation. relative stability of hydrophillic and hydrophobie colloids. Protection and protective colloids. Emulsion, Types, preparation,properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS :(3 MARKS)

Definition, classification, Necessasity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compunds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS:(4 MARKS)

A. Classification and IUPAC nomeuclature of organic compounds hamologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. ORGANIC REACTIONS & MECHANISM:(4 MARKS)

1. Fundamental auspects -

   A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
   B. Inductive effect, Mesomeric effect, Electromeric effect.

2.A. Mechanism of addition reaction (Markonicove's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophillic) hydrolysis of alkyle halide, electrophillic substitution halogenation, Sulphonation, Niration and friedel-Craft reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehyrohalogenation of primary alkyl halide.

15. POLYMERS :(3 MARKS)

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)

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2. Thermosetting and Thermoplastic resen -

A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers(Silicon)

16. SYNETHETIC MATERIALS :(4 MARKS)

A. Introduction - Fats and Oils
B. Saponification of fats and oils , Manufacturing of soap.
C. Synthetic detergents, types of detergents and its manufacturing.
3. EXPLOSIVES: TNT, RDX, Dynamite.
4. Paint and Varnish

LIST OF PRACTICALS

1. To analyse inorganic mixture for two acid and basic radicals from following radicals

A. Basic Radicals :

NH4+, Pb++, Cu++, Bi+++, Cd++, As+++, Sb+++,

Sn++, Al+++, Fe+++, Cr+++, Mn++, Zn++, Co++

Ni++, Ba++, Sr++, Ca++, Mg++

B. Acid Radicals :

CO3--, S--, SO3--, CH3COO-, NO2-,

No3- , Cl-, Br_ , I- , So4--

2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.

3. To determine the total hardness of water sample in terms of CaCo3 by EDTA titration method using Eriochroma black-T indicator.

4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalium as indicator.

5. To determine the Chloride content in supplied water sample by using Mohr's methods.

6. Determination of temporary hard ness of water sample by O-Hener's method.

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1.5 ENGINEERING DRAWING

[Common to Three years Diploma Course in Civil Engg., Electrical Engg., Chemical Engg., Dairy, Ceramic, Textile Technology, Textile Chemistry]

[Also Common to Four year Part-time Diploma Course in Electrical Engineering, Mechanical Engineering (Specilization in Production Engineering)]

[Also common to First year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology]

L	T	P
-	-	14

Rationale

Drawing, which is known as the language of engineers, is a widely used means of communication among the designers, engineers, technicians, draftmen and craftmen in the industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. Thus, for the effective and efficient communication among all those involved in an industrial system, it becomes necessary that the perosonnel working in different capacities acquire appropriate skills in the use of this graphic language in varying degrees of proficiency in accordance with their job requirements.

Generally speaking, an engineering technician working at the middle level of the threetier technical manpower spectrum, is required to read and interpret the designs and drawings, providedto him by technologists and subsequently to translate them to the craftsmen for actual execution of the job.

This course in Engineering Drawing has been designed, keeping in view, the above refered job functions of a technician in the industry. This preliminary course aims at building a foundation for the further courses in drawing and other allied subjects. The contents of the course have been selected as to form a core for the various deversified fields of engineering. It is expected that at the end of this session, the students acqures sufficient skill drafting and some ability in spetial visualization of simple objects.

Sl.N.		Units	Coverage Time L	T	P
1.		Drawing Instruents and their use	-	-	4
2.	A.	Lettering techniques	-	-	16
	B.	Introduction to scales	-	-	8
3.		Conventional Presentation	-	-	8
4.	A.	Principles of projections	-	-	12
	B.	Point Line, Plane	-	-	28
5.		Orthographic projection of simple geometrical solids	-	-	12
6.		Section of Solids	-	-	20
7.		Isometric Projection	-	-	20
8.		Free Hand Sketching	-	-	8
9.		Development of surfaces	-	-	24
10.		Orthographics Projection of Machine Parts	-	-	12
11.		Practice on Auto Cad	-	-	24
			-	-	196

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C O N T E N T S

NOTE : Latest Indian Standards Code of Practice to be followed.

1. Drawing, instruments and their uses. 1 Sheet

1.1 Introduction to various drawing, instruments. 1

1.2 Correct use and care of Instruments.
1.3 Sizes of drawing sheets and their layouts.

2. (a) Lettering Techniques 2 Sheet

Printing of vertical and inclined, normal single stroke capital letters.

Printing of vertical and inclined normal single stroke numbers.

Stencils and their use.

(b) Introduction to Scales 2 Sheet

Necesssity and use, R F

Types of scales used in general engineering drawing. Plane, diagonal and chord scales.

3. Conventional Presentaion : 1 Sheet

Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.

4. (a) Principles of Projection 1 Sheet

Orthographic, Pictorial and perspective.

Concept of horizontal and vertical planes.

Difference between I and III angle projections.

Dimensconing techniques.

(b) Projections of points, lines and planes. 1 Sheet

5 (a) Orthographic Projections of Simple 2 Sheet

Geometrical Solids
Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with referance planes.

(b) Orthographic views of simple composite solids from their isometric views.

(c) Exercises on missing surfaces and views

6. Section of Solids 2 Sheet

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Concept of sectioning

Cases involving cutting plane parallel to one of the reference planes and prependicular to the others.

Cases involving cutting plane perpendicular to one of the reference planes and inclind to the others plane, true shape of the section

7. Isometric Projection. 2 Sheet

Isometric scale

Isometric projection of solids.

8. Free hand sketching 1 Sheet

Use of squared paper

Orthographic views of simple solids

Isometric views of simple job like

carpentary joints

9. Development of Surfaces 2 Sheet

Parallel line and radial line methods of developments.

Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).

10. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: 2 Sheet

Nut and Bolt, Locking device, Wall bracket

11. PRACTICE ON AUTO CAD : 2 Sheet

Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode.Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

NOTE :

A. The drawiang should include dimension with tolerence whereever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure

B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

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1.6 APPLIED MECHANICS AND MACHINE COMPONENTS

L	T	P
4	1	3

RATIONALE

The subject Applied Mechanics deals with fundamental concepts of mechanics which are useful for the students for further understanding of the second & final year subjects like S.O.M. and theory and design of steel & masonry structures as well as RCC designs. The subject enhances the method ability of the students.

TOPIC WISE DISTRIBUTION OF PERIODS

SL.No.	Topic	L	T	P
1.	Introduction	2	-	
2.	System of Forces	5	1	
3.	Moment and Couple	5	1	
4.	General Condition of Equilibrium	4	1	
5.	Friction	4	1	
6.	Thermal Engineering			
A.	Sources of Energy	3	1	-
7.	Machine Components			
i.	Pins, Cotter & Knuckle Joints	4	1	
ii.	Keys, Key Ways, Splines On Shafts	4	1	-
iii.	Shafts, Collars, Cranks & Eccentrics	4	1	-
iv.	Couplings & Cluches	4	1	-
v.	Bearings	4	1	-
vi.	Gears	4	1	-
vii.	Springs	3	1	-
viii.	Transmission of Motion	3	1	-
8.	Mechanisms	3	1	-
	Total	56	14	42

DETAILED CONTENTS

1. Introduction:

Mechanics and its utility. Concept of scaler and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

2. System of Forces :

Concept of coplaner and non-coplaner forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a praticle,conditions of equilibrium of coplaner concurrent force system.

3. Moment & couple:

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* Concept of Varignon's theorem. Generalised theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple ; Simple applied problems such as pulley and shaft.

4. General Condition of Equilibrium:

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law of equilibrium, moment law of equilibrium application of above on body.

5. Friction:

Types of friction:statical,limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on eqilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

6. Thermal Engg.

A. SOURCES OF ENERGY:

Definition, Concept of thermodynamic system and surroundings, Closed system, Open system, Isolated system, Thermodynamics definition of work.Zeroth low of thermodynamics

Basic ideas, conventional and nonconventional forms-Thermal, Hydel, Tidal, wind, Solar, Biomass and Neuclear and their uses.

7. MACHINE COMPONENTS:

Brief Idea of loading on machine components.

(i) Pins, Cottor and Knuckle Joints.

(ii) Keys, Key ways and spline on the shaft.

(iii)Shafts, Collars, Cranks, Eccentrics.

(vi) Couplings and Clutches.

(v) Bearings-Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearings and their applications. Selection of ball bearing and roller bearing for given application using design data book.

(vi) Gears :

Different types of gears, gear trains and their use for transmission of motion. Determination of velocity ratio for spur gear trains; spur gear, single and double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module.

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(vii) Springs:

Compression, Tension, Helical springs,Torsion springs, Leaf and Laminated springs. Their use and material. Selection of spring by design data book, simple numerical problem.

(viii)Transmission of Motion By Belts, Ropes & Pulleys, Chain & Sporckets :

Open and cross belt drive, determination of velocity ratio. Effect of thickness and slip on the velocity ratio (Concept only, No mathematical treatment), Method of prevention of slip. Determination of velocity ratio in compound belt drive, use of stepped pulley. Classification and uses of ropes in transmission operation. Chains and their classifications, their application in power transmission, their comparison with other drive systems

8. MECHANISMS:

Definition of link, Frame and mechanism. Difference between machine and machanism, kinematic pairs, lower and higher pairs. Velocity diagram for four bar mechanism, slider crank mechanism, quick return mechanism. Introduction to Cam and its use.

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APPLIED MECHANICS AND MACHINE COMPONENTS : Practicals

1. To verify the law of Polygon of forces.

2. To verify the law of parallelogram and triangle of forces.

3. To verify the law of principle of moments.

4. To find the coefficient of friction between wood,steel, copper and glass.

5. To find the reaction at supports of a simply supported beam carrying point loads only.

6. Study and demonstration of the following

1. (a) Bio Gas Plant.
   (b) Wind Mill.
   (c) Solar Cooker.
   (e) Voltaic Cell Type Soalr Energy Converter.

2. Key's, Key ways and Splined shaft e.g. Jib head key, Flat key, Saddle key, Woodruff key, Feather key, Pin key, Splined shaft.

3. Pins- Split pin, Taper cotter type split pin, Cottor pin, Foundations Bolts- Lewis rag bolt, Fish tail bolt and Square head bolt.

4. Friction clutch and Coupling- Cone cluch, Plate cluch (Single Pair); Muff coupling, Flange coupling, Universal or Hook's joint coupling. Flexible coupling- Belt and Pin Type, Coil spring type.

5. Bearings- Plane, Bush, Split step bearings, Ball Roller bearings, Thrust bearings.

6. Gears- Spur gear, Single and Double herical gears, Bevel gears.

7. Gear Trains- Simple spur gear train, Compound gear train, Epicyclic gear train.
8. Compressor and Tension helical springs.

9. Slider Crank Mechanism.

Performance Practicals:
10. Determine the angle covered in forward and return stroke of Quick Return Mechanism of available shaper in machine shop.
11. Estimate the amount of ash and moisture in given sample of coal or coke

NOTE:-
Field visits are recomended for equipments not available in the institution such as biogas plant, wind mill. No need to purchase them. No actual installation of this lab in a separate room wanted. Equipment of this lab can be accommodated in applied mechanics lab or else where.

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II Semester

2.1 APPLIED MATHEMATICS I (B)

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time L	T	P
1.	Integral Calculus-I	12	4	-
2.	Integral Calculus-II	12	4	-
3.	Coordinate Geometry (2 Dimensional)	10	3	-
4.	Coordinate Geometry (3 Dimensional)	8	3	-
		42	14	-

DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I : (14 Marks)

Methods of Indefinite Integration :-

1.1 Integration by substitution.

1.2 Integration by rational function.

1.3 Integration by partial fraction.

1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :(14 Marks)

2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.

2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.

2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):(14 Marks)

3.1 CIRCLE :

Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

3.2 Standard form and simple properties

Parabola x2=4ay, y2=4ax,

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Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):(8 Marks)

4.1 Straight lines and planes in space -

Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),

4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz = d$ (Radius, Centre and General Equation)

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2.2 APPLIED PHYSICS-II

[Common to All Engineering Courses]

L	T	P
3	2/2	4

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject,teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Optics	4	1	-
2.	Introduction To Fiber Optics	4	1	-
3.	Laser & its Application	4	1	-
4.	Electrostatics	4	1	-
5.	D.C. Circuits	4	1	-
6.	Magnetic Materials & Their Properties	4	1	-
7.	Semi Conductor Physics	4	1	-
8.	Introduction Diode & Transistors	4	2	-
9.	Introduction To Digital Electronics	4	2	-
10.	Non-conventional energy sources	6	3	-
		42	14	56

1. Optics (4 Marks)

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Deotructive), Diffraction and Polarization (Concept Only), Law of Mallus and Polaroids.

2. Introduction To Fibre Optics :(5 Marks)

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications (4 Marks)

Absorbtion and Emission of energy by atom, Spontaneous and Stimulated Emission, Poluation inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :(4 Marks)

Coutomb's Law, Electric field, Electric potential, Potential energy, Capacator, Energy of a charged capacitor, Effect of dielectric on capacators.

5. D.C. Circuits (5 Marks)

Ohm's Law, Kirchoff's Law and their simple application,

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Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties: (5 Marks)

Dia, Para and Ferro-magnetism, Ferrites, Magnatic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

Concept of Energy bands in soldis, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semi conductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transister : (6 Marks)

Majority and Minority charge carriers,P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics : (6 Marks)

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources: (7 Marks)

(a) Wind energy : Introduction, scope and significance, measurement of wind velocty by anemometer, general principle of wind mill.

(b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

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PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.

2. Determination of 'g' by plotting a graph T2 verses l and using the formula g=4n2/Slope of the graph line

3. Determine the force connstant of combinationof springs incase of 1. Series 2. Parallel.

4. To verify the series and parallel combination of Resistances with the help of meter bridge.

5. To determine the velocity of sound with the help of resonance tube.

6. Determination of viscosity coefficient of a lubricant by Stoke's law.

7. Determination of E1/E2 of cells by potentio meter.

8. Determination of specific resistance by Carry Foster bridge.

9. Determination of resitivity by P.O.Box.

10. Verification of Kirchoff's Law.

11. To draw Characteristics of p-n Junction diode.

12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

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2.3 INTRODUCTION TO DAIRY ENGINEERING & TECHNOLOGY

L	T	P
5	4	-

Rationale :

As the name implies, this paper is to give beginner a ready and rough perception of mechanical engineering just to facititate his grasp of studies in the later years.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction To Dairy	30	26	-
2.	Introduction To Dairy Engineering	40	30	-
		70	56	-

DETAILED CONTENTS

1. INTRODUCTION TO DAIRY:

Dairy development in India and other country, Milk precurement, transportation. Principles of co-operative system in dairy development. Definition of market milk, milk industry in India and other coountries. Milk precurement and transportation. Co-operative dairies.

2. INTRODUCTION TO DAIRY ENGINEERING :

INTRODUCTION :

Sanitary features, sanitary pipes and fittings stainless steel pipes, glass pipes, plastic tubing, pipe and fitting standards, sanitary pipe and fitting. Sanitary pumps, centrifugal pump. Positive displacement pump specification, stuffing box, rotary seal. Maintenance used or dairy plant - Plastic, Rubber, Different types of stainless, glass, copper and other alloys

MILK RECEIVING EQUIPMENT:

Weigh can and receiving tank, chilling equipment, weighing and measuring milk standards. Canwashers-principles of operation. Trouble shooting and maintenance.

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2.4 ELEMENTARY WORKSHOP TECHNOLOGY
(Common With Mechanical Engineering)

L	T	P
5	-	-

Rationale :

The knowledge of " Workshop Technology " is very basis of mechanical engineering practice. For a beginner to technician course, familiarity with hand tools is a matter of utmost importance. The classroom teaching and a practice in shop will meet this need well.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	General Introduction	3	-	-
2.	Carpentry			
a.	Fundamentals of Wood Working Operations.	3	-	-
b.	Common Carpentry Tools	6	-	-
c.	Joining of timber Components	3	-	
3.	Metal Fabrication			
A.	Metal Shaping			
1.	Smithy	9	-	-
2.	Sheet Metal Working	9	-	-
B.	Metal Joining			
1.	Permanent Jointing	9	-	-
2.	Temporary Jointing	5	-	-
C.	Familiarity With Tools	5	-	-
4.	Protection of Fabricated Structure from Weather			
1.	Painting	5	-	-
2.	Varnishing & Polishing	3	-	-
5.	Foundry Work	5	-	-
6.	Machine Shop	5	-	-
		70	-	-

DETAILED CONTENTS

1. GENERAL INTRODUCTION:

(a) Scope of subject "Workshop Technology" in engineering.

(b) Different shop activities and broad division of the shops on the basis of nature of work done such as

(i) Wooden Fabrication (Carpentry)

(ii) Metal Fabrication (shaping and Forming, Smithy, Sheet metal and Joining-welding, Rivetting,Fitting and Plumbing.

(c) Organization and layout of workshop.
(d) General safety preaction in workshop

2. CARPENTRY :

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(a) Types of wood and timber, Cutting and seasoning of wood, Decaying of wooden component.

(b) Fundamental of wood working operations:

- Marking & Measuring.
- Holding & Supporting.
- Cutting & Sawing.
- Drilling & Boring.
- Turning.
- Jointing.

(c) Common Carpentry Tools:

Their classification, size, specification (name of the parts and use only).

(1) Marking and measuring tools:

Rules, try square, Bevel Square, Marking gauge, Mortise gauge, Scriber (marking knife). Combination set

(2) Holding and supproting Tools:

Carpentary vice, Bench hold fast, Bar clamp, Bench hook, Hand clamp C and G clamp.

(3) Cutting and Sawing Tools:

Saws: (Grip or Hand, panel, cross cut, Tenon, dove tail, compass, key hole and bow saw),

Chisel: (Firmer, dovetail, mortise and gauge),

Planes: (Wooden & Iron plane. Jack plane, Smoothing plane).

(4) Drilling and Boring tools: Auger, Gimlet, Hand drill, Brace and bits.

(5) Striking Tools: Mallet and Claw hammer.

(6) Turning Tools & Equipments: Wood working lathe and lathe tools.

(7) Miscellaneous Tools: Screw driver, Rasp, Pincer, Oil stone, Triangular file and Saw set.

(d) Joining of Timber Components For Fabrication Works:

Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet , Groove, Tongue, Dowel, operations in assembly-Simple lap and butt, Mortise, Tenon, Dovetail, Mitre & briddle joints. Uses of glue, dowelpin and screw in preparation of joints. Common defects likely to occur during and after joining, defects due to wrong use of tools, defects due to wrong operation, defects due to improper seasoning of timber-their identification and remedy. Safety (personal and equipment) to be observed.

3. METAL FABRICATION:

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(A) Metal Shaping :

Smithy:

(1) Operations involved (concept only)-Preparation of fire, Supporting and holding the metal, cutting the metal in size, heating, drawing down or fullering, usetting, swaging, bending, punching, blanking, drifting and forge welding,

(2) Tools and equipment used (Names, size, specification for identification only).

(3) Heating and fuel handling equipment-Smithy Forge, Blower, Shovel, Poker.

(4) Holding and supporting tools-Common tongs, anvil, swage block.

(5) Striking Tools-Ball pein, cross pein ,Straight pein double face and sledge hammers .

(6) Cutting tools - Hot and cold chisel and shear set.

(7) Punching & Drifiting Tools - Punch & Drift.

(8) Bending Tools and fixture.

(9) Forming & Finishing Tools - Fullers, Swage Flatters, Set hammers.

(10) Defects likely to Occur during and after operations their Identification and Remedy. Defects due to wrong operation , wrong tool and wrong heating.

(11) Safety of Personnel, Equipment & Tools to be observed.

(12) Study of forge hammers and power presses.

(2) Sheet metal working:

(I) Tools and Operation:

(1) Operations involved (Names and concept only) Laying out, marking and measuring,cutting, Shearing and blanking, Straightening bending and seaming, Punching and piercing , burring and stamping,

(2) Sheet metal joints - Lap, seam, Locked seam,hemp,wirededge, cup or circuler, Flange, angular and cap.

(3) Tools and equipments used (Name, size, specification for identification only).

(4) Marking Tools- Scriber, Divider and Trammel, Protractor, Trysquare, Dot punch, Steel Rule, Steel tape, Sheet metal gauge.

(5) Cutting and shearing Tools-hand Shear and lever, Snips, Chisels.

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(6) Straightening tool-Straight edge.

(7) Striking Tools-Mallet, Hammer.

(8) Holding Tools-Vice, Plier, C or G clamps, Tongs.

(9) Supporting Tools-Stakes and Anvil.

(10) Bending Tools-Crimpers, Form dies, Roundnose plier, Rails.

(11) Punching-Piercing and Drifting tools.

(12) Burring Tools-Files.

(13) Common defects likely to occur during and after operation-Their identification and remedy. Defects due to wrong operation or wrong tool.

(14) Safety of Personnel, Equipment & Tools to be observed.

(15) Development and estamination of sheet for simple articles.

(B) Metal Joining During Fabrication:

(1) Permanent Joining:

(a) (1) Welding methods-Forgewelding, gas welding (high and low pressure-oxyacetylene welding, types of flames.

(2) Electric welding- D.C. & A.C., Connected tools, operation, materials and safety measures.

(b) Soldering & Brazing:

For black Galvanised and Tincoated Iron sheet, brass and copper sheets only.

(1) Its concept, comparison with welding as joining method and classification, electric soldering and forge soldering.

(2) Soldering operation- edge preparation of joints, Pickling and degreasing, Fluxing, Tinning and Soldering.

(3) Materials Used-Common fluxes, soft and hard solder, solder wire (Plain and Resin core) and sticks, spelters and their specifications and discription (For Identification Only), forge soldering bits.

(4) Electric soldering iron.
(5) Common defects likely to occurs during and after soldering.
(6) Safety of Personnel, Equipment & Tools to be observed.

(c) Rivetting:

(1) Its comparison with welding as joining method.

(2) Rivets and Materials.

(3) Operation involved-Marking from given data, edge preparation, drilling and punching arrangements of joint elements (Lap, Butt with single cover plate and double cover plate) upsetting of rievet tail, shaping head and caulking.

(4) Tools and equipments used- (Names, Size, Specification and uses)-Supporting and holding tools (Stakes and Tonqs)-Striking tools-Ball pien, Straight pien and Cross pien hammers and head forming tools (Shapes), drills punches and solid punches, drift, elementary knowledge about working of pneumatic, hydraulic and electric rivetor.

(2) Temporary Joining (Fastners & Their Uses):

Introduction to

(1) Various types of Bolts (Names of prats and specification) and various types of washers and nuts used with them and their uses, material they are made of , studs and foundation bolts.

(2) Screws, keys, pins and cottors-their material and use.

(3) Pipe connectors-Sockets, elbows, tees, cross and bends, unions, volves, glands packing and operation in use of pipe connectors-cutting, marking, threading, pipe bending, joining different pipe line fittings- (Steps of operation only).

Tools and equipment used in their operations (Name, Size, Specification and Discription for Identification).

Supporting and holding tools-Pipe vices (Bench, leg and hand), Pipe wrenches, Spanners.

Cutting Tools- Hack saw and Pipe cutters.

Threading Tools- Pipe dies and Taps.

Materials Used for Joining-White lead, Cotton and Gasket.

Common defects lickely to occur during and after operation and their remedies.

(3) Familiarity with The Use of Various Tools Used In Mechanical Engineering Workshop:

Marking & Measuring:

Steel rule, surface gauge, marking block, protractor, trysquare, scriber, punches, divider and callipers,

surface plate, V. block, gauges- (screw, pitch, radius, feeler), Vernier callipers, Micrometer, Vernier height and depth gauge, use of dialgauge.

Holding Tools:

Vices (Bench, leg and hand vice), clamps tongs, pliers,

Cutting Tools:

Hack saw (Fixed and Adjustable framce), chisels-flat, cross cut, diamond, round nose.

Files:

According to section-Knife edge, Flat, Triangular round, Square, Half round,

According to grade - Rough, Bastard, Second cut, Smooth and Dead smooth,

Drills and Allied Tools:

Parallel and taper shank Twist drill,

Thread Cutting Tools:

Taps and Dies,

Miscellaneous Tools:

Wrenches, Keys, Spaners, Pliers, Screw drivers their specification and many others which have not been named for use in various shops. They should be shown physically to each student for famillarity.

4. PROTECTION OF FABRICATED STRUCTURES FROM WEATHER:

1. PAINTING:

Its need, Introduction to methods of paintings (Classification only); Mannual, Machine (spray) and dip painting at room temperature, operations involved-discription of steps only eg. surface preparation method for old and new surface in timber and iron structure-sanding, derusting, deqreasing, filling of pore and dents, paint application- manual, machine (spray and dip painting drying of paint air drying and oven drying under coat and filler material (red oxide, putty, yellow clay), surface preparation materials (sand and emery papers); tools and equipments used (Name, size specification for indification).

Brushes-Round and flat wire brush, scraper, trowel , spray gun, compressor.

Defects likely to occur in painting and their remedies

Safety of Personnel, Equipment & Tools to be observed.

2. VARNISHING & POLISHING:

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Its need operation involved (description of step only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and sprit polish,copal varnish. Defects likely to occur.

Safety of Personnel, Equipment & Tools to be observed.

5. FOUNDRY WORK:

Elementary idea of patterns, Types of moulds, sand and green sand moulds and moulding, tools and equipment used in green sand moulding.

6. MACHINE SHOP:

Introduction to machine tools viz lathe, drilling machine, shaper and planer simple line and block diagram of components and their functions. Brief concept of NC and CNC machines.

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2.5 WORKSHOP PRACTICE

[Common with Civil Engg., Civil Engg. (sp. in Rural Engg.), Electrical, Ceramic, Dairy, Agriculture, Chemical Technology (Rubber & Plastic), Chemical Technology (fertilizer), Four year chemical Engg.]

[Four year Past time Mechanical Engg. (sp. in Production Engg.)]

L	T	P
-	-	14

Rationale

A diploma holder in any branch of engineering has to work in between a skilled workman and an Engineer. In order to have effective control over skilled workmen it is necessary that the supervisory staff must have adequate knowledge and skill. For development of skills workshop practice is very essential.

Sl.No.	Units	Coverage L	T	Time P
1.	Carpentry shop	-	-	20
2.	Painting & polishing shop	-	-	16
3.	Sheet metal and soldering shop	-	-	56
4.	Fitting shop, Plumbing & Fastening Shop	-	-	24
5	Foundry shop			20
6.	Smithy shop	-	-	24
7.	Welding shop	-	-	20
8.	Machine shop	-	-	16
		-	-	196

DETAILED CONTENTS

1. Carpentry Shop :

EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood

EX-2 Planing and sawing practice

EX-3 Making of lap joint

EX-4 Making of mortise and tenon joint

Ex-5 Making of any one utility article such as wooden-picture frame, hanger, peg, name plate, etc.

2. Painting and Polishing Shop:

EX-1 Introduction of paints, varnishes, Reason for surface preparation, Advantange of painting, other method of surface coating i.e. electroplating etc.

EX-2 To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Ex-3 To prepare metal surface for painting, apply primer and paint the same.

EX-4 To prepare a metal surface for spray painting,first spray primer and paint the same by spray painting gun and compressor system.

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* The sequence of polishing will be as below:
i) Abrassive cutting by leather wheel.
ii) Pollishing with hard cotton wheel and with polishing material.
iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

EX-1 Introduction and Types of sheets, measuring of sheets
EX-2 Study and sketch of various types of stakes/anvil.
EX-3 Introduction & demonstration of tools used in Sheet metal working shop.
EX-4 Cutting, shearing and bending of sheet.
EX-5 To prepare a soap case by the metal sheet.
EX-6 To make a funnel with thin sheet and to solder the seam of the same.
EX-7 To make a cylinder and to solder the same.
EX-8 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.
EX-9 To braze small tube/conduit joints.

4. Fitting Shop, Plumbing Shop & Fastening Shop:

EX-1 Study of materials, limits, fits and toterances.
EX-2 Introduction & demonstration of tools used in Fitting Shop.
EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.
EX-4 Making bolt & nut by tap and die set and make its joints
Ex-5 To drill a hole in M.S. Plate and taping the same to creat threads as per need.
EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.
EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.
EX-8 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.
EX-9 Practice of bolted joints
EX-10 To prepare a rivetted joint
EX-11 To make a pipe joint
EX-12 To make a threaded joint
EX-13 Practice of sleeve joint

5. Foundry Work

Ex-1 Study of metal and non metals
Ex-2 Study & sketch of the foundry tools.
Ex-3 Study & sketch of cupula & pit furnace.
Ex-4 To prepare the green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)
Ex-5 Casting of non ferous (lead or aluminium) as per exercise 3.

6. Smithy Shop :

EX-1 Study & Sketch of Tools used in smithy shop.
EX-2 To prepare square or rectangular piece by the M.S. rod.

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EX-3 To make a ring with hook for wooden doors.
EX-4 Utility article-to preapre a ceiling fan hook.

7. Welding Shop :

EX-1 Introduction to welding, classinfication of welding, types of weld joints.
EX-2 Welding practice-gas and electric.
EX-3 Welding for lap joint after preparing the edge.
EX-4 Welding of Butt joint after preparation of the edge.
EX-5 'T' joint welding after preparation of edge.
EX-6 Spot welding, by spot welding machine.

8. Machine Shop

EX-1 Study & sketch of lathe machine.
EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines
Ex-2 Plain and step turning & knurling practice.
Ex-3 Study and sketch of planning/Shaping machine and to plane a Ractangle of cast iron.

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2.6 FIELD EXPOSURE-1

The purpose of this course is to train the students to learn working in factory situations under supervision of factory staff and polytechnic staff. The whole department faculty should be deputed for this purpose.

Head of faculty should procure seats for giving summer training for students with the assistance of Director, Board of Apprenticeship Training.

A small project like study of material handling system, Plant layout study, Inventory control, Work study, Process control rejection and rework study, Inspection system and Quality control, etc. may be alloted.

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III Semester

3.1 ELECTRICAL TECHNOLOGY & ELECTRONICS

(Common With Mechanical Engineering)

L	T	P
5	2	4

Rationale :

The superiority of electricity as power over other means in use in home or industry can not be denied. So it is imperative to introuce the mechanical engineering students with electrical machines and their various uses.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Electric Induction	4	-	-
2.	A. C. Theory	6	-	-
3.	Three Phase Circuits	6	-	-
4.	Measurement & Measuring Instruments	10	-	
5.	Electronics	10	-	-
6.	D. C. Machines	8	-	-
7.	Transformers	6	-	-
8.	Synchronous Machines	6	-	-
9.	Induction Motors	6	-	-
10.	Electro Heating	4	-	-
11.	Electro Plating	4	-	-
		70	28	56

DETAILED CONTENTS

1. ELECTRIC INDUCTION:

Faraday's Laws of electromagnetic induction. Self and mutual induction. Statically and Dynamically induced e.m.f., Lenz's law. Fleming's left hand and right hand rule.

2. A. C. THEORY:

Production of alternating e.m.f. Definition of cycle, Frequency, Amplitude, Time period, Instantneous, Average, R.M.S. maximum values of sinosoidal wave. Form factor, peak factor.

Representation of a sinosoidal quantity by a mathematical expression and phasor, phase and phase difference, Relationship of voltage and current for pure resistance, pure inductance and pure capacitive reactance,impedance. Solution and phasor diagrams of simple R.L.C. series and parallel circuits. Active and reactive power. Significance of P.F.

3. THREE PHASE CIRCUITS:

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Production of Three phase voltage, advantages of three phase supply. Concept of star and delta connections. Relationship between phase and line values of currents and voltages, Power in three phase circuits, simple numerical problems.

4. MEASUREMENT & MEASURING INSTRUMENTS:

(i) Primary and secondary instruments-Indicating, Recording and Integrated instruments.

(ii) Working principle and construction of the following instruments.

(a) Ammeter & Voltmeter (Moving coil & Moving Iron). Extension of their ranges.

(b) Dynamometer type wattmeter.

(c) Single Phase A. C. Engery Meter.

(iii) Measurement of power in a single phase and three phase circuits by wattmeter, Use fo digital multimeter for measurement of voltage, Current and testing of devices.

5. ELECTRONICS:

Basic idea of semi conductors P & N type. Semi conductor diodes, Zener diodes and their applications in rectifiers. Transistors-PNP and NPN-their characteristics and uses at an amplifier (Brief description only). Prniciple characteristics and application of SCR. Devices like UJT, FET, DIAC, TRIAC (Brief introduction, Introduction to operational amplifier, Introduction to basic logic gates and microprocessors.

6. D. C. MACHINES:

D. C. Generator:

Working principle, Constructional details, e.m.f. equation, Types of generators and their applications.

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D. C. Motor:

Working principle, Back e.m.f., Types of D. C. motor and elementary idea of their characteristics. Torque equation, Methods of speed control (Description Only).

7. TRANSFORMERS:

Working principle and constructional details of a single phase and 3 phase transformers, e.m.f. equation, Losses and efficiency, Cooling of transformers, Elementry idea of auto transformers and welding transformers.

8. SYNCHRONOUS MACHINES:

(a) Alternators:

Working principle, Types of alternators, Constructional details, E.M.F. equation, Condition for parallel operation.

(b) Synchronous MOtors:

Working principle, Constructional details, Vector diagram, Effect of excitation on armature current and power factor, Synchronous condenser.

9. INDUCTION MOTORS:

(a) Three Phase Induction Motors:

Working principle and constructional details-Types of induction motors-Slipring and Squirrel cage. Slip in induction motors. Speed torque characteristic, Starting and speed control. Application of induction motors in industry. General faults and their remedies.

(b) Single Phase Induction Motors:

Working principle and constructional details and application of single phase motors (Split phase, Capacitor start and Run Motor). A. C. series motors, General faults and their remedies.

10. ELECTRO HEATING:

Types of electro heating. Brief description of resistance ovens and induction furnace and core furnaces.

11. ELECTROPLATING:

Importance of electroplating, Principle of electroplating and equipement used. Processes used in electroplating, Anodising.

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ELECTRICAL TECHNOLOGY & ELECTRONICS LAB

1. To change the speed and direction of rotation of d.c. shunt motor by

   (a) Armature control method.
   (b) Field control method.

2. To change the speed and direction of rotation of d.c. compound motor by

   (a) Armature control method.
   (b) Field control method.

3. To measure the terminal voltage with variation of load current of

   (a) D.C. shunt generator.
   (b) D.C. compound generator.

4. To perform load test on a single phase transformer and determine its efficiency.

5. To start and run a induction motor by

   (a) Star Delta Starter.
   (b) Auto Transformer Starter.

6. To measure slip of an induction motor by direct loading.

7. To start and change the direction of rotation of an induction motor.

8. To measure transformation ratio of a single phase transformer.

9. To measure power and P.F. in a single phase circuit by Ammeter, Voltmeter and Wattmeter.

10. To measure power and P.F. in a 3 phase/A.C. circuit by two wattmeter method.

11. To calibrate a single phase energy meter at different P.F.'s and different loads.

12. To locate the faults in an electrical machine by a megger.

13. To connect a fluorescent tube and note its starting and running current.

14. To draw characteristics od Silicon Controled Rectifier (SCR).

15. Testing of electrical devices - Zenor, Diode, Transistor, FET, UJT, SCR.
16. Use of operational amplifier as adder, substractor, comparator, differentiator and integrators.

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3.2 STEAM ENGINEERING & HEAT ENGINES

L	T	P
5	1	-

Rationale :

The heat energy is still a major means of power in the world. Knowladge of Steam Engg. and Heat Engines is very important for Dairy Engineers. The paper presents a introduction to sources of heat and its application.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
	STEAM ENGINEERING:			
1.	Steam generators.	12	2	-
2.	Boiler draught.	8	2	-
3.	Boiler performance.	8	2	-
	HEAT ENGINES:			
4.	Heat Transfer	12	2	-
5.	Reciprocating steam engine	8	2	-
6.	I.C. Engines.	12	2	-
7.	Condensers	10	2	-
		70	14	-

DETAILED CONTENTS

STEAM ENGINEERING

1. STEAM GENERATORS:

Classification of Boilers, Differnce between fire tube and water tube boilers. Names of different types of boilers used in dairy plants, their merits and demerits. Principle of working of economic boilers, electric steam boilers. Function and working of different boiler mountings and accessories (simple line diagrams.)

2. BOILER DRAUGHT:

Purpose of draught, Concept of different types of draught such as natural, induced and forced draught.

3. BOILER PERFORMANCE:

Boiler trail, equivalent evaporation rating of boiler, thermal efficiency. sources of energy and simple numerical problems on boiler trails, boiler management and maintenance, selection of boilers, importance of boiler testing. Boiler safety problems in boiler operation, their identification, remedies and repair and maintenance.

HEAT ENGINES

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4. HEAT TRANSFER :

Conduction and convection, Concept of heat transfer through combined effect, Mean temperature difference for parallel and counter flow. Effectiveness of heat exchangers. Simple numerical problems for heat transfer (Heating and Cooling).

5. RECIPROCATING STEAM ENGINE

Working principle. A brief concept of engine details.

6. I.C. ENGINES:

Definition and their classification, principle of operation, 4-stroke and 2-stroke I.C. Engines (petrol and Diesel). General idea of mixture formation. Purpose and use of fuel equipment. Ignition, Importance of cooling and lubrication.

7. CONDENSERS:

Types of condensers. Importance of condenser in a steam power plant. Principle of working of a surface and jet condenser with simple line diagrames. (details not required.) Simple calculations related to condensers.

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3.3. DAIRY ENGINEERING - I

L	T	P
5	2	10

Rationale :

Milk is an important ingradient for health and therefore it is universally utilised by human being of all age groups. The supply terminals are normally satuated at distant places from the processing units. Therefore effective methods of milk collection and storage are required to avoid microbiological contamination of milk . The students are required to be trained in handling of milk at preprocessing stage.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Storage equipment.	15	6	-
2.	Heat exchanging equipments.	25	10	-
3.	Installation of infloor and on floor conveyor.	15	6	-
4.	Filling & Packaging Equipment	15	6	-
		70	28	140

DETAILED CONTENTS

1. STORAGE EQUIPMENT:

Insulated storage tank. refrigarated storage tanks specification for the storage tanks. Milk transport tank. Milk processing equipments, filters, clarifiers. Bactofuge. separators-warm milk seprators, cold milk spearators, Triprocess and self desludging centrifugals. Bottle washers, purpose and types, operation, maintenance and trouble shotting.

2. HEAT EXCHANGING EQUIPMENT:

Pasteurizing plants, purpose and special requirement. High temperature short time pasteurizer, utilities, regeneration, holding time. Metering pump and drive F.D.V. UHT (Ultra High Temperature) Pasteurizers. Flavour treating systems. Vaceator. Electric conduction pasteurization. direct steam heater. Milk sterlization. Indirect heating system, comparision between them.

3. INSTALLATION OF INFLOOR AND ONFLOOR CONVEYOR:

Different types of conveyors used in dairy industry, their drives, take up units. conveyor components, Case stackers and unstackers, platising milk cases, handling of dispenser milk containers, handling of ice cream.

4. FILLING AND PACKAGING EQUIPMENTS :

Different types of filling and packaging materials, their

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composition and usesBottle filler, Flexible packaging, Gravity fillers, Asceptic fillers, Satchet machines, Care and maintenance of fillers, Asceptic canning.

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3.4 DAIRY TECHNOLOGY -I

L	T	P
5	2	10

RATIONAL

TO manufacture various milk products from the milk. Various processes are done. The student is expected to posses the knowledge and methods to produce the quality milk products of BIS standards.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Milk Reception.	15	5	-
2.	Processing of milk.	15	5	-
3.	Cream separation.	10	5	-
4.	Butter.	10	5	-
5.	Ghee & Butter Oil	8	3	-
6.	Indigenous milk products.	12	5	-
		70	28	140

DETAILED CONTENTS

1. MILK RECEPTION:

   Raw milk receiving at reception docks-platform tests and quality control tests of milk. weighing and recording of milk and receiving tank, road tankers, storage tanks, can washers. different types of milk pumps.Can washing manual and Mechanical.

2. PROCESSING OF MILK:

   Milk chilling, milk filtration and clarification, milk pasteurisation, U.H.T. and vaccum pasturizaion. Bottle washing,fluid milk filling, Bulk canfilling Homogenisation of milk, storage of milk.

3. SPECIAL MILK AND CREAM SEPARATION:

   Special milk-tonned, double tonned, recombined, standardised milk, flavoured and chocolate milk and sterlised milk. Separation of cream, different types of creams. Vitamin "D" milk.

4. BUTTER:

   Conversion of cream in to butter, Equipment for butter making in Dairy industry, packing and storage of butter. Attributes of butter, its keeping quality. Renovation of spoiled butter. Defects in butter quality, causes and remedies.

5. GHEE & BUTTER OIL:

   Manufacturing process of ghee and butter oil from fresh

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cream. Cultured cream and butter, ghee making equipments. Ag mark: for Ghee.

6. INDIGENOUS MILK PRODUCTS:

Preparation of khoa, channa, panir, dahi and Srikhand. BIS standards for milk and milk products.

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3.5 DAIRY CHEMISTRY

L	T	P
5	1	6

Rationale :

Several milk products are manufactured from milk. The quality and variety of finished rpoducts require a qualitative and quantitative study of composition of milk. The student having knowledge about the initial essential constituents of milk like proteines, lactose, engymes, etc, will be very useful for milk processing plants.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Composition of Milk	10	2	-
2.	Physical Properties of milk	10	2	-
3.	Milk fat	8	2	-
4.	Milk proteins	6	1	-
5.	Lactose	6	1	-
6.	Enzymes	6	1	-
7	Vitamins and Pigments in milk	6	1	-
8.	Composition & Physico Chemical changes	8	2	-
9.	Minor Constituents	8	2	-
		70	14	84

DETAILED CONTENTS

1. COMPOSITION OF MILK:

Average gross composition of colostrum and milk of cow, buffalo, sheep and goat. Detailed composition of cow milk; factor affecting the composition of milk; basic differences between cow and buffalo milks.

2. PHYSICAL PROPERTIES OF MILK:

Colour,specific gravity,index of refraction,surface tension, vicosity, spesific heat and its significance in dairy industry, boiling point and freezing point ; acidity, pH and buffering capacity. Electrical conductivity, Osmotic pressure of milk.

3. MILK FAT:

Composition of milk fat; factors affecting composition of milk fat quality; physico-chemical constants of butter fat; hydrlysis; oxidation rancidity; saponification and hydrogenation.

4. MILK PROTIENS:

General properties and classification of milk protiens; casein, lactalbumin and lactoglobulin and thier general properties.

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5. LACTOSE:

General physical and chemical properties of lactose;hydrolysis of lactose; chemistry of fermentation of lactose into lactic acid; crystallisation of lactose & purification.

6. ENZYMES:

Definition and function, classification of milk enzymes and thier roles in different metabolic reactions.

7. VITAMINS AND PIGMENTS IN MILK:

General qualitative and quantitative study.

8. COMPOSITION AND PHYSICO CHEMICAL CHANGES

Composition and physico chemical changes in preparation of dairy products, such as cream, butter, ghee, condenced milk, whole milk powder and skim milk powder, baby food, Ice-cream, cheese, panir, chhanna, khoa, and dahi. Nutritiive value of milk and milk products.

9. MINOR CONSTITUENTS

Minor constituents and effect of metal in milk and milk products. Detection of adultration of milk & milk products. Preservation in milk and their detection.

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3.6 DAIRY ENGINEERING-I & DAIRY TECHNOLOGY LAB-I

A. DAIRY ENGINEERING:

1. Study of sanitary pipe fittings and pumps, dismantling and assembling of sanitary pumps, care and maintenance.

2. Study, operation, cleaning, maintenance and adjustment of milk receiving equipments, weight boards, pumps, tanks, flow meters and can conveyors.

3. Study, operation, adjustment and control of can weashers. (Straight through and Rotary.)

4. Study of constructional detail, installations, operation control and maintenance of bulk milk coolers, storge and transport tanks.

5. Study of constructional details, dismantling, assembling, adjustment, and maintenance, commissioning of clarifiers and separators.

6. Study of constructional details, dismantling, assembling adjustment operation, control and maintenance of:-

   (a) H.T.S.T. pasteuriser
   (b) Batch pasteuriser
   (c) Sterliser

7. Study the working, operation, maintenance, adjustments of bottle washing machine.

8. Study of constructional details, dismantling, assembling, adjustment, operation, control, maintenance of bottle filling and capping machine.

9. Study of constructional details, dismantling, assembling, adjustmnet, operation control and maintenance of fluid milk packaging machine.

10. Study of constructional details, disassembling, assembling, adjustment, operation and control of different types of bulk milk cooler and storage tanks.

11. Study the batch type steriliser for bottled milk.

B. DAIRY TECHNOLOGY:

1. Preparation of butter and Table butter.
2. Operation of can washers and bottle washers.
3. Operation of pasteurisers, cream separaters with milk.
4. Preparation of flavoured milk.
5. Preparation of standardised milk, tonned and double tonned milk.
6. Preparation of Sterlised milk.
7. Preparation of Dahi.
8. Preparation of Khoa.
9. Preparation of Ghee.
10. Manual cleaning of places of various storage tanks fitting and equipment.

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IV Semester

4.1 HYDRAULICS & HYDRAULIC MACHINES

(Common With Mechanical Engineering)

L	T	P
5	2	-

Rationale :

The mechanical behaviour of liquid in static as well as in dynamic conditions has always been the subject of interest for engineers. A mechanical engineer working in food or some chemical industry dealing with fluids frequently comes across problems of liquid flow, their static storage and disposal of liquid wastes. Also use of hydraulic in automation and power generation is well known to us all.

The subject gives an adequate insight to understand and face such situations related to working with liquids.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	2	1	-
2.	Hydrostatics	8	3	-
3.	Buoyancy	4	1	-
4.	Fluid Flow	6	2	-
5.	Energy & Momentum Equation	10	5	-
6.	Orifices	8	3	-
7.	Notches & Weirs	8	3	-
8.	Flow Through Pipes	6	2	-
9.	Flow Through Channels	8	3	-
10.	Hydraulic Machines	10	5	-
		70	28	-

DETAILED CONTENTS

1. INTRODUCATION:

Fluid, Fluid Mechanics, Hydraulics, Hydro-statics, Hydro dynamics, Ideal fluid.

2. HYDROSTATICS:

Properties of fluids, Pressure and depth relationship, Hydrostatic pressure, pascal's law, total pressure on flat surfaces, Centre of pressure on flat surfaces. (Simple Numerical Problems)

3. BUOYANCY :

Bouyancy, Condition of equilibrium of a floating body, Meta centre and Meta centric height. (Simple Numerical Problems)

4. FLUID FLOW:

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Different types of flow, Reynold's number, Equation of continuity and its applications. (Simple Numerical Problems)

5. ENERGY AND MOMENTUM EQUATION:

Types of energies, Energy equation and its application. Bernoulle'stheorem flow measurement instruments where energy equation is used e.g. Venturimeter, Orifice meter, Flow nozzle, pitot tube, Prandtle tube. (Simple Numerical Problems)

6. ORIFICES:

Flow through orifices, Co-efficient of contraction, Co-efficient of velocity, Co-efficient of discharge, Large vertical orifices, Drowned orifice, time of emptying a rectangular and circular tanks with flat bottoms. (Simple Numerical Problems)

7. NOTCHES & WEIRS:

Different types of notches, Measurement of discharge over rectangular notch, V-notch, Francis and Brazin's formula for rectangular weirs. Submerged weirs, Broad crested weirs. (Simple Numerical Problems)

8. FLOW THROUGH PIPES:

Losses in pipe flow due to friction, sudden enlargement, contraction and bends, Elbow & Tee. (Simple Numerical Problems)

9. CHANNELS:

Characteristics of flow, Uniform flow through channels. Rectangular and Trapezoidal channels, Application of Chezy's, Manning and Kutter's formula. Most economical channel sections of retangular and trepozoidal shapes. (Simple Numerical Problems)

10. HYDRAULIC MACHINES:

Impulse and reaction turbines, Principle of working of Pelton wheel, Francis and Kaplan turbines with simple line diagrams, their classification, construction, working, operational problems. Centrifugal and reciprocating pumps, Hydraulic press and Hydraulic Jack.

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4.2 HEAT ENGINE & HYDRAULICS LAB

L	T	P
-	-	4

A. HEAT ENGINES:

1. To study and sketch a boiler installed in the laboratory.

2. To study and sketch fire tube boiler i.e. a lancashire boiler.

3. To study the construction and working of various mountings.

   (a) Feed check value.
   (b) Safety valve, (dead weight safety valve, lever safety valve and rams bottom safety valve).
   (c) Stop valve.

4. To study the construction and working of various accessories of boiler.

   (a) Air-preneater.
   (b) Green's Economiser.
   (c) Superheater.

5. To study and sketch a two stroke petrol engine.

6. To study and sketch four stroke I.C. Engine:

   (a) Petrol Engine.
   (b) Diesel Engine.

7. To study and sketch Cooling system of a 4 stroke petrol Engine.

8. To study and sketch Lubrication system of a 4 stroke I.C. Engine.

9. To study and sketch steam condenser.

   (a) Surface condenser.
   (b) Jet condenser.

10. To study and sketch the fuel supply system of 4 stroke Diesel Engine.

11. To measure the BHP of an I.C. engine.

B. HYDRAULICS:

A. Demonstration of the following for study & sketch.

1. Piezometer tube, Mechanical flow meter, Manometers, Pressure gauge.

2. Hydraulic ram, press and jack.

3. Pelton wheel and Francis turbine or their model.

4. Centifugal and Reciprocating pumps.

B. Performance Experiments :-

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5. Measurement of discharge over notches and its verification.

6. To verify Bernaulli's theorem.

7. To determine coefficient of discharge of a Venturimeter.

9. To determine coefficient of contraction, coefficient of velocity and coefficient of discharge for a given orifice.

9. To determine the loss of head of water due to friction in a water pipe line.

10. To study performance

    i. Pelton Wheel
    ii. Francis Turbine.

11. To study the performance of a

    i. Centrifugal Pump
    ii. Reciprocating Pump.
    iii. Gear Pump

12. To measure the velocity of water flow in a open channel by a current meter

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4.3 DAIRY MICRO BIOLOGY

L	T	P
5	1	6

Rationale :

The chemical changes in the milk are caused due to micro-organism. The study of different type of micro-organism is essential for maintaining the nutritive value and taste of milk products. Disintigration of milk may result the unhygieneic effect on the human body and various types of deceases may be caused. Therefore micro-bilogical pollution should be controlled.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction to microbiology.	20	4	-
2.	Principle of hygenic milk production.	30	6	-
3.	Dairy Waste management	20	4	-
		50	14	84

DETAILED CONTENTS

1. INTRODUCTION TO MICROBIOLOGY:

General concept regarding classification and nomenclature of micro organisms. Principles of staining, morphology and structure of bacteria, yeast and moulds Growth, reproduction and spore formation in micro organisms. Bacteriological techniques for enumeration, isolation and indentification of bacteria. Mesurement of bactrial growth . Nutrition and metabolism of bactria. Effect of physical and chemical factors on growth and death of micro organisms.

2. PRINCIPLE OF HYGENIC MILK PRODUCTION:

Sources of contamination of milk, relative importnce and methods of their control. Growth of different types of micro-organisms in milk and their role in spoilage. Farm and dairy sanitation, cleaning and sanitisation of dairy equipments, different methods of controlling bactrial growth in milk, effect of cooling pasteurisation, sterillisation and ultra high temperature on bactria in milk, milk born diseases. Quality control tests for milk, psychrophillic, mesophilic, thermoduric and thermophillic bactria. Starter culture and their use in preparation of curd, butter, cheese, yogurt & acidophilus milk. microbial spoilage of evaporated and condensed milk, processed cheese ice-cream and other milk products.

3. DAIRY WASTE MANAGEMENT :

Characterisation of the dairy waste (solids, liquids & gases) and its treatement through chemical, physical & biological methods and thier utilization.

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4.4 REFRIGERATION - I

L	T	P
4	2	4

Rationale :

To avoid microbiological disintigration and lader preparation of milk air conditioning and refrigeration are required to produce low temprature. The students are required to posses the knowledge of various methods of creating low temperature.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Unit-I	12	6	-
2.	Unit-II	30	15	-
3.	Unit-III	14	7	-
		56	28	56

DETAILED CONTENTS

1. Importance and means of rerigeration . Reversibility, first and second laws of thermo-dynamics. Basic vapour compression cycle and its components. Representation on pressure-volume temperature. Entropy and Temperature. Enthaloy charts. Simple calculations of refrigeration effect. work done, h.p. requirement. Departure from theoritical vapour compression cycle. Volume efficiency.

2. Refrigerants particularly ammonia and freon. Detection of leaks of refrigerants, Air cycle refrigeration. Compression refrigeration machines. General discussion, types of equipment. Reciprocating compressors, open and hermetic compressors, cylinder arrangement. Number of cylinders, cylinder heads, stage compression, reciprocating compressor drives, receprocating compressor valves. Reciprocating compressor Lubrication and cooling. Rotary compressors, centrifugal compressors. Condensers, air cooled and water cooled condensers. evaporative condensers and cooling towers. Screw compressor, Lithium Bromide type and Evaporating compressors.

   Evaporators: types and selection, refrigeration, controls, Automatic expansion valve. Thermostatic expansion value. Low side and high side float valve, capillary tube. Compressor-motor control-Thermostatic motor control and pressure motor control, selenoid valve. Low and high pressure controls, Compressor capacity controls, oil separator. Dry expansion flooded system, direct expansion and brine cooling. Ice bank system.
3. Performance and capacity of refrigeration plants. Charging of plant. Maintenance of refrigeration plant. Ice plant, common defects and remedies. Introduction to absorption system of refrigeration.

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REFRIGERATION-I LAB:

1. To learn the installation of refrigeration plant:

   (a) To study how to cut, bend and flave copper tubing.

   (b) To study how to evaluate refrigeration system.

   (c) To study how to charge refrigeration plant.

2. To study different parts and operation of ice plant using ammonia as refrigerant.

3. To study the different parts and learn the operation of bulk milk cooler.

4. To dismantle an open type compressor, study its parts, assemble it again.

5. To dismantle a seald unit compressor, study its parts and assemble it again.

6. To study different refrigerant unit at different operating condition.

7. To test the condensing unit at different operating condition.

8. Fault tracing on refrigeration equipment.

9. Refrigeration plant maintenance.

10. To dismantle & assemble rotory type of compressor and study thier parts.

11. To dismentle and assemble a centrifugal compressor and study its parts.

12. To dismantle and assemble a gear type compressor and study its part.

13. To study and sketch of a domestic referigerator.

14. To study and sketch a water cooler.

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4.5 INTRODUCTION TO COMPUTER

[Common with Civil Engg., Civil (Spl. With Rural), Mechanical Engg.,(Specialisation in Production, Automobile, Refrigeration and Air conditioning), Electronics Engg.,Instumentation and Control Engg., Dairy Engg., Leather Technology, Footwear and Leather Goods Tech., Cermics, Chemical Engg.(Four year Sandwitch), Chemical Tech. (Rubber & Plastic), Chemical Tech. (Fertilizer)]

L	T	P
2	-	5

Rationale:

Computers are being used for design and information processing in all branches of engineering. An exposure to fundamentals of computer programming is very essential for all diploma holders. this subject has been included to introduce students in the use and application of computers in engineering.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction to Computer	4	-	-
2.	Introduction To Operating System (MS DOS/Windows)	3	-	-
3.	Word Processing	4	-	-
4.	Worksheet	4	-	-
5.	Presentation	4	-	-
6.	Data Base Operation	3	-	-
7.	Introduction to Internet	2	-	-
8.	Introduction to advance tools	4	-	-
		28	-	70

DETAILED CONTENTS

1. Introduction to Computer:

   A. Block Diagram of Computer.
   B. Types Of Computer
   C. Types of Input and Output devices
   D. Memories Devices (Its Types and Basic).

2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:)

   What is operating system, its significance, Commands of DOS, Features/Application of window.

3. WORD PROCESSING:

   File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup
   Edit : Cut, Copy,Paste, Office Clipboard, Select All, Find, replace, Goto, etc.
   View : Normal/Web Layout/Print Layout; Tool Bars; Header/Footer; Zoom, etc.
   Insert: Break, Page Number, Date & Time, Symbol, Comment, Reference, etc.
   Format: Font, Paragraph, Bullets & Numbering, Borders &

Shading, Column, Change case, Back ground, etc.
Tools : Spelling & Grammer, Language, Word Count, Letters & Mailing, Options, Customize, etc.
Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc.
Mail Merge

4. WORKSHEET:

Introduction, Use of Tools/Icons for preparing simple Mini Project.

5. PRESENTATION :

Introduction, Use of Tools/Icons for preparing simple presentation on Power Point.

6. DATABASE OPERATION :

Create database using MS Access, Create Table and Creating Reports.

7. Introduction to Internet:

What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails.

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.
A. Flow Chart
B. Algroithm
C. Programming

II. Use of advance Tools such as Skype, Teamviewer, Installation of Modem, use of WiFi, Etc.

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INTRODUCTION TO COMPUTER LAB

List Of Practicals

1. Practice on utility commands in DOS.

2. Composing, Correcting, Formatting and Article (Letter/Essay/ Report) on Word Processing tool Word and taking its print out.

3. Creating, editing, modifying tables in Database tool.

4. Creating labels, report, generation of simple forms in Database tool.

5. Creating simple spread sheet, using in built functions in Worksheet tool..

6. Creating simple presentation.

7. Creating mail ID, Checking mail box, sending/replying e-mails.

8. Surfing web sites, using search engines.

Note : In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/ MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/ Demonstration of project through Power Point Presentation.

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4.6 DAIRY CHEMISRTY AND DAIRY MICROBIOLOGY LAB:

L	T	P
-	-	12

(A) DAIRY CHEMISRTY:

1. Determination of Sp. gravity of milk by lactometer.
2. Determination of fat by Gerber methods and by milk tester.
3. Determination of percentage of S.N.F. by lactometer.
4. Determination of lactose content by polarimetric and volumetric methods.
5. Determination of protein content of milk by kjeldel method.
6. Common platform test of milk such as C.O.B, and alcohal sediment.
7. Determination of acidity of milk.
8. Determination of freezing point of milk.
9. To analyse the following milk products-cream, ghee, butter, icecream, khoa, channa.
10. Estimation of strength of various sanitizers and detergents.

(B) DAIRY MICROBIOLOGY :

1. Familiarity with equipments used in Microbiological work and common bacteriological techniques.
2. Motility of bacteria, yeast and molds..
3. Preparation of smears, simple staining, gram staining and study of morphology of bacteria, yeast and molds.
4. Direct microscopic count.
5. Standard plate count technique.
6. To conduct Dye-Reduction and presumptive and utensils.
7. Examination of sterility of dairy equipment colliiform tests.
8. Micro-organisms in air.
9. Examination of various milk products with respect of the

   (a) Total plate count.
   (b) Total caliiform count.
   (c) Total yeast and Mold counts.

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4.7 SUMMER IN PLANT TRAINING-I

Students after appearing in theory exams will under go a six week in plant training in a market milk plant to familiarise them with plant actual problems and environments.

The students shall prepare a report of this training and submit to their institution within one week of completion of training.

Viva-Voce shall be conducted on this by head of department.

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DAIRY ENGINEERING

SUMMER-IN-PLANT TRIAINING - I
(TRAINING SCHEDULE)

6 weeks structured, branch specific, task oriented Summer-in-plant training to be organised during summer vacation after Second year Examination.

The student during the vacational training must under take training in the following & submit the training report in the format given at annexure - III.

1. R.M.R.D. (Receiving Milk on Reciption Dock)

   Weighing machines, washing machines, loading and unloading of milk.

2. Processing of milk

   Chilling, Pasturizers, Cream separators, Homogenizers, Storage tanks.

3. Production of milk products

   Ghee, Khoa, Chhenna, Panir, Cheese, Milk powder.

4. Packaging and packaging machines

   Milk, Butter, Milk Powder, Ghee, Other products.

5. Transportation

   Transportation of milk & milk products.

6. Store procedures & quality control

   Store procedures of raw materials & dairy products.

7. Time office, Finance & Accounts

   Cash book maintenance, Salary distribution, factory schedule.

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V SEMESTER

5.1 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P
6	**2**	**-**

RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Principles of Management	8	-	-
2.	Human Resource Development	10	-	-
3.	Wages and Incentives	4	-	-
4.	Human and Industrial Relations	6	-	-
5.	Professional Ethics	2	-	-
6.	Sales and Marketing management	10	-	-
7.	Labour Legislation Act	10	-	-
8.	Material Management	8	-	-
9.	Financial Management	8	-	-
10.	Entrepreneurship Development	8	-	-
11.	Fundamental of Economics	5	-	-
12.	Accidents and Safety	5	-	-
		84	-	-

DETAILED CONTENTS

1. **Principles of Management**
   - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling.
   - 1.2 Organizational Structure, Types, Functions of different departments.
   - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
   - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.
2. **Human Resource Development**
   - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
   - 2.2 Recruitment, methods of selection, training strategies and career development.
   - 2.3 Responsibilities of human resource management – policies and functions, selection – Mode of selection – Procedure – training of workers, Job evaluation and Merit rating.
3. **Wages and Incentives**
   - 3.1 Definition and factors affecting wages, methods of wage payment.
   - 3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives of supervisor.
   - 3.3 Job evaluation and merit rating.
4. **Human and Industrial Relations**
   - 4.1 Industrial relations and disputes.
   - 4.2 Relations with subordinates, peers and superiors.
   - 4.3 Characteristics of group behaviour and trade unionism.
   - 4.4 Mob psychology.
   - 4.5 Grievance, Handling of grievances.
   - 4.6 Agitations, strikes, Lockouts, Picketing and Gherao.

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4.7 Labour welfare schemes.
4.8 Workers’ participation in management.

5. **Professional Ethics**
   5.1 Concept of professional ethics.
   5.2 Need for code of professional ethics.
   5.3 Professional bodies and their role.

6. **Sales and Marketing management**
   6.1 Functions and duties of sales department.
   6.2 Sales forecasting, sales promotion, advertisement and after sale services.
   6.3 Concept of marketing.
   6.4 Problems of marketing.
   6.5 Pricing policy, break even analysis.
   6.6 Distribution channels and methods of marketing.

7. **Labour Legislation Act (as amended on date)**
   7.1 Factory Act 1948.
   7.2 Workmen’s Compensation Act 1923.
   7.3 Apprentices Act 1961.
   7.4 PF Act, ESI Act.
   7.5 Industrial Dispute Act 1947.
   7.6 Employers State Insurance Act 1948.
   7.7 Payment of Wages Act, 1936.
   7.8 Intellectual Property Rights Act

8. **Material Management**
   8.1 Inventory control models.
   8.2 ABC Analysis, Safety stock, Economic ordering quantity.
   8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
   8.4 Material handling techniques.

9. **Financial Management**
   9.1 Importance of ledger and cash book.
   9.2 Profit and loss Account, Balance sheet.
   9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.

10. **Entrepreneurship Development**
   10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
   10.2 Distinction between an entrepreneur and a manager.
   10.3 Project identification and selection.
   10.4 Project formulation.
   10.5 Project appraisal.
   10.6 Facilities and incentives to an entrepreneur.

11. **Fundamental of Economics**
   11.1 Micro economics.
   11.2 Macro economics.

12. **Accidents and Safety**
   12.1 Classification of accidents based on nature of injuries, event and place.
   12.2 Causes and effects of accidents.
   12.3 Accident-prone workers.
   12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
   12.5 Safety consciousness and publicity.
   12.6 Safety procedures.
   12.7 Safety measures – Do’s and Don’ts and god housing keeping.

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5.2 DAIRY ENGINEERING - II

L	T	P
3	2	6

Rationale :

To produce various types of milk products, different types of equipments and their operation is the essential requirement of dairy plant. Therefore the student should posses the knowledge of handling , operating and maintenance of these equipments to manufacture the different types of finished milk products.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Ice Cream Equipments.	10	7	-
2.	Homogenisers.	12	7	-
3.	Cream, Butter and Ghee Equipments.	10	7	-
4.	Cheese & Casein Equipments.	10	7	-
		42	28	84

DETAILED CONTENTS

1. ICE CREAM EQUIPMENTS:

Ice cream freezer batch freezer, Continuous freezers, type of designs, air incorporation, over run, control systems, freezing cylinder, dasher, scrapping blades, controls of refrigeration, packing of ice cream, hardening methods, storing, transportation, cabinets, dismentling, cleaning and assembling of ice cream freezer, daily and periodical maintenance, calculation of freezing point and refrigeration requirement of mixes, refrigeration requirement of freezer, condition affecting of freezer.

2. HOMOGENISERS:

Theory of homogenization, design, material, single stage and two stage homogenizers, efficiency of homogenization, gear, piston, valves, gauges, starting, operation, dismentling, cleaning, assembling, horsepower, relation to power, daily and periodical maintenance, lubrication, checking for condense water in oil, spare parts.

3. CREAM, BUTTER AND GHEE HANDLING EQUIPMENT:

Cream ripening tanks, design, material, automatic control, operation, cleaning, maintenance of Continious Butter making equipment. Wooden churn, metal churn, design of barrel foll and roll less types of churns, gear box, rear frame, low mounting, high mounting motor, speed of churn, power consumption, washing, cleaning, daily and periodical maintenance, pumping of butter tolley, butter packing machines, type, design, operation, cleaning and

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maintenance, Ghee pans, construction, cleaning, packing and storage.

4. CHEESE AND CASEIN EQUIPMENTS:

Cheese vats, tanks, design, material, dimension, manual agitation, mechanical agitation, curing, mills, cheese hoops, presses, transportation, curring rooms, storage rooms, continous cheese making, casein, (acid and rennet) casein vats, pressure dryers, air and steam requirements, capacity, dimension etc. Daily and periodical maintenance, lubrication, spare parts.

DAIRY ENGINEERING II LAB

Study of constructional details, dismentling, assembling, adjustment, operation, control and maintenance of:

1. Homogeniser.

2. (a) Batch type ice cream freezers.
   (b) Continuous ice cream freezers.

3. Different types of butter churns.

4. Cheese vats accessories.

5. Case in driers.

6. Ghee pans and continuous ghee making machine.

7. Packaging machines for ghee, butter, ice cream and Cheese products.

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5.3 DAIRY TECHNOLOGY-II

L	T	P
5	2	7

Rationale :

Various milk products are manufactured from milk which are served as special dishes in hotels and special function without spoilng the nutrition value of milk. Prepration of these articles is a spacilized job. A student aware of preparation and packaging of these dairy products will be useful in the dairy plant and enterpreneure.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Manufacture of Cheese	20	8	-
2.	Manufacture of Casein & Other byproducts.	5	2	-
3.	Ice creams	20	8	-
4.	Condensed and Dry products	20	7	-
5.	Packing of Dairy products	5	3	-
		70	28	98

DETAILED CONTENTS

1. MANUFACTURE OF CHEESE:

Basic principles underlying the manufacture of Cheese, different varaieties of cheese. Manufacture of chedder, cheese and processed cheese, their defects, causes and remedies. Average composition and yield of different types of cheese.

2. MANUFACTURE OF CASEIN & OTHER BY PRODUCTS:

Basic principles involved in Casein manufacture, classification of caseins, Manufacture of different types of lactose, why protein and different types of casein. Defects, their causes and remedies, manufacture of caseinates.

3. ICE-CREAMS:

Composition of different varieties of ice-creams. Selection of different ingradients used in ice-cream. Manufacturing procedures for batch and contineous ice-cream and dried ice-cream mixed defects, their causes and remedies.

4. CONDENSED AND DRIED MILK PRODUCTS:

Manufacture, packaging and storage of sweetend condensed milk. Concentration of milk by Membrane system. Manufacture of evaporated milk and infant foods, instant powders and other formulated products.

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5. PACKING OF DAIRY PRODUCTS:

Different systems and materials of packaging of dairy products, primary and secondry packages, flexible packages and metal containers methods for sterilization of packaging materials.

DAIRY TECHNOLOGY-II LAB

1. Preparation of starter culture.
2. Preparation Cheddar Cheese, Cottage Cheese and Processed Cheese.
3. Preparation of ice cream.
4. Preparation of different types of casein.
5. Demostration of preparation of Spray Dried milk powder (skim and whole milk powder)
6. Preparations of evaporated milk and sweetened, condensed milk.
7. Use of packing machines for processed products.
8. Manual cleaning and cleaning in place of various fitting and equipments.
9. Cleaning of Dairy Floors.

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5.4 REFRIGERATION - II

L	T	P
3	2	5

Rationale :

Microbiological disintegration of milk can be delayed at reduced temperatures. Therefore the student of dairy engg. is supposed to have ample knowladge of airconditioning and refrigeration system.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Psychrometries	12	8	-
2.	Cold Storage	15	10	-
3.	Refrigeration plant	15	10	-
		50	28	70

DETAILED CONTENTS

1. PSYCHROMETRIES:

Definition, properties of air vapour mixtures. Pressures, Volume and density, temperature, humidity, heat content. Psychrometers, Sub freezing conditions, Psychrometric charts. Process involving air vapour mixtures, Dehumidification, dehumidifies, humidity measurements, humidity control, overload protection.

2. COLD STORAGE:

Types of loads in cold storages and their calculations. Product condition on entering. Product chilling. Quick freezing. Sharp freezing of packaged materials. Equipment selection. Construction of cold storage and freezing rooms. Insulating materials and their characteristics. Condensation problems in insulation, recommended thickness. Insulating materials pipes and rooms, protection of insulation. Water vapour barriers.

3. REFRIGERATION PLANT:

Testing of refrigeration equipments and their performance. Compressor capacity and its control. Condensing water control. Ice cream handling chambers and equipments, Equipment design. Design of condenser and cooling tower for different applications. Design of evaporator. Refrigeration piping.

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REFRIGERATION II- LAB

1. To study different parts and operation of Air Cooler.

2. To study different parts and operation of room, Airconditioning Unit.

3. To charge a sealed unit refrigeration system of an air conditioner. With the given refrigerant & Air conditioner with the given refrigerant.

4. To charge an open unit refrigeration system of an air conditioner with the given refrigerant.

5. Cold storage design and equipment selection.

6. To learn how to fire different insulations for different applications (Thermocole, Fibre glass etc.)

7. Study of ice cream hardening room design equipment. Selections.

8. Study do construction details, dismentally, assembling, adjustment, operation, control and maintenance of different types of compressors and thermo recompressors.

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5.5 INSTRUMENTATION AND PROCESS CONTROL

L	T	P
3	2	-

Rationale :

Precision measurement of process parameters such as pressure, level density, speed, temperature, flow, moisture etc. is very essential for successful running of a process industry. Various telemetric and mannual control circuits are to be handled by technicians employed in these industries. Therefore to equip the diploma student in instrumentation and control engineering with the knowledge and skill of principles and circuitry for measurement of these parameters will be useful in world of work.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	4	-
2.	Pressure Instrumentation	6	4	-
3.	Temperature Instrumentation	6	5	-
4.	Level Instrumentation	6	5	-
5.	Measurement of Density	8	5	-
6.	Controls	10	5	-
		42	28	-

DETAILED CONTENTS

1. INTRODUCTION:

1.1 Introduction of a process, chemical engineering process and process variable, listing of different process variable and their definitions, Introduction and definition of the term process instrumentation as applicable to the field of engineering.

1.2 Block diagram of a general instrumentation system, Elements of an instrument.

2. PRESSURE INSTRUMENTATION:

2.1 Definition.
2.2 Units KCS, Bar, Pascal, MPa, N/M2, PSI, WCL and conversion of one unit into another.
2.3 Importance of pressure measurement.
2.4 Types of pressure, atmospheric pressure, absolute pressure, gauge pressure, vaccum pressure.
2.5 Liquid column manometers principle, Manometers liquid, 'U' tube manometer, inclined and well type over manometer, advantage of inclined and well type over U' tube , ring manometer, Bell type, dp gauge.

2.6 Uses of manometers for differential pressure measurement.
2.7 Electric pressure elements-Diaphram, capsule, Bellows, Bourdon tube (different types) constuction.
2.8 Measurement of pressure of corrosive fluids-diaphragm

seal, liquid seal.

2.9 Measurement of static and dynamic pressure.

2.10 Pressure switch and regulators.

2.11 Calibration of pressure gauge (Dead weight pressure gauge tester) construction and working operation.

3. TEMPERATURE INSTRUMENTATION:

Temperature scales, thermometers, mercury in glass thermometers, Bimetallic thermometers, pressure spring thermometers, thermo-couples resistance thermometers, pyrometers, Monometer, pressure elements, Differential pressure. Direction operated pressure regulators, pilot operated pressure regulators.

4. LEVEL INSTRUMENTATION:

Direct liquid level measurement. Direct and indirect devices, measurement, Direct and indirect opearated device. Flow rate of flow meters, differential pressure meters, variable area meters, total flow meters, positive displacement meters, velocity meters, integrators. Rate control, ratio control, coscade control. Humidity absolute humidity, measuring relative humidity measuring dew point and moisture, Transmission pneumatic transmission, electrical transmission.

5. MEASUREMENT OF DENSITY:

Definiation relationship between density, pressure at the bottom of column of liquid and weight of a given volume

5.1 Liquid level method.

5.2 Displacement method

5.3 Hydrometer method

6. CONTROLS:

Study the working of various control system, control elements, control actions, pneumatic control system, electric control, final elements. Chromatography, electrolytic conductivity. Applicants temperature steam heat, gas or oil heat, electric heat.

5.6 IN PLANT TRAINING - I

4 week in plant training-I to be organised after examination in II year. The marks will be awarded by the external examiner in the in the final year. The marks will be of 50 marks for this exposure (Examination marks : 30, Sessional marks : 20).

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VI Semester

6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

L	T	P
4	-	-

RATIONALE:

A diplima student must have the knowledge of different types of pollution caused due to industrialisation and construction activities, so as he may help in balancing of eco-system and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.

TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Introduction	6		
2.	Pollution	4		
2.1	Water Pollution	8		
2.2	Air Pollution	8		
2.3	Noise Pollution	4		
2.4	Radio Active Pollution	6		
2.5	Solid Waste Management	6		
3.	Legislations	4		
4.	Environmental Impact Assessment	4		
5.	Disaster Management	6		
	TOTAL	56	-	-

DETAILED CONTENTS

1. INTRODUCTION :

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigration, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.

- Lowering of water level , Urbanization.

- Biodegradation and Biodegradibility, composting, bio remediation, Microbes .Use of biopesticidies and biofungicides.

- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain,etc.

2. POLLUTION :

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION :

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- Factors contributing water pollution and their effect.

- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.

- Physical, Chemical and Biological Characteristics of waste water.

- Indian Standards for qulity of drinking water.

- Indian Standards for quality of treated waste water.

- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, GO, CO2, NH3, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.

A. Settling chambers
B. Cyclones
C. Scrubbers (Dry and Wet)
D. Multi Clones
E. Electro Static Precipitations
F. Bog Fillers.

- Ambient air qulaity measurement and their standards.

- Process and domestic emission control

- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

2.4 RADISACTIVE POLLUTION :

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made thereunder-

- The Water (Prevention and Control of Pollution) Act - 1974.

- The Air (Prevention and Control of Pollution) Act - 1981.

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- The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.

  # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000

  # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003.

  # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.

  # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.

  # Municipal Solid Wastes (Management and Handling) Rules, 2000.

  # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.

- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT :
   Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benifit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

   Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

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6.2 DAIRY ENGINEERING-III

L	T	P
3	2	6

Rationale :

To produce dry milk for infants food and for other needs of human being, the different types of operations with various types of equipment are done. The student should posses the knowledge of handling, operating and maintenance of these equipments to manufacture dry milk product.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Evaporators.	10	06	-
2.	Vapour recompression system.	8	6	-
3.	Drying Equipments.	20	10	-
4.	Membrane Speration	5	6	-
		42	28	84

DETAILED CONTENTS

1. EVAPORATORS:

Objectives, single and multiple operation. Types of evaporators (single pan, falling film, rising film, forced circulation, plant centrifuging and expanding flow type.) Performance of tubelar evaporators, evaporator capacity boiling point elevation, effect of liquid head, and friction on temp. Drop material and Enthalphy balances of single effect calculation. Multiple effect calculations, maintenance of evaporators.

2. VAPOUR RECOMPRESSION SYSTEM:

Mechanical recompression. Thermo recompression systems. Heat pump cycle (Low temperature concentration) condensers and other ancillaries.

3. DRYING EQUIPMENTS:

(i) Different Types of Drying Equipment:

Classification of different drying systems, spray drying system.

(ii) SPRAY DRYING SYSTEMS:

Pressure spray nozzles, centrifugal discs spraying, thermodynamics and engineering aspects of air entering and leaving the dryer,cyclone separators, by filters, hire spray dryer, swans on spray dryer, operation, care and maintenance of spray dryers.

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4. MEMBRANE SEPRATION SYSTEMS:

Ultrafiltration process and Difiltration process equipments. Different materials used for membrane sepration, Batch and contineous ultrafiltration, Reverse Osmosis Processes, Comparision between ultrafiltration and R.O. systems. Nanofiltration, Principal working and material used for Nanofiltration.

DAIRY ENGINEERING III LAB

Study of constructional details, dismentling, assembling, adjustment, operation, control and maintenance of:

1. Water softening unit.

2. Different types of evaporators.

3. Condensers, low temperature concentrators.

4. Spray dryer and controls, cyclone and bag filters.

5. C.I.P. system and its circuits.

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6.3 DESIGNING OF DAIRY EQUIPMENT

L	T	P
5	2	-

Rationale :

A Dairy engineer whether working as design or production can not go without knowledge of machine design.The paper provides useful insight of principles and working of machine design.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Designing of Pasteurizer	15	6	-
2.	Designing of Butter Churner	15	6	-
3.	Designing of Ghee Kettle	15	6	-
4.	Designing of Evaportor	15	5	-
5.	Designing of Dryer	10	5	-
		70	28	-

DETAILED CONTENTS

1. DESIGNING OF PASTEURIZER:

Different parameters for designing of posteurizer, designing of vat pasteurizer, calculation of surface area steam load calculation. The basis of inlet/outlet emperature of milk. Steam temperature etc. Designing of palte pasteurizer - Designing of plate calculation of steam load on the basis of inlet/out let temperature of milk, hotwater and other factors. Calculation of residence time, calculation of surface area.

2. DESIGNING OF BUTTER CHURNER:

Different factors in consideration, calculation of size of butter churner according to capacity and rotational speed.

3. DESIGNING OF GHEE KETTLE:

Calculation of effective area for heating, steam temperature, time and other related factors. Calculation of steam requirement for ghee kettle. Designing of ghee settling tank.

4. DESIGNING OF EVAPORATOR:

I. DESIGNING OF VACUUM PAN :

Calculation of surface area, Heat load and stem requirement for vacuum pan.

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II. DESIGNING OF CONTINEOUS EVAPORATOR :

Calculation of surface area of tubes, contact time, etc. Calculation of steam requirement. Enthalpy and mass balance equation. Calculation of evaporator capacity and economy.

5. DESIGNING OF DRYER :

I. DESIGNING OF DRUM DRYER :

Calculation of size of drum on the basis of inlet/outlet temperature of milk, feed rate capacity etc. Calculation of steam requirement for drying and drying period.

II. DESIGNING OF SPRAY DRYER :

Factors of feeting the designing of spray dryer such as evaporation rate, DT particle size, etc. Designing of atomization system, Designing of drying chamber. Calculation of steam requirements, Designing of product recovery and emission control for spray dryer.

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6.4 DAIRY PLANT LAYOUT,MAINTENANCE AND AUTOMATION

L	T	P
5	1	-

Rationale :

The functioning of a dairy plant is very much dependent on the layout & power maintenance schedule, followed in the plant. Energy in the form of steam & electricity is utilised in processing of milk products. Therefore safety measures are to taken for the personal employed in the plant. A student should have basic knowledge about maintenance & safety of the plant.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	15	5	-
2.	Dairy Plant Layout	20	8	-
3.	Organisation of Repairs and Maintenance	15	5	-
4.	Lubrication	10	5	-
5.	Automation	10	5	-
		50	28	-

DETAILED CONTENTS

1. INTRODUCTION:

Plant maintenance, brief concept and its meaning, types and advantages. Wear in machines and their causes, mechanical wear and corrosive wear. Defects due to wear in equipment.

2. DAIRY PLANT LAYOUT :

General introduction to the subject, location of dairy plant selection of site, consideration of general points, designing a dairy plant. Planning and principles of dairy layout process schedule, floor plan, Selection of flow pattern, arrangement of different sections and equipment. Area and space requirements, of process room, workshop, office rooms and a okiliary services in relation to plant maintenance of dairy building including colour conditioning.

3. ORGANISATION OF REPAIR AND MAINTENANCE:

Need of organisation, function of maintenance , definition of repair and maintenance. Types of maintenance (only brief concept). Preperation for assembly and disassembly, Definition of preventive maintenance, advantage of preventive maintenance. Principle and practice of developing preventives for dairy plants.

4. LUBRICATION:

Lubrication principle. Types of lubricants and their specifications. Selection of lubricants for dairy

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equipments.

5. AUTOMATION :

Introduction to automation of process in dairy plant. Advantages and disadvantages of automation, different factors for automation and their effects. Economic aspects of automation level, general control system for automated process. Automatic air-actuated valves and controls. Automatic controls like thermostate for temperature control, FDV in HTST unit, Vaccum control in evaporation plant.

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6.5 MACHINE TOOL TECHNOLOGY & MAINTENANCE

(Common With Mechanical Engineering)

L	T	P
5	1	-

Rationale :

A mechanical engineer whether working as design, maintenance or production engineer can not go without knowledge of machine tools. The paper provides useful insight of principles and working of machine tools.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Basic features & Kinematics	8	1	-
2.	Centre Lathe	12	2	-
3.	Shaping, Planing & Slotting Machines	6	1	-
4.	Drilling & Boring Machines	6	1	-
5.	Milling Machines	15	2	-
6.	Grinding Machines	4	1	-
7.	Broaching Machines	4	1	-
8.	Jigs & Fixtures	3	1	-
9.	Cooling Process	2	1	-
10.	Automatic Machining Centres	3	1	-
11.	Plant Maintenance	6	1	-
		70	14	-

DETAILED CONTENTS

1. BASIC FEATURES AND KINEMATICS:

Various types of machining operations and machine tools. Common features of all basic machine tools, work holding and tool holding devices, Drive systems, sources of power, Bed, body or frame. Mechainaical drive system for providing reciprocating, oscillating and rotational movement. Systems of stepped and stepless, friction and positive drives. Principle of setting upper, Lower and Intermediate speeds. Mechanical methods of providing automaticity in machine tools.

2. CENTRE LATHE:

The centre lathe and its principle of working. Types of lathes, Lathe specification and size, Features of lathe bed. Head stock and tail stock. Feed mechanism and change-gears, carriage saddle, Cross slide, Compound rest, Tools post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe dogs, mandrils, Steady rest, Lathe attachements. Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring,

reaming, Knurling, Parting off, Under cutting, Relieving. Types of lathe tools and their uses.

Brief description of semi automatic and automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintance of a centre lathe.

3. SHAPING, PLANING & SLOTTING MACHINES:

Working principles of planer, shaper and slotter. Differences and similarties among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry . General and periodic maintenance of a shaper.

4. DRILLING & BORING MACHINES:

Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

5. MILLING MACHINES:

Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rack milling, cutting speed and speed for different tools in up and down milling. Simple compound and Differential indexing, milling of spur gears and racks.General and periodic maintenance of milling machine.

6. GRINDING MACHINES:

Common abrasive grinding wheel materials, Bonds, Grain or grits of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding. Types of grinding machines, precision finishing operations like honing.

7. BROACHING MACHINES:

Broaching- internal and external surface Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines.Comparision of broaching with others processes.

8. JIGS AND FIXTURES:

Object of Jigs and Fixture. Difference between jigs and fixtures. Principle of location. Principle of clamping. Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs- Bushes (Fixed liner, Renewal slip). Template. Plate jigs. Channel jigs, Leaf jigs. Simple example of milling, turnning, grinding, horijontal boring fixtures and broaching fixtures. Welding fixtures. devices.

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9. COOLING PROCESS:

Coolants and cutting fluids difference between coolant and cutting fluid, Function and action of cutting fluids. Requirement of good cutting fluids, their selection for different materials and operations.

10. AUTOMATION OF MACHINING CENTRES :

Introduction to CNC Machine tools (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

6. PLANT MAINTENANCE

(A) Maintenance: maintenance definition, scope of maintenance, maintenance strategies, economics and performance measures, objective of maintenance, concepts of general approach to eliminate Losses, classification of maintenance-corrective, scheduled, preventive, predictive and productive maintenance. common techniques to monitor the conditions of systems-vibration based, radiographic, thermographic, ferro graphic, computer based diagnosis etc, forms of wear, wear on guide surfaces, breakdown and remedies of machine tools, repair cycle, installation and maintenance of machine tools, PERTin maintenance.

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6.6 PROJECT ON DAIRY PLANT LAYOUT AND DESIGN

1. Detailed drawing of milking pad.
2. Milking Vat isometric view.
3. Working drawing of milk bottle crate.
4. Development of milk can or any other dairy vessel.
5. Arrangement of different sections in a dairy building.
6. Operational layout.
7. Design of dairy (market milk plant), capacity 10000 litres per day (Small dairy).
8. Design of dairy (milk and milk products), capacity 30,000 litres per day (Medium dairy).
9. Design of dairy capacity 50,000 litres per day with provision for future expansion (Large dairy) .
10. Design of dairy (milk and milk products) capacity one lac litres per day (Large dairy).
11. Model planning group project I on layout planning (Market Milk Plant/Milk and Milk product).
12. Model planning group project II on layout planning (Fluid Milk and Milk products)

PROJECT:

A project problem on Dairy plant layout and design shall be given to students to be completed by them under the guidence of their H.O.D. Students are required to prepare detailed project report. Viva shall be conducted on this by external examiner deputed by board.

6.7 IN PLANT TRAINING - II

Students after appearing in final year theory examinations will under go a eight weeks in plant training in a Milk Product Plant to familiarise them with plants actual problems and enviornment.

The students shall prepare a report of this training and submit to their Institution within one week of completion of training.

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IN-PLANT TRIAINING - II
(TRAINING SCHEDULE)

4 weeks structured, branch specific, task oriented Summer-in-plant training to be organised during summer vacation after Final year Examination.

The student during the vacational training must under take training in the following & submit the training report in the format given at annexure - III.

1. Manufacture of Dairy Engineering equipment

   Study of raw materials to be used in the manufacture of dairy plant equipment & machinery.

2. Fabrication, Erection & Operation of dairy plant

   Study of fabrication, erection and operational asspects of Dairy Engineering equipments & machinery.

3. Time office, Finance & Accounts

   Cash book maintenance, Salary distribution, factory schedule.

4. Store procedures & quality control

   Store procedures of raw materials & dairy products.

5. Pollution aspects

   Study of plant sanitation, enviornment & pollution control asspects.

6. Maintenance aspects

   Study of maintenance asspects including preventive & breakdown of dairy plant.

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STAFF STRUCTURE

THREE YEAR (SIX SEMESTER) DIPLOMA IN DAIRY ENGGINEERING

Intake of the Course 60
Pattern of the Course Semester Pattern

Sl. No.	Name of Post	No.	
1.	Principal	1	
2.	H.O.D.	1	
3.	Lecturer Dairy Engineering	2	
4.	Lecturer Dairy Technology	2	
5.	Lecturer in Mech. Engg.	1	
6.	Lecturer in Maths	1	Parttime/ Common with Other disci- plines if the intake is more than 180
7.	Lecturer in Chemistry	1	
8.	Lecturer in Physics	1	
9.	Lecturer in Comm. Tech.	1	
10.	Lecturer in Elect. Engg.	1	
11.	Computer Programmer	1	
12.	Steno Typist	1	
13.	Accountant / Cashier	1	
14.	Student / Library Clerk	1	
15.	Store Keeper	1	
16.	Class IV	6	
17.	Sweeper	Part time as per requirement	
18.	Chaukidar & Mali	as per justification	

Note :

1. Services of other discipline staff of the Institute may be utilized if possible
2. Qualifications of Staff : as per service rule
3. The post of "Computer Programmer" in not needed in the institutions where diploma in "Electronics Engineering" is running.

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SPACE STRUCTURE

[A] ADMINISTRATIVE BLOCK

Sl. No.	Details of Space	Floor Area Sq. metres	Remark
1.	Principal's Room	30	
2.	Confidential Room	10	
3.	Steno's Room	6	
4.(a)	Office including Drawing Office	80	
(b)	Record Room	20	
5.	Staff Room		
	(a) Head 1	15	
	(b) Lecturer 10 sq.m./ Lect. for 8 Lecturers	80	
6.	Library and Reading room	150	
7.	Store	100	
8.	Students Common room	80	
9.	Model Room	90	

[B] Academic Block

Sl.No.	Detail of Space	No.	@ Sq.m	Floor Area Sq.m.
1.	Class Room	2	60	120
2.	Drawing Hall	1	90	90
3.	Physics Lab			75
4.	Chemistry Lab			120
5.	App. Machanics Lab.			60
6.	Electrical Tech. & Electronics Lab.			60
7.	Dairy Engineering Lab			120
8.	Dairy Technology Lab.			90
9.	Dairy Chemistry & Mocrobiology Lab			60
10.	Refrigeration Lab			60
11.	Heat Engine & Hydraulics Lab Over Head Tank 2000 Litre Cap; Under Ground Tank 600 Litre Cap;			90
12.	Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling)			60

[C] Work shop

I	Workshop Supdt. Room	12
II	Store	20
III	Shops	
(a)	Carpentry Shop	50
(b)	Smithy Shop	70
(c)	Fitting Shop	50

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(d) Welding Shop		50
(e) Painting Shop		50
(f) Sheet Metal ,Soldering & Brazing shop		50
(g) Plumbing shop		50
(h) Machine Shop		150
(i) Foundry		75

[D] Student's Aminities

1.	Hostel	40	%	of Strength of Students
2.	Cycle Stand	50	%	of Strength of Students
3.	Canteen and Tuck shop	50		
4.	N.C.C. Room	70		
5.	Dispensary	40		
6.	Guest Room(Attached Bath) incuding kitchen & store	45		

[E] STAFF RESIDENCES

1.	Principal	1	100	100
2.	Head of Department	1	100	100
3.	Lecturer	4	80	320
4.	Non teaching & Supporting staff	8	60	480
5.	Class IV	6	30	180

Priorty to be given in following order

(1)
 a. Administrative Building
 b. Labs
 c. Workshop
 d. Over head Tank
 e. Boundary Wall
 f. Principal Residence
 g. Fourth Class Quarters (2/3)

(2)
 a. Hostel
 b. Students Aminities

(3)
 Residences of employee

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LIST OF EQUIPMENTS

Only those of the equipments given below which are essentially required for the conduction of practicals mentioned in the curriculum are to be procured by the institutions.

"Machine/Equipments/Instruments of old BTE list which are not included below are to be retained in the Lab/Shop for Demonstration purpose but not to be demanded fresh for purchase."

NOTE : Equipment for different shop and lab of latest verson should be purchased.

I. APPLIED PHYSICS LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Brass ball with hook dia 1.8 Cm to 2 Cm diameter	2	50	100
2.	Stop watch least count Least Count 0.1 Sec.(non-megnetic) 0.01 sec to 0.001 sec (Electronic Desirable)	4	750	3000
3.	Wall bracket with clamping arrangement 8" to 10" length	2	50	100
4.	Meter scale Least count 0.1cm,wooden 1meter	5	40	200
5.	Meter scale Least count 0.1cm,wooden 50 Cm	5	40	200
6.	Searl's conductivity apparatus with copper & steel rods 25 cm length 4 cm.diameter with all accessaries	2 set	1500	3000
7.	Constant Level Water Flow Container of one liter capacity vertical stand & rubber tubing	2	250	500
8.	Thermometer 0-110oC(Least count 0.1oC desirable)	4	100	400
9.	Potentiometer - 10 wires (1 meter length of each wire) with jockey, sunmoical top	4	750	3000
10.	Moving coil galvenometer 30-0-30 with moving mounting	5	300	1500
11.	Rheostat 50 ohm.,100 Ohm.,150 Ohm. capacity	16	300	4800
12.	Lead Accumulator 2V,6V (1 No.Each)	2	250	500
13.	Meterbridge 1 meter length, sunmica top copper strips fitted with scale	2	300	600
14.	Resistance Coil (Standard) 1 ohm. to 10 ohm.	10	50	500
15.	Moving coil ammeter 0-1 amp., 0-2 amp., 0-5 amp. with mounting	8	250	2000
16.	Moving coil voltmeter 0-1 V.,0-2V 0-5 V., 0-10 V. with mounting	8	250	2000
17.	Denial cell with complete accessories	2	250	500

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
18.	Leclaunche Cell with complete accessories	2	250	500
19.	Standard Cadmium Cell with complete accessories	2	250	500
20.	Battery Charger with complete accessories	1set	1800	1800
21.	Battery Eliminator Multi range	2set	750	1500
22.	Multimeter(Digital)	1set	800	800
23.	Carey Foster Bridge (With all accessories)	2set	4500	9000
24.	Resistance Box (2 No. Each) 0-1 Ohm, 0-100 Ohm.	4	850	3400
25.	Fractional Resistance Box 0-1 Ohm.	2	1200	2400
26.	Post office box Key type	2	1200	2400
27.	Post office box Dial type	2	1200	2400
28.	Resistance Wire(100 Gm.) (Constanton/Maganin)	1 lacchi	100	100
29.	Connecting Wire Copper(1/2 Kg.) (Cotton Insulated)	1 lacchi	700	700
30.	Screw gauge L.c 1/100 mm	5set	150	750
31.	Vernier Callipers L.c. 1/10 mm	5set	100	500
32.	Appratus for determining character-stics of P-N junction diode complete with all accessaries	2 set	1500	3000
33.	Resonance Column of steel One Meter length and 3-4 Cm diameter fitted with scale & water level arrangement	2	1600	3200
34.	App. for determining coefficient of friction on a horrizontal plane (Complete with all accessories)	2 set	700	1400
35.	Tuning Fork's Sets Set of different frequency (with rubber pad)	3set	350	1050
36.	Physical balance with weight box Complete with Fractional weight	2	800	1600
37.	Anemometer with counter cup type	1	1000	1000
38.	Spring Force Constant Apparatus with graduated mirror & pointer, weight set with hanger	2	1200	2400
39.	Viscosity Apparatus (Stock law) with steel balls and viscous liquid & timer	2set	1600	3200
40.	Thermometer of different range Mercury thermometer 0-50oC to 0-110oC	10set	100	1000
41.	Wall Thermometer Alcohal Filled 0-50oC	2set	20	40
42.	Sprit Level Technical Type	1set	60	60
43.	Drilling Machine Electric with different size bits	1set	800	800
44.	LPG Gas Burner with Cylinder	1set	800	800
45.	Tool Kit with different tools Complete	1set	800	800
46.	Lab stools	30		

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
47.	Lab tables	8		
48.	Plug Keys One Way	5	50	250
49.	Plug Keys Two Way	5	100	500
50	Helical Springs - Soft, 10 cm each	6	100	600

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II. APPLIED CHEMISTRY LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Test tube stand (Plastic/Tafflon)	30	20	600
2.	Funnel stand (Plastic/Tafflon)	30	20	600
3.	Burette stand Stainless Steel/Wooden/Iron	30	50	1500
4.	Pipette stand Stainless Steel/Wooden/Plastic	30	20	600
5.	Chemical balances with analytical weights 1gm -200gms	5	1500	7500
6.	Fractional weights set with rider 10 mg to 500 mg with rider	5sets	25	125
7.	Kipp's apparatus 1000 ml. Plastic/ Tafflon	2	500	1000
8.	Reagents bottles			
	250ml	120	20	2400
	500ml	25	25	625
	1000ml	5	30	150
9.	Wide mouth bottle 250 ml Glass	50	15	750
10.	Winchester bottle 2.5 litre Plastic/Tafflon	15	30	450
11.	Test tubes 1/4" x 6"			
	i. Corning or Borosil	200	9	1800
	ii. Glass	200	2	400
12.	Boiling tube 1" x 6"			
	i.Corning or Borosil	100	16	1600
	ii. Glass	100	5	500
13.	Pestle and morter Dia 10 cms 15 cms (Ceramics)	2	30	60
14.	Watch glass 5.0 cms,7.5 cms glass	15	5	75
15	Beakers (Glass/Brosil/Corning Plastic)			
	250 ml.	50	20	1000
	500 ml.	50	20	1000
16.	Weighing Tube 10 ml with lid (Plastic)	30	10	300
17.	Wash bottles (Plastic/Tafflon)	30	15	450
18.	Conical flask 250 ml. Glass (Brosil/Corning/Plastic) Transparnt	100	30	3000
19.	Flat bottom flask 500 ml.Glass	15	40	600
20.	Flat bottom flask 250 ml.Glass	15	25	375
21.	Burette 50 ml. (Plastic/Tafflon)	30	60	1800
22.	Pipette 25 ml. (Plastic/Tafflon)	30	20	600
23.	Measuring flask 250 ml. with stopper	30	50	1500
24.	Measring cylinder of various sizes (100 ml,250 ml,500 ml,1000 ml) 3 no. of each	12	30	360
25.	Bunsen's burner of brass	30	50	1500
26.	Gas plant petrol/LPG 10 to 20 burners automatic	1	5000	5000
27.	Spirit lamp (Brass)	30	30	900
28.	Tripod stand (Steel/Iron) Large/Medium	30	30	900
29.	Wire gauge 15 X 15 cm. with asbestos	30	15	450
30.	Test tube holder wodden	50	10	500

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
31.	Porcelain plates Ceramic	30	20	600
32.	Funnel 15 cm. Glass Borosil Corning/Plastic	60	16	960
33.	Spatula hard & nickel/steel	2 each	50	100
34.	Distilled water units (electrical)	1	10000	10000
35.	Distilled water units (solar)	1	5000	5000
36.	Open balance 1000 gms./10 mg.	1	600	600
37.	Brush for cleaning Hydro Fiber Acid & Alkali Resistant	100	10	1000
38.	Jars 20 Lit. for keeping destilled water	5	100	500
39.	Lab table 2 m. x 1.2 m. x 1 m. hight with central sink and cup boards (Teak wood) with drawers and two built in almirah on each side with reagent racks, better tile top	4	8000	32000
40.	Exhaust fans 18" (GEC make/Crompton)	4	2000	8000
41.	Side racks and selves for bench reagents made of teak wood for 24 bottels each set	4	2000	8000
42.	Digital balance electronic Electronics upto 2 decimal places	1	10000	10000
43.	Hot plates 7-1/2", 3" dia controled 2000 watts	1	1000	1000
44.	Hot air oven thermostatically controled with selves and rotary switches 350 x 350 x 25 high	1	8000	8000
45	pH Meter (Digital)	1	1000	1000
46	Glass Electrode	2	850	1700
47.	Reference Electro	2	850	1700
48.	Weight Box 1gm,2gmX2, 5gm,10 gm 20gmX2, 50gm, 100gm with for cep Miscellaneous	LS		15000

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III. APPLIED MECHANICS & MACHINE COMPONENT LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Polygon of Forces Apparatus	4	1500	60000
2.	Universal Force Table	2	2500	5000
3.	Principle of Moment Appratus Bell Crank lever	4	1500	60000
4.	Combined Inclind plane & Friction apparatus	4	1500	60000
5.	Simple wheel and axle	2	2500	5000
6.	Differential wheel and axle	2	3500	7000
7.	Double sleave Pulley Block	1	800	800
1.	Centre lathe	8	100000	800000
2.	Allgerared head Lathe	2	200000	400000
3.	C.N.C. Trainer Lathe Center height 100 mm, swing over carriage 60mm, distance between center 200 mm, Max. machining diameter-50 mm, Max. lengitndial travem-300 mm, Spindle speed 40-2000 RPM, Automatic lubrication paints provided.	2	600000	1200000
4.	Planing Machine	1	100000	100000
5.	Shaping Machine	3	80000	240000
6.	Slotting Machine	1	50000	50000
7.	Universal Milling Machine 3 Axis, Travel X-300mm, Y-250 mm Z-125 capable of milling acrylic, Al., Wood, etc. Campatible with FM5/DNC	1	400000	400000
8.	Universal Tool Cutter and Grinder	1	250000	250000
9.	Two Wheel bench Grinder (Wheel size 150x16x12 mm) (Wheel standard Accessories single pahse motor .25 HP high speed)	1	10000	10000
10.	Bench Drilling Machine 13 mm capacity, 5 HP, AC 230 Volt Single Phase 1400 rpm motor with starter switch 30 mm capacity drill chuck V belt 100 mm machine vice	1	20000	20000
11.	Power Hacksaw motorised with collant pump, vice, lenth gauge, machine drive belt guard, 1 H.P. A.C. 440/3/50/1440 rpm electric motor with starter. Capacity to cut 175 mm. round and 150x150 mm. square rod,	1	20000	20000

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	Blade size 350x25 mm.			
12.	Marking off Table Black granite Surface, flat nonmagnetic, nonglaring, Planing Accurecy as per I.S. size 1000mm x 630mm x 150mm of grade B with slab carbide scriber.	1	10000	10000
13.	Surface Plates			
	(a) size 450 x 450 mm	1	10000	10000
	(b) size 450 x 600 mm cost iron surface plate planed and hand swapped and seasoned, Brown & sharp type ribbing, complete with lifting handles & wooden surface cover. Conforming to I.S. 2285-1963	1	10000	10000
14.	Cylindrical grinding machine (Plain)	1	150000	150000
15.	Surface grinder table size 12"x8". (Planer type)	1	20000	20000
16.	Turret/Capstan lathe	1	300000	300000
17.	Tools & Instruments-Cutters drill set, taps, dies, drill chucks, milling machine cutters tapper, reamers, micrometers verniers, gear tooth verniers, dial gauges, callipers, steel rules & Hand Tools Such as hammers, chiesels etc.		LS	40000

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HEAT ENGINES & HYDRAULICS LAB.

HEAT ENGINE

(A.)

Sl.	Equipment	Qty.	Cost
1.	Cochran Boiler with all items mountings and accessories.	1	100000
2.	Model of babcock and wilcox water tube boiler.	1	3000
3.	Model of lancashire boiler.	1	3000
4.	Model of a surface condenser.	1	800
5.	Model of jet condenser	1	800
6.	Sectional Model of 4-Stroke petrol engine.	1	5000
7.	Sectional Model of 2-Stroke petrol engine.	1	5000
8.	Sectional Model of Zenith Carburetter.	1	900
9.	Single cylinder two stroke petrol engine.	1	6000
10.	Single cylinder four stroke diesel engine.	1	6000
11.	Single stage reciprocating compressor fitted with an electric motor.	1	7000
12.	Multicylinder diesel engine.	1	10000
13.	Models of francis, pelton and kaplan turbine.	1 each	6000

(B.)

HYDRAULICS LAB

1.	Notches-V, Rectangular, Semicircular circular with discharge tank.	1 Set	1800
2.	Venturmeter App.	1	1000
3.	Current Meter.	1	2500
4.	Centrifugal pump with motor (Mono block pump 3 H.P. Motor).	1	2500
5.	Turbine Pump with motor	1	5000
6.	Submerged pump.	1	8000
7.	Burnaullis theoram apparatus.	1	5000

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DAIRY CHEMISTRY & DAIRY MICROBIOLOGY LAB.

DAIRY CHEMISTRY

Sl.	Equipment	Qty.	Cost
1.	Westphal balance	2 Nos.	8000
2.	Lactometers	15 Nos.	300
3.	Lactometer Jars.	15 Nos.	300
4.	Buretere (50 Ml)	15 Nos.	2250
5.	Pipettes (10 Ml)	3 x 12	360
	(11 Ml)	3 x 12	360
	(1 Ml)	3 x 12	300
6.	Graber centrifuge for 12 tests electric and manually operated.	1 No	2500
7.	Butynometers		
	(a) Milk	50	750
	(b) Cream	30	600
	(c) Butter	10	250
	(d) Cheese	10	200
	(e) Skimmed milk	20	300
8.	Lock stoppers	3 Gross	900
9.	Lock stopper keys	15	75
10.	All glass apparatus (micro type)	2 Nos.	1000
11.	Kjeldel flasks (150 Ml)	50	2500
	(300 Ml)	50	4000
12.	Digetion heater for protein estimation (6 sets)	2	5000
13.	Phosphatase Kit for Measuring the efficiency for pestrization.	One Set	2000
14.	Inpared moisture balance.	One Set	3000
15.	Hot air oven thermostaically controlled temp rang 60-120 oC.	One	4000
16.	Moisture dishes with lids aluminium 70 mm diam 70 ml. capacity.	30	450
17.	Cryoscope, hortvet type for freezing point of milk.	--	10000
18.	Other glass wares	--	10000

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DAIRY MICROBIOLOGY

Sl.	Equipment	Qty.	Cost
1.	Secrological Water bath	One	2000
2.	Celony Counter.	One	1500
3.	Ph-meter.	One	3000
4.	Autoclave.	One	6000
5.	Microscope, Compound type.	Ten	50,000
6.	Dilution bottles, glass.	100	5000
7.	Petri dishes.	5 x 12	1800
8.	Copper case for petridishes.	2	400
9.	Copper case for pipettes (Microbiological).	4	400
10.	Incubator (165 Litres capacity)	1	8000
11.	Refrigerator thermostatic	2	10000
12.	Beakers, testtubes, measuring flasks cylinder etc.	--	10000

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REFRIGERATION LAB-I

Sl.	Equipment	Qty.	Cost
1.	Sealed unit refrigeration service kits containing all sort of tools.	5 Nos.	4000
2.	Refrigeration unit open type service lits containing all sorts of tools.	10 Nos	6000
3.	Gage mainfeld (various sizes)	3 Nos.	600
4.	Presure gages (low & high)	3 Nos.	2000
5.	Vaccum pump/4 H.P. with motor trolley type.	2 Nos.	6000
6.	Gas charging slamp.	1 Nos.	3000
7.	Gas cylinders Freon 12, 5Kg capacity.	2 Nos.	200
8.	Gas cylinders F. 22.		
9.	Gas cylinders for Ammonia 5 Kg.	2 Nos	800
10.	General tech. tools viz. Bench Vices spanners (open ring, box) Allenkey, pliers, adjustable and pipe wrnches etc.	10 Sets	10000
11.	Chargin Noses.	30 Sets.	3600
12.	Moisture indicators frenons.	10 Nos.	1000
13.	Liquid indicators freons.	10 Sets	1000
14.	Moisture indicators Ammonia	2 Nos.	150
15.	Copper tubing (A nealed) 1/4 dia	100 M	2500
16.	Do 3/8 dia	50 M	1500
17.	Do 1/2 dia	50 M	2000
18.	Copper tubing (Harddrawn) 1" dia	50 M	3000
19.	Ammonia Black Iron pipe tubing 1/2"dia	50 M	400
20.	Do 1" dia	50 M	600
21.	Do 1 1/2 dia	50 M	800
22.	Tube fitting copper & brass different sizes & types.		4000
23.	Tube fitting ammonia iron different sizes & types.		2000
24.	Line shut off valves (freon) diferent sizes.	50 Nos.	2000

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Sl.	Equipment	Qty.	Cost
25.	Line shut off valves (Ammonia) 1/4	20 Nos.	1000
26.	Gauge		
	(i) Freon-12	50 Kg	1500
	(ii) Ammonia	50 Kg.	1000
27.	Leak detector haltide.	10 Nos.	1000
28.	Leak detector electronics.	2 Nos.	4000
29.	Capacitiors different capacities	10 Nos	500
30.	Insulation		
	(i) Glass Wool	20 Kg.	200
	(ii) Thermocol Sheets	50 Sheet	500
	(iii) Plaster of paris	20 Kg.	200
	(iv) Slag wool	40 Kg.	200
31.	Electronic Motor I.H.P.A.C.	1 Nos.	1600
32.	Starting relays		
	(i) Voltage type	4 Nos	200
	(ii) Current type	4 Nos.	200
	(iii) Box type	5 Nos.	300
33.	Overload relays.	10 Nos.	400

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REFRIGERATION LAB-II

Air Conditions

Sl.	Equipment	Qty.	Cost
1.	Air conditioner 1 ton without reversibly single phase.	1 No.	2000
2.	Expansion valves		
	i. Low side float valve 5 TY(Ammonia)	1 No.	300
	ii. High side float valve 5TY(Ammonia)	1 No.	300
	iii. Ammonia Expansion valve 5 TY	2 No.	2000
3.	Thermostaic Switches		
	i. For air conditioner ITY	2 No.	300
	ii. For ammonia systems 5 TR	1 No.	500
4.			
	(i) Pressure stats for air conditioner(ITR)	1 No.	300
	(ii) Pressure state for ammonia plant (5TR)	1 No.	500
5.	Solenoid valves different capacities		
	(i) FOr freon system	3 No.	1600
	(ii) For ammonia systems	1 No.	500
6.	Voltmeter (Handy & other types)	1 each	5000
7.	Stop watches	2 each	400
8.	Siling psychormeters	15 each	750
9.	Aspiration psychrometers	1 set	2500
10.	Bellos types psychrometers	1 set	500
11.	Dry and Wet bulb wall hygrometer	2 set	200
12.	Fortins Barometer	1 set	1000
13.	Hair Hygrometer	2 set	500
14.	Humidistats	2 set	2000
15.	Kata thermometer	6 Nos.	1500
16.	Dial type hygrometer	6 Nos.	900
17.	Pannel Board showing temp pressure at different stages	6 Nos	10000
18.	Device for measuring flow of refri-gerant.	2 Nos.	600

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Sl.	Equipment	Qty.	Cost
19.	Pannel Board for making electric connections	2 Nos.	2000
20.	Evaporator Cooler (i) Pannel Board for determining its performance.	2 Nos.	1000
21.	Pocket type thermometers.	6 Nos.	300
22.	Voltage stabilizer (Automatic) 3 Phase	6 Nos.	1500
23.	Exhaust fans	6 Nos.	1000
24.	Electric oven fitted with temp. control experimental types.	1 Nos.	5000
25.	Electric Heaters	5 Nos.	250
26.	Work Benches	10 Nos.	3000
		Total:-	50000

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DAIRY ENGINEERING & DAIRY TECHNOLOGY

Sl.	Equipment	Qty.	Cost
1.	Cream seperater (Capacity 100 lts. per hour hand operated)	1	9000
2.	Cream seperator (capacity 500 lts per hour electrically operated).	1	12000
3.	Plate Heat "Exchanger (Capacity 1000 lts. per hour)	1	90,000
4.	Pasteurizer with temperature controler recorder & flow diversion valves.	1	150000
5.	Can washer (Staight through)	1	100000
6.	Rotary can washer 3 cans per minutes.	1	60000
7.	Bottle Whasher.	1	500000
8.	Bottle Filler	1	300000
9.	Butter Churner (Roller type) 250 Kg. butter per batch.	1	40000
10.	Stainles steel centrigugal pump (capacity 2000 lts, per hour).	2 (50000 each)	100000
11.	Sanitary stainless steel rotary pump (capacity 1000 lts. per hour)	1	50000
12.	Jacketed Rectangular cheese vat (capacity 250 lts.)	1	70000
13.	Jacketed storage tank (vertical) with agita to (capacity 500 lts.)	1	100000
14.	Referigerated Bulk Milk cooler (Capacity 500 lts.)	1	110000
15.	Jacketed ghee pan without agitator ver- tical.	1	25000
16.	Pipe expander 1" and 1-1/2" size	2set (1 set each)	1000 (500 each)
17.	Stainless steel pipes 1/2" to 1-1/2" sizes, fillings (union, nut, coupling yoke type clamp type) valves 1/2", 1" (two way & three way type).	1set	10000
18.	Homogensier 1000 lts/hour cap.	1	450000
19.	Spray dryer with evaporator one tonne cap/day cap.	1	10000000

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Sl.	Equipment	Qty.	Cost
20.	Ice-cream freezer		
	(A) Batch type 25 Kg./hour	1	5000
	(B) Contineous type 50 Kg./hour cap	1	200000
21.	Casein making equipment 500 Kg./batch cap.	1	100000

NOTE:- Since items noted at Sl. 4,5,7,8,18,19,20,21,22 are costly, hence efforts may be made that students should study these items in some dairies.

SPECIAL RECOMMENDATION:(Optional)

All the above equipments are costly so In place of the item 4,5,7,8,18,19,20,21,22 a small capacity Milk Plant (Pilot Plant) of minimum capacity 100 litre per day to 500 litre per day should be installed in the institute. Plamt will be included with manufacturing equipments of market milk (with packaging unit), Butter, Ghee, Chesse, Casein, Dried milk, etc.

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ELECTRICAL TECHNOLOGY & ELCETRONICS LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	D.C. Shunt Motor 3 Kw. 1500 RPM with 3 Point Starter.	2	10000	20000
2.	D.C. Compound Motor 3 Kw. 1500 RPM	2	10000	20000
3.	Single Phase Transformer 1 KVA 50 Hz. Primary Voltage 230 with tapping at 50%, 86.6 % Facility	2	6000	12000
4.	3 Phase Induction Motor 415 V., 50 Hz, 440 RPM, 3 KVA Star/Delta/Autotransformer Starter.	2	5000	10000
5.	Loading Drum Spring Balance & Belt Arrnagement.	2 Set	1000	2000
6.	Tachometer (Analog/Digital)	1	2000	2000
7.	3 Phase Inductive Loading of Variable Nature	1	8000	8000
8.	Single Phase Inductive Loading Variable 0-10 Amp., 50 Hz.	1	8000	8000
9.	Moving Coil Ammeter 0-10 Amp.	8	1000	1000
10.	Moving Coil Voltmeter 0-300 V.	8	1000	8000
11.	Moving Iron Ammeter 0-10 Amp.	8	1000	8000
12.	Moving Iron Voltmeter 0-300 V.	8	1000	8000
13.	Wattmeter Single Phase Dynamo Type 75/300/600 V. 2.5/5 Amp.	4	2500	10000
14.	Three Phase Variable Inductive Loading.	1	8000	8000
15.	Single Phase Variable Inductive Loading with Rheostat.	1	8000	8000
16.	Megger 0-20 Mega Ohm, 500 RPM .			
17.	Flouroscent Tube With Choke.	1	100	100
18.	SCR Bread Board	1	1000	1000
19.	Power Supply 230 V.	1	1000	1000
20.	Moving Coil Ammeter 0-500 M.A.	1	1000	1000

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
21.	Moving Coil Voltmeter 0-250 V.	1	1000	1000
22.	Energy Meter Single Phase 230 V., 5 Amp	1	2000	2000
	Misc.		LS	1500

Note:

1. Above items are for 2 batches of 15 students each.

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INTRODUCTION TO COMPUTER (Common to all Trades)

COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST (in Rs.)
1.	Core-2 Quad Processor, 4GB RAM 1 GB SATA HDD, 19" TFT Monitor/ Server of Latest Specification OS-Windows 2007/2008/Latest Version	02 Server	1,20,000=00
2.	General Desktop Computer-Intel i5 or Higher(with latest Specification Pre loaded latest Anti Virus with Life time Subscription, Licence Media and Manual with UPS 660 VA with latest window OS Including licence OR Computer of latest Specification With latest window os including licence	60 node	36,00,000=00
3.	Software :((Latest Version)		
	i. MS OFFICE 2010/Latest Version	LS	LS
	ii COMPILER 'C', C++, JAVA-7	LS	LS
4.	Hardware	4,50,000.00	LS
	i. Switch-32 Port	02	
	ii. Router	02	
	iii. Hub	04(8 Port)	
	iv. Ext. Modem	02	
	v. Wireless N/W Adaptor	02	
	vi. Series Access Point	02	
	vii.LAN Cable Meter	05	
	viii. LAN Cable Analyzer	05	
	ix. Crimping Tool and all other accessories related to Networking	15	
5.	Scanner- Flat Bed A4/Auto Lighter (Bit depth 48)	02	20,000
6.	132 Column 600 CPS or faster 9 Pin dot matrix printer with 500 million character head life	02	50,000
7.	Laser Jet-A4 All In one 20 page per min (2 Each)	04	50,000
8.	Desk Jet-A4 Photo Smart (2 Each)	04	40,000
9.	5 KVA on line UPS with minimum 30 minute battery backup along with sealed maintenance free batteries. Provision for connecting external batteries with network connectivity.(For 2 Labs)	04	8,00000

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10.	Split Air Conditioner 1.5 tones capacity with ISI mark along with electronic voltage stabilizer with over voltage and time delay circuit	08	35,0000
11.	Room preparation and furniture	LS	
12.	19" rack, 24-port switch. connector RJ-45 Cat-6 cabling for network	LS	10,0000
13.	2 KVA Inverter Cum UPS	02	6,0000
14.	Fire Extinguisher (2 Kg.)	04	15000
15.	Fire Extinguisher (5 Kg.)	04	25000
16.	Vacuum Cleaner	02	25000
17.	LCD Projector 3000 Lumen with all Accessories	02	350000
18.	Pen Drive 16 GB	10	10000
19.	DVD Writer External	02	10000
20.	HDD External 500 GB	02	15000
21.	PAD (Latest Configuration)	02	15000
22.	Broadband For Internet(Speed Min. 8mbps)	04	LS
23.	USB Modem	02	8000
24.	Generator 15 KVA Water Coolant	01	450000

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7.	LEARNING RESOURCE MATERIALS			
1.	LCD Projector with Screen	1	--	20000
2.	Handicam	1	--	30000
3.	Cutting, Binding & Stitching equipment.	1	--	30000
4.	Desk Top Computer with Internet Core i5/i7- 760, Processor, Genuine Windiw 7, Professional 18 inch HD, Flat Panel Monitor Optical Mouse, Key Board & all related media or latest version	1	--	40000
5.	Home Theater Support Disc type CD. CDR/CDRW DVDR/DVDRW, VCD Supported with USB Port Support-DIVX/JPEG/MP3	1	--	25000
6.	Commerical P A System 16 W-220W output, AC & 24V DC Operated, 5 Mic. & 2 Auxilary input, Speaker output 4 Ohm, 8 Ohm, 17 V & 100 V	1	--	20000
7.	Interactive Board	1	--	50000

ote :

1. This center will be only one at the institute level irrespective of all branches.

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ANNEXURE-QUESTIONNAIRE

INSTITUTE OF RESEARCH,DEVELOPMENT AND TRAINING U.P.KANPUR -208024

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Dairy Engineering.

PURPOSE: To design and develop diploma curriculum in Dairy Engineering.

NOTE: 1.Please answer the questions to the points given in the questionnaire.
2.Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1.Name of the organisation:_____
_____

2.Name & Designation of the officer filling the questionnaire _____
_____

3.Name of the department/section/ shop _____
_____

4.Importent functions of the department/section/shop _____
_____

5.Number of diploma holder employees under your charge in the area of Dairy Engineering. _____

6.Please give names of modern equipments/machines handled by a diploma holder in Dairy Engineering.

1. 2. 3.

4. 5. 6.

7.What proficiencies are expected from a diploma holder in Dairy Engineering.

1. 2. 3.

4. 5. 6.

8.Mention the approximate percentage of the following desired in Diploma teaching.

1. Theoretical knowledge ----------%
2. Practical knowledge ----------%
3. Skill Development ----------%

9.Do you think " on the job training" / Industrial training

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should form a part of curriculum. (Yes/ No)
if yes then
(a) Duration of training ----------
(b) Mode of training 1. Spread over different semesters

2. After completion of course

3. Any other mode

10.What mode of recruitment is followed by your organisation.

1. Academic merit
2. Written test
3. Group discussion
4. Interview
5. On the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Dairy Engineering.
(a) Technical knowledge ----------
(b) Practical skill ----------
(c) Etiquettes and behaviour ----------
(d) Aptitude ----------
(e) Health habit and social background ----------
(f) Institution where trained ----------

12. Does your organisation have any system for the survey of Home articles of different countries/States. Yes/No

13. Does your organisation conduct field survey to know users views regarding. Yes/No
1. Home Articles for different age groups and sex.
2. Effect of climatic conditions
3. Any other
If yes ; Please give brief account of each.

14. Which type of assignment do you suggest for an entrepreneur in Dairy Engineering.

15. In which types of organisations can a diploma holder in Dairy Engineering can work or serve.

1 2 3

4 5 6

16. Job prospects for the diploma holder in Dairy Engineering the next ten years in the state / country.

17. In your opinion what should be the subjects to be taught to a diploma student in Dairy Engineering.

Theory Practical

18. Kindly mention particulars regarding topics/areas which should be given more emphasisin the curriculum .

Theory Practical

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19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field.
If yes : Please give names of experts in your organisation to whom contact. Yes/ No

20. Kindly give your valuable suggestions for being considered at the time of finilisation of curriculum.

21. What changes in technologies are to be incorporated in the development of curriculum in Dairy Engineering.

(Signature)

Kindly mail the above questionnaire duly filled to:-

Lal Ji Patel
T. B. O.
Institute of Research,Development & Training,U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential for the use of curriculum design only)

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ANNEXURE - II

Dairy Engg. students after II Sem. Exam will undergo a two week Industrial Exposure, (in small scale units atleast) arranged and supervised by the iunstitute staff. They may try their hands on simple tools and machines and will incorporate following points in their reports.

1. Name & Address of the unit

2. Date of

   i. Joining.

   ii. Leaving.

3. Nature of Industry

   i. Product.

   ii. Services.

   iii. Working Hrs.

4.

   i. Names of the sections of the unit visited.

   ii. Number of persons engaged.

   iii. Activities in the section.

   iv. Name of tools/machines/ instruments used.
   simple sketch of tools & instruments.

   v. Source of power.

5.

   i. What is learnt. (Give on separate field)

   ii. What interested him most. (Give details)

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ANNEXURE - III

IN-PLANT TRAINING - I/II/

In Plant Training I/II in units/dairy plants not less than small scale industries should preferably to be arranged in manufacturing (producing dairy machines, equipments or dairy products). They will work and focus their attention there on following points to incorporate them in their reports.

1. Name & Address of the unit/plant

2. Date of

   i. Joining.

   ii. Leaving.

3. Nature of Industry/plant

   i. Product.

   ii. Services.

   iii. Working Hrs.

4. Sections of the unit visited and activities there in.

5. Details of machines/Tools & instruments used in working in the section of the unit visited.

6. Work procedure in the section visited.

7. Specifications of the product of the section and materials used.
8. Work of repair and maintenance cell.
9. Details of the shops related to repair and maintenance work.
10. Name of checking and Inspecting Instruments and their details.
    Quality controls measures taken.
11. Details of hadraulics/pneumatic/ thermal units or appliances used if any.
12. Discripton of any breakdown and its restoring.
13. Use of computer - if any.
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygeinic.
16. Name of Dairy machinery/equipment manufactured.
17. Name of Dairy products manufactured.

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RECOMMENDED BOOKS

List of standard Text Books recommended for diploma level institutions of Uttar Pradesh

1. DISCIPLINE : APPLIED PHYSICS

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	ANUPRAYUKT BHAUTKI	GUPTA & GUPTA	HINDI	1995	75.00	ASIAN PUBLISHERS, 85-C NAI MANDI, MUZAFFAR NAGAR
2.	ENGINEERING BHAUTKI	Dr. BHARGAVA	HINDI	1995	60.00	DHANPAT RAI & SONS
3.	ANUPRAYUKT BHAUTKI	KUMAR & TYAGI	HINDI	1995	75.00	NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD,MEERUT
4.	ANUPRAYUKT BHAUTKI	Dr. R.C.PANDEY	HINDI	1994	75.00	NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD, MEERUT
5.	APPLIED PHYSICS-I (Vol - I)	Dr. H.H.LAL	ENGLISH	1993	45.00	TATA McGRAW HILL
6.	APPLIED PHYSICS-II(Vol - II)	Dr. H.H.LAL	ENGLISH	1993	54.00	TATA McGRAW HILL
7.	MODERN COLLEGE PHYSICS	WHITE	ENGLISH	1995	110.00	C. B. S.
8.	PHYSICS Vol - I & II	HOLLIDAY AND RESNIC	ENGLISH	1993	100.00	WILEY EASTERN

1. DISCIPLINE : APPLIED MATHEMATICS

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	APPLIED MATHEMATICS (Math-I & Math-II)	KAPOOR & TARAMAN	HINDI	1994	75.00	NAV BHARAT PRAKASHAN, MEERUT
2.	APPLIED MATHEMATICS (Math-I & Math-II)	Dr KAILASH SINHA	HINDI	1994	60.00	BHARAT BHARATI PRAKASHAN, MEERUT
3.	APPLIED MATHEMATICS (I & II)	LUTHERA	HINDI	1994	65.00	B. Tec. PRAKASHAN, LUCKNOW
4.	APPLIED MATHEMATICS (I & II)	P. GUPTA	HINDI	1994	65.00	ASIAN PUBLISHERS, MUZAFFAR NAGAR
5.	ADVANCE Engg. MATHS	H. K. DAS	ENGLISH	1994	125.00	S. CHAND & COo., RAM NAGAR NEW DELHI

1. DISCIPLINE : PROFESSIONAL COMMUNICATION

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	ENGLISH FOR COMMUNICATION	V. SHASHIKUMAR M. N. K. BOSE	ENGLISH	1987	21.00	I. R. D. T. U. P., KANPUR
2.	SAMPRESHAN TAKNIK	Prof. R. PAL Dr. Smt NEERAJ SHUKLA Dr.SUBHASH GARG	HINDI	1989	15.00	I. R. D. T. U. P., KANPUR

1 DISCIPLINE : APPLIED CHEMISTRY

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	ANUPRAYUKT RASAYAN	KHANNA & KHANNA & BOUNTRA	HINDI	1994	60.00	BHARAT BAARTI PRAKASHAN, MEERUT
2.	PRAYUKT RASAYAN	MAHENDRA AND SRIVASTAVA	HINDI	1994	58.00	B.TECH. PUBLISHERS,AMMINABAD LUCKNOW
3.	PRAYUKT RASAYAN SHASTRA	S. CHANDRA	HINDI	1994	60.00	NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD,MEERUT
4.	APPLIED CHEMISTRY	V. P. MEHITA	HINDI	1993	60.00	ASIAN PUBLISHERS, 85-C NAI MANDI, MUZAFFAR NAGAR
5.	ENGINEERING RASAYAN	Dr. LALIT	HINDI	1994	45.00	DHANPAT RAI & SONS, 1682 NAI SARAK, DELHI
6.	ENGINEERING CHEMISTRY	P. C. JAIN	ENGLISH	1994	100.00	DHANPAT RAI & SONS, 1682 NAI SARAK, DELHI

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1. DISCIPLINE : DAIRY ENGINEERING

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	DAIRY MICROBIOLOGY	R. B. SINGH	ENGLISH	LATEST		LAXMI PUBLICATION, MADRAS
2.	DAIRY MICROBIOLOGY	NELSON & FROSTER	ENGLISH	LATEST		PINTICE HALL, NEW DELHI
3.	DAIRY MICROBIOLOGY	K. C. MOHANTA	ENGLISH	LATEST		
4.	DAIRY MICROBIOLOGY	HEMMER & BEBBEL	ENGLISH	LATEST		WELLY ESTERN Ltd., NEW DELHI
5.	FOOD MICROBIOLOGY	W. C. FREZER	ENGLISH	LATEST		WELLY ESTERN Ltd., NEW DELHI
6.	MICROBIOLOGY OF MILK	ROBINSON	ENGLISH	LATEST		APPLIED SCIENCE PUBLICATION, NEW DELHI
7.	MICROBIOLOGY & PRODUCT	ROBINSON	ENGLISH	LATEST		APPLIED SCIENCE PUBLICATION, DELHI
8.	WASTE WATER ENGINEERING	METCALF & EDDY	ENGLISH	LATEST		TATA McHILL, DELHI
9.	CHEMISTRY FOR ENVIRONMENTAL ENGINEERING	SAIRYES	ENGLISH	LATEST		TATA McHILL, DELHI
10.	PRINCIPLES OF DAIRY CHEMISTRY	JONNES & PETTON	ENGLISH	LATEST		WELLEY EASTERN Ltd., DELHI
11.	FUNDAMENTAL OF DAIRY CHEMISTRY	WEBB & JOHNSON	ENGLISH	LATEST		C. B. S. DELHI
12.	CHEMISTRY OF TESTING OF DAIRY PRODUCTS	HENRY V.	ENGLISH	LATEST		C. B. S. DELHI
13.	DUGDHA RASAYAN SHASTRA	Dr. V. P. SINGH	HINDI	LATEST		RAJESTHAN HINDI AKADEMY, RAJESTHAN
14.	FOOD CHEMISTRY	HAYER	ENGLISH	LATEST		WELLEY EASTERN/AVI PUBLICATION, DELHI
15.	OUTLINES OF DAIRY TECHNOLOGY	SUKUMARDE	ENGLISH	LATEST		OXFORD UNIVERSITY PRESS, DELHI
16.	DUGDHA VIGYAN	BHARRY & LOVENEYA	HINDI	LATEST		V. K. PRAKASHAN, MEERUT
17.	TECHNOLOGY OF MILK PROCESSING	A. Q. KHAN	ENGLISH	LATEST		LAXMI PUBLICATION, MADRAS
18.	TECHNOLOGY OF MILK DAIRY PRODUCT	A. Q. KHAN	ENGLISH	LATEST		LAXMI PUBLICATION, MADRAS
19.	DICTIONARY OF DAIRY	DAVIS G. J.	ENGLISH	LATEST		LONARD HILL, LONDONMADRAS
20.	DUGDHA VIGYAN	Dr. J. SINGH	ENGLISH	LATEST		V. PRAKASHAN, MEERUT

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21.	MILK PRODUCT OF INDIA	SHOI NIWASHAN & ANANT KRISHNAM	ENGLISH	LATEST			C. A. R. PUBLICATION, DELHI
22.	MILK & MILK PRODUCT	ECKLES & MACAY	ENGLISH	LATEST			B. S. PUBLICATION, DELHI
24.	MILK HYGINE	F. A. O.	ENGLISH	LATEST			H. O.
25.	ENGINEERING FOR DAIRY & FOOD PRODUCT	A. W. FARRAL	ENGLISH	LATEST			WELLEY EASTERN, NEW DELHI
26.	TECHNOLOGY OF ENGG. OF PLANT OPERATION	C. P. ANANT KRISHNA	ENGLISH	LATEST			LAXMI PUBLICATION, MADRAS
27.	DAIRY PLANT SYSTEM ENGINEERING	TUFEL AHMAD	ENGLISH	LATEST			KITAB MEHAL, ALLAHABAD
28.	PLANT DESIGN AND ECONOMICS FOR CHEMICAL ENGINEERS	PETER AND TIMMER HOUSE	ENGLISH	LATEST			Mc GRAWHILL
29.	PLANT DESIGN FOR CHEMICAL ENGINEERS	VILBRANTT AND DRYDEN	ENGLISH	LATEST			Mc GRAWHILL
30.	CHEMICAL ENGINEERING Vol-6	COULSON AND RICHARDON	ENGLISH	LATEST			
31.	MANAGEMENT OF DAIRY PLANT	TRACY	ENGLISH	LATEST			
32.	DAIRY PLANT MANAGEMENT	MORTORSON	ENGLISH	LATEST			
32.	MANNUAL FOR MILK PLANT OPERATION		ENGLISH	LATEST			
33.	INDUSTRIAL INSTRUMENTATION	DONAL P. EKMAN	ENGLISH	LATEST			WILLEY PUBLICATION,
34.	AUTOMATIC PROCESS CONTROL	DONAL P. EKMAN	ENGLISH	LATEST			WILLEY PUBLICATION,
35.	PROCESS SYSTEM ANALYSIS AND CONTROL	COUGHNER	ENGLISH	LATEST			Mc GRAWHILL,
36.	INDIAN MILK PRODUCTS	R. P. ANEJA	ENGLISH	LATEST			
37.	DAIRY INDIA-2007		ENGLISH	LATEST			

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