West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Agricultural Engineering [AGR]

Part-II (3rd Semester)

Revised 2022

WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT
(A Statutory Body under West Bengal Act XXVI of 2013)
(Technical Education Division)
Karigari Bhavan, 4th Floor, Plot No. B/7, Action Area-III, Newtown, Rajarhat, Kolkata–700 160

WBSCTVESD Curriculum for Diploma Courses in Engineering and Technology

Semester – III

(Agricultural Engineering)

SL NO	COURSE CODE	SUBJECT	TYPE	SEM	L	PR	CONTACT HR PER WEEK	CREDIT	MARKS
3RD SEMESTER CURRICULUM OF AGRICULTURAL ENGINEERING									
1	AGPC301	Basic Soil Science	TH	3rd	2		2	2	100
2	AGPC302	Surveying and Leveling	TH	3rd	3		3	3	100
3	AGPC303	Thermodynamics	TH	3rd	2		3	3	100
4	AGPC304	Agricultural Process Engineering	TH	3rd	2		2	2	100
5	AGPC305	Environmental Engg	TH	3rd	3		3	3	100
6	AGPC306	Hydraulics	TH	3rd	3		3	2	100
7	AGPC307	Agricultural Process Engineering Lab	PR			2	1	1	100
8	AGPC308	Basic Soil Science Lab	PR	3rd		4	4	2	100
9	AGPC309	Field Survey Lab	PR	3rd		4	4	2	100
10	AGPC310	Practical of Horticultural crops	PR	3rd		2	2	1	100
11	AG-SI-311	Summer Internship I		3rd		0	0	1	100
					15	12	27	22	1100

Syllabus for Basic Soil Science (Theory)

Course Title	Basic Soil Science
Course Code: AGPC301	Semester: Third
Duration: Seventeen weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 2 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 30	Class Attendance: 10 Marks
Credit 2	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Aim:-

To develop basic knowledge and skills for measurement of basic soil properties their classification, soils structure, soil mass andfundamental 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, structurepore-spaces soil moisture and other physical and chemical properties

SL. NO.	TOPIC	Contact period
Unit 1	INTRODUCTION	4
Unit 2	SOIL FORMATION	5
Unit 3	SOIL PROFILE	5
Unit 4	PROPERTIES	4
Unit 5	SOIL WATER	4
Unit 6	SOIL AIR	4
Unit 7	SOIL TEMPERATURE	4
	TOTAL	30

Content: Theory (Basic Soil Science)   2 hrs/wk

1.0 INTRODUCTION:

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:

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:

3.1 Soil As A Natural Body And Medium For Plant Growth

4.0 PROPERTIES:

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

4.2 Chemical Properties - Ph

5.0 SOIL WATER:

5.1 Composition And Classification

5.2 Soil Moisture Constants And Function

6.0   SOIL AIR:

6.1   Soil Air Composition And Function

7.0   SOIL TEMPERATURE:

7.1   Source And Function

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	-------

Syllabus for Surveying and Leveling (Theory)

Course Title	**Surveying and Leveling**
Course Code: AGPC302	Semester: Third
Duration: Seventeen weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 45	Class Attendance: 10 Marks
Credit 3	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Aim:-

The course content of Surveying has been designed to provide adequate information to develop competency in a learner to enable toprepare 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 measurementswith 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
Unit 1	INTRODUCTION	1
Unit 2	LINEAR MEASUREMENT	3
Unit 3	CHAINING	6
Unit 4	CHAIN SURVEYING	6
Unit 5	ANGULAR MEASUREMENT	6
Unit 6	CHAIN AND COMPASS SURVEYING	6
Unit 7	LEVELING	6
Unit 8	PLANE TABLE SURVEYING	6
Unit 9	C0MPUTATION OF AREA AND VOLUME	5
	TOTAL	45

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

1.   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
2.1   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. Accessories In Chain Surveying- Features And Use (Detailed Description To Be Covered In Practical)
4.2   Field Books- Single Line & Double Line Entry, Field Book Recording (Detailed Description To Be Covered In Practical)
4.3   Reconnaissance Survey - Method, Index Map, Reference Sketch
4.4   Selection Of Survey Stations, Base Line, Tie Lines, Check Lines
4.5   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.
4.6   Method Of Chain Surveying, Locating Objects, Recording Entry In Field Book.
4.7   Plotting - Selection Of Scale, Conventional Signs, Plotting On Drawing Sheet From Field Book Data.
4.8   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.

Syllabus for Thermodynamics and heat transfer process (Theory)

Course Title	**Thermodynamics and heat transfer process**
Course Code: AGPC303	Semester: Third
Duration: Seventeen weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 45	Class Attendance: 10 Marks
Credit 3	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

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 willalso 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. Thisis 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 thevarious 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
Unit 1	INTRODUCTION	2
Unit 2	FUNDAMENTALS OF THERMODYNAMICS	6
Unit 3	PROPERTIES OF GASES	7
Unit 4	LAWS OF THERMODYNAMICS	3

Unit 5	THERMODYNAMIC PROCESSES OF PERFECT GASES	4
Unit 6	ENTROPY OF GASES	4
Unit 7	THERMODYNAMIC AIR CYCLES	6
Unit 8	PROPERTIES OF STEAM	6
Unit 9	STEAM BOILER	5
	TOTAL	45

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:

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.   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

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 $C_p > C_v$
Prove $C_p - C_v = R/J$ and $C_p/C_v = 1 + R/JC_v$ 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

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 problems.

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.

8.0 Difference between gas and vapour; saturation temperature and pressure; sensible heat; latent heat; total heat; dryness fraction.
Wet steam; dry saturated steam; superheated steam; degree of superheat
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 Function of steam boiler; fire tube & water tube boilers; working principle of Cochran, Lancashire, Locomotive, Babcock and Wilcox, Stirling boilers
Constructional features and uses of important boiler parts like shell, grate, drum, tubes, furnace, mountings, accessories. Fuels; burning equipment; feed water treatment
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:

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.

Syllabus for Agricultural and Process Engineering (Theory)

Course Title	**Agricultural and Process Engineering**
Course Code: AGPC304	Semester: Third
Duration: Seventeen weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 2 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 30	Class Attendance: 10 Marks
Credit 2	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

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
Unit 1	INTRODUCTION	3
Unit 2	PROCESSING EQUIPMENT AND MACHINERY	12
Unit 3	HEAT AND MASS TRANSFER	10
Unit 4	PROCESS PLANT AND MANAGEMENT	5
	TOTAL	30

Content: Theory (Principles Of Process Engineering)   2 hrs/wk

(A) Agricultural Process Engineering

1. Introduction:
Food Constituents, Classification of food, Factors responsible for food spoilage, Food Preservation Methods, Micro-Organism in Deterioration and Preservation of Food, Agricultural/Food Processing, Importance of Food Processing, Unit Operation.
2. Processing Equipment and Machinery:

Introduction to Processing Industries, Processing Industries in West Bengal, Future Prospect With Reference To West Bengal, Equipment and Machineries for Processing of Cereals, Pulses and Oil seeds.

3. Heat and Mass Transfer:

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, Types Of Heat Exchanger, Log Mean Temperature Difference, Introductory Radiation Heat Transfer.

3.2 Introduction to Mass Transfer Process, Fick's Law

4. Process Plant and Management:

Location of Plant, Working Condition and General Requirements in plant, Lay Out Of Plant & Machinery.

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

Syllabus for Environmental Engineering (Theory)

Course Title	**Environmental Engineering**
Course Code: AGPC305	Semester: Third
Duration: Seventeen weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 3 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 45	Class Attendance: 10 Marks
Credit 3	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

Aim:-

The course has been designed to enable the students of diploma programmes to acquire awareness with basic understanding ofconcepts 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, anengineering 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
Unit 1	GENERAL CONCEPTS	7
Unit 2	ELEMENTS OF ECOLOGY	5
Unit 3	ENVIRONMENTAL POLLUTION	17
Unit 4	ENVIRONMENTAL SANITATION	4
Unit 5	RESOURCES CONSERVATION	5
Unit 6	ENVIRONMENTAL MANAGEMENT	7
	TOTAL	45

Content: Theory (Environmental Engineering)   3 hrs/wk

GENERAL CONCEPTS
•   Nature And Scope Of Environment Problems Definition; Interaction Of Systems; Environmental Disturbances; Public Awareness And Action.

- 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

ELEMENTS OF ECOLOGY

- Concepts Of Ecosystem-Biosphere And Its Components; Examples Of Ecosystems
- Energy Flow And Food Chain In Ecosystem
- Natural Resources Cycles (C, N, P Water Cycle)

ENVIRONMENTAL POLLUTION

- Water Pollution - Pollutants Types, Sources And Their Effects; Natural Recovery Process Of Water Bodies; Minimum National Standards; Examples
- Air Pollution - Pollutants Type, Sources And Their Effects; Air Quality Standards; Examples
- Land Pollution - Types Of Pollutants, Their Sources And Effects; Examples
- Noise Pollution - Sources And Effects Minimum Standard; Examples
- Radioactive Pollution - Pollutants Types Sources And Their Effects; Minimum Standard, Examples

ENVIRONMENTAL SANITATION

- Epidemiology - Infections Diseases, Sources Vectors And Transmission Of Diseases, Sanitary Protection Measures
- Occupational Health Hazards
- Solid Wastes - Sources, Characteristics, Disposal Methods

RESOURCES CONSERVATION

- Conservation Of Land, Forest, Timber, Wild Life, Minerals
- Resource Recycling

ENVIRONMENTAL MANAGEMENT

- Concepts Of Environmental Impact Assessment
- Pollution Control Strategies
- 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 disposaland Environmental Pollution Engineering	A.K. Chatterjee	Khanna Publisher
4	Lab manual in Env. Engg.	P.D. Kulkarni	Jaico publishing house

Syllabus for Hydraulics (Theory)

Course Title	**Environmental Engineering**
Course Code: AGPC306	Semester: Third
Duration: Seventeen weeks	Maximum Marks 100
Teaching Scheme	Examination scheme
Theory: 2 hrs./week	Mid Semester Test: 20 Marks, Quizzes, Viva-voce, Assignment: 10 Marks
Total hours: 30	Class Attendance: 10 Marks
Credit 2	End Semester Exam.: 60 Marks
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.	

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 ofHydraulics. Therefore, hydraulics is a very important basic subject for students of agricultural engineering.

SL. NO.	TOPIC	Contact period
Unit 1	Hydrostatics	15
Unit 2	Kinematics of fluid flow	10
Unit 3	Pumps	5
	TOTAL	30

Content: Theory (Environmental Engineering)   2 hrs/wk

Hydrostatics:
•	Properties of fluids, density, specific gravity, surface tension, capillarity, viscosity and their uses
•	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
•	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.

•   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

Kinematics of fluid flow

•   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.

•   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)

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

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

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

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

•   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.

•   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)

Pumps

•   Types of pumps

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

•   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

Syllabus for Agricultural Process Engg (Lab)

Course Title	Agricultural Process Engg (Lab)				
Course Code: AGPC307	Semester: Third				
Duration: Seventeen weeks	Maximum Marks 100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 2 hrs./week Total hours: 30	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit 1	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.					

Content: Practical (Agricultural Process Engineering Lab.)   2 hrs/wk

  i.   Introduction to Agricultural process engineering Laboratory
 ii.   Measurement of moisture content by direct method
iii.   Measurement of moisture content by indirect method
 iv.   Determination of milling quality of paddy
  v.   Performance of a rice polisher
 vi.   Visit to modern rice mill

Syllabus for Basic Soil Science (Lab)

Course Title	**Basic Soil Science (Lab)**				
Course Code: AGPC308	Semester: Third				
Duration: Seventeen weeks	Maximum Marks 100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 4 hrs./week Total hours: 64	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit 2	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.					

Content: Practical (Basic Soil Science Lab.)   4 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.

Syllabus for Field Survey (Lab)

Course Title	**Field Survey (Lab)**				
Course Code: AGPC309	Semester: Third				
Duration: Seventeen weeks	Maximum Marks 100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 4 hrs./week Total hours: 64	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit 2	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.					

Content: Practical (Surveying & Levelling Lab.)   4 hrs/wk

LINEAR MEASUREMENTS:

Study Of The Essential Features Of Different Types Of Chains And Tapes, To Describe The Chains & Tapes With Neat Sketches.

CHAINING:

Testing And Adjusting Of A Metric Chain

Measurement Of Distance Between Two Points (More Than 2 Chain Lengths Apart) With Chain Including Direct Ranging

Setting Out Different Types Of Triangles, Given The Lengths Of Sides With Chain & Tape

Measurement Of Distance Between Two Points By Chaining Across A Sloping Ground Using-Stepping Method & A Clinometer

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

CHAIN SURVEYING:

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

Setting Oblique Offsets To Objects (At Least 3) From A Chain Line Using Tape

ANGULAR MEASUREMENT:

Study Of Features And Parts Of A Prismatic Compass And A Surveyor's Compass To Describe The Compasses By Drawing Neat Sketches.

Testing And Adjustment Of Prismatic Compass And Surveyor's Compass

Measurement Of Bearings Of Lines (At Least 3 Lines) And Determination Of Included Angles Using Prismatic Compass And Surveyor's Compass.

Setting Out Triangles (At Least 2) With Compass, Given The Length And Bearing Of One Side And Included Angles.

CHAIN AND COMPASS SURVEYING:

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

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)

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)

LEVELLING:

Study Of Essential Features And Parts Of Different Types Of Levels

Study Of Essential Features Of Different Types Of Levelling Staffs

Making Temporary Adjustments Of Levels

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

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

Syllabus for Practical for Horticultural Crops (Lab)

Course Title	**Practical for Horticultural Crops (Lab)**				
Course Code: AGPC310	Semester: Third				
Duration: Seventeen weeks	Maximum Marks 100				
Teaching Scheme	Continuous Assessment-60			End Semester Assessment-40	
Practical: 2 hrs./week Total hours: 30	Assignments (to be allotted)	Class Performance	Class Attendance	Assignment on the day of Viva-voce	Viva-voce (Before Board of Examiners)
Credit 1	30	20	10	20	20
Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.					

Content: Practical (Practical Of Horticultural Crops Lab.) 2 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.