															MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI														
				TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																											
COURSE NAME :		DMA IN AGRICULTURE ENGINEERING																													
COURSE CODE :		AU																													
DURATION OF COURSE : 6 SEMESTERS										WITH EFFECT FROM 2012-13																					
SEMESTER : FOURTH										DURATION : 16 WEEKS																					
PATTERN : FULL TIME - SEMESTER										SCHEME : G																					
SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17400)														
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)																	
								Max	Min	Max	Min	Max	Min	Max	Min																
1	Environmental Studies \$	EST	17401	01	--	02	01	50*#	20	--	--	--	--	25@	10	50															
2	Soil Mechanics	SME	17450	02	--	02	02	50	20	25#	10	--	--	25@	10																
3	Surveying & Levelling	SLE	17451	03	--	04	03	100	40	50#	20	--	--	25@	10																
4	Hydraulics	HYC	17452	03	--	02	03	100	40	50#	20	--	--	25@	10																
5	Farm Power & Tractor Systems	FTS	17453	03	--	02	03	100	40	--	--	--	--	25@	10																
6	Agricultural Economics and Business Management	AEM	17454	03	--	--	03	100	40	--	--	--	--	--	--																
7	Manufacturing Technology	MTG	17047	--	--	04	--	--	--	50#	20	--	--	50@	20																
TOTAL				15	--	16	--	500	--	175	--	--	--	175	--	50															
Student Contact Hours Per Week: 31 Hrs.																															
THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.																															
Total Marks: 900																															
@ - Internal Assessment, # - External Assessment, <div></div> No Theory Examination, \$ - Common to all branches, β – Common to Mechanical & Chemical Engineering Groups, *# - On Line Theory Examination.																															
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work																															
➤ Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).																															
➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.																															
➤ Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.																															

Course Name : All Branches of Diploma in Engineering & Technology

**Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/FG/AU**

Semester : Fourth

Subject Title : Environmental Studies

Subject Code : 17401

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	01	50#*	--	--	25 @	75

***# Online Theory Examination**

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

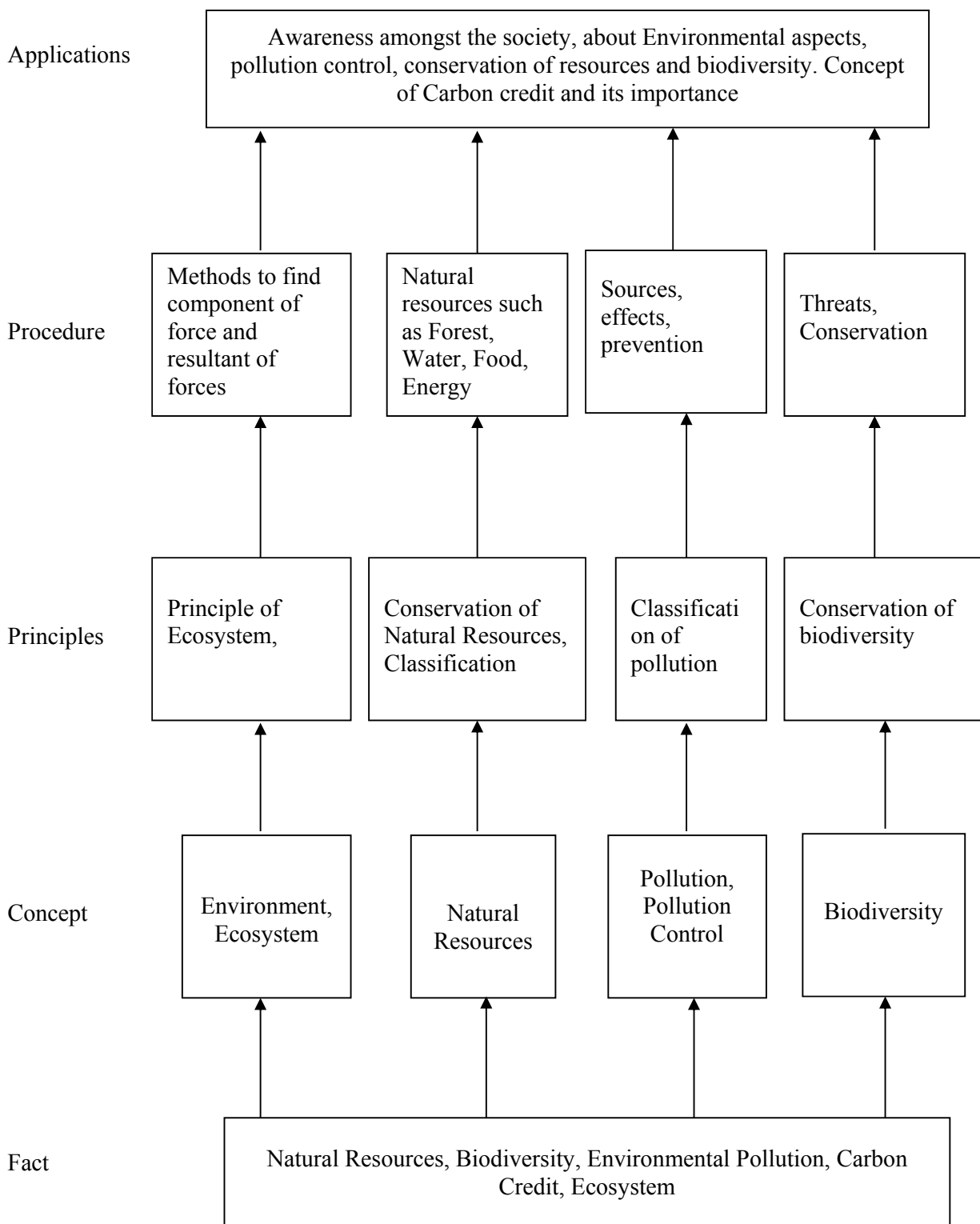
Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis. The unceasing industrial growth and economic development of the last 300 years or so have resulted in huge ecological problems such as overexploitation of natural resources, degraded land, disappearing forests, endangered species, dangerous toxins, global warming etc.

It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, Forests, etc.

General Objectives: The student will be able to,

1. Understand importance of environment
2. Know key issues about environment
3. Understands the reasons for environment degradation
4. Know aspects about improvement methods
5. Know initiatives taken by the world bodies to restrict and reduce degradation

Learning Structure:

Theory:

Topic and Contents	Hours	Marks
Topic 1: Nature of Environmental Studies Specific Objectives: <ul style="list-style-type: none"> ➤ Define the terms related to Environmental Studies ➤ State importance of awareness about environment in general public Contents: <ul style="list-style-type: none"> • Definition, Scope and Importance of the environmental studies • Importance of the studies irrespective of course • Need for creating public awareness about environmental issues 	01	04
Topic 2: Natural Resources and Associated Problems Specific Objectives: <ul style="list-style-type: none"> ➤ Define natural resources and identify problems associated with them ➤ Identify uses and their overexploitation ➤ Identify alternate resources and their importance for environment Contents: 2.1 Renewable and Non renewable resources <ul style="list-style-type: none"> • Definition • Associated problems 2.2 Forest Resources <ul style="list-style-type: none"> • General description of forest resources • Functions and benefits of forest resources • Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc. 2.3 Water Resources <ul style="list-style-type: none"> • Hydrosphere: Different sources of water • Use and overexploitation of surface and ground water • Effect of floods, draught, dams etc. on water resources and community 2.4 Mineral Resources: <ul style="list-style-type: none"> • Categories of mineral resources • Basics of mining activities • Mine safety • Effect of mining on environment 2.5 Food Resources: <ul style="list-style-type: none"> • Food for all • Effects of modern agriculture • World food problem 	04	10
Topic 3. Ecosystems <ul style="list-style-type: none"> • Concept of Ecosystem • Structure and functions of ecosystem • Energy flow in ecosystem • Major ecosystems in the world 	01	04
Topic 4. Biodiversity and Its Conservation <ul style="list-style-type: none"> • Definition of Biodiversity • Levels of biodiversity • Value of biodiversity 	02	06

<ul style="list-style-type: none"> Threats to biodiversity Conservation of biodiversity 		
Topic 5. Environmental Pollution <ul style="list-style-type: none"> Definition Air pollution: Definition, Classification, sources, effects, prevention Water Pollution: Definition, Classification, sources, effects, prevention Soil Pollution: Definition, sources, effects, prevention Noise Pollution: Definition, sources, effects, prevention 	03	08
Topic 6. Social Issues and Environment <ul style="list-style-type: none"> Concept of development, sustainable development Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate Concept of Carbon Credits and its advantages 	03	10
Topic 7. Environmental Protection Brief description of the following acts and their provisions: <ul style="list-style-type: none"> Environmental Protection Act Air (Prevention and Control of Pollution) Act Water (Prevention and Control of Pollution) Act Wildlife Protection Act Forest Conservation Act Population Growth: Aspects, importance and effect on environment <ul style="list-style-type: none"> Human Health and Human Rights 	02	08
Total	16	50

Practical:**Skills to be developed:****Intellectual Skills:**

1. Collection of information, data
2. Analysis of data
3. Report writing

Motor Skills:

1. Presentation Skills
2. Use of multi media

List of Projects:

Note: Any one project of the following:

1. Visit to a local area to document environmental assets such as river / forest / grassland / hill / mountain
2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems of ponds, river, hill slopes etc

Prepare a project report on the findings of the visit illustrating environment related facts, analysis and conclusion. Also suggest remedies to improve environment.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	Anindita Basak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Environmental Studies	Wiley India

Course Name : Diploma in Agriculture Engineering**Course code : AU****Semester : Fourth****Subject Title : Soil Mechanics****Subject Code : 17450****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	---	02	02	50	25 #	---	25 @	100

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

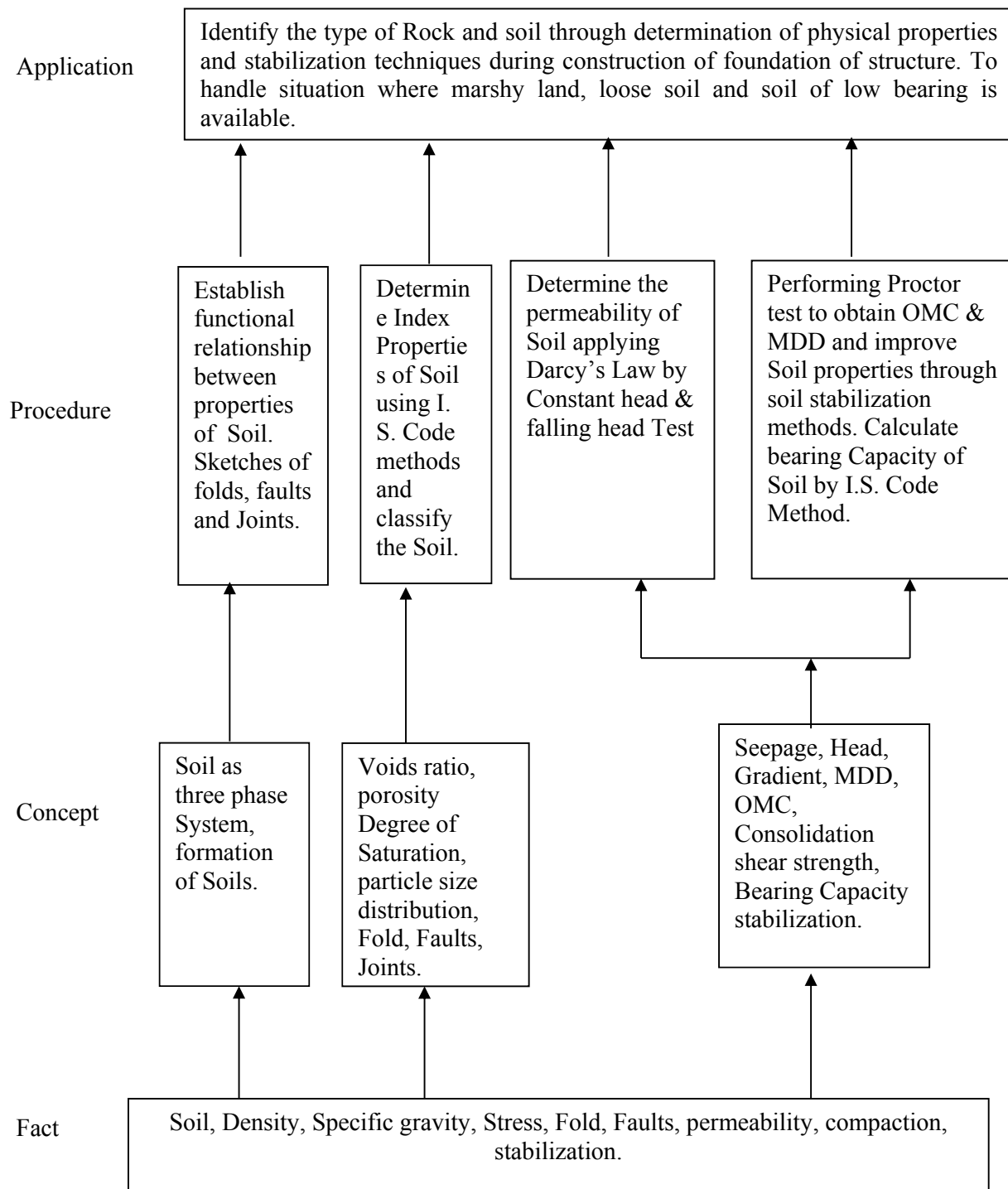
Every engineering structure such as building, bridges, dams, towers, monuments etc. are supported by soil and rock the stability of these structures depends upon behaviors of soil and capacity of soil to carry loads under different environmental conditions. The soil and rocks are also used as construction materials for embankments, roads, dams, mud walls etc.

Thus it becomes mandatory to learn this subject which includes knowledge of physical properties, classification of soil, its behavior and various techniques to improve soil properties as well as agricultural structures viz. farm stead's, poultry houses, dairy barns, water supply system and sanitations, grain storage structures and silos.

Objectives:

The student will be able to,

1. Explain soil as three phase system and establish relationships between soil properties.
2. To determine properties of soil by standard tests, procedures and plot particle size distribution curves.
3. Determine permeability by constant head and falling head tests by using Darcy's law.
4. Obtained Optimum Moisture Content and Maximum Dry Density for any soil samples by performing Proctor compaction tests.

Learning Structure:

Theory:

Chapter	Name of the topic	Hours	Marks
01	Overview of Soil Mechanics 1.1 Definition of soil and introduction to soil formation. 1.2 Importance of soil in Civil Engineering as construction material and as Foundation material. 1.3 Field applications of soil mechanics-for foundation design, pavement design, design of earth retaining structures, design of earthen dams. 1.4 Various constituents of soil and their importance, soil as medium of plant growth. Major soils of India.	04	06
02	Basic soil properties 2.1 Composition of soil, soil as three phase system, weight relationships, volume relationship, soil structure, factors affecting soil structure, bulk density, particle density of soil, soil consistency, Porosity, voids ratio, inter relationships, Water content, Degree of saturation, specific gravity, Available soil moisture, Field capacity, Permanent wilting percentage, Drainable porosity. Wilting point, ultimate wilting and wilting range. Relationships between soil properties. 2.2 Soil moisture content, methods of soil moisture content determinations. 2.3 Retention of soil moisture, maximum retentive capacity, 2.4 Experimental determination of water content, unit weight, specific gravity. 2.5 Consistency of clay soils, stages of consistency, Atterbergs limit of consistency, plasticity index, determination of liquid limit, plastic limit, shrinkage limit. 2.6 Numerical problems on above topic	12	16
03	Soil classification 3.1 Need for soil classification, Criteria for classification, Grain size classification, classification based on plasticity, symbols and graphical representation. 3.2 Textural classification of soils. 3.3 Mechanical analysis, Particle size distribution curve, Effective diameter of soil, Uniformity coefficient, coefficient of curvature.	04	06
04	Permeability, seepage and capillarity 4.1 Soil moisture - Modes of soil moisture occurrence, adsorbed water, capillary water and free water. Darcy's law, Coefficient of permeability, Infiltration and infiltration rate, soil air and aeration. Soil temperature, Soil tilth and its importance. 4.2 Flow of water through soil - permeability, factors affecting permeability, Determination of permeability (Constant head and falling head) test, values of permeability for different soils. 4.3 Capillary phenomenon in soils. 4.4 Shrinkage and swelling in soils. 4.5 Seepage through earthen structures, seepage forces, phreatic line, flow lines, equipotential lines, flow net, characteristics of flow net, quick sand, application of flow net.(no numerical.)	08	14

05	Soil Compaction and stabilization 5.1 Compaction phenomenon, Purpose, field application, standard Proctor test, modified Proctor test, compaction curve and factors affecting compaction, Field methods of compaction. 5.2 Soil stabilization concept, necessity, Introduction to methods of stabilization, CBR test.	04	08
Total		32	50

Practical:**Skills to be developed:****Intellectual Skills:**

1. Select appropriate method for determining field capacity
2. Use various methods to decide quality of soil

Motor Skills:

1. Ability to perform various tests on soil accurately
2. Ability to measure various quantities like Specific gravity, Soil permeability etc.

List of Experiments

1. Determination of water content by oven drying method.
2. Determination of specific gravity by pycnometer method.
3. Mechanical analysis of soil for particle distribution.
4. Determination of liquid limit and plastic limit.
5. Determination of field capacity and unit weight by core cutter method.
6. Determination of field capacity, voids ratio and unit weight by sand replacement method.
7. Determination of soil permeability by constant head permeameter.
8. Determination of soil permeability by falling head permeameter.
9. Determination of Optimum Moisture Content and Maximum Dry Density by standard proctor test.

Reference:**Books:**

Sr. No	Title	Author	Publisher
1	Basic and Applied Soil Mechanics	Gopal Ranjan and A.S.R. Rao	New Age International Publisher
2	Geotechnical Engineering	C. Venkatramaiah	New Age International Publisher
3	Soil Mechanics	B. C. Punmia	C. Jamanadas and Company
4	Soil Mechanics	Dr. S. B. Sehgal	CBS Publisher and Distributor

Course Name : Diploma in Agriculture Engineering**Course Code : AU****Semester : Fourth****Subject Title : Surveying & Levelling****Subject Code : 17451****Teaching and Examination Scheme**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	04	03	100	50#	--	25@	175

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

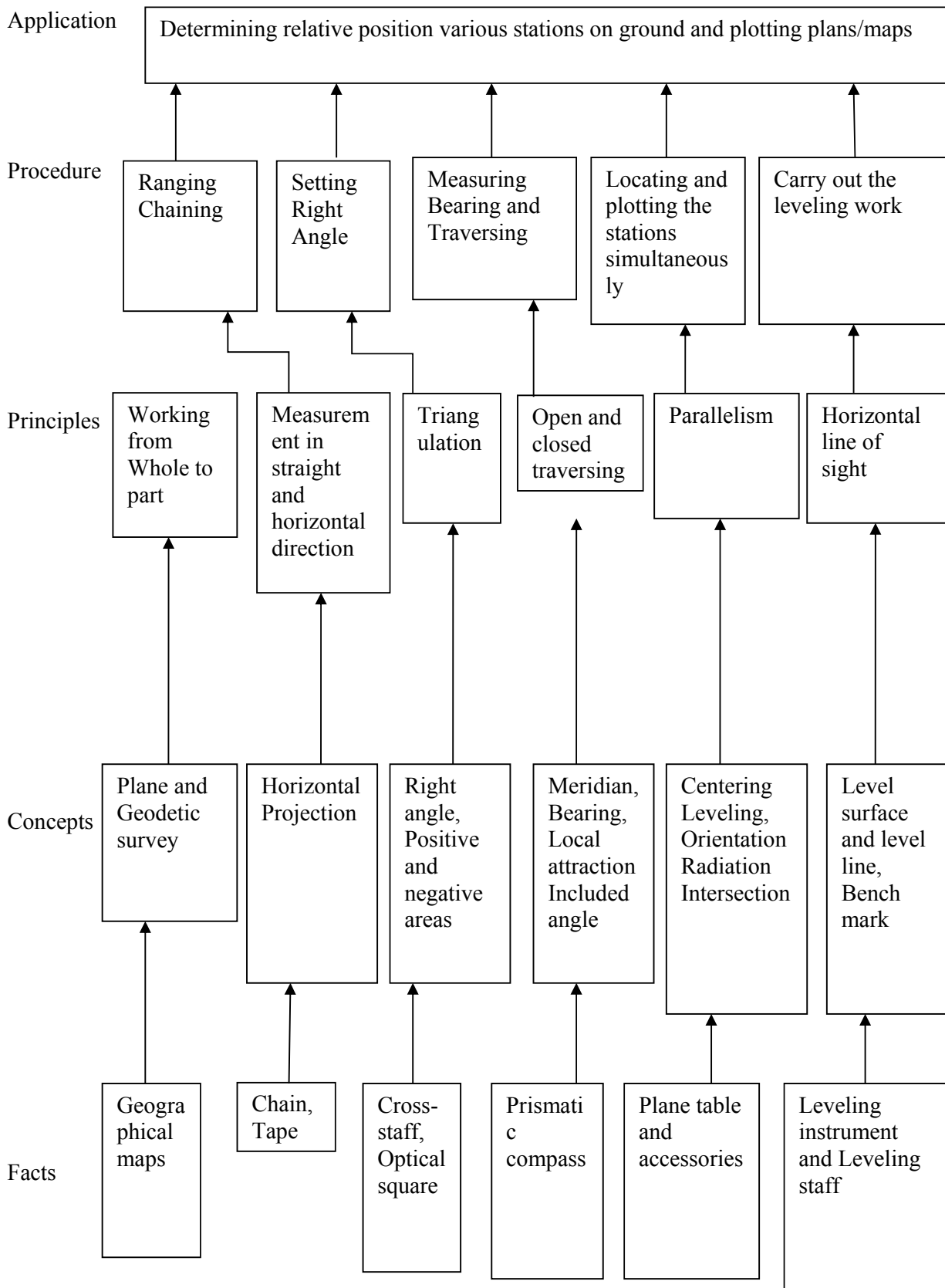
Diploma holders in Agricultural Engineering are vitally engaged in the field work rather than administration and management. In order to take up this job satisfactorily and skill fully, he must study the subject of basic importance like surveying. In the field he has to handle the surveying equipments like compass, plane table, optical squares, cross staff and dumpy level etc. and take readings, make the calculations and prepare the drawings.

For doing so he should be equipped with the knowledge of handling the surveying equipments and prepare the drawings and reports.

Objectives:

The student will be able to,

1. Understand the principles and methods of different types of surveys.
2. Use the equipments on the field, note the readings
3. To make the calculations using the data collected
4. Prepare the drawings and reports

LEARNING STRUCTURE:

Theory:

Chapter	Name of the topic	Hours	Marks
01	Basics of Surveying 1.1 Definition of surveying 1.2 Object of surveying 1.3 Types of survey 1.4 Classification of surveying-plane and Geodetic 1.5 Principles of surveying. 1.6 Uses of surveying.	03	08
02	Linear Measurements 2.1 Study of metric chain: 20m & 30m, its components 2.2 Study of tape-Types of tapes - linen, metallic, steel and invar. 2.3 Instruments for marking stations- pegs, arrows, ranging rods viz. specifications, material used for construction and applications. 2.4 Chaining- chaining on plain and on sloping ground. 2.5 Errors in chaining errors due to incorrect length of chain, correction in length and area 2.6 Study of scales-plain, vernier and diagonal.	06	12
03	Chain and Cross Staff Survey 3.1 Chain triangulation, Definitions of survey stations, Base line, Check line, Tie line, Well-conditioned triangle, Selection of survey stations. 3.2 Offsets- Perpendicular and Oblique offsets. Instruments used for setting out right angles - Open cross staff and Optical square. 3.3 Chain and Cross staff survey - Calculation of area from recorded observations in field books and plan. 3.4 Obstacles in chaining and methods to overcome obstacles. 3.5 Conventional signs on survey maps for- Cutting, Embankment, Marshy land, Road, Railway, River, Bridge, Tunnel, Fencing, Transmission line, Cultivated land, Orchard, Places of worship	06	14
04	Chain and Compass Survey 4.1 Prismatic Compass - Principle, components, construction and use. 4.2 Bearing of a line - True meridian, arbitrary meridian and magnetic meridian. Whole circle and quadrantal system, reduced bearings, fore bearing and back bearing. Conversion of bearings, calculations of included angles from bearings. 4.3 Local attraction-errors due to local attraction, precautions to be taken to avoid local attraction, corrections of bearings affected by local attraction, numerical problems, magnetic declination, dip of needle. 4.4 Traversing with chain and compass, different methods of plotting the traverse, closing error, graphical adjustment of closing error by Bowditch's rule.	08	16
05	Leveling 5.1 Definitions - Level surface, horizontal line, vertical line, datum surface, reduced level, bench mark, and its types-GTS, permanent, arbitrary, and temporary. 5.2 Dumpy level - components, temporary adjustments of level,	12	24

	line of sight, line of collimation, axis of bubble tube, fore sight, back sight, intermediate sight, change point, height of collimation, fundamental axis and their relationships. 5.3 Study and use of auto level. 5.4 Levelling staff-telescope and folding type. 5.5 Calculation of reduced levels, arithmetic check, examples by plane of collimation method and rise and fall method, computations of missing reading, obstacles in leveling, numerical problems. 5.6 Classification of leveling - Simple levelling, differential levelling, fly leveling, profile levelling and cross sectioning, check levelling. Sources of errors in levelling-precautions to be taken to eliminate the same.		
06	Contouring 6.1 Definitions – Contour, contour interval, horizontal equivalent. 6.2 Characteristics of contour lines. 6.3 Interpolation of contours – Direct and Indirect method of locating contours. 6.4 Uses of contour map, establishing grade contours.	04	08
07	Plane table survey 7.1 Principles of plane table survey, accessories used in plane table survey. 7.2 Setting up of plane table- centering, levelling, orientation by magnetic needle and back sighting. 7.3 Methods of plane table surveying-radiation, intersection and traversing. 7.4 Merits and demerits of plane table surveying, situations where plane table survey is preferred.	05	12
08	Minor Instruments 8.1 Polar planimeter- construction and use, Numerical problems on calculation of area. 8.2 Digital planimeter, study and use. 8.3 Total Station study and Use	04	06
TOTAL		48	100

Practical:**Skills to be developed:****Intellectual Skills:**

- Identify the different instruments for linear measurement and leveling.
- Record and observe necessary observations with the survey instruments.
- Select various types of survey instruments.
- Identify the errors of the survey instruments.
- Reading and Interpretation of drawing (plans/maps)

Motor Skills:

- Measure distances, Bearings and finding Reduced Levels with survey instruments.
- Recording of survey field data collected in Field Book and Leveling Book.
- Prepare drawing (plans/maps) using survey data.

List of Practicals:**(All practicals to be booking in field book.)**

1. Study and use of chain (20 m, 30m) Metallic and steel tapes, Ranging rods, pegs and arrows.
2. Direct and Indirect ranging, study and use of line ranger, Measurement of distances with chain and tape.
3. Study and use of open cross staff and optical square, measurement of area of five sided traverse by chain and cross staff survey.
4. Running a survey line to locate adjacent objects such building, road, trees, electric poles etc. by taking offsets with open cross staff / optical square. Booking field notes.
5. Study and use of Prismatic compass – components, their functions, adjustments, Observing fore bearings and back bearing of lines, calculation of included angles.
6. Observing fore bearing and back bearing of a Five sided closed traverse, identifying the stations affected by local attraction and calculation of corrected bearings.
7. Study and use of Dumpy level, components, temporary adjustments and study of leveling staff.
8. Carrying out differential leveling, recording the reading in a level field book and calculation of Reduced Levels, (H. I. Method) also applying arithmetic check.
9. Carrying out differential levelling, Calculation of reduced Levels (rise and fall method) also applying arithmetic checks.
10. Fly levelling – carrying bench mark from one point to another point.
11. Study and use of auto level – temporary adjustments, taking staff readings.
12. Contouring by direct / indirect method.
13. Setting of contours by level and tube and 'A' frame in the field.
14. Measurement of area irregular figure by polar planimeter
15. Measurement of area irregular figure by Digital planimeter.
16. Study and use of plane table and its accessories, temporary adjustments of plane table. Locating points by method of radiation.
17. Locating details by the method of intersection and traversing. Orientation of plane table by back sighting and magnetic meridian.

List of Projects

1. Chain and compass traverse survey- a closed traverse of minimum 5 sides enclosing a building, calculation of included angles and corrected bearings, locating details and plotting on A1 size imperial drawing sheet.
2. Profile levelling and cross-sectioning- Running a base line 300M. Length with cross section at every 30m. Length of crossing may be 20m on either side with staff reading @ 10m.interval. Spot levels should be taken at every 10m along the base line. Plotting of L-section and minimum of 3 cross-sections on A1 size imperial drawing sheet.
3. Block contouring - A block of 100 m X 100 m with spot levels @ 10 m X 10 m and plotting the contours with suitable contour interval by interpolation on A1 size imperial drawing sheet.
4. Plane table traversing- running a minimum Five sided traverse enclosing a building using method of traversing. Locating details of building, poles etc. by radiation and intersection method. Plotting the traverse with details on A1 size imperial drawing sheet.

Reference:**Books:**

Sr. No	Title	Author	Publisher
1	Surveying and Levelling Vol. 1 & Vol. 2	T. P. Kanetkar and S.V. Kulkarni	Pune Vidyarthi Griha Prakashan
2	Surveying and Levelling Vol. 1 & Vol. 2	Dr. B.C. Punmia	Laxmi Publication New Delhi.
3	Surveying and Levelling Vol. 1 & Vol. 2	S. K. Duggal	Tata McGraw Hill
4	Surveying and Levelling	N. N. Basak	Tata McGraw Hill

Course Name : Diploma in Agriculture Engineering**Course Code : AU****Semester : Fourth****Subject Title : Hydraulics****Subject Code : 17452****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25@	175

NOTE:

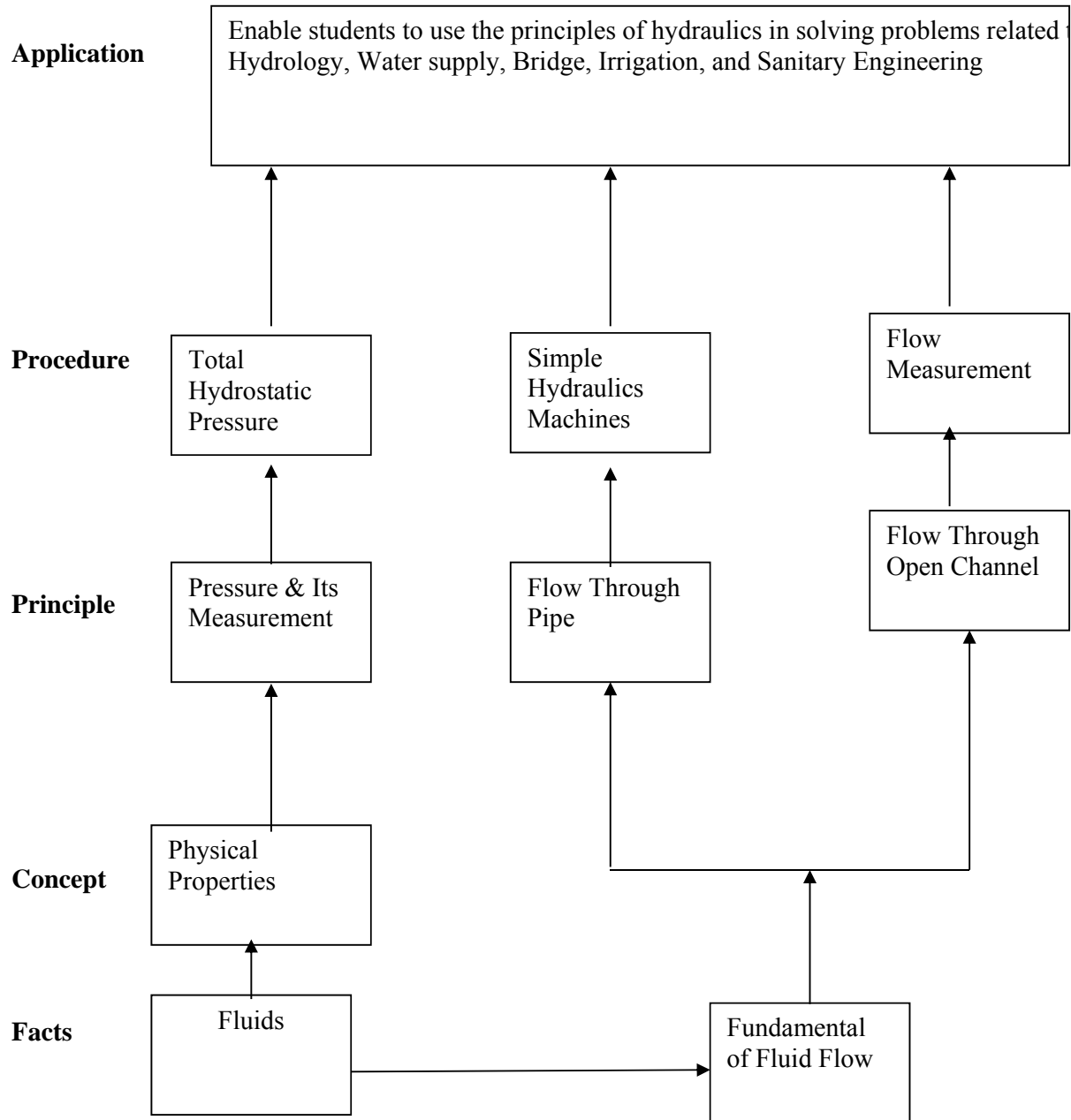
- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

Now a days the fluid mechanics find wide applications in many situations directly or indirectly. Agricultural engineers are expected to have the knowledge and the understanding of the basic principles and concepts of fluid mechanics both in static and dynamic conditions. This is to enable them to analyse and design systems in which fluid is the working medium.

Objectives: The student will be able to,

1. Explain the working of mechanical gauges.
2. Explain continuity equation and Bernoulli's equation.
3. Know types of flow of fluids and practical applications.
4. Estimate the discharge through orifices, mouth pieces, notches & weirs.
5. Definition of flow through pipes, losses of head due to friction.
6. Flow through open channel, velocity of flow in open channel.
7. Select the type and size of the pump as per the requirements

Learning Structure:

Theory:

Topic and Contents	Hours	Marks
Topic 1: Properties of Fluids 1.1 Introduction: Fluid; Real Fluid, Ideal Fluid, Fluid Mechanics, Hydraulics, Hydrostatics, Hydro kinematics and Hydrodynamics 1.2 Properties of Fluids Properties of fluids, mass density, weight density, specific volume, specific gravity, compressibility, vapour pressure, cohesion and adhesion, surface tension, capillarity, viscosity, types of viscosity, classification of fluids, Problems.	05	10
Topics 2: Pressure and Its Measurement Pressure units , atmospheric pressure, gauge pressure, vacuum pressure, absolute pressure, pressure vary with depth and pressure head, pressure head in terms of equivalent liquid column, Pascal's law of transmissibility, proof, applications, hydraulic press, hydraulic jack, Pressure device, Piezometer tubes, U-tube manometers (simple and differential) problems. Mechanical pressure gauges: Bourdon's tube, diaphragm and dead weight pressure gauges. Pressure on plane surfaces, Total pressure, centre of pressure, depth of centre of pressure, fluid pressure on plane surfaces immerse in liquid, vertically and inclined simple problems.	06	14
Topics 3: Flow of Fluids 2.1 Flow of Fluids Types of fluid flow, steady, unsteady , uniform and nonuniform, laminar, turbulent, definitions only, mean velocity of flow and discharge, units, Equation of continuity of flow, Hydraulic energy and total head, Bernoulli's theorem (statement only), limitations , practical applications, problems, Venturimeter, simple problems, Orifice meter, comparison with Venturimeter, Pitot, simple problems. 2.2 Orifices, Mouth Pieces, Notches & Weirs Orifice , definition, types of orifices , Flow through small orifice, head causing flow, Vena-contracta, velocity and discharge, hydraulic coefficients and its relationship, problems, Mouth piece - definition, types, discharge through mouth piece, Notches, definition, types, discharge through rectangular & triangular notches, Advantages of V-notch over rectangular notch, Weir, classification, difference between notch and weir.	10	20
Topics 4: Flow Through Pipes 4.1 Loss of head due to friction, Darcy-Weisbach Equation Friction factor, relative roughness. Moody's diagram and its use. Common range of friction factor for different types of pipe material. 4.2 Minor loss of head in pipe flow- loss of head due to sudden Contraction, sudden expansion, gradual contraction & expansion, at entrance and exit of pipe in various pipe fittings. Pipes in series and parallel Equivalent pipe – Dupuit's equation 4.3 Hydraulic gradient line and Energy gradient line, Siphon pipe. Water hammer in pipes – cause effects and remedial measures Use of Nomograms for design of water distribution system. Numerical Problems.	08	16

Topics 5: Flow Through Open Channels 5.1 Types of channels- artificial & natural, purposes of artificial channel, Different shapes of artificial channels Geometrical properties of channel section - wetted area, wetted Perimeter, hydraulics radius Prismatic channel sections, steady- uniform flow through prismatic channel section. 5.2 Chezy's equation and Manning's equation for calculation of discharge through an open channel, common range of values of Chezy's constants and Manning's constant of different types of channel surfaces. Most economical channel section, conditions for most economical channel sections. 5.3 Froud's number and its significance. Critical, sub-critical and supercritical flow in channel Hydraulic jump and its occurrence in field, uses of hydraulic jump. Numerical Problems.	08	16
Topics 6: Agricultural Pumps 6.1 Centrifugal Pumps Centrifugal pumps, description and working, Types of casings and impellers, Bearing housing , Stuffing boxes and glands, Drives for centrifugal pumps, operation of centrifugal pumps, priming, use of foot valve and strainers, Layout and accessories, Maximum height of suction, Multistage pumps, Maintenance and repair of centrifugal pumps, causes of vibration trouble and remedies, Problems on discharge power and efficiency, Selection of pump for given speed and discharge specifications, no problems. 6.2 Reciprocating Pumps Reciprocating pumps , classifications , working of single acting and double acting reciprocating pump , plunger and piston pumps , discharge of reciprocating pump , theoretical power required , coefficient of discharge , slip , negative slip , indicator diagram , separation or cavitations , air vessel , simple problems. Special pumps , jet pumps , Turbine pumps , Submersible pumps , Working principles, no problems 6.3 Submersible Pumps: description and working , Types of casings and impellers	11	24
Total	48	100

Practical:**Skills to be developed:****Intellectual Skills:**

- Interpret test results
- Calculate quantities of parameters
- Draw graphs

Motor Skills:

- Measure different parameters accurately
- Adjust levels by operating valves

List of Practicals:

- Measurements of pressure and pressure head by Piezometer, U-tube manometer
- Verification of Bernoulli's theorem
- Reynolds experiment to study types of flow

4. Determination of Minor losses in pipes (any two)
5. Demonstration of Hydraulic jump
7. Determination of coefficient of discharge for given rectangular or triangular notch.
8. Determination of coefficient of discharge for a given Venturimeter.
9. Determination of hydraulic coefficients for sharp edge orifice
10. Study of a model of centrifugal and reciprocating pump.
11. Use of characteristic curves/ nomograms /charts / catalogs from manufactures for selection of pump for the designed discharge and head (Refer IS: 9694)

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
01	Dr. P. N. Modi & Dr. S. M. Seth	Hydraulics & Fluids Mechanics	Standard Book House, Dehli
02	R. S. Khurmi	A Text Book of Hydraulics, Fluids Mechanics Hydraulics Machines	S. Chand & Company Ltd. New Delhi
03	Dr. Jagdish Lal	Fluids Mechanics Hydraulics	Metropolitan Book Co. Private Ltd. New Delhi
04	Dr. R. K. Bansal	Fluids Mechanics & hydraulic structures	Laxmi Publication
05	A.M. Michael & S.D. Khepar	Water wells & pump Engineering	Tata McGraw Hill, Delhi
06	S. K. Likhi	Hydarulics Laboratory Manual	T.T.T.I. Chandhigrah

2. IS, BIS and International Codes:

- A) Refer IS: 9694 for selection pumps

Course Name : Diploma in Agriculture Engineering**Course Code : AU****Semester : Fourth****Subject Title : Farm Power and Tractor Systems****Subject Code : 17453****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

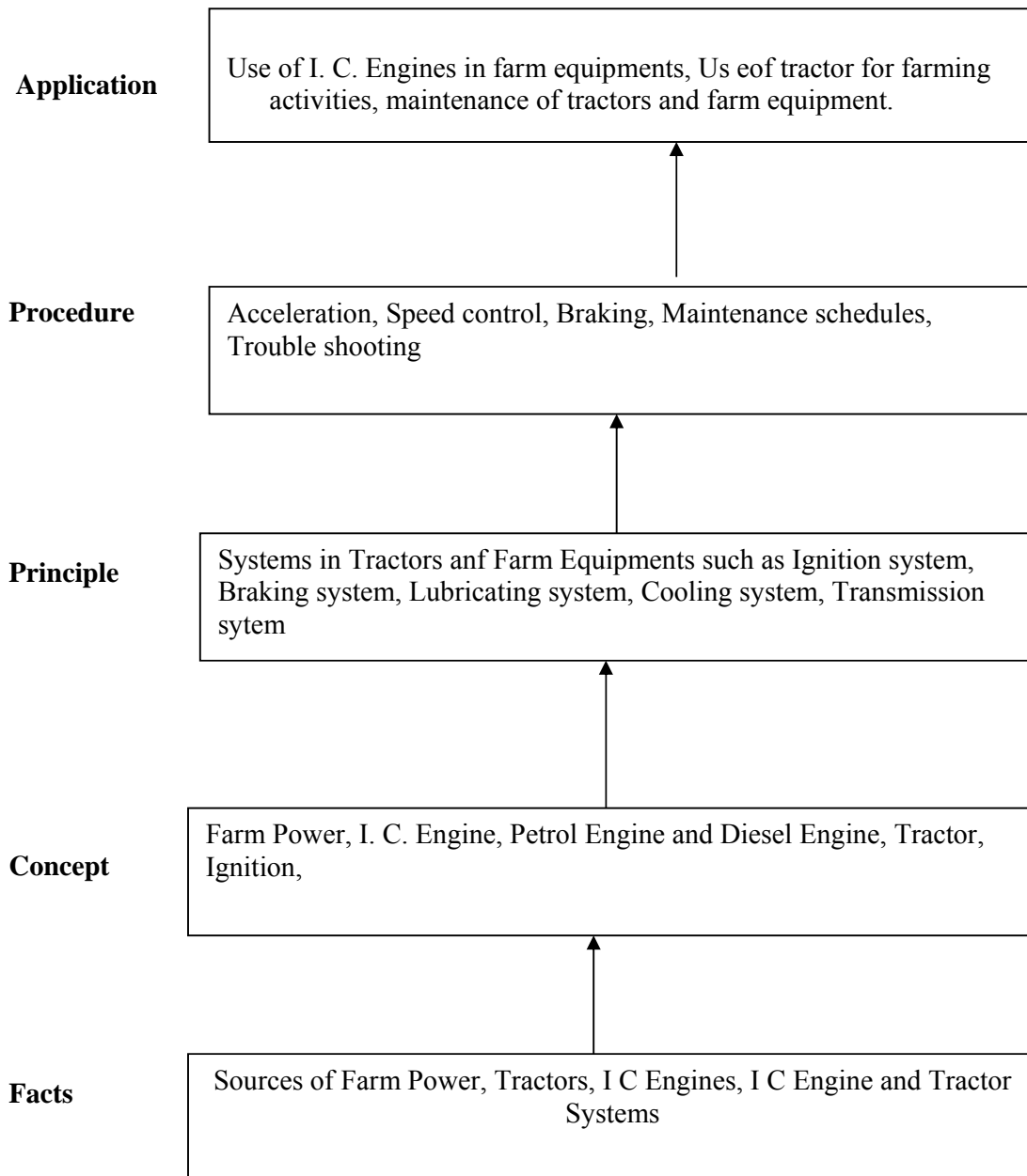
Rationale:

Diploma holders in agricultural Engineering should have the knowledge of different sources of power available at farms for driving the farm machinery and equipment. I.C. Engines and tractors are the primary sources of power available on farms.

The aim of introducing this subject is to equip them with the knowledge of both conventional and non-conventional sources of Power. The contents of this subject have been developed to cater above mentioned needs.

Objectives: The students should be able to:

1. Know the Sources of farm power
2. Able to classify of IC engines,
3. Knows function of the engine, details of construction and maintenance requirements of engine and hence able to look after of the maintenance of engine
4. Know Air cleaning, Fuel, Cooling, Lubrication, Valves, Ignition and Governor systems.
5. Select Tractor or farm equipment as per requirements
6. Know all the systems of tractor

Learning Structure:

Theory:

Topic	Hours	Marks
1. I. C. ENGINE SUPPORTING SYSTEMS 1.1 Air Cleaning System of I.C. Engine Need of air cleaning system, Different types of air cleaners, Oil soaked element type of air cleaner, Dry type air cleaner, Oil bath type of air cleaner Pre- cleaner. 1.2 Fuel System of I.C. Engine Requirements of a diesel fuel supply and injection mechanism, Systems of fuel injection (Air injection method AND Direct or Solid injection method), Fuel supply system in spark ignition system, Carburetor and its functions, Functions of carburetor, working of simple carburetor, components of carburetor and their function, Fuel supply system in diesel engine, Turbocharger. 1.3 Cooling System Purpose of Cooling, Air cooling, Water cooling its types, components & functions 1.4 Lubrication System of I.C. Engine Needs of lubrication, Theory of lubrication, Classification of lubricants, Functions of engine oils, Types of lubrication systems, Splash Lubrication System, Pressure/Forced feed lubrication system, Main Parts of Lubrication System, Crank Case Ventilation.	08	18
2. Sources of Farm Power Classification of sources of farm power, The characteristics, advantages and disadvantages of different sources of power, Classification of biogas plants, Different components of biogas plants, Floating drum type biogas plant, Fixed drum type biogas plant, Pre-requisites of biogas system, Difference between floating gas holder type & fixed drum type biogas plant, Ways of collection of solar radiations, Classification of wind mills, Performance of wind mills.	04	08
3. I. C. Engine Different types heat engines, Classification internal combustion engine in different ways, Different parts of I. C. engine components & their construction, Terms related to I. C. engines, Solved Problems, Working of four stroke cycle engine, Working of two stroke cycle engine, Difference between two stroke and four stroke engine, Difference between Diesel Engine and Petrol Engine.	06	10

<p>4. I. C. Engine Systems</p> <p>4.1 Valves, Firing Order & Firing Interval</p> <p>Different parts in Valve operating system, The different valve arrangements used in the engines, Large size flywheel for single cylinder engines, Poor balance of single cylinder engines, Valve operating mechanism, Valve Clearance, Valve timing diagram, Firing Order (F.O.), Firing Interval (F.I.)</p> <p>4.2 Ignition System of Tractor</p> <p>Spark ignition system, Battery ignition system, Components battery ignition system, Capacity of Battery, Battery charging, Magneto ignition system with neat diagram, Difference in Battery Ignition and Magneto Ignition, Effect of ignition advance and ignition retard, Need of spark advance and retard mechanism.</p> <p>4.3 Governors & Methods of Governing</p> <p>Need of governor, Governing Systems, Hit & Miss System, Throttle System, Difference between Hit & Miss System and Throttle System of governing, Construction and working of Centrifugal Governor (Watt governor) and Pneumatic Governor, Governor Regulation, Governor Hunting, Difference between Fly wheel and Governor.</p>	08	16
<p>5. Tractor</p> <p>Introduction, Classification of tractor and adoptability. Factors affecting selection of Tractor. General idea about different makes, models, in different H.P. ranges of tractors.</p>	02	06
<p>6. Study of transmission systems</p> <p>6.1. Clutch</p> <p>Main functions of clutch, Essential features of clutch, Principle of operation of clutch, Different types of clutch, Working of single plate clutch system. Different parts of clutch system, Working of dual plate clutch system, Clutch adjustment, Trouble shootings.</p> <p>6.2 Gear Box</p> <p>Need of gear box in tractors, Principle of gearing, Different types of gear box available on tractors, Sliding mesh gear box, Constant mesh gear box, Synchromesh gear box, Trouble shootings.</p> <p>6.3 Differential and Final Drive</p> <p>Necessity and function of differential unit in a tractor, Principle of operation of differential unit, Operational details of differential unit, Transmission efficiency of differential. Differential lock. Final drive</p>	10	18

mechanism.		
7. Study of Supporting systems of tractor		
7.1 Brakes Classification of brakes, Internal expanding shoe brake, Brake pedal free play, External contracting shoe brake, Disc brakes, Principle of operation of hydraulic brake, Working of hydraulic brake system.		
7.2 Steering Geometry Qualities of steering system, Ackerman steering, Steering geometry, Main parts of steering system, Working of steering system, Steering ratio, Power Steering.	08	18
7.3 Hydraulic System Merits of hydraulic system over mechanical system, Basic characteristics of fluids, basic components of hydraulic system. Working of hydraulic system, Types of hydraulic system, Position control, Draft control, Mixed control		
8. Tractor Power Outlets		
Hitching of implements to tractor, Power Take Off (PTO) shaft. Different types of PTO, Belt pulley.	02	06
Total	48	100

Practicals:**Skills to be developed:****Intellectual Skills:**

1. Identify various parts of I. C. Engines and know their functions.
2. Operate the I. C. Engine under various conditions which occur on the farm.
3. Identify tractor parts and know their functions.
4. Know how to operate tractor as per the requirement on the farming jobs.

Motor Skills:

1. Ability to draw sketches of the parts of I. C. Engine and Tractor
2. Operate the tractor under different conditions for its appropriate use on farm
3. Ability to identify faults in I. C. Engines/tractors
4. Able to identify the places for lubrication and lubricate the machines efficiently and effectively

List of Practicals:

1. Demonstration of different systems of an IC engine; Students to identify Engine parts and functions, working principles etc.

2. Operation of two and four stroke engines.
3. Demonstration of Valve system, valve timing diagram and valve setting procedure.
4. Demonstration fuel system and air cleaning system of IC engine and familiarization with its parts/components, students to identify functions
5. Demonstration of cooling system of tractor engine and familiarization with its parts/components.
6. Demonstration of lubrication of tractor engine and familiarization with its parts/components.
7. Introduction to transmission system and components
8. Demonstration of clutch system and trouble shooting.
9. Demonstration of different types of gear box, differential and final drive system and trouble shooting.
10. Demonstration of brake systems and trouble shooting.
11. Study hydraulic system in tractor.
12. Visit to Tractor repair workshop & spare part agencies.

List of Assignments:

Collection of information broacher, service manual/Operators manual from various dealers of the different makes of the Tractor companies and study the specifications of the same.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
1	SC. Jain & CR.Rai	Farm tractor maintenance & repair second Reprint, 1999	Standard Publishers Distributors, New Delhi
2	S. B. Patil	Farm Power, First Reprint, 2011	Aditi Prakashan, At/Po: Bhadole, Dist: Kolhapur-416 112,
3	AM Michael and TP Ojha	Principles of Agril. Engineering Vol-I 2 nd Edn	Jain brothers, 16/873 East Park Road Karol Bagh, New Delhi 110005
4	Jagdiswar Sahay	Elements of Agril. Engineering, - Fourth Edition 2004	Standard publishers Distributors, New Delhi
5	JB Liljedahl & et al.	Tractor and their power unit, 4 authors books (1 st Edition, 1997)	CBS Publishers and Distributors, New Delhi
6	C. P. Nakra	Farm machines & Equipment Edition 1990.	Dhanpat Rai & Sons, 1962, Nai Sarak Delhi.

Course Name : Diploma in Agricultural Engineering
Course Code : AU
Semester/Year : Fourth
Subject Title : Agricultural Economics and Business Management
Subject Code : 17454

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	--	03	100	--	--	--	100

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Seasonal Work (SW).

Rationale:

The subject is very important to understand Economics of Agriculture and also the Agricultural Business aspects to prepare the students for agri business. This deals with importance of Agriculture in India's Economy. It deals with all the aspects of the business such as Accounting, Marketing, Finance, Planning, and Organisation.

Objectives: The student will be able to,

1. Know all aspects of Agricultural Business.
2. Understand the organisation structure.
3. Able to select the financial mode for business operation.

Theory:

Topic and Contents	Hours	Marks
Topic 1: Agribusiness : An Overview 1) Meaning and definition 2) System of Agribusiness <ul style="list-style-type: none"> a) Agricultural Input Sector b) Production Sector c) Processing Manufacturing Sector d) Distribution- Marketing Sector 3) Structural Agribusiness Breakdown of the Input, Farm & Product Market Sector <ul style="list-style-type: none"> a) Farm Supplies <ul style="list-style-type: none"> • Seed • Fertilizer & Chemicals • Machinery & Equipments • Petroleum • Transportation • Feed • Others b) Farming <ul style="list-style-type: none"> • Types of farming: Individual, Contractual and Community Farming, c) Processing <ul style="list-style-type: none"> • Industrial • Food: Supermarkets, Moll, Restaurants, Institutions • Retail • Other 	08	20
Topic 2. Functions of Management : <ul style="list-style-type: none"> ➤ Planning <ul style="list-style-type: none"> 1. Definition of Planning 2. Function of Planning 3. a. Types of Plans b. Planning Process <ul style="list-style-type: none"> ➤ Purpose ➤ Objectives ➤ Policies ➤ Procedure ➤ Practices c. Characteristics of Sound Plan d. Steps in Planning <ul style="list-style-type: none"> ➤ Gathering facts ➤ Analyzing the Facts ➤ Forecasting Change ➤ Setting Goals & Results ➤ Organizing <ul style="list-style-type: none"> • Meaning 	20	40

<ul style="list-style-type: none"> • Legal Structure <ul style="list-style-type: none"> a. The sole Proprietorship <ul style="list-style-type: none"> • Creating a sole Proprietorship • Advantages & disadvantages b. The Partnership <ul style="list-style-type: none"> • Types of Partnerships • Advantages and Disadvantages c. The Corporation <ul style="list-style-type: none"> • Types of Corporation • Characteristics of Corporation (Limited, Liability, Continuity of Operation, Tax Aspects, Estate Planning) d. Co-operative Society e. Govt. Sector ➤ Directing: <ul style="list-style-type: none"> • Meaning • Objectives <ul style="list-style-type: none"> a) Personal Management b) Finding or Recruiting People c) Selecting the right person d) Job Orientation e) Compensation & Fringe Benefits f) Evaluating Performance g) Training & Development h) Promotion & Advancement i) Termination & dismissal ➤ Motivating <ul style="list-style-type: none"> • Meaning • Different Ideas for Managing & Motivating People <ul style="list-style-type: none"> a) Maslow's Need Hierarchy b) Motivators & Hygienic Factors • Meaning & Concept of Controlling, Ordering, Leading, Supervision, Communication 		
<p>Topic 3 Financial management of Agribusiness</p> <ul style="list-style-type: none"> ➤ Importance of financial statement ➤ Balance sheet and Income statement Meaning, concept ,importance, preparation of balance and income statement, ➤ Preparation of income statement and profit and loss statement Meaning, concepts and calculation of profit and loss, Study of different financial ratios : Capital turn over ratio, Rate of return on investment, Net farm income, Net return to total capital 	08	16

Topic: 4 Agro - based Industries. <ul style="list-style-type: none"> • Importance, need, Classification and types of Agro-based Industries. • Study of sugar industry, cotton industry, Dal Mills, Rice Mills and Fruit and Vegetable Processing industry. • Study of procedures and constraints in Agro industry. ➤ Marketing in Agro based Industries: <ul style="list-style-type: none"> • Meaning of marketing, definition, concepts and difference between Marketing and Selling, • Market cost, Price Spread, Market Margin and Marketing efficiency. • Study of Future and e - Marketing • Marketing Mix • 4 P's of Marketing ➤ Market Segmentation :Meaning Role and Methods ➤ Price Policy: Meaning, objectives, pricing methods and prices at various stages. 	12	24
Total	48	100

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
1	V.P.S. Arora	Agribusiness Management Conceptual Overvise	Manual of arora
2	S. Subha Reddy and P.Raghu Ram	Agricultural Finance and Management	Oxfordand and IBH Publishing, New Delhi
3	Rais Ahmad	Agribusiness and Rural Management	Mittal Publishing, New Delhi
4	J. Price Gittinger	Economics Analysis of Agricultural Projects	Manual of Gittinger

Course Name : Diploma in Agriculture Engineering**Course Code : AU****Semester : Fourth****Subject Title : Manufacturing Technology****Subject Code : 17047****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	50#	--	50@	100

Rationale:

Manufacturing process is a basic technology course for mechanical engineering. It enhances the skills which the students have acquired in workshop practice. The technician should be introduced to the basic processes of manufacturing. The course will help the student to get familiarize with working principles and operations like with various patterns, molding, casting, fabrication, turning, drilling, brazing etc.

The basic knowledge of these processes will be helpful to select most suitable processes for conversion of raw material into finished product as per the requirement.

General Objectives:**Student will be able to develop:**

- Know and identify basic manufacturing processes for manufacturing different components.
- Operate and control different machine tools and equipments.
- Manufacture job as per specified dimension.
- Inspect the job.
- Adopt the safety practices.

Theory: Theory to be taught during practical hours.

Topic and Contents
Topic 1: PATTERN MAKING 1.1 Pattern making materials (wood, plastics, rubbers, plasters, waxes) 1.2 Types of patterns: Single piece pattern, Split pattern, Match plate pattern, Sweep pattern, Skeleton pattern 1.3 Pattern making allowances: Shrinkage, draft, machining, distortion, rapping 1.4 Core prints: Horizontal, vertical, hanging, balancing, wing Colour coding for patterns and core boxes.
Topic 2: MOULDING 2.1 Moulding Sand 2.2 Types: Green, Dry, Loam, Facing, Backing, System, parting, Core sand 2.3 Properties of Moulding sand 2.4 Moulding Processes: Green sand, Dry sand, Machine and Shell Moulding
Topic 3: CASTING 3.1 Casting Principle and operation 3.2 Die casting methods: Hot chamber die casting method, Cold chamber die casting method 3.3 Melting furnace for ferrous metals: Cupola furnace: Construction and operation, zones, capacity, Temperature range 3.3 Melting furnace for non ferrous metals 3.4 Electric furnace for steel: Direct arc furnace, High frequency induction furnace 3.5 Defects in casting: Causes and remedies, inspection & testing of casting
Topic 4: FABRICATION 4.1 Classification. 4.2 Arc welding: Principle, Applications, Shielded metal arc welding, Sub-merged arc welding 4.3 TIG/MIG Welding 4.4 Resistance welding: Spot, Projection, Seam, Percussion 4.5 Gas welding: Techniques, Types of flames, Welding defects. 1.6 Soldering and Brazing: Types, Principle and Application
Topic 5: METAL TURNING PROCESS (LATHE MACHINE) 5.1 Types of lathes: Light duty, Medium duty and Heavy duty geared lathe, CNC lathe 5.2 Specifications 5.3 Basic parts and their functions 5.4 Operations and tools – Turning, parting off, Knurling, facing, Boring, drilling, threading, step turning, taper turning

Practical:

Skills to be developed:

Intellectual Skills:

- To develop the skill of manufacturing patterns and their allowances.
- To know and identified different molding methods for different casting methods.
- To understand the molding processes.

Motor Skills:

- To prepare a pattern making job for casting and moulding.
- To operate lathe machine and to know about speed, feed, depth of cut and to perform different turning operations.
- To fabricate component by using welding.

List of Practicals:

1. One simple wooden and thermocole Pattern Job of maximum 4 students per group, each group should make different type of pattern.
2. One turning job on lathe containing the operations like facing, plain turning, step turning, grooving, chamfering.
3. Demonstration and assignment on types of molding sands.
4. One composite welding job having two different joints. With preparation of joints (Batch of four students per job.)
5. Industrial Visit to TIG / MIG welding setup and write report
6. Demonstration on molding processes.

List of Assignments:

- Workshop diary must be maintained by the instructor/lecturer during practical sessions

Learning Resources:**1. Books:**

Sr. No.	Author	Title	Publisher
1	S. K. Hajra Chaudary, Bose, Roy	Elements of workshop Technology - Volume I & II	Media Promoters and Publishers limited
2	B.S. Raghuvanshi	Elements of workshop Technology - Volume I & II	--
3	D. L. Wakyl	Processes and Design for Manufacturing	Prentice Hall
4	O. P. Khanna and Lal	Production Technology - Volume I & II	--
5	P. L. Jain	Principles of Foundry Technology	--
6	W.A.J. Chapman	Workshop Technology – Volume I , II & III	--

7. CDs, PPTs Etc.:

- Various PPT's and Transparencies related practical.

8. IS, BIS and International Codes:**9. Websites:**