CURRICULUM FOR THREE YEAR

(SIX SEMESTER)

DIPLOMA COURSE IN

FOOD TECHNOLOGY

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, 04.05.2017

Corrected and Approved By B.T.E. on Dated 04-05-2017

STUDY AND EVALUATION SCHEME FOR
THREE YEAR(Six Semester) DIPLOMA COURSE IN FOOD TECHNOLOGY
(Effective From Session)
(Common With Three Year Diploma Course In Chemical Engineering)

I SEMESTER

Curriculum							Scheme of Examination								
Periods Per Week						S U B J E C T	Theory			Practical			Grand Total
Lec.	Tutorial	Draw	Lab	Workshop	Total		Examination Dur.	Marks	Sess. Marks	Total Marks	Examination Dur.	Marks	Sess. Marks	Total Marks	
4	-	-	-	-	4	1.1 Foundational Communicaton	2.5	50	20	70	-	--	--	--	70
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
4	2		4	--	10	1.4 Mechanical Operation And Solid Handling	2.5	50	20	70	3	60	30	90	160
4	2		--	--	6	1.5 Measuring Instrument and Measurements	2.5	50	20	70	--	--	--	--	70
4	-	10	-	-	14	1.6 Engineering Drawing	3.0	50	20	70	-	-	-	-	70
22	6	10	4	-	42	<---------TOTAL---------->	--	300	120	420	--	60	30	90	510
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
						Aggregate									535

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	1		2	-	8	2.3 Applied Mechanics	2.5	50	20	70	3	40	20	60	130
6	-	-	4	-	10	2.4 Applied Chemistry	2.5	50	20	70	3	40	20	60	130
-	-	-	-	14	14	2.5 Workshop Practice	--	--	--	--	4	60	30	90	90
17	3	-	10	14	44	<---------TOTAL---------->	--	200	80	280	--	180	90	270	550
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
						Aggregate									575

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 well in advance at institute level as per need.

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III SEMESTER

Curriculum							Scheme of Examination									
Periods Per Week						S U B J E C T	Theory				Practical				Grand Total
Lec.	Tut orial	Draw	Lab	Work Shop	Total		Examination Dur.	Marks	Sess. Marks	Total Marks	Examination Dur.	Marks	Sess. Marks	Total Marks	
5	2		--		7	3.1 Applied Mathematics-II	2.5	50	20	70	--	--	--	--	70
6	2		-		8	3.2 Chem. Engg. Thermodynamics	2.5	50	20	70	-	-	-	-	70
6	2		-	--	8	3.3 Introduction to Food Tech.	2.5	50	20	70	-	--	--	--	70
5	2		4		11	3.4 Elect.Tech. & Electronics.	2.5	50	20	70	3	40	20	60	130
2	-		5		7	3.5 Introduction To Computer	---	--	--	--	3	60	30	90	90
24	8	--	9	-	41	<---------TOTAL---------->	--	200	80	280	--	100	50	150	430
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
						Aggregate									455

IV SEMESTER

4	-	-	-	-	4	4.1 FunctionalCommunicaton	2.5	50	20	70	-	--	--	--	70
5	1		4		10	4.2 Food Chemistry	2.5	50	20	70	3	40	20	60	130
5	2		--		7	4.3 Conventional & Non Conven- tional Source of Energy	2.5	50	20	70	--	--	--	--	70
5	2		4		11	4.4 Food Microbiology	2.5	50	20	70	3	60	30	90	160
5	2		4		11	4.5 Technology of Plant Foods	2.5	50	20	70	3	80	40	120	190
3	-	-	2		5	4.6 Energy Conservation	2.5	50	20	70	3	20	10	30	100
27	7	-	14	--	48	<---------TOTAL---------->	--	300	120	420	--	220	110	330	750
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
						Aggregate									775

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 well in advance at institute level as per need.
(6) 4 weeks structured and supervised, branch specific, task oriented Industrial/field exposure to be organised during summer vacation. Student will submit a report. There will be 150 marks for this exposure. These marks will be awarded by project examiner in the final year (Examination Marks : 100, Sessional Marks : 50). (See Annuxure-I)

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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	Workshop	Total		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks	
-	-	-	4	-	4	5.1 IntegrativeCommunicaton	2.5	--	--	--	3	40	20	60	60
6	2		--		8	5.2 Industrial Management and Enterprenurship Development	2.5	50	20	70	--	--	--	--	70
5	1		3		9	5.3 Heat Transfer Operations	2.5	70	30	100	-4	100	50	150	250
5	1		3		9	5.4 Mass Transfer Operations	2.5	70	30	100	_				100
5	2		4		11	5.5 Technology of Animal Foods	2.5	50	20	70	3	80	40	120	190
5	2		-		7	5.6 Food Preservation and Process Principles	2.5	50	20	70	-	-	-	-	70
26	8	-	14	--	48	<---------TOTAL---------->	--	290	120	410	--	220	110	330	740
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
													Aggregate		765

VI SEMESTER

4	1		--		5	6.1 Pollution Control & Industrial Safety	2.5	70	30	100	--	--	--	--	100
5	2		-		7	6.2 Food Packaging	2.5	50	20	70	-	--	--	--	70
6	2		-		8	6.3 Food Processing Waste Management	2.5	50	20	70	-	-	-	-	70
5	2		4		11	6.4 Food Quality & Food Laws	2.5	50	20	70	3	100	50	150	220
	-			10	10	6.5 Equipment Design Project									
						A- Project	-	-	-	-	VIVA	80	40	120	120
						B- Field Exposure	-	-	-	-	-	100	50	150	150
20	7	--	4	10	41	<---------TOTAL---------->	--	220	90	310	--	280	140	420	730
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
													Aggregate		755
													30% of I & II Semester		333
													70% of III & IV Semester		861
													100% of V & VI Semester		1520
													Grand Total		2714

NOTE:-
(1) Each period will be 50 minutes duration.
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(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) Field visit and extension lectures at institute level as per need be organised.

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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 Food Technology
2.	Duration of the Course	:	Three Year(Six Semester)
3.	Type of the Course	:	Full Time Institutional
4.	Pattern of the Course	:	Semester System
5.	Intake	:	60
6.	Entry Qualification	:	High School Passed With 35% Marks
7.	Admission Criteria	:	State Joint Entrance Examination

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List of experts whose deliberation helped the new developmnet curriculum for Three Year Diploma Course in Food Technology at I.R.D.T. U.P., Kanpur on 15.01.15, 18.02.15 and 19.02.15 are honourably named below -

1.	Dr. Gauri Shanker	Ex. H.O.D.	B.E.F.T., H.B.T.I., Kanpur
2.	Shri B.N. Singh	Ex. Director	I.R.D.T.,U.P., Kanpur
3.	Dr. Alak Kumar Singh	Associate Professor	B.E.F.T.,H.B.T.I., Kanpur
4.	Dr. Seema Sonker	Head(Food Sc.)	C.S.A.Uni. Kanpur
5.	Dr. Umesh Chandra	Lect.(Chemical Engg.)	U.I.E.T., C.S.J.M. Uni. Kanpur
6.	Shri Avanish Kumar	Asstt. Prof(Food Pro.)	S.H.I.A.T.S. Allahabad
7.	Dr. Shatrughan Singh	Lect.(Food Tech.)	S.L. Bahuguna Uni.,Dehradoon
8.	Sri F. R. Khan	Principal	G.P., Kanpur
9.	Sri A. K. Agarwal	H.O.D., Chem. Engg..	G.P., Sutawali Moradabad
10.	Shri R. K. Rakesh	Lecturer(Dairy Engg.)	G.P. Etawah
11.	Sri Durgesh Chandra	Lect(Chemical Engg.)	G.P.,Firozabad
12.	Sri G. N. Singh	Assisstant Professor	I.R.D.T.,Kanpur

List of experts whose deliberation helped the development of curriculum in Semester System for Three Year Diploma Course in Food Technology at I.R.D.T. U.P., Kanpur on 15.2.17 are honourably named below –

1.	Shri U C Sharma	Professor (Chem. Engg)	UIET,CSJM Uni. Kanpur
2.	Shri Durgesh Chandra	HOD(Chemical)	G.P.,Firozabad
3.	Shri M. Q. Zaman	Lecturer(English)	G. P., Kanpur
4.	Shri Prabhu Nath Jaiswal	Lecturer(Chemical)	G. P., Kanpur
5.	Namrata Pal	Lecturer(Chemical)	G. P., Kanpur
6.	G. N. Singh	Asstt. Prof.	I.R.D.T.,Kanpur

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LIST OF EXPERTS

A Curriculum Workshop for Development of Curriculum on the Subject " Energy Conservation" was held on 22nd January, 2018 at NITTTR, Chandigarh. The following participated in the workshop:-

S. No.	Name, Designation and Official address
From Field/Industries/Institutions of Higher Learning	
1.	Shri Jotinder Singh, Engineer-in-Chief(Retd.) Punjab State Power Corpn. Ltd.(PSPCL), Punjab
2.	Shri Punit Sharma, Asstt.General Manager, Electrical & Energy Management, Godrej Appliances Ltd. Mohali, Punjab
3.	Ms. Anu Singla, Associate Professor, Chitkara University, Rajpura, Punjab
4.	Shri Girish Kumar, UP New and Renewable Energy Development Authroity (UPNEDA), Lucknow, U.P.
5.	Sh. Lal Ji Patel, TBO/ CDC Officer, IRDT Kanpur, U.P.
6.	Shri Ravinder Kumar, Research Assistant, IRDT, Kanpur, U.P.
From NITTTR, Chandigarh	
7.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, **Coordinator**

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I Semester

1.1 FOUNDATIONAL COMMUNICATION
SECTION "A" (ENGLISH)

L	T	P
4	-	-

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
Section A English				
1.	PARTS OF SPEECH	12	-	-
2.	VOCABULARY BUILDING	05	-	-
3.	Grammar	15	-	-
4.	DEVELOPMENT OF EXPRESSION (Composition)	12	-	-
Section B Hindi				
5.	Topic 5	2	-	-
6.	Topic 6	5	-	-
7.	Topic 7	5	-	-
		56	-	-

DETAILED CONTENTS

1. **PARTS OF SPEECH :**

   a. Noun
   b. The pronoun : Kinds and Usage
   c. The adjective : Kinds and Degree
   d. Determiner : Articles
   e. The verb : Kinds
   f. The Adverb : Kinds, Degree and Usage
   g. Prepositions
   h. Conjunctions
   i. The Interjections
   j. Subject: Verb Agreement (Concord)

2. **VOCABULARY BUILDING :**

   a. Antonyms and Synonyms
   b. Homophones
   c. One word substitutions
   d. Idioms and Phrases
   e. Abbreviations

3. **Grammar**

   a. Sentence & its types
   a. Tenses
   b. Punctuations
   c. Active and Passive voice
   d. Transformation of Sentences
   e Synthesis of Sentences
   f. Direct and Indirect Narrations

4. **DEVELOPMENT OF EXPRESSION (Composition) :**

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a. Paragraph Writing
b. Essay Writing
c. Proposal Writing
d. Letter Writing (Formal,Informal,Business,official etc.)
f. Report Writing
g. Note Making
h. News Making
i. Application Writing
j. Minute Writing
k. Invitation Letter Writing

SECTION "B" (Hindi)

5& laKk] loZuke] fo'ks"k.k] fdz;k fo'ks"k.k] o.kZ lekl] laf/k] vyadkj] jl] milxZ izR;;A

6& i= ys[ku] fufonk lafonk] nj vkea=.k ¼dksVs'ku½ vihy] LorU= vfHkO;fDr] izfrosnu ys[ku] izsl foKfIrA

7& okD;@okD;ka'k ds fy, 'kCn] i;kZ;okph ;k lekukFkhZ 'kCn] foykse 'kCn] vusdkFkhZ 'kCn] 'kCn;qXe ;k leqPpkfjr 'kCn lewg] okD; 'kqf) ¼'kq) v'kq) okD;½] eqgkojs ,oa yksdksfDr;kWaA

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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

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(right and left), elementary test for continuity and differentiability.

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 resprect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizental and Vertical cases),angular velocity,angular acceleration and

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centripetal acceleration.Relationship between linear and angular velocity and acceleration. Centripetal and 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 MECHANICAL OPERATION AND SOLID HANDLING

[Common to Chemical Technology (Fertilizer), Chemical Engineering (Petrochemical)

L	T	P
4	2	4

Rationale:

Solid handling is the fundamental of different machine and equipments used in the chemical industries such as grinding, crushing, ball mills etc. chain belts and screw conveyor, filteration & mixing equipments. Theoretical and experimental work will indicate their interest in learning and teaching among the students and teachers.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	3	-
2.	Characterisation of Solid Particles	6	3	-
3.	Size Reducation	8	4	-
4.	Conveying of Solid Particles	12	6	-
5.	Mechanical Separation	12	6	-
6.	Mixing Equipments	8	4	-
7.	Fluidization	4	2	-
		56	28	56

DETAILED CONTENTS

1. INTRODUCTION:

Concept and role of unit operation in Industries.

2. CHARACTERISATION OF SOLID PARTICLES:

Characterisation of solid particles, screening equipments, standard screens, screen analysis, Grizzles, trommels.

3. SIZE REDUCTION:

Theory of crushing, Rittinger's law, Kick's law, Bonds Law,Crushing and grinding machinery; their classification, general description of jaw crusher, gyratory crusher, rol crusher, hammer mills, ball mills, open circuit and closed circuit Systems.

4. CONVEYING OF SOLIDS PARTICLES:

Conveying equipments, their classification general construction and industrial application, Belt conveyors, chain conveyors and screw conveyors.

5. MECHANICAL SEPARATIONS:

(i) Types of filtration equipement, their application and operation, sand filters, filter press, leaf filters, rotary filters, filter aids. Centrifugal filtration.

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(ii) Classifiers.

(iii)Thickener

(iv) Cyclones.

6. MIXING EQUIPMENTS:

Details of mixing equipment, Homogenious mixing equipment, Mixing equipments used for liquid-liquid, liquid-solid and liquid-gas system.

7. Fludization

REFERENCE BOOKS

1. Unit operation of chemical engineering by Mc Cabe & Smith
2. Mechanical Operation for Chemical Engineers by C.M. Narayan and B. C. Bhattacharya
3. Chemical Engineering Vol. II by Rechardson & Coulson.
4. Momentum Transfer Operation By S. K. Gupta, TMC, 1979

MECHANICAL OPERATION AND SOLID HANDLING LAB

1. To draw a layout of Chemical Engineering lab.

2. To analyse the given sample on a set of screens and report the analysis.

3. To determine the critical speed of a ball mill.

4. To determine the efficiency of disintegrator.

5. To determine filteration constant by a plate and frame filter press.

6. To determine the rate of settling of slurries of various concentration draw a height VS time curve.

7. To determine the efficiency of Jaw crusher.

8. To study and sketch a Rotary filter.

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1.5-MEASURING INSTRUMENTS AND MEASUREMENTS

[Common to Three year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology]

L	T	P
4	2	-

Rationale:

The curriculum of measuring instruments and measurements deals with various measuring instruments like pressure and vacuum gauges, thermometers, pyrometers, orifice, venturimeters, rotameters etc. The students will be well aware of use of these instruments which will inculcate their knowledge.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction and Classification of Instruments.	12	6	-
2.	Pressure and Vacuum gauges	12	6	-
3.	Thermometers and Pyrometers	12	6	-
4.	Mass & Weight Measurement	10	5	-
5.	Liquid level meters	10	5	-
		56	28	-

DETALLED CONTENTS

1. INTRODUCTION & CLASSIFICATION OF INSTRUMENTS:

Importance of instruments in chemical process industries. General classification of industrial instruments. Indicating and recording type of instruments. Static & Dynamic characteristics of instruments. Description and constructional details, working principle, ranges and application of following instruments.

2. PRESSURE AND VACUUM GAUGES:

Liquid column gauges, Bourdan tube gauge, Melleod gauge, Ionization and thermal conductivity meters.

3. THERMO METERS AND PYROMETERS:

Bimetallic thermometers, liquid expansion thermometers, thermocouples, resistance thermometers, optical and radiation pyrometers.

4. MASS & WEIGHT MEASUREMENT :

Measurement equipment - Two pan balance and single pan mechanical balances, Single pan electronic balance.

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5. LIQUID LEVEL METERS:

Visual indicators, Float actuated level meters, static pressure type instruments. The bubbler system, diaphragm box and air trap system. Electrical contact type liquid level indicators. Hydrostatic head density compensator level meter, Hydrostep, Radar or microwave level indicator, Ultrasonic or Sonic level indicator.

REFERENCE BOOKS

1. Industrial instrumentation by Donald, P. Ekman
2. Instrumentation by Krik and Ramboi.

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1.6 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
4	-	10

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	5	-	4
2. A.	Lettering techniques	3	-	16
B.	Introduction to scales	2	-	8
3.	Conventional Presentation	5	-	8
4. A.	Principles of projections	3	-	12
B.	Point Line, Plane	2	-	28
5.	Orthographic projection of simple geometrical solids	5	-	12
6.	Section of Solids	5	-	20
7.	Isometric Projection	5	-	20
8.	Free Hand Sketching	5	-	8
9.	Development of surfaces	5	-	24
10.	Orthographics Projection of Machine Parts	5	-	12
11.	Practice on Auto Cad	6	-	24
		56	-	140

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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

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their isometric views.

(c) Exercises on missing surfaces and views

6. Section of Solids 2 Sheet

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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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

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Parabola x2=4ay, y2=4ax,

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 x2 + y2 + z2 + 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.

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5. D.C. Circuits (5 Marks)

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

2.3 APPLIED MECHANICS

[Common to three years Diploma Course in Civil Engg., Agriculture, Dairy, Ceramic, Civil & Rural Engg., Chemical Engineering, Architecture Assistantship, Computer Science & Engineering]

[Also Common to Mechanical Engineering (Spacialization In Production Engineering]

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

L	T	P
5	1	2

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	4	1	
2.	System of Forces & General Condition of Equilibrium	18	4	
3.	Moment and Couple	8	1	
4.	Friction	8	1	
5.	Machines	8	1	
6.	Center of Gravity	8	2	
7.	Moment of Inertia	8	2	
8.	Beam & Trusses	8	2	
	Total	70	14	28

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.A. 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

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resultant of any number of forces in one plane acting upon a praticle,conditions of equilibrium of coplaner concurrent force system.

B. 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.

3. Moment & couple:

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. 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.

5. Machines:

Definition of a machine. Mechancial advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine Lifting machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle. Simple screw jack, differential screw jack, simple worm and worm wheel.

6. Centre of Gravity:

Concept, definition of centroid of plain figures and center of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, Centroid of bodies with removed portion. Determination of center of 'gravity' of solid bodies - cone, cylinder, hemisphare and sphere, composite bodies and bodies with portion removed.

7. Moment of Inertia:

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical section : rectangle, triangle, circle (without derivations). Second moment of area for L, T, I and channel section, section of modulus.

8. Beams & Trusses:

Definition of statically determinate and indeterminate

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trusses. Types of supports. Concept of tie & strut, Bow's notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members. Analytical methods: method of joints and method of sections.(simple problems only)

Applied Mechanics Lab : 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. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss. (King / Queen post truss)
8. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines:

   (i) Simple wheel & axle
   (ii) Differential wheel & axle
   (iii) Differential pulley block
   (iv) Simple Screw jack
   (v) Simple Worm & worm wheel
   (vi) System of Pulleys (any type).

9. To find out center of gravity of regular lamina.
10. To find out center of gravity of irregular lamina.

2.4 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

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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.

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.

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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 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

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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)

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

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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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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

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and compressor system.

* 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 :

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

3.1 APPLIED MATHEMATICS II

[Common to All Engineering Courses]

L	T	P
5	2	-

Rationale :

The study of mathematics is an important requirement for the understanding and development of concepts of Engg.The purpose of teaching mathematics to the Diploma Engg. students is to give them basic foundation and understanding of mathematics so that they can use the same for the understanding of engineering subjects and their advancements.

Sl.No.	Units	Coverage Time L	T	P
1.	Matrices	16	6	-
2.	Differential Calculus	15	6	-
2.	Differential Equations	15	6	-
4.	Integral Calculus	12	5	-
5.	Probability & Statistics	12	5	-
		70	28	-

DETAILED CONTENTS

1. MATRICES :(12 Marks)

1.1 Algebra of Matrices, Inverse :

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

1.2 Elementry Row/Column Transformation :

Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix :

Linear dependence/independence of vectors, Definition and computation of a rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors,Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem :

Definition and evaluation of eign values and eign vectors of a matrix of order two and three, Cayley-Hamilton theorem

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(without Proof) and its verification, Use in finding inverse and powers of a matrix.

2. DIFFERENTIAL CALCULUS :(10 Marks)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation :

Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Eulens theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus :

Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION :(10 Marks)

3.1 Formation, Order, Degree, Types, Solution :

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, Nonlinear equation.

3.2 First Order Equations :

Variable seperable, equations reducible to seperable forms, Homogeneous equtions, equtions reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for X=eax, Sin ax, Cos ax, Xn, eaxV, XV.

3.4 Simple Applications :

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. INTEGRAL CALCULUS - II: (12 Marks)

4.1 Beta and Gamma Functions :

Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series :

Fourier series of f(x),-n<x<n, Odd and even function,Half

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range series.

4.3 Laplace Transform :

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations.

5. PROBABILITY AND STATISTICS :(6 Marks)

5.1 Probability :

Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution :

Discrete and continuous distribution, Bionimal Distribution, Poisson Distribution, Normal Distribution..

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3.2-CHEMICAL ENGINEERING THERMODYNMICS

L	T	P
6	2	-

Rationale:

The subject incolves the laws of thermodyunamics, refrigeration process, chemical reactions and their equilbrium and chemical kinetics. The student will be well conversent the stratagies involved in the processes.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Definitions	12	4	-
2.	First Law	16	6	-
3.	Second Law	20	6	-
4.	Entropy	12	4	-
5.	Refrigerations & Liquefaction	12	4	-
6.	Vapour Liquid Equilibria	12	4	-
	Total	84	28	-

DETAILED CONTENTS

1. INTRODUCTION

Scope of Thermodynamics,open & closed system, Thermodynamic properties-Temperature, Volume, Pressure, Specific heat atconstant volume, Isothermal & Adiabetic process, irreversible & reversible process, Intensive & Extensive properties.

T hermodynamic system, properties and state of a substance, processes and cycle, equality of temp. the Zeroth law of thermodynamics; the pure substance; phases of a pure substance; Phase Rule Independent properties of a pure substance; eqation of state for vapor phase (Wonder Wall Equation).

2. FIRST LAW:

Various froms of energy; Heat work, Internal energy, Enthalpy comparison of heat and work, calculation of U, KE, PE, Q & W first law of thermodynamics for a closed system undergoing a cycle; for a change in state of a closed system; Joule Thomson coefficient J; Throttling process. Calculation of U, H, Q & W for Ideal gas under going reversible isometric, Isothermal, Isobar and adiabatic processes.

3. SECOND LAW:

Kelvin, Planck and Classius statement, the reversible process, Factors that render process irreversible: the Carnot cycle, Two propositions regarding the efficiency of a Carnot cycle. Thermodynamic temperature scale and ideal gas temperature scale. thermal thermodynamic equation-Maxwell

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relation.

4. ENTROPY :

Inequality of classius, entropy- a property of a system, Entropy change in reversible process; Entropy change for an open system; principle of increase of entropy; efficiency, irreversibility and availability; simple numerical problem

for calculation of entropy change; thermodynamic relations.

5. REFRIGERATIONS & LIQUEFACTION :

The Cornot refrigeration cycle, the air refrigeration cycle, vapor compression cycle, Absorption refrigeration-flow diagram and their descriptions; coefficient of performance (C.O.P).liqefaction process. Latest refrigerant and their qualities and application.

6. VAPOUR LIQUID EQUALIIBRIA :

Concept of chemical potential, Roult's Law, Henery's Law, Fugacity, Fugacity coefficient activity coefficient.

NOTE:- At least one Question should be asked from each topic (1 To 5).

REFERENCE BOOKS

1. Introduction to Chemical Engineering Thermodynamics by J. M. Smith
2. Chemical Engineering Thremodynamics by Pandey and Chaudhary
3. Chemical Engineering Thermodynamics by Mishra and Rastogi

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3.3 INTRODUCTION TO FOOD TECHNOLOGY

L	T	P
6	2	-

Rationale:

Sl.No.	Units	Coverage L	Time T	P
1.	Topic 1	30	10	
2.	Topic 2	30	10	
3.	Topic 3	24	8	
		84	28	--

DETAILED CONTENTS

1. BASIC CONSIDERATION:

World food problems, Introduction to food chemistry, Basic knowledge of major, Indian crops, their total production, losses in storage and opportunity available for their processing to augment availability through out the year, Scope of food technology : Prerequisite and channenges, Desirable and potentially undesirable food constituents and their importance

2. BASIC BIOCHEMISTRY :

Energy transformation in living cells, Bioenergetics, Enayme and Metabilic pathways, Regulation and control.

3. BASIC MICROBIOLOGY :

Characterization, classification and identification of micro-organisms, Microscopy, Micro-organism : Morphology and structure, Pure culture and cultural characteristics, Reproduciton growth and cultivation, Control of micro-organisms, Beneficial uses of microbes in foods, General principles of food hygiene.

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3.4 ELECTRICAL TECHNOLOGY & ELECTRONICS

(Common with Diploma in Mech., Dairy Engg.)

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	3	1	-
2.	A. C. Theory	5	3	-
3.	Three Phase Circuits	5	3	-
4.	Measurement & Measuring Instruments	12	4	
5.	Electronics	12	4	-
6.	D. C. Machines	8	3	-
7.	Transformers	5	2	-
8.	Synchronous Machines	5	2	-
9.	Induction Motors	6	2	-
10.	Electro Heating	6	3	-
11.	Electro Plating	3	1	-
		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:

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,

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Anodising.

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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3.5 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.

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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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IV SEMESTER

4.1 Functional Communication

L	T	P
4	-	-

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
Section A English				
1.	On Communication	04	-	-
2.	Exploring Space	04	-	-
3.	Sir C.V. Raman	04	-	-
4.	Professional Development	04	-	-
5.	Buying a Second Hand Bicycle	04	-	-
6.	Leadership and Supervision	04	-	-
7.	First Aid	03	-	-
8.	The Romanance of Reading	03	-	-
9.	No Escape from Computers	03	-	-
10.	Bureau of Indian Standards	03	-	-
Section B Hindi				
1.	Topic 1	02	-	-
2.	Topic 2	02	-	-
3.	Topic 3	02	-	-
4.	Topic 4	02	-	-
5.	Topic 5	02	-	-
6.	Topic 6	02	-	-
7.	Topic 7	02	-	-
8.	Topic 8	01	-	-
9.	Topic 9	02	-	-
10.	Topic 10	02	-	-
11.	Topic 11	01	-	-
		56	-	-

Section “A” (English)

Text Lessons

Unit I.	On Communication
Unit.II	Exploring Space
Unit.III	Sir C.V. Raman
Unit.IV	Professional Development of Technicians
Unit.V	Buying a Second Hand Bicycle
Unit.VI	Leadership and Supervision
Unit.VII	First Aid
Unit.VIII	The Romanance of Reading
Unit.IX	No Escape from Computers
Unit.X	Bureau of Indian Standards

Section “B” Hindi

1& Lojkstxkj

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2& Hkkjrh; oSKkfudksa ,oa rduhfd;ksa dk Hkkjr ds fodkl esa ;ksxnku
3& xzkE; fodkl
4& ifjokj fu;kstu
5& lkekftd laLFkk;sa
6& fu;kstu vkSj tu dY;k.k
7& Hkkjr esa izkS|Skfxdh ds fodkl dk bfrgkl
8& gfjr dzkafUr
9& i;kZoj.k ,oa ekuo iznw"k.k
10& Jfed dY;k.k
11& Hkkjr esa Jfed vkUnksyu

4.2 FOOD CHEMISTRY

L	T	P
5	1	4

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	15	3	
2.	Topic 2	15	3	
3.	Topic 3	10	2	
4.	Topic 4	10	2	
5.	Topic 5	10	2	
6.	Topic 6	10	2	
		70	14	56

DETAILED CONTENTS

1. Water in foods : Structure, Properties, Interations, Water activity and stability.

2. Carbohydrates : Functions, Reactions and properties and simple and complex carbohydrate, Selection of natural or modified carbohydrates for incorporation into processed food.

3. Lipids : Consistency of commerical fats Lipolysis, Auto oxidation, Thermal decomposition and effect of ionizing radiation, Refining of oils, Modificaiton of oils and fats, Role of food lipids in flavor, Nutritional aspects.

4. Proteins : Nutritive and supplementary value of food protein, Chemical reactions and interactions of amino acid and proteins, De-naturation and it implications, Functional properties of food proteins, Modification of food proteins in processing and storage and its implientions.

5. Vitamins, Minerals, Pigments and Flavours : Chemistry and stability of water and fat-soluble vitamins, Chemical properties of minerals and their bioavailability, Enrichment and fortification, Natural pigments in foods and their retention in processed foods. Flavoring constituents in foods. Development of process and reaction flavour volatiles.

6. Characteristics of muscle tissues, Milk, Egg and edible plant tissues, Integrated approach to food chemistry.

LIST OF PRACTICALS

1. Analysis of water for potable and food purpose.
2. Moisture content in foods.
3. Non-enzymatic browing reactions and its determinations.
4. Determination of rate/extent of hydrolysis of sucrose/ starch.
5. Determination of free fatty acid content fats and oil.
6. Determination of heat stabilotyof vitamin c.
7. Study of some functional properties of proteins.
8. Detection/Estimation of adulterants in some foods.

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4.3-CONVENTIONAL AND NON CONVENTIONAL SOURCE OF ENERGY

L	T	P
5	2	-

Rationale:

The student of chemical engineering has to deal with various types of fuels and materials. The fuels generally used are solid liquid and gaseous. Their properties advantages and disadvantages are included in the curriculum. The student will enhance their knowledge in the field of fuel technologies related to chemical industries.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
PART-A	: CONVENTIONAL ENERGY SOURCE			
1.	Introduction	4	2	-
2.	Solid Fuels	10	3	-
3.	Liquid Fuels	10	3	-
4.	Gaseous Fuels	8	2	-
5.	Combustion Calculation	8	2	-
PART-B	: NON CONVENTIONAL ENERGY SOURCE			
1.	Solar Energy	5	2	-
2.	Wind Energy	5	2	-
3.	Bio Energy	5	3	-
4.	Hydro Energy	5	3	-
5.	Geothremal Energy	5	3	-
6.	Wave and Tidal Energy	5	3	-
	Total	70	28	-

DETAILED CONTENTS

PART-A : CONVENTIONAL ENERGY SOURCE

1. INTRODUCTION

Introduction of various Solid, Liquid and Gaseous fuels.

2. SOLID FUELS:

Wood, Charcol, Coal (Peat, Lignite, Bituminous and Anthracite) and Coke . Calorific value Definition and experimental determenation by bomb callorimeter and calculations. Washing of coal, Purpose of washing, Principle description and operation of Jigs and washers,Carbonization (Low temperature and High temperature).

3. LIQUID FUELS:

(i) Fuel Oil, Gasoline, Desel Fules, Kerosine, Biogas, Biomass, GNG, PNG.

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(ii) Properties (Sp. gravity, Viscosity, Flash & fire Point, Octane no, Cetane no. & Ignition delay).

(iii Advantages and disadvantages of liquid fuels.

4. GASEOUS FUELS:

Natural Gas, LPG -Advantages and disavantages of gaseous fuels.

5. COMBUSTION CALCULATION:

Calculation of percentage of products of combustion, numerical Quostions.

PART-B : NON CONVENTIONAL ENERGY SOURCE

1. SOLAR ENERGY:

Energy from the Sun, Application of solar technology : Solar thermal, Electricity production, Fuel production, Energy storage methods.

2. WIND ENERGY :

Source of wind energy, Wind power : Types of wind power, Wind power industry : Wind forms, wind turbine.

3. BIO ENERGY:

Resource of Bio energy, Solid biobass, Electricity generation from biomass, Bio energy product.

4. HYDRO ENERGY:

Types of Hydropower, Advantage and disadvantages of hydroenergy

5. GEOTHERMAL ENERGY:

Types of Geothermal energy, Resources, Production, Renewability and sutainability.

6. WAVE AND TIDAL ENERGY:

Generation of Tidal energy and wave energy. Generating methods, Difference between wave and tidal energy.

REFERENCE BOOKS

1. Nonconventional Energy Resources by D. S. Chauhan
2. Thermal Engineering by R. K. Rajpoot
3. Fundamental of Renewable Energy System by D. Muknergy

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4.4 FOOD MECROBIOLOGY

L	T	P
5	2	4

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage L	Time T	Time P
1.	Topic 1	20	7	-
2	Topic 2	20	7	-
3.	Topic 3	20	7	-
4.	Topic 4	10	7	-
	Total	70	28	56

DETAILED CONTENTS

1. Incidence of mocroorganism in foods, source of contamination. Principle underlying spoilage and preservation of foods.

2. Contamination, spoilage and preservation of cereal products, sugar products, fruit and vegetable products, meat products, fish and sea foods eff and poultry products milk and milk products and other foods, Microbiological standard of foods.

3. Food poisoning and food borne infections, food plant sanitation, inspection adn control, personnel hygiene, HACCP in food industry.

4. Beneficial mocroorganisms and their utilization in food fermentation.

LIST OF PRACTICALS

1. Micromentry and determination of size of deferent microbes.
2. Simple and differential staining of micro-organisms and their examination.
3. Direct total, viable and non-viable count of micro-organisms in food.
4. Pure culture isolation techniques.
5. Determination of stanard Plate Count (SPC) in natural and/or processed food
6. Determination of phosphatase test in milk.

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4.5 TECHNOLOGY OF PLANT FOOD

L	T	P
5	2	4

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	15	6	-
2.	Topic 2	15	6	-
3.	Topic 3	15	6	-
4.	Topic 4	15	6	-
5.	Topic 5	10	4	-
	Total	70	20	56

DETAILED CONTENTS

1. Composition, structure and processing characteristics of cereal grains, Legumes and oilseeds, Wheat and its quality characteristics for milling into flour and semolina, Flour milling. Proboriling and milling of paddy, Quality characterisitcs processed rice products.

2. Flour grades and their suitability for baking purposes, Assessment of flour quality and charcteristics, Macaroni products, Ingredients, Technology and quality parameters for baked products; Bread, Biscuits and cakes: Breakfast cereals. Dry and wet milling of corn, Starches and its conversion products, Malting of barley.

3. Milling of legume-pulses by traditional and improved processes. Processing of oil seeds for direct use and consumption, Oil and protein products, Processing of extracted oil refining, hydrogenation. Processing of deoiled cake into protein concentrated and isolates, Textured protein, Functional protein preparations, Peanut butter, Margarine and spread.

4. Structural, Compositional and nutritional aspects of fruits and vegetables, Physiological development: Growth, Maturation, ripening and senescence, Post harvest handling and storage. Techniques of processing and preservaion of fruits and vetetables by low temperature, canning, bottling, drying and dehydration. Technology of fruits and vegetable products; Juices adn pulps, Concentrated and powders, Squashes and cordials, Beverages, James, Jellies and Marmalades. Preserves, candies and crystallized fruits. Tamato products; Pure, Paste, Ketchup, sauce and soup, Chutneys, pickles and other products.

5. Spices : Composition, structure and characteristics, Preservation and processing of major and minor spices of India; Whole spice, Spice powder, Paste and extracts,

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Composition, Production and processing of tealeaves; Black tea, Green tea and Oolong tea, Instant tea. Production of instant coffee from cherries, Production, Processing and chemical composition of cocoa beans, elementary idea about manufacturing process for chocolate, Confectionary products.

LIST OF PRACTICALS

1. Orientation to different processing equipments, their functions and uses.
2. Blanching of fruits and vegetables and determination of its adequancy.
3. Preparation of syrups and brines.
4. Preparation of jam, jelly and preserve
5. Preparation of pickle by various methods.
6. Preparation of chutney.
7. Extraction of tomato juice by hot and cold break methods.
8. Preparation of tamato sauce/ketchup.
9. Preparation of tamato puree/paste.
10. Extraction of juice by various methods.
11. Bottling and processing of fruit juice.
12. Preparation of amla based products.
13. Dehydration of fruits and vegetables.
14. Freezing of peas.
15. Preparation of soups based on fruits and vegetables.
16. Waxing of fruits.
17. Canning of fruits and vegetables.
18. Demonstration of process of essential oil extration and oleoresin of different spices.
19. Study of detection of adulteration in spices.
20. Manufacture of white bread.
21. Manufacture of biscuits, cookies, cake.
22. Practicals related to : cleaning, grading, milling, blending, formulating and purchasing of spices and spice mixer.
23. Visit to relevant industries.

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4.6 ENERGY CONSERVATION

L	T	P
3	-	2

RATIONALE

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

DETAILED CONTENTS

1. **Basics of Energy**

1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
1.2 Global fuel reserve
1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
1.4 Impact of energy usage on climate

2. **Energy Conservation and EC Act 2001**

2.1 Introduction to energy management, energy conservation, energy efficiency and its need
2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
2.3 Standards and Labeling
  2.3.1 Concept of star rating and its importance
  2.3.2 Types of product available for star rating

3. **Electrical Supply System and Motors**

3.1 Types of electrical supply system
3.2 Single line diagram
3.3 Losses in electrical power distribution system
3.4 Understanding Electricity Bill
  3.4.1 Transformers Tariff structure
  3.4.2 Components of power (kW, kVA and kVAR) and power factor, improvement of power factor
  3.4.3 Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

3.5 Transformers
  3.5.1 Introduction
  3.5.2 Losses in transformer

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3.5.3 Transformer Loading

3.5.4 Tips for energy savings in transformers

3.6 Electric Motors

3.6.1 Types of motors

3.6.2 Losses in induction motors

3.6.3 Features and characteristics of energy efficient motors

3.6.4 Estimation of motor loading

3.6.5 Variation in efficiency and power factor with loading

3.6.6 Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

4.1 Pumps

4.1.1 Introduction to pump and its applications

4.1.2 Efficient pumping system operation

4.1.3 Energy efficiency in agriculture pumps

4.1.4 Tips for energy saving in pumps

4.2 Compressed Air System

4.2.1 Types of air compressor and its applications

4.2.2 Leakage test

4.2.3 Energy saving opportunities in compressors.

4.3 Energy Conservation in HVAC and Refrigeration System

4.3.1 Introduction

4.3.2 Concept of Energy Efficiency Ratio (EER)

4.3.3 Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5 Lighting and DG Systems

5.1 Lighting Systems

5.1.1 Basic definitions- Lux, lumen and efficacy

5.1.2 Types of different lamps and their features

5.1.3 Energy efficient practices in lighting

5.2 DG Systems

5.2.1 Introduction

5.2.2 Energy efficiency opportunities in DG systems

5.2.3 Loading estimation

6 Energy Efficiency in Thermal Utilities

6.1 Thermal Basics

6.1.1 Types of fuels

6.1.2 Thermal energy

6.1.3 Energy content in fuels

6.1.4 Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces

6.2.1 Introduction and types of boilers

6.2.2 Energy performance assessment of boilers

6.2.3 Concept of stoichiometric air and excess air for combustion

6.2.4 Energy conservation in boilers and furnaces

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6.2.5 Do's and Don'ts for efficient use of boilers and furnaces

6.3 Cooling Towers

6.3.1 Basic concept of cooling towers

6.3.2 Tips for energy savings in cooling towers

6.4 Efficient Steam Utilization

7 Energy Conservation Building Code (ECBC)

7.1 ECBC and its salient features

7.2 Tips for energy savings in buildings

7.2.1 New Buildings

7.2.2 Existing Buildings

8 Waste Heat Recovery and Co-Generation

8.1 Concept, classification and benefits of waste heat recovery

8.2 Concept and types of co-generation system

9 General Energy Saving Tips

Energy saving tips in:

9.1 Lighting

9.2 Room Air Conditioner

9.3 Refrigerator

9.4 Water Heater

9.5 Computer

9.6 Fan, Heater, Blower and Washing Machine

9.7 Colour Television

9.8 Water Pump

9.9 Cooking

9.10 Transport

10 Energy Audit

10.1 Types and methodology

10.2 Energy audit instruments

10.3 Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

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V SEMESTER

5.1 INTEGRATIVE COMMUNICATION

L	T	P
-	-	4

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction to Personality Development	-	-	02
2.	Factors Influencing / Shaping Personality	-	-	02
3.	Self Awareness – 1	-	-	03
4.	Self Awareness – 2	-	-	02
5.	Self Awareness – 3	-	-	02
6.	Change Your Mind Set	-	-	02
7.	Interpersonal Relationship and Communication	-	-	03
8.	Non-Verbal communication Communication Skills	-	-	02
9 .	Communication Skills ACTIVITIES	-	-	06
10.	Body Language skills	-	-	03
11.	Leadership Traits & Skills	-	-	03
12.	Attitude	-	-	03
13.	Analyzing & Solving a Problem skills	-	-	02
14.	Time Management skills	-	-	03
15.	Stress Management Skills	-	-	02
16.	Interview Skills	-	-	04
17.	Conflict Motives	-	-	02
18.	Negotiation / Influencing Skills	-	-	02
19.	Sociability	-	-	03
20.	Importance of Group	-	-	03
21.	Values / Code of Ethics	-	-	02
		-	-	56

PERSONALITY DEVELOPMENT

1 **Introduction to Personality Development**
AIM, Skills, Types of Skills, LIFE SKILLS VS OTHER SKILLS, Concept of Life Skills. Ten core Life Skills identified by WHO

2. **Factors Influencing / Shaping Personality :**
Introduction, Physical and Social Factors Influencing / Shaping Personality (Hereditary, Self-Development, Environment, Education, Life-situations) Psychological AND Philosophical Factors Influencing / Shaping Personality (Past Experiences, Dreams and Ambitions, Self-Image, Values)

3. **Self Awareness – 1**
DIMENSIONS OF SELF AWARENESS (Self Realization, Self Knowledge or Self Exploration, Self Confidence, Self Talk, Self Motivation, Self Esteem, Self Image, Self Control, Self Purpose, Individuality and Uniqueness, Personality, Values, Attitude, Character), SELF REALIZATION AND SELF EXPLORATION THROUGH SWOT ANALYSIS AND JOHARI WINDOW,

4. **Self Awareness – 2**
SYMPATHY VS EMPATHY AND ALTRUISM,
Importance ofEmpathizing with Others,

5. **Self Awareness – 3**
Self-Awareness through Activity, Body Image (What is Body

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Image, What Decides our Body Image, What is Poor Body Image, What are the Harmful Effects of Poor Body Image), Tackling Poor Body Image(Enhance Self-Esteem, Build Up Critical Thinking, Build up Positive Qualities, Understand Cultural Variation, Dispel Myths, Utilize Life Skills)

6. **Change Your Mind Set**

What is Mindset, HOW TO CHANGE YOUR MINDSET (Get the Best Information Only, Make the best people your Role Model, Examine Your Current Beliefs, Shape Your Mindset with Vision and Goals, Find Your Voice, Protect Your Mindset, Let Go of Comparisons, Put An End To Perfectionism, Look At The Evidence, Redefine What Failure Means, Stop Worrying About What "People" Think)

INTERPERSONAL SKILLS

7. **Interpersonal Relationship and Communication**

INTERPERSONAL RELATIONSHIP , Forms of Interpersonal Relationship, Must Have in an Interpersonal Relationship, Interpersonal Relationship between a Man and a Woman (Passion, Intimacy, Commitment), Relationship Between Friends, ROLE OF COMMUNICATION IN INTERPERSONAL RELATIONSHIP (Take Care Of Your Tone And Pitch, Choice of Words is Important in Relationships, Interact Regularly, Be Polite, Try To Understand The Other Person's Point Of View As Well, Individuals Can Also Communicate Through Emails,

8. **NON-VERBAL COMMUNICATION Communication Skills**

Non-Verbal Communication, We Communicate with Our Eyes, Communication with Facial Expression, A Good Gesture, Appearance, Posture and Gait, Proximity and Touch), IMPORTANCE OF LISTENING, Characteristics of Good and Effective Listener(Is Attentive, Do Not Assume, Listen for Feelings and Facts, Concentrate on the Other Speakers Kindly and Generously, Opportunities)

9. **Communication Skills ACTIVITIES –**

Activities in Making Collages, Making Advertisements, PPT Preparation & Presentation, Speaking -Seminars, Group Discussions, Debates, Extempore Speeches, Listening to an audio clip and telling its gist, Answering a telephone call, Making enquiries, General tips- Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, Magazines (Current Affairs, Economic magazines, Technical magazines), How to read a report, article, Writing- Resume Writing, Writing joining report, Notice writing, Report making, Proposal writing, Advertisement, Notice for tender, Minutes writing, E-Mail writing, Listening News, Listening to audio clips.(Lecture, poetry, speech, songs),

10. Body Language skills

Introduction, What is Body Language , Body Language Parts, Personal Space Distances (Intimate Distance, Personal Distance, Social Distance, Public Distance), IMPORTANT BODY LANGUAGE SIGNS AND THEIR MEANING

UNDERSTANDING OTHERS

11. **Leadership Traits & Skills :**

Introduction, Important Leadership Traits (Alertness, Bearing, Courage, Decisiveness, Dependability, Endurance, Enthusiasm, Initiative, Integrity, Judgment, Justice, Knowledge, Loyalty, Sense of Humour), Other Useful traits (Truthfulness, Esprit-de-corps, Unselfishness, Humility and sympathy, Tact without loss of moral

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courage, Patience and a sense of urgency as appropriate, Selfconfidence, Maturity, Mental including emotional stability)

12. **Attitude**
    Types of Attitude, Components of Attitudes (Cognitive Component, Affective Component, Behavioral Component), Types of Attitudes (Positive Attitude, Negative Attitude, Neutral Attitude, Rebellious Attitude, Rational and Irrational Attitudes, Individual and Social Attitudes), Kinds of Attitude, ASSERTIVENESS, How to Develop Assertiveness (Experiment and Try New Things, Extend Your Social Circle, Learn to Make Decisions for Yourself, Indulge in Knowledge, Admire Yourself & Others), Negotiation (Be Sensitive to The Needs Others, Be Willing To Compromise, Develop Your Problem-Solving Skills, Learn to Welcome Conflict, Practice Patience, Increase Your Tolerance For Stress, Improve Your Listening Skills, Learn To Identify Bottom-Line Issues Quickly, Be Assertive, Not Aggressive)

PROBLEM SOLVING

13. **Analyzing & Solving a Problem skills**
    Critical Thinking, Creative Thinking, Decision Making, Goal Setting & Planning, Problem Solving
14. **Time Management skills**
    Need of Time Management, TIME WASTERS (Telephone, Visitors , Paper work, Lack of Planning & Fire Fighting , Socializing , Indecision , TV , Procrastination), PRINCIPLES OF TIME MANAGEMENT - Develop a Personal Sense of Time (Time Log , value of other people's time), Identify Long-Term Goals , Concentrate on High Return Activities , Weekly & Daily Planning (The Mechanics of Weekly Planning , Daily Planning), Make the Best Use of Your Best Time , Organize Office Work (Controlling Interruptions , Organizing Paper Work), Manage Meetings, Delegate Effectively, Make Use of Committed Time, Manage Your Health,
15. **Stress Management Skills**
    INTRODUCTION, Understanding Stress and its Impact, Expected Responses (Physical, Emotional, Behavioral), stress signals(thoughts, feelings, behaviors and physical), STRESS MANAGEMENT TECHNIQUES (Take Deep Breath, Talk It Out, Take A Break, Create a Quite Place in Your Mind, Pay Attention to Physical Comfort, Move, Take Care of Your Body, Laugh, Mange Your Time, Know Your Limits, Do You Have To Be Right Always, Have A Good Cry, Look for the Good Things Around You, Talk Less, Listen More), UNDERSTANDING EMOTIONS AND FEELINGS-through Activity
16. **Interview Skills (2 sessions from Industry Expert is Compulsory)**
    Curriculum Vitae (When Should a CV be Used, What Information Should a CV Include, personal profile, Covering Letter, What Makes a Good CV, How Long Should a CV Be, Tips on Presentation), Different Types of CV (Chronological, Skills-Based), BEFORE THE INTERVIEW , CONDUCTING YOURSELF DURING THE INTERVIEW , FOLLOWING THROUGH AFTER THE INTERVIEW , Interview Questions To Think About , MOCK INTERVIEW – Activity (MOCK INTERVIEW EVALUATION - NON-VERBAL BEHAVIORS, VERBAL BEHAVIORS, General Etiquettes to face the Board , Telephonic interview
17. **Conflict Motives –Resolution**
    Motives of Conflict(Competition for Limited Resources, The Generation Gap and Personality Clashes, Aggressive

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Personalities, Culturally Diverse Teams, Competing Work and Family Demands, Gender Based Harassment), Merits and Demerits of Conflict , Levels of Conflict (Interpersonal Conflict, Role Conflict, Inter-group Conflict, Multi-Party Conflict, International Conflict), Methods of Conflict Resolution (The Win-Lose Approach, The Lose-Lose Strategy, The Win-Win Approach), Techniques for Resolving Conflicts (Confrontation and Problem Solving Leading to Win-Win, Disarm the Opposition, Cognitive Restructuring, Appeal to Third Party, The Grievance Procedure)

18. **Negotiation / Influencing Skills**
Why Influencing, What Is Influencing, TYPES OF INFLUENCING SKILLS (Probing And Listening, Building Rapport, Sign Posting, Pacing, Selling, Assertiveness), LAWS AND PRINCIPLES OF INFLUENCE, The Six Laws of Influence (The Law of Scarcity, The Law of Reciprocity, The Law of Authority, The Law of Liking, The Law of Social Proof, The Law of Commitment and Consistency), Influencing Principles (Making a Start, Buy Yourself Thinking Time, Dealing With Disagreement, Difficult And Sensitive Situations)

19. **Sociability : Etiquettes And Mannerism & Social Skills**
Need for Etiquette , Types of Etiquettes (Social Etiquette, Bathroom Etiquette, Corporate Etiquette, Wedding Etiquette, Meeting Etiquette, Telephone Etiquette, Eating Etiquette, Business Etiquette, E-Mail Etiquettes,), MANNERISMS, HOW TO IMPROVE YOUR SOCIAL SKILLS (Be Yourself, Be Responsible, Be Open & Approachable, Be Attentive, Be Polite, Be Aware, Be Cautious)

20. Importance of Group / Cross Cultural Teams / Team Work skills
Introduction, Types and Characteristics of Groups (Definition of a Group, Classification / Types of Groups, Friendship Group, Task Group, Formal Groups, Informal Group, Effective Group), Importance of a Group, Characteristics of a Mature Group, TYPES AND CHARACTERISTICS OF A TEAM (Definition of a Team, Types of Teams, Functional Teams, Problem Solving Teams, Cross - Functional Teams, Self - Managed Teams), Importance of a Team, Characteristics of a Team

21. VALUES / CODE OF ETHICS
Meaning, A FEW IMPORTANT VALUES (Honesty, Integrity, Purity, Discipline, Selflessness, Loyalty, Fairness, Equality, Trust, Support, Respect, etc)

Note : One Orientation module for the faculty is must.
Involvement of Industry Experts is necessary for Interview Skills

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5.2 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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5.3 HEAT TRANSFER OPERATIONS

L	T	P
5	1	3

Rationale:

The subject already dealt as mechanical operations & Solid handling fluid mechanics in first and second year was the fundamentals.To further study the subject Heat transfer Operations is included to get the knowledge of modes of Heat transfer like conduction, convection and radiation. Different heat exchangers, condensers, evaporators, crystalysers, insulators used in chemical plant. Different types of simple numerical will be dealt to get the chemical engineering students aware of the problems generally occuring the industries.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Modes of Heat transfer	5	1	--
2.	Conduction.	8	2	--
3.	Convection.	8	2	--
4.	Radiation.	8	2	--
5.	Heat Exchanger	8	2	--
6.	Condenser.	8	2	--
7.	Evaporaters.	8	1	--
8.	Crystalliysers.	8	1	--
9.	Insulation.	9	1	--
	Total	70	14	52

DETAILED CONTENTS

1. MODES OF HEAT TRANSFER:

Conduction, convection & radiation.

2. CONDUCTION:

Fourier's law, Thermal conductivity, Conductance,flat Wall, Multilayer flat wall, Hollow cylinder, Multilayer cylinder log mean area, geometric mean area & Arthmatic mean area, Simple numerical problems in S.I. Units.

3. CONVECTION:

Natural and froced convection,
Physical significance of dimension less number. Reynold No, Prandle No., Nusselt No., Stanton No., Peclet No., Grashoff No., Dittus Boelter's equation-simple numerical problems using Dittus Boelter equation. Fouling factor. Individual heat transfer coefficient and over all heat transfer coefficient.

4. RADIATION:

Reflection, absorption and transmission of radiation, Kirchoff law, Emissive power, Wein's displacement law, the

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stefen Boltman law, Heat transfered by radiation exchange of energy between two parallel planes of difference emissivity, Radiant Heat transfer coefficient, Solar radiation, gray surfaces or gray body.

5. HEAT EXCHANGERS:

Log.-Mean-temp.-Difference (L.M.T.D.) for parallel or cocurrent - flow, counter-current-flow, cross - flow, construction and description of

1. Double pipe heat exchangers.
2. Shell & Tube heat exchanger.
3. Finned tube heat exchangers.
   Scale formation and cleaning devices, Wilson's plot (Simple Numerical Problems).
4. Plate type heat exhanges.

6. CONDENSER:
Film-wise and Drop-wise condensation. Construction & description of contact condenser and surface condenser.

7. EVAPORATORS:
Construction and description of

1. Horizontal tube types.

2. Standard vertical type or calendria type.

(a) Natural and forced circulation type.
(b) Entrainment and foam formation.
(c) Method of feeding evaproators-Forward,Backward & cross, mixed multi effect evaproation.
(d) BOILING : Nucleare boiling, film boiling, Transition boiling, Maximum flux and critical temperature drop, construction & description of Kettle type boilers. Boiling point rise (B.P.R) and effect, steam economy for single effective evaporator (Simple Numerical Problem).

8. CRYSTALLIZERS:
Classification of crystallizers; construction and description of
1. Swensen walker.
2. Vacuum crystalizer.

9. INSULATION:

Purpose of insulation common insulators, critical thickness of insulation for cylinder and spheres, optimum thickness of insulation, Heat loss from a pipe.

REFERENCE BOOKS

1. Heat Transfer by D. Q. Kern
2. Unit Operating in Chemical Engineering by Mc Cabe & Smith
3. Introduction to Chemical Engineering by Badger & Bancaro

5.4-MASS TRANSFER OPERATIONS

L	T	P
5	1	3

Rationale:

It is the further step of Unit Operation deals with the gas absorption, distillation, boiling point diagrams, extraction operation, humidification and drying processes in chemical industry. The subject have experiments as well, to be aware of the facts involved in actual process.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Diffusion	10	2	-
2.	Absorption	15	3	-
3.	Distillation	15	3	-
4.	Extration	15	3	-
5.	Humidification	10	2	-
6.	Drying	5	1	-
	Total	70	14	42

DETAILED CONTENTS

1. DIFFUCION:

Definition of diffusion, Rate of diffusion in Mass Transfer, Fick's law, diffusion in the gas phase-Equimolecular counter diffusion, diffusion through a stationary gas (Stefan's Law), Mass. Transfer Coefficient. Film theory and penetration theory of Mass Transfer, Diffusion in solids. Derivation of the following relations.

I. $$\frac{1}{K_G.a} = \frac{1}{k_G.a} + \frac{m}{k_L.a}$$

II. $$\frac{1}{K_L.a} = \frac{1}{k_L.a} + \frac{1}{m.k_G.a}$$

2. ABSORPTION:

Introduction, importance, absorption with chemical reaction, Mechanism of absorption - two film theory, Diffusion of gases through a stagnant gas, Diffusion in liquid phase, Rate of absorption, Relation between film and overall coefficient, Factors influencing the transfer coefficient. Gas absorption equipments - Plate and packed calumn, Spray towers, Choice of solvent for absorption, Height of Transfer Unit (HTU), Number of Transfer Unit (NTU), Meaning and their relationship (Simple Numerical Problems).

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3. DISTILLATION:

Various distillation methods:-

1. Equilibrium or flash distillation .

2. Differential distillation

3. Batch distillation.

4. Vacuum and Steam distillation.

5. Azeotropic and Extractive distillation.

Types of distillation columns:-

1. Perforated plate or sieve plate column

2. Bubble cap plate column

Vapor liquid equilibrium diagram, Raoult's law; Relative volatility, constant boiling mixtures, equilibirium diagram and construction of equilibrium diagram, Fractionating column calculation- Heat & material balance, Reflux ratio, equilibrium plate, Location of feed plate. Sub cooled reflux; effect of reflux ratio, Total reflux, Minimum reflux ratio Entrainment; Mc-Cable Thiele diagram-section above and below feed plate; Intersection of operating line. Location of q-line, optimum reflux ratio, calculation of no. of equilibrium plate by Mc-Cable Thiele diagram. Overall plate efficiency.

4. EXTRACTION :

1. Applications of this operation.
2. Choice of solvent.
3. Steps of extraction operation
4. Solid Liquid extraction, construction and description of

A. Moving Bed-Basket type oil seed extractor or Bollman extractor.

B. Rotocel extractor.

Liquid extractor; description and construction of

A. Mixer settler extraction system.

B. Perforated plate and baffle towers.

5. HUMIDIFICATION:

Definition and calculation of

1. Humidity

2. Percentage humidity

3. Relative humidity

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4. Humid volume.

5. Humid heat.

6. Enthalpy and its calculation.

7. Dry bulb and wet bulb-temp.

8. Adiabatic saturation temperature.

9. Use of humidity chart. Dew point, simple numerical problem using humidity chart, construction and description of cooling towers. (Natural and induced draft)

6. DRYING

General drying behaviour-Critical moisture content, equilibrium moisture content: Discription and construction of dryer.

1. Tray dryer.
2. Screen conveyor dryer.
3. Rotary dryer.

NOTE:- At Least One Question From Each Topic.

REFERENCE BOOKS

1. Mass Transfer Operation by R. Treybal
2. Chemical Engineering Vol. II by Richardson & Coulson
3. Unit Operation of Chemical Engineering by Mc Cabe & Smith
4. Introduction To Chemical Engineering by Badger & Bancher

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HEAT & MASS TRANSFER LAB.

LIST OF EXPERIMENT

(At Least 7 experiment to be Performed)

1. To determine over all heat transfer coefficient for an open pan evaperater in steady state conditions.

2. To determine over all heat transfer coefficient for an open pan evaporater in unsteady state conditions.

3. To determine 'U' for a double pipe heat exchanger in steady state conditions and also to determine efficiency of heat utilization.

4. To determine 'U' for a shell and tube heat exchanger in steady state conditions and also to determine efficiency of heat utilization.

5. To study a shieve plate distillation operation and to calculate over-all efficiency of the distillation column.

6. To determine steam economy of a single and double effect evaporator.

7. To study the rate of drying in a vacuum dryer.

8. To determine the pounds of volatile compounds distilled per unit pounds of steam distilled in a steam distillation operation.

9. To determine rate of setting of crystals in a crystaliser.

10. To study the rate of drying in Rotary dryer.

11. To determine drying rate for a wet material in a Tray Dryer.

12. To study packed tower in various industries.

13. To study various extractors in solvent extraction plant.

14. To study a spray pond in suger and other industries for cooling system.

15. Determination of Thermal conductivity of Asbestus Powder.

16. Study of Insulating Material (Glass wool, Mineral wool, Ceramic blanket, Fire brik, Fire cement, Fire clay, Asbestus power, Fire crete)

5.5 TECHNOLOGY OF ANIMAL FOODS

L	T	P
5	2	4

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	15	6	-
2	Topic 2	15	6	-
3.	Topic 3	15	6	-
4.	Topic 4	15	5	-
5.	Topic 5	10	5	-
	Total	70	20	56

DETAILED CONTENTS

1. Fluid Milk : Composition of milk and factor affecting it. Physico-chemical characteristics of milk and milk constituents. Production and collection, cooling and transporation of milk. Packaging storage and distribution of pasteurized milk: Whole, standardized, Toned, Double toned and Skim milk. Test for milk quality and adulteration. UHT processed milk, flavoured, Sterilized milk, Cleaning and sanitization of dairy equipments.

2. Definition, classification, composition and physico-chemical properties of cream. Production processes and quality control, Butter : Definition, classification, composition and methods of manufacture, Packaging and storage, Butter oil/ghee. Ice Cream : Manufacture, quality attributes and defects.

3. Evaporated and condensed Milk : Method of manufacture, Packaging an storage. Defects, casuses and prevention. Roller and spray drying of milk solids, Elementary idea about properties of milk powder. Manufacture of casein, Whey protein, Lactose from milk or use in formulated fodds.

4. Ante-mortem examination of meat animal, Scienctific slaughtering, Post mortem changes, Tendering and curing of meat, Beef mutton, Pork sausages and other meat products, Catch, Handling and transportation of fish. Fish spoilage, Processing, Preservation of fish, Shell fish and other sea foofs.

5. Poultry Processing, canning of poultry products, Physical, Chemical Nutritional and functional characteristics of egg. Causes of deterioration of quality of eff, Preservation and processing of egg. Manufacturing of egg. white, Egg yolk and whole eff solids/powder

LIST OF PRACTICALS

1. To perform sampling of milk
2. To conduct platform test of milk
3. Determination of fat by Gerber Method.
4. Determination of specific gravity, total solids, SNF (Solid Not Fat) of milk.
5. Adequacy of pasteurized milk.
6. Determination of moisture and fat content of milk powder.
7. Study of familiarization with various parts and working of cream separator and clarifer.
8. Preparation of Khoa.
9. Detection of adulterants in milk like water, urea, neutralizers, preservatives, sucrose, starch, etc.
10. Preparation of channa and paneer.
11. Preparation of ice cream.
12. MBR Test.
13. Visit to different dairy plants.

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5.6 FOOD PRESERVATION AND PROCESS PRINCIPLES

L	T	P
5	2	-

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	15	6	-
2.	Topic 2	15	6	-
3.	Topic 3	15	6	-
4.	Topic 4	15	5	-
5.	Topic 5	10	5	-
	Total	70	28	--

DETAILED CONTENTS

1. Basic Consideration : Aims and objectives of preservation and processing of foods, Characterisitcs of tissues and non-tissues foods, Degree of perishability of unmodified foods, Causes of quality deterioration and speilage of perishable foods, intermediate moisture foods, wastage of foods.

2. Preservation of foods by low temerature :

A. Chilling temperatures : Consideration relating to storage of foods at chilling temperatures. Applications and procedures, Controlled and modified atomsphere storage of foods, Post storage handling of foods.

B. Freezing temperatures : Freezing process, Slow and fast freezing of foods and its consequence, other occurences associated with freezing of foods. Technological aspects of pre freezing, Actual freezing, Frozen storage and thawing of foods.

3. Preservation of foods by high temperatures : Basic concepts in thermal destruction of microorganisms D,Z,F values. Heat resistance and thermophic microorganisms. Cooking, blanching, pasteurization and sterilization of foods. Assessing adequacy of thermal processing of foods, General process of caning of foods, Spoilage in canned foods.

4. Preservation by water removal :

A. Principles, technological aspects and application of evaporative concentration process; Freez concentration and membrane process for food concentrations.

B. Principles, Technological aspects and applicaiton of drying

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and dehydration of foods, cabinet, tunnel, belt, bin, drum, spray, vaccum, foam mat, fluidized-bed and freeze drying of foods.

5. Principles, Technological aspects and application of sugar and salt, Antimicrobial agents, Bioligical agents, non ionizing and ionizing radiations in preservation of foods, Hurdle technology.

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VI Semester

6.1-POLLUTION CONTROL & INDUSTRIAL SAFETY

L	T	P
4	1	-

Rationale:

A chemical engineering technician must have the knowledge of different types of pollution caused due to industrialsation so that he may help in balancing the eco-system and control the pollution by means of control devices. The technician must know various types of accidents which occour in chemical plants and how to safe gaurd them to avoid injury to men and material. The content of the subject have been developed to cater the above needs.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	1	-
2.	Air Pollution	6	1	-
3.	Water Pollution	6	2	-
4.	Environment Protection	6	2	-
5.	Radioactive Pollution	6	2	-
6.	Solid Waste Management	6	1	-
7.	Pollution Acts	6	2	-
8.	Safety in Chemical Industry	6	2	-
9.	Disaster Management	6	1	-
	Total	84	28	-

DETAILED CONTENTS

1. INTRODUCTION:

What is environment ? What is Pollution? Classification of pollution e.g. Land, Water, Air, Noise. Impact assesment of development projects. Character and origin of industrial wastes.

2. AIR POLLUTION:

(i) Definition of air pollution, Types of Air pollutants and their sources like SPM, SOX, NOX, NH3, F, Cl, CFC, Co2 etc.

(ii) Air pollution control equipment in industries.
- (a) Settling chambers
- (b) Cyclones
- (c) Scrubbers (dry & wet)
- (d) Multiclones
- (e) Electro Static Precipitations (ESPS)
- (f) Bug Filters

(iii) Ambient air quality measurement & their standards.

(iv) Vehicular Pollution and its control

(v) Noise Pollution and its control mechanism.

3. WATER POLLUTION:

Water pollution, standards for drinking water, domestic

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waste water and industrial waste water. Methods of measurement of various parameter like BOD, SS, pH, COD, TDS etc. Methods of treatment of industrial waste water like

(a) Chemical treatment
(b) Physio-Chemical treatment
(c) Bio-chemical treatment
(d) Any other advance treatment

4. ENVIORNMENT PROTECTION :

Enviornmental protection from hazardeous Chemicals & Waste :-

Terminology relating to chemical hazards and air pollution, classification of chemical hazards and hazardous chemicals, codes of safety for operational hazards in laboratories, industries etc. (Reference should be made of I.S. Codes)

5. RADIO ACTIVE POLLUTION:

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

6. SOLID WASTE MANAGEMENT:

Municipal solid waste, Biomedical waste, Plastic waste and Its Management.

7. POLLUTION ACTS:

A water pollution prevention control Act 1974, Air pollution Act 1981, Environment protection Act 1986, Hazardous chemical manufacturing, Storage and impact rules 1989 and hazardous waste and management and handling rules 1989, Noise Pollution Act.

8. SAFETY IN CHEMICAL INDUSTRY:

Receiving and storing chemicals-Transporting and moving chemicals- Safety in chemical reactions, Pipe-lines in chemical factories. Precautions in the case of processes in operations involving explosive or inflammble dusts, gases, vapours etc. Maintenance of chemical plants-corrosion health hazards in common chemical processes, Fire hazards and their Prevention. Codes of practice and specification for safety equipment (Reference should be made from I.S. Codes).

9. 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,

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Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

REFERENCE BOOKS

1. Safety in Process Plant Design by Wells
2. Safety and Accident Prevention in Chemical Operation by H. H. Tawcatte and W S Wood
3. Engineering Chemistry by P. C Jain

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6.2 FOOD PACKAGING

L	T	P
5	2	-

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	15	6	-
2.	Topic 2	15	6	-
3.	Topic 3	15	6	-
4.	Topic 4	15	5	-
5.	Topic 5	10	5	
	Total	100	28	-

DETAILED CONTENTS

1. Basic concept : Concept of packaging, Function of a food package, Package development factors and food package development factors, Aseptic packaging, Newer trends.

2. Cellulosic and Polymeric packaging materials and forms : Food grade polymeric packaging materials, Ridid plastic packages, Films, oriented, Co-extruded, Laminates and metallised; cellophane, olefins, polyamides, polyesters, PVC, PVDC, PVA, Inomers, Copolymers, Polycarbonates, Phenoxy, Acrylic and Polyurethane, Their mechanical sealing and barrier properties.

3. Glass and Metal Containers :

   Glass : Composition, Properties, Bottle making and closures for glass containers.
   Metal : Bulk containers, Tin-Plate containers, Tin free steel containers, Aluminium containers, Latest development in metal cans and protective lacquers.

4. Food product characteristics and package requirement, Selection of materials, Forms, Machinery and methods for fresh produce (Fruits, Vegetables, Egg, Meat and Fish), Edible oil and fats, Spice and Spice products, Processed products (Fruit and Vegetable, Ceral & Pulse, Dairy, Confectionary and Snacks, Meat and Marine products).

5. Package printing, Packaging Laws and Regulations, Evaluation of Food Packaging Materials and Package performance.

6.3 FOOD PROCESSING WASTE MANAGEMENT

L	T	P
6	2	-

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	18	6	-
2.	Topic 2	18	6	-
3.	Topic 3	18	6	-
4.	Topic 4	15	5	-
5.	Topic 5	15	5	-
	Total	84	28	-

DETAILED CONTENTS

1. Basic consideration : Standards for emission or discharge of environmental pollutants from food processing industries as per the updated provision of Environment (Protection) Act 1886. Elements of importance in the management of food processing waste.

2. Characterzation and utilization of by products from Cereal Pulses and Plantation products, Fermented food, Milk, Fish and Meat Industry.

3. Characterization of food industry effluents, Physical and chemical parameters, Oxygen demands and their interrelationship. Unit concept of treatment of food industry effluent, Screening, Sedimentation, Floatation as pre and primiary reactants.

4. Biological oxidations : Objects,organisms, reaction, oxygen requirements, aeration devices systems : Lagoons, Activated sludge process, oxidation ditches, rotating biological cont caters and their variations and advance modifications.

5. Waste water treatment system, Physical separation, Micro-strainers, Filters, Ultra filtration and electrodylisis osmosis, Physico-chemical separation; activated carbon adsorption.

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6.4 FOOD QUALITY & FOOD LAWS

L	T	P
5	2	4

Rationale:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	20	8	-
2.	Topic 2	20	8	-
3.	Topic 3	20	8	-
4.	Topic 4	10	4	-
	Total	70	28	84

DETAILED CONTENTS

1. Description of food quality, quality control and quality assurance. Total quality control and role of management/ TQM. Statistical quality control. Quality cost, analysis and interpreation of sensory scores. Application of sensory evaluation in quality management of foods.
2. Measurements of sensory attribute of foods : appearance, color and flavour and texture.
3. Nutritional quality fo foods and its assessments : Food proteins (Digestibility, Biological value, NPU, PER), Modification of foods constituents due to processing and storage and their nutritional implications.
4. Food standards and specification; compulsory and voluntary trade and company standards, consumer, company, in process and finished product specifications, relevant food laws :PFA, FPO, SWMA, MPO, Mark and BIS standards.

LIST OF PRACTICALS

1. Sensitivity tests (Threshold/Dilution) to measure individual ability for sensory analysis.
2. Differnce texts to evaluate qualitative and quantitative difference and/or performance between test product.(Basic Idea)
3. Assesment of quality of wheat flour (Water absorption power, Gluten content, Sedimentation value etc.)
4. Evaluation of quality of bakery products : Bread, Biscuits, Cakes, etc.
5. Evaluation of quality of dairy products : over run and fat content in Ice cream, specific gravity of milks, etc.
6. Assessment of quality of fruit and vegetable products : Tamato Products, Jam, Jelly, Marmalades, Squashes adn Cordials, Canned Products.
7. Assessment of quality of beverages : Tea and Coffee, Carbonated and RTS beverages.

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6.5 PROJECT

L	T	P
-	-	10

Rationale:

Every diploma holder have to do a project work before going into the world of work so that he may have sufficient knowledge to face the various problems involved in solving the project. Chemical engineering technician must be well aware of these too. So the project on the design of pressure vessel, storage tanks, heat exchanger, distillation column and evaporator are included in the subject.

Every Students is supposed to design one of the following problems alloted by Head of Deptt. and prepare the complete Project Report. The viva - voce will be conducted by the external examiner appointed by the board of Technical Education for the purpose.

The Students should be acquinted with the various codes and standards and the requirements of inspection and safety.

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FIELD EXPOSURE

Student have to go for a industrial training of 4 weeks in a chemical industry under the guidance of their H.O.D.. The student will submit a industrial training report which will be scrutinized and examined by the external examiner appointed by the B.T.E.. There will be viva voce of 100 marks and sessional marks 50.

TRAINING SCHEDULE

04 weeks structured supervised branch specific, task oriented Industrial Training to be organised during summer vacation after IInd year examination. The student during the industrial training must under take training in at least any one of the following and submit the training report in the format given at Annexure-I & II.

1. OPERATION OF CHEMICAL PLANT:

   Operation of chemical plant, Process control, Management of labour, Material and utility, Safety of workers and equipments.

2. CHEMICAL ANALYSIS:

   Analysis of sample, Interpretation of results of analysis.

3. ERECTION & COMMISSIONING OF CHEMICAL PLANT:

   Reading and inter-preting the skeches, drawings, layout, planning etc. Erection of chemical plants, Commisioning of chemical plants.

4. INSPECTION & TESTING OF CHEMICAL EQUIPMENT:

   Inspection, testing and performance of individual equipment, Fault finding or trouble shooting and its rectification.

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STAFF STRUCTURE

THREE YEAR DIPLOMA IN FOOD TECHNOLOGY

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 Chemical Engineering	3	
4.	Lecturer Food Technology	3	
5.	Lecturer in Mech. Engg.	1	Parttime/ Common with other disciplines if the intake is more than 180
6.	Lecturer in Maths	1	
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. Mechanics Lab.			60
6.	Electrical Engg. Lab.			120
7.	Unit Operation Over Head Tank 2000 Litre Cap; Under Ground Tank 600 Litre Cap;			120
8.	Anatical Food Technology Lab-I			120
9.	Anatical Food Technology Lab-II			120
10	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
(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

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	1set	800	800

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	Complete			
46.	Lab stools	30		

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

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
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
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

III. APPLIED MECHANICS 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
8.	Simple Screw Jack	4	3000	12000
9.	System of pulleys (Any I,II,III)	2Set Each	4000	8000
10.	Worm & Worm wheel	2Set Each	5000	10000
11.	Simply Support Beam with different weights (2 Sets)	2	3000	6000
12.	Jib Crane	2	2500	5000
13.	Jointed Roof Truss Apparatus	2	2500	5000
	Misc.	Lum Sum		5000

Note :
1. S. No. 1,2 Acrylic/Wood material/Aluminium Cast
2. S.No. 3,4,5,8,9 working model of Acrylic/Aluminium/Cast
3. Above items are for 2 batches of 15 students each.

V. WORKSHOP PRACTICE

CARPENTRY SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	60 cm.rule	10	50	500
2.	Flexible steel rule 2 metre	2	75	150
3.	T square 23 cm. steel	10	50	500
4.	Bevel square 23 cm. steel	2	100	200
5.	Marking knife 25 cm. steel	10	100	1000
6.	Marking gauge wooden & brass 25 cm.	10	150	1500
7.	Mortise gauge wooden & brass 25 cm.	10	150	1500
8.	Caliper inside,steel 20 cm.	2	200	400
9.	Caliper outside , steel 20 cm.	2	200	400
10.	Compass steel 20cm.	2	100	200
11.	Devider steel 20 cm.	2	100	200
12.	Plumb	2	75	150
13.	Wooden bench vice steel 20 cm.	10	500	5000
14.	Bench hold fast steel 30 cm.	10	300	3000
15.	Bar clamp 2 m.	2	500	1000
16.	G clamp of flat spring steel 20x30 cm.	4	150	600
17.	Rip saw 40-45 cm.	10	200	2000
18.	Cross cut saw 40-45 cm.	2	200	400
19.	Tennon saw 30-35 cm.	10	200	2000
20.	Dovetail saw 30-35 cm.	2	150	300
21.	Compass saw 35 cm.	4	150	600
22.	Key hole saw or pad saw 30-35 cm.	2	150	300
23.	Bow saw	2	200	400
24.	Frame saw	2	200	400
25.	Chisel fish brand 1" to 1/8"			
	firmer	3 set	250	750
	Dovetail	3 set	250	750
	Mortise	3 set	250	750
26.	Gauge or Golchi 1" to 1/8"	3 set	300	900
27.	Wooden jack plane complete	10	100	1000
28.	Wooden smoothing plane	10	250	2500
29.	Iron jack plane complete	10	200	2000
30.	Iron rebate plane complete	3	200	600
31.	Iron grooving plane complete	3	300	900
32.	Iron compass plane complete	3	350	1050
33.	Wooden moulding plane complete	3	500	1500
34.	Bradawl	3	350	1050
35.	Gimlet drills set	1 set	300	300
36.	Center bit	2	250	500
37.	Twist bit	2	200	400
38.	Auger bit	2	200	400
39.	Dovetail bit	2	200	400
40.	Counter shank bit	2	200	400
41.	Ratchet brace machine	2	300	600
42.	Grand drill machine 1/4"	2	600	1200
43.	Wooden hand drill burmi	5	700	3500
44.	Wooden mallet	10	100	1000
45.	Claw hammer	3	100	300
46.	Carpenters hammer	10	100	1000
47.	Cutting tool for Universal wood working machine	3 set	1500	4500

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48.	Screw driver 18" & 15"	6	100	600

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
49.	Adze 500 gm.	10	100	1000
50.	Pincer 175 mm.	6	250	1500
51.	Plier 150 mm.	4	200	800
52.	Oil stone 8"	4	180	720
53.	Rasp file 12"	4	200	800
54.	Half round file 12"	4	200	800
55.	Round file 12"	4	200	800
56.	Triangular file 5", 4"	8	200	1600
57.	Water stone	4	80	320
58.	Carpentry work benches	4	4000	16000
59.	Band saw machine complete	1	60000	60000
60.	Circular saw machine	1	35000	35000
61.	Double Ended Electric Bench grinder	1	15000	15000
62.	Universal wood working machine	1	30000	30000
	misc. for foundation of machines	LS		20000
	SMITHY SHOP			
1.	Anvil 150 Kg. with stand	5	5500	25500
2.	Swage block 50x30x8cm.&45x45x10cm.	2	3000	6000
3.	Hammers			
	Ball peen 0.8 Kg. (Approx.)	10	350	3500
	Cross peen 0.8 Kg. (Approx.)	10	350	3500
4.	Beak iron 25 Kg.	1	1000	1000
5.	Swages different types	6	100	600
6.	Fullers different types	6	100	600
7.	Leg vice 15 cms. opening	1	300	300
8.	Electric blower with motor	1	10000	10000
9.	Furnace chmney with exhaust pipe	5	10000	50000
10.	Sledge hammer - 5 Kg.	2	400	800
	Misc. tools		LS	5000
	SHEET METAL, SOLDERING & BRAZING			
1.	Dividers - 15cm.	5	100	500
2.	Trammel 1 m.	1	80	80
3.	Angle protector	5	100	500
4.	Try square 30 cm.	5	80	400
5.	Centre punch	5	50	250
6.	Steel rule 30 cm. , 60 cm.,	5	25	125
7.	Sheet metal gauge	1	250	250
8.	Straight snips 30 cm.	2	500	1000
9.	Curved snips 30 cm.	2	600	1200
10.	Bench shear cutter 40 cm.	1	10000	10000
11.	Chisel 10 cm.	5	200	1000
12.	Hammer	5	300	1500
13.	Bench vice 13 cm.	5	2000	10000
14.	Plier	5	100	500
15.	Nose plier	5	120	600
16.	Sheet metal anvil/stakes	5	3500	17500
17.	Shearing machine 120 cm.	1	5000	5000
18.	Solder electric	2	1000	2000
19.	Solder furnace type	2	500	1000

20.	Brazing equipments and accessories	1	10000	10000
21.	Blow lamp	2	400	800
22.	Sheet bending machine	1	20000	20000
	Misc.		LS	10000

FITTING SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Bench vice jaw 10 cm.	10	600	6000
2.	Surface plate 45x45 cm.	2	4500	9000
3.	V. Block 10x7x4 cm.	5	700	3500
4.	Try square	10	100	1000
5.	Bevel protractor 30 cm.	1	250	250
6.	Combination set	1	3000	3000
7.	Divider	5	100	500
8.	Centre punch	5	80	400
9.	Calipers (Different sizes)	12	100	1200
10.	Vernier calipers 30 cm.	2	1500	3000
11.	Micrometer 0-25, 25-50 m.m.	4	1500	6000
12.	Vernier depth gauge	1	700	700
13.	Feeler gauge--15 blades	1	100	100
14.	Radius gauge	1	200	200
15.	Angle gauge	1	200	200
16.	Thread gauge	1	200	200
17.	Bench drilling machine 13 mm.	1	10000	10000
18.	Double ended electric grinder	1	8000	8000
19.	Drill set	1set	2000	2000
20.	Reamer set	1set	3500	3500
21.	Tap set	1set	3500	3500
22.	Adjustable wrenches (15 cm.,20cm. 30 cm.)	1set	1200	1200
23.	Allen key set	1set	700	700
24.	Spanners	6	100	600
25.	Work benches	6	4500	27500
26.	Power hacksaw	1	8000	8000
	Misc. Files, Dieset, Hexa frames etc.		LS	20000

WELDING SHOP

1.	Ellectric welding set oil cooled	1	20000	20000
2.	Industrial regulator type oil cooled arc welder	1	25000	25000
3.	Air cooled spot welder 7.5 KVA	1	30000	30000
4.	General accssories for air cooled spot welder of 7.5 KVA			15000
5.	Gas welding set with gas cutting torch and complete with all accessories	1	30000	30000
6.	Misc. work benches		LS	35000

PAINTING & POLISHING SHOP

1.	Air compressor complete with 2 HP motor	1set	25000	25000
2.	Spray gun with hose pipe	1	1500	1500

3. Stoving oven	1	6000	6000
4. Buffing machine with leather and cotton wheels	1	8000	8000
5. Electroplating Equipment for cromium Nikle plating.	1	20000	20000
Misc.		LS	5000

PLUMBING SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Pipe vice 5 cm.	4	500	2000
2.	Chain wrenches	5	500	2500
3.	Ring spanner Set	5	250	1250
4.	Wheel pipe cutter	2	600	1200
5.	Water pump plier	4	100	400
6.	Pipe die set 2" set	2 set	1200	2400
7.	Pipe bending device	1	5000	5000
8.	Work benches	4	6500	26000
9.	Set of various types of plumbing fittings e.g. Bib cock Cistern, Stop cock, Wheel volve, Gat volve etc.	LS		4000
10.	Misc. Hacksaw frame and others	LS		4000

FOUNDRY SHOP

1.	Moulding boxes	25		12000
2.	Laddles	5		2000
3.	Tool kits	10 sets		5000
4.	Quenching tanks water or oil	2		2000
5.	Permiability tester	1		2000
6.	Mould hardness tester	1		12000
7.	Sand tensile testing equipment	1		15000
8.	Portable grinders	1		6000
9.	Temperature recorders/controllers	LS		10000
10.	Pit furnace with Blower	1		10000

MACHINE SHOP

1.	Lathe machine 4.5 feet "V" bed. Height of centres 8.5 inch. Dog chuck 8 inch complete 1 H.P. motor 440v, push button starter with coolent pump,tray and with standard accessories.	4		50000
2.	Shaper machine 12 inch stroke with 2 H.P. motor 440 volts push button starter with vice 6 inch (Swivel base)	2	20000	200000

NOTE:-

1. The institutes running mechanical engg. course need not purchase these two items sepreately because they will have one complete machine shop for the course

2. 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 60 node 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		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	04	8,00000

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	connectivity.(For 2 Labs)		
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

UNIT OPERATION LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Apparatus to verify Bernoulli's Thorem	1 set	15000	15000
2.	Apparatus for conducting experiments on venturimeter with collecting and supplying tank	1 set	15000	15000
3.	Reynold's apparatus with storage tank and flow steadying arrangement with 1/2 HP pump and accessories	1 set	10000	10000
4.	Apparatus for determining Cc, Cv and Cd (with set & micrometer guage)	1 set	15000	15000
5.	Apparatus for determining various head losses in pipes (Fitted with all valves & Orificemeter along with storage tank)	1 set	25000	25000
6.	Notch apparatus with set of notches with v-type, square-type notch	1 set	13000	13000
7.	Model of Reciprocating pump-1.4"	1	5000	5000
8.	Model of Centrifugal pump	1	5000	5000
9.	Pressure gauge Borden's type Max. 4 Kg/Cm2/1/4" connection Nipple	1	5000	5000
10.	In place of item no. 1,2,4,5 & 8 Hydraulic bench may be purchased with all accessories or such institution if already have above items may purchase one unit, Otherwise 6 units	6	20000	20000
11.	Misc. for tools, Manometer Pitot's tube, Differential manometer and minor equipments			20000
12.	Orifice Meter(Orifice Diameter 25mm)	1	1000	1000
13.	Rota Meter 40-400 lit. per. min. with all parts	1	10000	10000
14.	Stop Watch (1/10 racer)	3	1200	3600
15.	Centrifugal Pump with Motor 230 V, 1HP Single Phase	1	15000	15000
16.	Plate & Frame filter Press 240X240 mm, 6 No. of Folter Plate/5 Nos. of frame with stand, tray, tighting arrangement, filter cloth & moterized pump & tank	1		55000
17.	Sieve Shaker with Motor & Time Switch/stop watch	1		7000
18.	Test Sieve with FHP Motor through a reduction gear suitable to carry upto 7 sieve of 50 cm. or 20 cm. diameter	1 Set		15000
19.	Sieve Plate(S.S.) Distillation Column Column dia 6-8" test size 200mm dia with Reboiler and condenser	1		75000

Sl.No.	Name of Equipment	No.	Rate	Amount
20.	U Tube Double Pipe Heat Exchanger 1800 mm length inside pipe 30mm OD 25 mm, welded leak proff with inlet and outlet valves & steam trip, all fitted on M.S. structure	1		55000
21.	Stainless Steel Spherical Jackted Open Pan Evaporator. 1X4' with jacket for cooling stirrer	1		50000
22.	Stainless Steel Crystalizer 500 Lit. with stirrer motor and Gear Box	1		40000
23.	Rotatory Dryer Drying Shell : Material Stainsteel 1.5 M Dia 110 mm, Feed Hopper, Product receiver, Heating Chamber, Heater, Temperature Sensors, Standard make on/off switch Main indicator, etc	1		100000
24.	M.S. Thickner	1		45000
25.	S.S. Spherical Jackted Open Pan Evaporator With Stirrer. 500 liter with Stirrer motor and gear box	1		50000
26.	Shell & Tube Heat Exchanger System water ro water (1-2 shell & tube type) Shell : Material Stainless Steel dia 220 mm, length 500 mm(Aprox.), Tube : OD 16 mm (Aprox.), Length 500mm (24 Nos.)	1		50000
27.	Tray Dryer Drying Chamber:Stainless Steel Material, Heater, Temperature Sensors, Digital Temperature Controller with standard make on/off switch	1		70000
28.	Rotary Vacuum Filter Drum Dia 1'-1.5 slurry through vaccum/suction pump	1		50000
29.	Electric Bioler with temperature control recorder & pressure guage (100-800hp, 15-300 psig)	1		80000
30.	Disintegrator Alongwith Wattmeter and voltmeter fitted with Motor and stand, hammer type Common guage plate input hopper and discharge element (1 Horse Power)	1		25000
31.	Jaw Crusher alongwith Wattmeter and voltmeter 4"X4" 40 kg. per hour with 3 HP motor made of heavy steel body with meganetic steel jaws and stand	1		50000

Sl.No.	Name of Equipment	No.	Rate	Amount
32.	Ball Mill Moc : MS Chamber Size : 300(D) * 350 (L) mm Speed : 65 RPM with step pully arrangement Evevation : Centre line of the shell @ 50 cm high from the ground level 2 hp ac motor, 1440 rpm, single phase, 230V & 50 Hz with step pulleus to give Three different speed of drum. Accessories : Set of Step pulleys & Suitable belt 50 nos. 25 mm dia proelain Ball/ms balls 1 no. or product collection Tray of suitable size of MS with painted	1		600000
33.	Vacuum Pump Water Ring Type	1		
34.	Vacuum Pump Oil Ring Type	1		
35.	Valves (Gate, Gloves, Cock, Check, Butterfly, Steam trap, Safety valve, Ball valve.	1 Each		
36.	Fittings (Flange, Socket, Union, Nipple, Elbow, Reducer, T, Plug)	1 Each		
37.	Thermal Conductivity Meter (For Asbestos Powder)	1		

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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 Arrangement.	2 Set		
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.	Flouroscant 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

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.		L.S.	1500

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ANALYTICAL AND FOOD TECHNOLOGY LAB

1. Analytical Food Technology Lab-I : Food Chemistry, Technology of Plant Food, Food Microbiology Lab
2. Analytical Food Technology Lab-II : Technology of Animal Food, Food Quality and Food Laws 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.	Fractional weights set with rider 10 mg to 500 mg with rider	5sets	25	125
6.	Reagents bottles			
	250ml	120	20	2400
	500ml	25	25	625
	1000ml	5	30	150
7.	Wide mouth bottle 250 ml Glass	50	15	750
8.	Winchester bottle 2.5 litre Plastic/Tafflon	15	30	450
9.	Test tubes 1/4" x 6"			
i.	Corning or Borosil	200	9	1800
ii.	Glass	200	2	400
10.	Boiling tube 1" x 6"			
i.	Corning or Borosil	100	16	1600
ii.	Glass	100	5	500
12.	Pestle and morter Dia 10 cms 15 cms (Ceramics)	2	30	60
13	Beakers (Glass/Brosil/Corning Plastic)			
	250 ml.	50	20	1000
	500 ml.	50	20	1000
14.	Wash bottles (Plastic/Tafflon)	30	15	450
15.	Conical flask 250 ml. Glass (Brosil/Corning/Plastic) Transparnt	100	30	3000
16.	Flat bottom flask 500 ml.Glass	15	40	600
17.	Flat bottom flask 250 ml.Glass	15	25	375
18.	Burette 50 ml. (Plastic/Tafflon)	30	60	1800
19.	Pipette 25 ml. (Plastic/Tafflon)	30	20	600
20.	Measuring flask 250 ml. with stopper	30	50	1500
21.	Measring cylinder of various sizes (100 ml,250 ml,500 ml,1000 ml) 3 no. of each	12	30	360
22.	Bunsen's burner of brass	30	50	1500
23.	Gas plant petrol/LPG 10 to 20 burners automatic	1	5000	5000
24.	Spirit lamp (Brass)	30	30	900
25.	Tripod stand (Steel/Iron) Large/Medium	30	30	900
26.	Wire gauge 15 X 15 cm. with asbestos	30	15	450
27.	Test tube holder wodden	50	10	500
28.	Porcelain plates Ceramic	30	20	600

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
29.	Funnel 15 cm. Glass Borosil Corning/Plastic	60	16	960
30.	Spatula hard & nickel/steel	2 each	50	100
31.	Brush for cleaning Hydro Fiber Acid & Alkali Resistant	100	10	1000
32.	Jars 20 Lit. for keeping destilled water	5	100	500
33.	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
34.	Side racks and selves for bench reagents made of teak wood for 24 bottels each set	4	2000	8000
35.	Digital balance electronic Electronics upto 2 decimal places	1	10000	10000
36.	Hot plates 7-1/2", 3" dia controled 2000 watts	1	1000	1000
37.	Hot air oven thermostatically controled with selves and rotary switches 350 x 350 x 25 high	1	8000	8000
38	pH Meter (Digital)	1	1000	1000
39	Glass Electrode	2	850	1700
40.	Reference Electro	2	850	1700
41.	Weight Box 1gm,2gmX2, 5gm,10 gm 20gmX2, 50gm, 100gm with for cep Miscellaneous	LS		15000
42.	Incubator	1		30000
43.	Vertical Autoclave	1		30000
44.	Analytical Balance	1		50000
45.	UV-vis spectrophotometer	1		300000
46.	Compound Microscope	1		10000
47.	Water distillation plant	1		20000
48.	Water bath	1		20000
49.	Muffle furnace	1		200000
50.	Kjeldal assembly for N2 estimation	1		20000
51.	Deep Freezer	1		40000
52.	Food processor	1		7000
53.	Soxhlet Extration Extration Apparatus Glass Assembly	1		6000
54.	Heating Mentle (2 lit & 5 lit)	1		5000
55.	Juicer/Mixer/Grinder	1		5000
56.	Centrifuge	1		20000
57.	Microwave Oven	1		20000
58.	Fluidised Bed Reactor	1		60000
59.	Refrigerator	1		10000
60.	Laminar Air Flow	1		20000
61.	Clinching Machine	1		7000
62.	Butyrometer Glass Assembly	1		2000
63.	Refractometer	1		12000
64.	Vaccum Oven	1		300000
65.	Tray Dryer	1		200000
66.	Freeze Dryer	1		500000

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
67.	Baking Oven	1	300000	
68.	Homogenizer	1	50000	
69.	Cream Seperator	1	50000	
70.	Freeze Drier	1	534000	
71.	Mini Spray Drier	1	200000	
72.	Balances	1	126000	
73.	UV Vls. Spectrophotometer	1	309000	
74.	Gel Electroforesis	1	102000	
75.	Trinocular Microscope	1	214000	
76.	Microprocessor Controlled Gas Chromatograph	1	395000	
77.	Automatic Solvent Extraction Extraction System	1	194000	
78.	Automatic Fibre Extraction Extraction System	1	249000	
79.	Infra Red Mositure Analyser(IR-30)	1	120000	
80.	Research Microscope	1	127000	
81.	Automatic Microprocessor Bomb Calorimeter	1	458000	
82.	Texture Analyzer	1	864000	
83.	Patato Chip Making Plant	1	85000	
84.	Pasta Making Machine	1	308000	
85.	Economy Khoa Machine	1	78000	
86.	Automatic Protien Analyzer	1	1250000	
87.	Water Activity Meter	1	468000	
88.	Electronic Analytical Balance	1	50000	
89.	Water Treatment Plant	1	128000	
90.	Colour Measurement System	1	11905 USD	

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LIST OF LABORATORY EQUIPMENT(Energy Conservation)

Sr. No	Particulars	Qty	Estimated Cost (Rs)
1.	Multimeter	1	17,000
2.	Power Analyzer	1	20,000
3.	Luxmeter	1	5,000
4.	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25,000
5.	Centrifugal pump, 1 kW	1	15,000
6.	Variable Frequency drive	2	50,000
7.	Water Flow meter	1	10,000
8.	Pressure Gauge	1	2,000
9.	Experimental Set up for Valve Throttling vs VFD	1	50,000
10.	Compressor, 20 cfm, single-stage	1	50,000
11.	Air leakage meter	1	18,000
12.	Blower (2 HP)	1	8,000

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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

Note :

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

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ANNEXURE - I

FORMAT FOR FIELD EXPOSURE

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. 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 (welding, Foundary, Machine shop etc) 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.

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ANNEXURE - II

TRAINEES ASSESSMENT

This Institution invites the comments on the training of its students (work & behaviour) from their immediate supervisors on the following points.

1. Name of the trainee

2. Date of

   i. Joining.

   ii. Leaving.

3.

   i. Regularity & Punctuality

   ii. Sense of responsibility

   iii. Readiness to work/learn

   iv. Obedience

   v. Skill aquired

4. Name of the sections of the unit he attended during his stay.
   His activities/worth of being there.

5. Any thing specific

Sinnature of the Assessor

Date :- Designation

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

1. Presentations of Case Studies
2. Debate competitions
3. Poster competitions
4. Industrial visits
5. Visual Aids

COURSE OUTCOMES

After studying this course, a student will be able to co-relate and apply fundamental key concepts of energy conservation and energy management in industry, commercial and residential areas. A student will be able to:

- Define principles and objectives of energy management and energy audit.
- Understand Energy Conservation Act 2001 and its features.
- Understand various forms & elements of energy.
- Identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- Identify areas of energy conservation and adopt conservation methods in various systems.
- Evaluate the techno economic feasibility of the energy conservation technique adopted.

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

REFERENCE BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi&Shashank Jain published by TERI. Latest Edition
5. **Important Links:**
   (i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
   (ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
   (iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
   (iv) **Central Pollution Control Board (CPCB),** Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.
   (v) Energy Efficiency Sevices Limited (EESL). www.eeslindia.org.
   (vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

ANNEXURE-III QUESTIONNAIRE

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

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Food Technology.

PURPOSE: To design and develop Threer Year diploma curriculum in Food Technology..

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 Food Technology.. _____

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

1. 2. 3.

4. 5. 6.

7.What proficiencies are expected from a diploma holder in Food Technology.

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

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 Food Technology.
(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 Food Technology.

15. In which types of organisations can a diploma holder in Food Technology.can work or serve.

1 2 3

4 5 6

16. Job prospects for the diploma holder in Food Technology 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 Food Technology.

Theory Practical

18. Kindly mention particulars regarding topics/areas which

should be given more emphasisin the curriculum .

Theory Practical

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 Food Technology.

(Signature)

Kindly mail the above questionnaire duly filled to:-

G N Singh
Asstt. Professor
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)