PROPOSED CURRICULUM STRUCTURE FOR THE SEMESTER 3 of DIPLOMA IN ARRIGULTURAL ENGINNERING

SI No	SUBJECT	Subject code	Question code	Packet code	lecture	sessionaL	Mid Semester Exam(CT)	TA	Total internal	obj	SUbj	Marks allotted For ESE	THEORETICAL SUBJECT	TW	PR	total	FULL MARKS	Credits	Page No.
	THEORITICAL																		
1	Basic soil Science				3	--	20	10	30	20	50	70	100	--	--	--	100	3	
2	Surveying & Levelling				4	--	20	10	30	20	50	70	100	--	--	--	100	3	
3	Agricultural Process Engineering				3	--	20	10	30	20	50	70	100	--	--	--	100	3	
4	Thermodynamics & Heat Transfer Process				3	--	20	10	30	20	50	70	100	--	--	--	100	3	
5	Environmental Engineering				3	--	20	10	30	20	50	70	100	--	--	--	100	3	
6	Hydraulics				3	--	20	10	30	20	50	70	100	--	--	--	100	3	
	SESSIONAL																		
6	Basic Soil Science Lab.				--	6	--	--	--	--	--	--	--	50	50	100	100	2	
7	Field survey practice				--	6	--	--	--	--	--	--	--	50	50	100	100	2	
8	Agricultural Process Engineering Lab.				--	3	--	--	--	--	--	--	--	25	25	50	50	2	
9	Practical of Horticultural Crops Lab.				--	6	--	--	--	--	--	--	--	50	50	50	100	2	
	TOTAL				19	21	120	60	180	120	300	420	600	150	150	300	900	26	

Student contact hour per week is 31 hour.

Theory and Practical classes will be of 1(one) hour duration.

List of abbreviation used: CT – class test; TA - Teacher's Assessment (Attendance & surprise quizzes = 6 marks ; Assignment & group discussion = 4 marks.)

Obj: objective Subj - Subjective Minimum passing marks for Theoretical and Sessional subjects will be 40%

All other rules and regulations for assessment of practical and term work will be carried out as per prevailing norms

NO QUESTION SHOULD START WITH "WHY" OR ASKS FOR " GIVING OR CITING REASONS"

TW – Term work (to be evaluated by a board of departmental teachers) PR- Practical (to be evaluated by external teachers)

1 BASIC SOIL SCIENCE

Name of course: Diploma in Agricultural Engineering   Subject: BASIC SOIL SCIENCE
Curse Code: Agr. E   ·Course Duration: 6 semester   Subject offered in·semester: Third   ·
Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

Aim:-
 To develop basic knowledge and skills for measurement of basic soil properties their classification, soils structure, soil mass and fundamental concepts and principles of soil behaviours.

Objective :-
The basic knowledge regarding properties of Soil with a view to grow the crops is an essential requirement of the Agricultural Engineering profession. It also helps in designing the agricultural machineries used for land preparation. This course facilitate the true knowledge for measurement of the various soil parameters, like soil pH, soil micro-organism, minerals, soil texture, structure pore-spaces soil moisture and other physical and chemical properties

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	INTRODUCTION	6	5
Unit 2	SOIL FORMATION	12	11
Unit 3	SOIL PROFILE	4	12
Unit 4	PROPERTIES	10	10
Unit 5	SOIL WATER	3	8
Unit 6	SOIL AIR	3	9
Unit 7	SOIL TEMPERATURE	3	8
Unit 8	SOIL ORGANISM	4	7
	TOTAL	48	70

 Content: Theory (Basic Soil Science)   3 hrs/wk

1.0 INTRODUCTION: 04
    1.1 History Of Agricultural Chemistry And Scope
    1.2 Development And Discipline Of Soil Science
    1.3 Composition Of Earth's Crust
    1.4 Concept Of Lithosphere Troposphere, Stratosphere And Ionosphere
2.0 SOIL FORMATION: 12
    2.1   Soil Forming Rocks And Minerals- Origin, Classification And
            Composition
    2.2   Weathering Of Rocks And Minerals
    2.3   Weathering Processes Geochemical And Pedochemical

2.4	Parent Material-Classification	
2.5	Soil Forming Process	
2.6	Factors Of Soil Formation	

3.0 SOIL PROFILE: 04

    3.1 Soil As A Natural Body And Medium For Plant Growth

4.0 PROPERTIES: 10

    4.1 Physical - Soil Texture, Structure, Densities, Pore Spaces

    4.2 Chemical Properties - Ph

5.0 SOIL WATER: 03

    5.1 Composition And Classification

    5.2 Soil Moisture Constants And Function

6.0 SOIL AIR: 02

    6.1 Soil Air Composition And Function

7.0 SOIL TEMPERATURE: 03

    7.1 Source And Function

8.0 SOIL ORGANISM: 04

    8.1 Macro-Organism And Their Role In Soil Fertility.

        Class Test & Revision 03

Text Books:

Sl NO	Name of Book	Writer's Name	Publisher's Name
1	Measurement of engineering properties of soil	E Saibaba Reddy & K. Rama Sastri	New age International publication
2	Introduction to Soil Science	D. K. Das	-------

2 SURVEYING AND LEVELLING

Name of course: Diploma in Agricultural Engineering   Subject: SURVEYING AND LEVELLING

Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: Third

Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : 4 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

Aim:-

The course content of Surveying has been designed to provide adequate information to develop competency in a learner to enable to prepare maps by conducting chain & compass surveying and prepare land profile by leveling.
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Objective :-

Surveying is an essential component of the day to day work of an Agricultural Engineering Technician. The job includes conducting detailed surveying, plotting of survey data, preparation of survey maps etc. The course content of Surveying includes the basic concept horizontal linear and angular measurements and conducting surveys involving horizontal linear and angular measurements with stress on familiarization with various equipment used. It also includes vertical linear measurements to indicate the profile of the land surface by leveling has also been covered in details.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	INTRODUCTION	1	1
Unit 2	LINEAR MEASUREMENT	4	5
Unit 3	CHAINING	6	7
Unit 4	CHAIN SURVEYING	6	10
Unit 5	ANGULAR MEASUREMENT	6	10
Unit 6	CHAIN AND COMPASS SURVEYING	7	10
Unit 7	LEVELING	7	10
Unit 8	PLANE TABLE SURVEYING	6	10
Unit 9	C0MPUTATION OF AREA AND VOLUME	5	7
	TOTAL	48	70

Content: Theory (Surveying And Levelling)   3 hrs/wk

1.0 INTRODUCTION:
    1.1   Definition, Aims And Objectives Of Surveying
    1.2   Classification Of Surveying
    1.3   Principles Of Surveying
    1.4   Precision And Accuracy Of Measurements
2.0 LINEAR MEASUREMENT:
    2.1   Methods Of Measuring Distance, Their Merits And Demerits, Suitability
    2.2   Instruments For Measuring Distance: Tape, Chain And Accessories, Their Merits And Demerits, Suitability.
3.0 CHAINING:
    3.1   Equipment And Accessories For Chaining-Description (Demonstration In Class/Lab), Use And Purpose
    3.2   Method Of Chaining, Ranging, Chaining On Slope
    3.3   Field Problems - Setting Perpendicular With Chain & Tape, Chaining Across Different Types Of Obstacles: Numerical Problems.
    3.4   Errors And Mistakes In Linear Measurement - Classification, Sources Of Errors And Remedies.
    3.5   Correction To Measured Lengths Due To-Incorrect Length, Temperature Variation, Pull, Sag, Numerical Problem Applying Corrections
    3.6   Precautions During Chaining, Maintenance Of Equipment.
4.0 CHAIN SURVEYING:
    4.1   Purpose Of Chain Surveying, Principles Of Chain Surveying-Well Conditioned And Ill Conditioned Triangles

4.2   Accessories In Chain Surveying- Features And Use (Detailed Description To Be Covered In Practical)

4.3   Field Books- Single Line & Double Line Entry, Field Book Recording (Detailed Description To Be Covered In Practical)

4.4   Reconnaissance Survey - Method, Index Map, Reference Sketch

4.5   Selection Of Survey Stations, Base Line, Tie Lines, Check Lines

4.6   Offsets- Necessity, Perpendicular And Oblique Offsets, Setting Offset With Chain & Tape, Instruments For Setting Offset - Cross Staff, Optical Square, Features, Use & Handling (Demonstration In Field), Merits & Demerits, Suitability, Sources Of Error & Remedies, Limiting Length Of Offsets.

4.7   Method Of Chain Surveying, Locating Objects, Recording Entry In Field Book.

4.8   Plotting - Selection Of Scale, Conventional Signs, Plotting On Drawing Sheet From Field Book Data.

4.9   Errors In Chain Surveying - Causes & Remedies, Precautions During Chain Surveying.

5.0 ANGULAR MEASUREMENT:

5.1   Measurement Of Angles With Chain & Tape, With Compass

5.2   Compass – Types - Surveyors' Compass, Prismatic Compass, Features, Parts, (Detailed Description To Be Covered In Practical), Merits & Demerits, Suitability Of Different Types, Testing & Adjustment Of Compass

5.3   Designation Of Angles - Concept Of Meridians- Magnetic, True, Arbitrary Concept Of Bearings-Whole Circle Bearing, Quadrantal Bearing, Reduced Bearing, Suitability Of Application, Numerical Problems On Conversion Of Bearings.

5.4   Effect Of Earth's Magnetism - Dip Of Needle, Magnetic Declination, Variation In Declination, Numerical Problems On Application Of Correction For Declination.

5.5   Errors In Angle Measurement With Compass - Sources & Remedies, Precaution During Use Of Compass, Maintenance Of Compass.

6.0 CHAIN AND COMPASS SURVEYING:

6.1   Principles Of Traversing- Open & Closed Traverse, Advantages & Disadvantages Over Chain Surveying.

6.2   Methods Of Traversing - Locating Objects, Field Book Entry.

6.3   Local Attraction - Causes, Detection, Errors, Corrections, Numerical Problems On Application Of Correction Due To Local Attraction.

6.4   Plotting Of Traverse - Check Of Closing Error In Closed & Open Traverse, Bowditch's Correction.

6.5   Errors In Chain & Compass Surveying-Sources & Remedies, Precautions During Chain & Compass Surveying.

6.6   Computation Of Area From Plotted Survey Map-Planimeter, Features, Use Of Mensuration Techniques-Average Ordinate Rule, Trapezoidal Rule, Simpson's Rule.

7.0 LEVELING:

7.1   Purpose Of Levelling

7.2   Definition Of Terms Used In Levelling- Concepts Of Level Surface, Horizontal Surface, Vertical Surface, Datum, R.L., B.M.

7.3   Description Of Essential Features And Uses Of Different Types Of Levelling Instruments

7.4   Concepts Of Line Of Collimation, Axis Of Bubble Tube, Axis Of Telescope, Vertical Axis

7.5   Levelling Staff- Types, Features And Use

7.6   Temporary Adjustments Of Level, Taking Reading With Level

7.7   Concept Of Bench Mark, BS, IS, FS, CP, HI

7.8   Principles Of Leveling - Simple Levelling, Differential Leveling

7.9   Field Data Entry - Level Book-Height Of Collimation Method And Rise & Fall Method, Comparison, Numerical Problems On Reduction Of Levels Applying Both Methods, Arithmetic Checks

7.10   Different Types Of Levelling, Uses And Methods - Fly Levelling, Check Levelling, Profile Leveling - Longitudinal Sections And Cross-Sections

7.11   Plotting Of Profiles

7.12   Effects Of Curvature And Refraction, Numerical Problems On Application Of Correction

7.13 Reciprocal Levelling-Principles, Methods, Numerical Problems, Precise Leveling

7.14 Difficulties In Levelling, Errors In Levelling And Precautions

7.15 Sensitiveness Of Bubble Tube, Determination Of Sensitiveness

7.16 Permanent Adjustments Of Different Types Of Levels

7.17 Setting Grades And Stakes, Setting Out Grades Of Sewers And Related Problems

8.0 PLANE TABLE SURVEYING

8.1 Principle

8.2 Accessories of plane table

8.3 Orientation

8.4 Procedure of setting up plane table over a station

8.5 Methods of plane tabling

8.6 Errors and precautions

8.7 Procedure of plane table traversing

8.8 Advantages and disadvantages of plane tabling

9.0 C0MPUTATION OF AREA AND VOLUME:

9.1 Introduction

9.2 Computation of area from field notes

9.3 Problems on computing area from field notes

9.4 Computation of area from plotted plan

9.5 The mid ordinate rule

9.6 The average ordinate rule

9.7 The trapezoidal rule

9.8 Simpson's rule

9.9 Formula for calculation of volume

9.10 Worked-out problems

Text Books:

Sl NO	Name of Book	Writer's Name	Publisher's Name
1	Surveying & Levelling Vol.I	T.P.Kanetkar & S.V.Kulkarni	Griha Prakash, Pune
2	Surveying Vol.I	B.C.Punmia	Laxmi Publications, Delhi-6
3	A text book of surveying and levelling	R.agor; Khanna	Khanna Publishers, Delhi-6
4	Surveying and Levelling	Hussain and Nagraj	S.Chand & Co, Delhi
5	Surveying & Levelling	S.C.Rangawala	Charotar Book Stall, Pune
6	Surveying & Levelling	N.N. Basak	Tata Mc. Graw Hill
7	Plane Surveying	A. De	S. Chand & Co.

3 PRINCIPLES OF PROCESS ENGINEERING

Name of course: Diploma in Agricultural Engineering   Subject: PRINCIPLES OF PROCESS ENGINEERING

Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: Third

Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20

Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

Aim:-
  The basic aim of this subject is to develop the knowledge on technologies involved in various processing operation and develop skill in operation and maintenance of related machine.

Objective :-
  Processing of Agricultural products is an important aspect of Agricultural Engineering. It includes the study of all the operation involved in Primary and secondary processing till the process product reaches the consumer. The student should have knowledge of this technology and operation and maintenance of machine involved in these processes.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	INTRODUCTION	2	5
Unit 2	PRINCIPLES OF PROCESSING	17	10
Unit 3	PROCESSING EQUIPMENT AND MACHINERY	10	10
Unit 4	PROCESS PLANT AND MANAGEMENT	7	10
Unit 5	MECHANICAL HANDLING OF AGRICULTURAL PRODUCT	2	10
Unit 6	SEED PROCESSING TECHNOLOGY	3	10
Unit 7	UTILIZATION OF AGRICULTURAL BY PRODUCT (FIBRE, PAPER ETC.)	4	10
Unit 8	AGRO-INDUSTRIES	3	5
	TOTAL	48	70

Content: Theory (Principles Of Process Engineering)   3 hrs/wk

1. Introduction:
   Food Constituents, Micro-Organism In Deterioration And Preservation Of Food.
2. Principles Of Processing:
2.1 Modes Of Heat Transfer, One Dimensional Steady-State And Unsteady-State Heat Transfer In Simple Geometries, Newton's Law Of Cooling, Free And Forced Convection, Correlations, Heat Transfer Coefficient, Introductory Radiation Heat Transfer.
   Types Of Heat Exchanger, Log Mean Temperature Difference, Heat Exchanger Performance.
2.2 Introduction To Mass Transfer Process, Fick's Law, Molecular Diffusion In Fluids And Solids, Convective Mass Transfer Coefficients, Mass Transfer Correlations
3. Processing Equipment And Machinery:
3.1 Introduction To Processing Industries, Future Prospect With Reference To West Bengal.
3.2 Sources Of Fruits, Vegetables And Raw Material For Processing, Transportation Fruit Vegetables And Raw Material And Finished Product; Marketing.
3.3 Equipment And Machineries For Processing Of:
   Solid Foods Such As Cereals, Pulses, Cattle Feeds, Etc.
   Liquid And Semi-Solid Food Materials
4. Process Plant And Management:
4.1 Location Of Plant, Working Condition And General Requirements-Sanitation, Waste Disposal, Ventilation, Lighting, Humidity Temperature.
4.2 Lay Out Of Plant & Machinery.
4.3 Procurement Planning, Post Harvest Changes.
5. Mechanical Handling Of Agricultural Product:
6. Seed Processing Technology:
7. Utilization Of Agricultural By Product (Fibre, Paper Etc.):

8.   Agro-Industries:
8.1 Aims And Objectives, Agro-Industries In India, Future Prospect With Particular Reference To West Bengal.
8.2 Role Of Agro-Industries Corporation In Mechanising Agriculture.

Text Books:

Sl NO	Name of Book	Writer's Name	Publisher's Name
1	Transfer Process And Unit Operation	C.J.Geankoplis	P.H.I. Pvt. Ltd. New Delhi-110001
2	Process Heat Transfer	Donald & Kern	Mcgraw Hill, InternationalEdition, Chemical Engg. Series
3	Fundamentals of Food Process Engineering	Romeo T. Toledo	----
4	Transport Processes & Unit Operations	C.J. Geankoplis	----
5	Unit Operations in Agricultural Processing	Sahay & Singh	----
6	PHE of Cereal, Pulses & Oil seeds	Amalendu Chakraborty	----
7	Agricultural Process Engineering	S.M. Henderson & C. H. Perry	AVI Publication

4 Thermodynamics & Heat Transfer Process

Name of course: Diploma in Agricultural Engineering   Subject: THERMODYNAMICS & HEAT TRANSFER PROCESS
Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: Third
Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

Aim:-
   To have a clear understanding of the subject "Thermodynamics" and its importance for mechanical engineers. Students should know and understand the physical significance of first law and second law of thermodynamics. They should also learn about the thermodynamic properties of gases and steam which acts as the thermodynamic medium and how heat energy contained in the medium is converted to mechanical energy by passing through cyclic thermodynamic processes. Students will also learn the properties of steam, how steam is produced commercially in a boiler.

Objective :-
Amount of useful energy produced and spent is the most important factor by which a country's technical advancement is measured. Useful mechanical and electrical energy is produced from heat energy. It is of paramount importance to an engineer to know the basic principles by which heat energy can be converted into mechanical energy, which in turn can be converted into electrical energy. Thermodynamics is the field of applied science which deals with the energy possessed by heated gases and vapours and the laws which govern the conversion of this energy into mechanical energy and vice versa. This is the fundamental subject for understanding the process of producing vast amount of mechanical energy from heat energy

and therefore necessary to be learned by the engineering students. Understanding the working principles and features of the various machines and plants in which either such heated gas / vapours are produced or conversion of heat to mechanical energy takes place is of great importance.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	INTRODUCTION	2	1
Unit 2	FUNDAMENTALS OF THERMODYNAMICS	6	10
Unit 3	PROPERTIES OF GASES	7	10
Unit 4	LAWS OF THERMODYNAMICS	3	9
Unit 5	THERMODYNAMIC PROCESSES OF PERFECT GASES	6	10
Unit 6	ENTROPY OF GASES	4	10
Unit 7	THERMODYNAMIC AIR CYCLES	6	10
Unit 8	PROPERTIES OF STEAM	6	5
Unit 9	STEAM BOILER	7	5
	TOTAL	48	70

Content: Theory (Thermodynamics & Heat Transfer Process)   3 hrs/wk

1.0 INTRODUCTION

Importance of conversion of heat energy into mechanical energy and electrical energy; definition of Thermodynamics; concept of heat engines.
Explain importance of study of Thermodynamics.
Give examples from every day life where heat energy is converted into mechanical energy and vice-versa.
State the function of a heat engine.

2.0 FUNDAMENTALS OF THERMODYNAMICS:

2.1 Definition and understanding of terms: Energy, work, power, law of conservation of energy, heat, units of heat, temperature, absolute temperature, pressure, absolute and gauge pressure, specific heat.

2.2 Thermodynamic system, closed, open and isolated systems; system boundary; properties of a thermodynamic system; concept of work and heat energy transfer to and from a system.
State relationship between: work and power, Centigrade and Fahrenheit scale of temperature, work and heat energy.
Distinguish between absolute pressure and gauge pressure.
Understand a thermodynamic system
Differentiate between a closed, open and isolated system.

3.0 PROPERTIES OF GASES

3.1 Gas as the working substance in a thermodynamic system; definition of gas and perfect (or ideal) gas; laws of perfect gases—Boyle's law, Charle's law and Gay- Lussac law with corresponding gas equations; characteristic gas equation $pv = mRT$; problems
Define an ideal (or perfect) gas
State three laws of perfect gases
Write mathematical expression for the three gas laws
Deduce characteristic equation of gas from the gas laws.
Solve problems on gas laws
Explain why $Cp > Cv$
Prove $Cp - Cv = R/J$ and $Cp/Cv = 1 + R/JCv$
Solve problems on specific heats of gas.

4.0 LAWS OF THERMODYNAMICS
Thermal equilibrium; statement of Zeroth law; first law of thermodynamics; mechanical equivalent of heat; non flow energy equation (heat added = work done + rise in internal energy); second law of thermodynamics-statements; physical significance of second law, state clausius inequality.
Understand meaning of first and second law of thermodynamics.
Justify that second law does not contradict first law.

5.0 THERMODYNAMIC PROCESSES OF PERFECT GASES
    5.1   Definition of thermodynamic (or non-flow) process; P - V diagram; constant volume, constant pressure, isothermal, adiabatic, polytropic and throttling processes.
        Understand on meaning of thermodynamic process Draw p-v diagrams for different thermodynamic processes.
        Deduce formulae for work done by gas in (i) Constant pressure,
        (ii) isothermal and adiabatic expansion.
        Problems on thermodynamic processes.
        Solve simple

6.0 ENTROPY OF GASES
Concept of entropy; relation between heat and entropy; T-S diagram; change of entropy during different thermodynamic process (final expressions only, deduction not required) and their representation on T-S diagram.
Write the mathematical expression for change of entropy
Draw T-S diagram of various thermodynamic processes

7.0
Definition of thermodynamic cycle; representation of a cycle in P-V diagram; work done in the cycle; reversible and irreversible cycle; working of an ideal engine; efficiency of a cycle; Carnot cycle in P-V and T-S diagram; expressions for work done and efficiency; simple problems on air cycles.
Explain thermodynamic cycle. Represent a cycle in the p-v diagram and identify the work done per cycle.
Draw a Carnot cycle in T-S diagram and work out their efficiency problems on air cycles.
olve.

8.0
    8.1 Difference between gas and vapour; saturation temperature and pressure; sensible heat; latent heat; total heat; dryness fraction.
    8.2 Wet steam; dry saturated steam; superheated steam; degree of superheat
    8.3 Use of steam table; Mollier's diagram; calculation of total heat; specific volume and internal energy of steam; solve problems.
       Use steam table and solve problems.

9.0
    9.1   Function of steam boiler; fire tube & water tube boilers; working principle of Cochran, Lancashire, Locomotive, Babcock and Wilcox, Stirling boilers
    9.2   Constructional features and uses of important boiler   parts like shell, grate, drum, tubes, furnace, mountings, accessories.
    9.3   Fuels; burning equipment; feed water treatment
    9.4   Boiler performance; boiler efficiency
        Understand the difference between fire tube and water tube boilers
        Explain working principles of various types of boilers with help of sketches
        State use and importance of various parts and systems of a boiler.

Text Books:

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Sl NO	Name of Book	Writer's Name	Publisher's Name
1	Heat Engineering	V. P. Vasandani & D. S. Kumar	Metropolitan Book Co (P) Ltd .
2	A text book of Engineering Thermodynamics	R. S. Khurmi	S. Chand & Co. Ltd
3	Thermal Engineering	B. K. Sarker	Tata McGraw Hill
4	Thermal Engineering	P. L. Ballaney	Khanna Publishers
5	Heat Power	K.C.Pal	Orient Longman
6	Engineering Thermodynamics	M.Achuthan	Prentice Hall of India Pvt. Ltd.
7	Engineering Thermodynamics	J.B.Jones and R.E.Dugan	Prentice Hall of India Pvt. Ltd.

5 ENVIRONMENTAL ENGINEERING

Name of course: Diploma in Agricultural Engineering   Subject: ENVIRONMENTAL ENGINEERING
Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: Third
Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

Aim:-

   The course has been designed to enable the students of diploma programmes to acquire awareness with basic understanding of concepts of environmental degradation and its protection.

Objective :-

The engineering activities taken up by the technical personnel are to a large extent responsible for the environmental degradation. The engineers are also responsible for adopting the remedial measures for protection of environment. As such, an engineering diploma holder should have adequate knowledge & awareness about the types of pollution caused by various activities for adopting preventive and remedial measures. They should also be aware of the various environmental laws for effective control of environmental pollution.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	GENERAL CONCEPTS	7	12
Unit 2	ELEMENTS OF ECOLOGY	5	10
Unit 3	ENVIRONMENTAL POLLUTION	17	14
Unit 4	ENVIRONMENTAL SANITATION	4	10

Unit 5	RESOURCES CONSERVATION	5	11
Unit 6	ENVIRONMENTAL MANAGEMENT	10	13
	TOTAL	48	70

Content: Theory (Environmental Engineering)   3 hrs/wk

1.0 GENERAL CONCEPTS
    1.1 Nature And Scope Of Environment Problems Definition; Interaction Of Systems; Environmental Disturbances; Public Awareness And Action.
    1.2 Pollution And Economic Growth; Population Growth; Impacts Of Industrialization And Urbanization On Environment; Future Consumption Of Energy And Availability Of Energy Sources; Impacts Of Energy Development

2.0 ELEMENTS OF ECOLOGY
    2.1 Concepts Of Ecosystem-Biosphere And Its Components; Examples Of Ecosystems
    2.2 Energy Flow And Food Chain In Ecosystem
    2.3 Natural Resources Cycles (C, N, P Water Cycle)

3.0 ENVIRONMENTAL POLLUTION
    3.1 Water Pollution - Pollutants Types, Sources And Their Effects; Natural Recovery Process Of Water Bodies; Minimum National Standards; Examples
    3.2 Air Pollution - Pollutants Type, Sources And Their Effects; Air Quality Standards; Examples
    3.3 Land Pollution - Types Of Pollutants, Their Sources And Effects; Examples
    3.4 Noise Pollution - Sources And Effects Minimum Standard; Examples
    3.5 Radioactive Pollution - Pollutants Types Sources And Their Effects; Minimum Standard, Examples

4.0 ENVIRONMENTAL SANITATION
    4.1 Epidemiology - Infections Diseases, Sources Vectors And Transmission Of Diseases, Sanitary Protection Measures
    4.2 Occupational Health Hazards
    4.3 Solid Wastes - Sources, Characteristics, Disposal Methods

5.0 RESOURCES CONSERVATION
    5.1 Conservation Of Land, Forest, Timber, Wild Life, Minerals
    5.2 Resource Recycling

6.0 ENVIRONMENTAL MANAGEMENT
    6.1 Concepts Of Environmental Impact Assessment
    6.2 Pollution Control Strategies
    6.3 Environmental Ethics

Text Books:

Sl NO	Name of Book	Writer's Name	Publisher's Name
1	Environment and Pollution	V.S. Bais & U.S. Gupta	Northern Book Centre
2	Environment and Human Habitation	L.N. Verma	Himangshu publication
3	Water supply, water disposal and Environmental Pollution Engineering	A.K. Chatterjee	Khanna Publisher
4	Lab manual in Env. Engg.	P.D. Kulkarni	Jaico publishing house
5	Hand book on Env. Science	R.N. Trivedi	Anmol publication

6 HYDRAULICS

Name of course: Diploma in Agricultural Engineering   Subject: HYDRAULICS
Curse Code: Agr. E   ·Course Duration: 6 semester   Subject offered in·semester: Third   ·   .
Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10 .
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

Aim:-
    To aim of the subject Hydraulics is to develop basic concepts regarding behiviour of fluid, specially water, at rest and in motion.

Objective :-
The subject of Hydraulics deals with behaviour of fluid at rest and in motion. The Agricultural Engineering profession is much concerned with subjects like water supply, Sanitary Engineering and Irrigation Engineering, which need a sound knowledge of Hydraulics. Therefore, hydraulics is a very important basic subject for students of agricultural engineering.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	Hydrostatics	14	10
Unit 2	Kinematics of fluid flow	29	28
Unit 3	Pumps	5	32
	TOTAL	48	70

     Content: Theory (Environmental Engineering)   3 hrs/wk

1.0 Hydrostatics:
    1.1 Properties of fluids, density, specific gravity, surface tension, capillarity, viscosity and their uses
    1.2 Pressure and its measurements: Definitions- intensity of pressure, atmospheric pressure, gauge pressure, absolute pressure and vacuum pressure; Relation between atmospheric pressure, absolute pressure and gauge pressure, pressure head, pressure gauges
    1.3 Pressure exerted on an immersed surface; Definitions - total pressure, resultant pressure, expression of equation for total pressure exerted on horizontal, vertical and inclined immersed surface (No deduction); Center of pressure and its expression.
    1.4 Floatation and buoyancy: Archimedes principle- buoyancy & center of buoyancy, center of pressure, metacenter, metacentric height, determination of metacentric height by experimental method, equilibrium of floating bodies- stable, unstable & neutral equilibrium
2.0 Kinematics of fluid flow

2.1 Basic equations of fluid flow and their application (No deduction): rate of discharge, equation of continuity of a liquid flow, total energy of a liquid in motion- potential, kinetic & pressure, Bernoulli's theorem and its limitations. Practical applications of Bernoulli's equation.

2.2 Flow through Orifices: orifices, types of orifices, venacontracta, hydraulic coefficients and their relations, determination of hydraulic coefficients, discharge formulae for different types of orifices and their application (No deduction)

2.3 Flow through mouthpieces: mouthpieces, types of mouthpieces, discharge formulae for different types of mouthpieces and their application (No deduction)

2.4 Flow over Notches: notch, types of notches, discharge formulae for different types of notches and their application (No deduction)

2.5 Flow over Weirs: weir and its difference with notches, types of weirs, discharge formulae for different types of weirs and their application (No deduction)

2.6 Types of Flow through pipes: uniform & non-uniform; laminar & turbulent; steady & unsteady; Reynold's number and its implication.

2.7 Losses of head of a liquid flowing through pipes: due to friction (statement of Darcy's equation), sudden enlargement, sudden contraction, change of direction of flow, loss at inlet & exit (No deduction, only statement of formulae and their application), total energy lines and hydraulic gradient lines.

2.8 Flow through Open Channels: types of channel sections-rectangular, trapezoidal & circular, Discharge formulae- Chazy's and Manning's equation, best economical section, phenomenon of hydraulic jump (only description and no deduction)

3.0 Pumps

3.1 Types of pumps

3.2 Centrifugal pumps- basic principles, discharge, horse power of pump, efficiency of centrifugal pump, simple numerical problems

3.3 Reciprocating pumps: types, operation, discharge, calculation of horse power, efficiency, simple numerical problems

Text Books:

Sl NO	Name of Book	Writer's Name	Publisher's Name
1	Hydraulics	Jagdish Lal	Metro Publishing Books Limited
2	Hydraulics, Fluid Mechanics and Fluid Machines	S. Ramamrutham	Dhanpat Rai & Sons, Delhi
3	Hydraulics	R.S.Khurmi	--
4	Hydraulics	Priyany	--
5	Hydraulics	S.K.Lakhi	--
6	Hydraulics	Dr.P.N.Modi &S.M.Seth	
7	Hydraulics and Hydraulic Machinery	V. Thanikachalam	Tata McGraw-hill Publishing Company Limited

6 Basic Soil Science Lab.

Name of course: Diploma in Agricultural Engineering   Subject: Basic Soil Science Lab.
Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: third
Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 50
Tutorial: Nil	Practical (PR) - 50
Practical: 11	Total marks -100
Credit:- 2	

Aim:-

Objective :-

Content: Practical (Basic Soil Science Lab.)   3 hrs/wk

1. Soil Sampling And Processing
2. Determination Of Soil Texture By Field Method
3. Mechanical Analysis For Determination Of Particle Size Distribution
4. Determination Of Field Capacity Of Soil In Fields
5. Determination Of Soil Moisture Content
6. Determination Of Organic Matter Content Of Soil
7. Determination Of Soil Ph
8. Determination Of Soluble Salts.
9. Determination Of Lime Requirement Of Soil
10. Determination Of Gypsum Requirement Of Soil
11. Determination Of Total Nitrogen In Soil
12. Determination Of Available Phosphorus In Soil.
13. Determination Of Available Potassium In The Soil.
14. Determination Of Calcium And Magnesium In Soil.
15. Determination Of Available Sulpher In Soil.

16. Determination Of Exchangeable And Soluble Sodium In Soil.
17. Determination Of Available Micronutrients In Soil.

7 Surveying & Levelling Lab.

Name of course: Diploma in Agricultural Engineering   Subject: SURVEYING & LEVELLING LAB.
Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: third
Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 50
Tutorial: Nil	Practical (PR) – 50
Practical: 6	Total marks - 100
Credit:- 2	

Aim:-

Objective :-

Content: Practical (Surveying & Levelling Lab.)   3 hrs/wk

1.0   LINEAR MEASUREMENTS:
   1.1   Study Of The Essential Features Of Different Types Of Chains And Tapes, To Describe The Chains & Tapes With Neat Sketches.
2.0   CHAINING:
   2.1   Testing And Adjusting Of A Metric Chain
   2.2   Measurement Of Distance Between Two Points (More Than 2 Chain Lengths Apart) With Chain Including Direct Ranging
   2.3   Setting Out Different Types Of Triangles, Given The Lengths Of Sides With Chain & Tape
   2.4   Measurement Of Distance Between Two Points By Chaining Across A Sloping Ground Using- Stepping Method & A Clinometer
   2.5   Measurement Of Distance By Chaining Across Obstacles On The Chain Line- (1) A Pond (2) A Building (3) A Stream / River (In The Event Of Non-Availability Of Stream /River, A Pond Or Lake May Be Taken, Considering That Chaining Around The Same Is Not Possible
3.0   CHAIN SURVEYING:
   3.1   Setting Perpendicular Offsets To Various Objects (At Least 3) From A Chain Line Using- (1) Tape, (2) Cross-Staff, (3) Optical Square And Comparing The Accuracy Of The 3 Methods
   3.2   Setting Oblique Offsets To Objects (At Least 3) From A Chain Line Using Tape
4.0   ANGULAR MEASUREMENT:
   4.1   Study Of Features And Parts Of A Prismatic Compass And A Surveyor's Compass To Describe The Compasses By Drawing Neat Sketches.
   4.2   Testing And Adjustment Of Prismatic Compass And Surveyor's Compass
   4.3   Measurement Of Bearings Of Lines (At Least 3 Lines) And Determination Of Included Angles Using Prismatic Compass And Surveyor's Compass.
   4.4   Setting Out Triangles (At Least 2) With Compass, Given The Length And Bearing Of One Side And Included Angles.
5.0   CHAIN AND COMPASS SURVEYING:

5.1 Setting Out A Closed Traverse Of 5 Sides, Using Prismatic Compass, Given Bearing Of One Line And Included Angles And Lengths Of Sides.

5.2 Conducting Chain & Compass Traverse Surveying In A Given Plot Of Area (2 Plots) And Recording Data In The Field Book.
(5 To 6 Students/Group)

5.3 Preparation Of Survey Map By Plotting, Individually, The Field Book Data From Exercise 5.2 And Computation Of The Plotted Area.
(Plotting Should Be Done During Class Hours)

6.0 LEVELLING:

6.1 Study Of Essential Features And Parts Of Different Types Of Levels

6.2 Study Of Essential Features Of Different Types Of Levelling Staffs

6.3 Making Temporary Adjustments Of Levels

6.4 Determining Reduced Levels Of Five Given Points Taking Staff Readings With Levels

6.5 Determining The Difference Of Levels Between Two Points (3 Pairs Of Points/Group) By Taking Staff Readings From A Single Set Up Of Level, Recording The Readings In Level Book And Application Of Arithmetic Check

6.6 Conduct Fly Levelling (Compound) Between Two Distant Points With Respect To The R. L. Of A Given B. M. And Reduction Of Levels By Both Height Of Collimation And Rise & Fall Method And Applying Arithmetic Check. (At Least 3 Change Points Must Be Covered)

6.7 Finding R. L Of (1) Roof, (2) Chajja Or Canopy With Reference To The R. L. Of Given B. M. By Taking Inverted Staff Reading

6.8 Conduct Profile Levelling Along The Given Alignment For A Road/ Canal For 150m Length, Taking Leveling Staff At Every 15m And Cross Staff At 1m & 3m Apart On Both Sides At Every 30m Interval And Recording The Data In Level Book And Applying Arithmetical Check

6.9 Plotting The Profile Of The Alignment Surveyed In Exercise 6.8 And Drawing The Grade Of Alignment Desired (To Be Drawn During The Class Hours)

6.10 Computation Of Volume Of Earthwork, Cutting And Filling, Required To Obtain The Desired Grade From The Plotting In Exercise 6.9

6.11 Contour Mapping By Direct And Indirect Method

8 Agricultural Process Engineering Lab.

Name of course: Diploma in Agricultural Engineering   Subject: AGRICULTURAL PROCESS ENGINEERING LAB.
Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: third
Subject Code: Question Code: Marks: 50

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 25
Tutorial: Nil	Practical (PR) – 25
Practical: 3	Total marks - 50
Credit:- 2	

Aim:-

Objective :-

Content: Practical (Agricultural Process Engineering Lab.)   3 hrs/wk

1. Determination of thermo-physical properties of liquid and solid foods
2. Operation and Maintenance of shell and tube heat exchangers, plate heat exchanger, tubular heat exchanger, continuous flow dryer, batch dryer, concurrent flow dryers, counter flow dryers, milling equipments.
3. Determination of germination, vigour index of seeds - study and experiments on moisture meters, threshers, shellers, decorticators, graders, delinting machine, seed extractors.

9 Practical of Horticultural Crops Lab.

Name of course: Diploma in Agricultural Engineering   Subject: PRACTICAL OF HORTICULTURAL CROPS LAB**.**
Curse Code: Agr. E   Course Duration: 6 semester   Subject offered in semester: third
Subject Code: Question Code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 50
Tutorial: Nil	Practical (PR) – 50
Practical: 20	Total marks - 100
Credit:- 2	

Content: Practical (Practical Of Horticultural Crops Lab.)   3 hrs/wk

1. Identification of seeds and plants of fruits, vegetables, flowers and spices.
2. Drawing of map in of India and West Bengal showing distribution of fruits, vegetables, flowers and spices.
3. Seed bed preparation for raising of fruit seedlings.
4. Sowing of seeds, planting of fruit saplings, lifting of plants and picking for sale.
5. Potting and repotting of plants.
6. Layout of fruit nursery.
7. Demonstration of management practices with respect of fruits.
8. Seedbed preparation for raising of vegetable seedlings.
9. Sowing of vegetable seed, saplings, lifting of plants and packing for sale. Potting and repotting of plants. Planning and layout for kitchen garden.
10. Layout of vegetable nursery.
11. Demonstration of management practices with respect to vegetables.
12. Identification of tools and implements.
13. Sowing of seeds of ornamental plants.
14. Planting of sapling, lifting of plants and packing for sale.
15. Potting and repotting of flowering plants.
16. Layout of flower garden.
17. Demonstration of management of flower garden.
18. Planting of trees, shrubs, and climbers.
19. Identification of important spices.
20. Cultivation of annual spices. Method of planting of termeric and ginger. Tabular presentation of spices which will include common name scientific name family use etc.