COURSE CODE:	FIS407
COURSE TITLE:	Aquatic Environmental Survey
NUMBER OF UNITS:	3 Units
COURSE DURATION:	Three hours per week

COURSE DETAILS:

Course Coordinator:	Prof. Yemi Akegbejo-Samsons
Email:	samsons56@yahoo.co.uk
Office Location:	Room D210, COLERM
Other Lecturers:	Dr. W.O. Abdul and Dr. F.I. Adeosun

COURSE CONTENT:

Visual survey (reconnaissance)- (Purpose, location, water parameters, geology, meteorology), Surveying (Levelling) or Topographic survey – Levelling instruments and its maintenance. Booking- (record keeping)

COURSE REQUIREMENTS:

This is a compulsory course for all students in Department of Aquaculture & Fisheries Management. In view of this, students are expected to participate in all the course activities and have minimum of 75% attendance to be eligible to write the final examination.

.

READING LIST:

LECTURE NOTES

What is surveying?

☞Surveying is the branch of applied mathematics which deals with measuring and recording of the size and shape of any portion of the earth's surface, and the delineation of the same in a map or plan.

☞ It deals with the setting out of works such as roads, railways, waterworks, drainage schemes etc and the calculation of areas and volumes.

☞ It may be taken to include levelling i.e. determination of the relative heights of different points on the earth surface.

Types of surveying

1. Trigonometrical surveying : - This is for the preparation of maps of large extents of territory

2. Land surveying: - this is ranging from the land division system and extensive topographical surveys and work for boundary commission to small ones such as farms and estates.

3. Hydrographical surveying: - ranging from coast surveys to plans for harbour works.

4. Engineering location surveying: - For the construction of highways, railways and various public works.

5. Preliminary or parliamentary surveys: - This is in connection with a projected scheme such as the construction of a railway or a waterworks.

6. Exploratory surveying: - This is for geological, engineering and mining enterprises including archaeological expeditions.

7. Environmental survey: - his is survey carried out for forest and water parameters.

Difference between surveying and Levelling:
Surveying consists in making measurements in the horizontal plane while Levelling is making measurements in the vertical plane.
In surveying, the measurements consist in fixing position of points in the horizontal plane; 2 points fix a straight line while 3 or more straight lines determine the plan of a plane figure.

What is Visual survey?
This is also called reconnaissance survey.
⇒It is the preliminary inspection of an area to be surveyed.
⇒ It is a see-for-yourself walk-over of the ground to be used for a fish pond or a fish farm. It is first done with a view to visualise the work to be done.
⇒ It is the venture taken to note and identify all the parameters to be measured or surveyed.
⇒ It is a rough sketch of the field or fields in which all positions and stations are made in the field book.
⇒It is preliminary work done whereby the routes of the main chain lines are noted.

What do you do during visual survey?

(i) The purposes of the survey should be noted.

This includes (a) is it for pond construction?
(b) Is it for damming? (c) Is it for irrigation purposes; (d) Is it for Hydro-electric power (HEP)?

The purpose will determine the extent of the reconnaissance survey.

(ii) The water parameters to be measured should be noted as from the beginning. Such parameters include : (a) Water level; (b) Geological attributes; (c) Soil conditions (texture, structure and permeability); (d) Water pH, hardness, alkalinity, chloride, phosphate, ammonia, sulphide, sulphite, dissolved oxygen etc

Survey in pond construction

Through topographic survey, the proposed site is inspected and professionally approved. The water, soil and other parameters are determined. Using levelling instrument, the topography of the site is ascertained and the area to be dug/ excavated or filled is pegged out with the use of lines.

Topic 2
Topographic survey

Topographic survey is carried out at the site selected for a fish farm project. This is based on a convenient datum marked with a temporary bench mark (TBM) at the site.

There are several methods used for topographic surveys, depending on the nature and size of the land required for the project.

The following methods are the most commonly applied for topographic surveying:

(i) Gridding

(ii) Plane tabling

(iii) Cross-section method with traverse survey

(iv) Radiating lines method with traverse survey

(v) Tachiometry.

Methods (i) and (ii) are ideal on relatively flat land, while methods (iii) and (iv) may also be used but are best suited to hilly terrain or in narrow long valley.

The following topographic maps and plans are generally needed for a project:

(i) Index or location map

(ii) Boundary map

(iii) Contour map

(iv) Cross and longitudinal section and

(v) Land map

General Information and data needed for topographic survey

A. **The Project site**

- Location

- Accessibility

- Communication

- Power supply

- Land status

- Existing improvements

B. **Hydrological data**

- Design flood

- Runoff

- Ground water potential

C. **Meteorological data**

- Mean monthly temperature

- Mean monthly rainfall

- Mean monthly evaporation

- Mean monthly humidity

- Mean monthly sunshine

- Mean monthly wind speed and prevailing direction

D. **Water Source and quality**

- Description of water source

- Statement for water rights or water restrictions

- Summary of water analysis

E. **Topography**

- Summary of topographic survey

- List of the boundary points' coordinates

- List of the temporary bench marks

F. **Soil characteristics**

- Summary of the soil report

- Water table conditions

LEVELLING

This deals with the determination of the relative heights of points on the earth's surface. The process of this determination is either direct or indirect. A direct measurement is one taken up or down from one point to another which may be made by spirit level, water level, and brick layer's level or indirect measurement made depression from one point to the other.

Data from levelling operations are used to prepare topographical plans and map. These drawings show the main physical features on the ground, such as rivers, lakes, roads,etc as well as the changes in elevation between land forms such as valleys and hills(called vertical reliefs).Plans are

usually large-scale (e.g. 1cm for 100m) drawings; maps are small-scale (e.g. 1cm for 200m) drawings. A plan shows information on farm features such as dikes, ponds, drainage canals or outlets structures. Topographical map shows the fish farm site. These are very important in fish farm construction. They help guide in choosing a site, planning the fish farm, and designing the structures that are needed for the farm. They also guide in the layout, so that one can follow the plan that has been made for the fish farm, and build the structures on it correctly.

SOME TERMS USED IN LEVELLING OPERATIONS

1. Bench mark (BM): it is a fixed point on the earth's surface whose level above ordance datum is known.

2. Ordnance Datum (OD): it is the mean sea level to which all other levels are related.

3. Back sight (BS): is the first sight taken after the level has been set up. A sight taken to a point whose height is known or can be calculated.

4. Foresight (FS): The last sight taken. A sight taken to a point whose height is required to carry on the line of level.

5. Intermediate Sight (IS): it is any other sight taken.

6. Reduced Level (RL): calculated level of a point above or below the datum.

7. Height of Instrument (HI): The height of the line of collimation above the datum.

8. Line of Collimation (LM): It is an imaginary horizontal line drawn between two points.

9. Rise and fall: The difference is height or is level between two is referred to as a rise or fall.

10. Change Point (CP): the point at which both a foresight and then a back sight are taken.

LEVELING INSTRUMENTS

These include:

. A Level e.g. theodolite, transit dumpy level(automatic level),e.t.c.

. A staff

. Devices for angle measurements e.g. graphometer, magnetic compass, prismatic compass, orientation compass

. Chain or tape

. Pegs, arrows and ranging poles

TACHEOMETRY

This is the operation of measuring distances by means of stadia hairs. Measuring the distances using stadia hairs involves setting the instruments at one end of the line being measured and a leveling staff is held vertically at the other end. The points where the stadia hairs cut the staff are read. The difference between the readings is the staff intercept, S. Assuming H is the horizontal distance between the instrument and staff, then

H = KS + (f + C)

Where K = constant multiplier

(f +c) = additive constant

Note that K = f/i

Where f = focal length of the objective lens.

i= interval between stadia hairs

The equation above is applied to external focusing telescope, but when an anallactic lens is fitted is

the telescope to bring the focal point on the vertical axis and therefore remove the need for additive

constant.

H = KS.

But when the ends of the line being measured are on different levels such that the telescope has to be elevated of depressed through an angle of Θ_0, the formulae above changes to:

$H = KS \cos_2 \theta$

`and reduced level:

$V = KS \cos \Theta \sin \Theta + HI - H$

HI = height of instrument

h = staff reading

Occasionally, if θ exceeds 45_0, it is better to tilt the staff so that it is perpendicular to the line of sight. Short sight is therefore attached to the staff to enable this to be done accurately. The method

is called normal staffing then the formulae becomes:

$H = KS \cos \theta + h \sin \theta$

$V = KS \sin \theta + HI — h \cos \theta$

TYPES OF LEVELLING

1. Continuous leveling
2. Reciprocal leveling

METHODS USED IN CONTINUOUS LEVELLING

- Collimation method or height of instrument
- Rise and fall method.

In collimation method height of instrument

HI = BS + RL

And reduced level

RL = HI – FS

At the end computation, the difference of the sum of BS and FS must be equal to the difference of first RL and last RL data recorded. Meanwhile in Rise and Fall method, a rise will occur when the

staff reading is less than the reading on the proceeding station. The data recorded are also checked

for correctness as above, but this time, rise and fall are used instead of BS and FS.

TRAVERSE DURING LEVELLING:

Definition:

A traverse is a continuous frame work of line connecting a number of points, the lengths of the lines and their angular relationship to each other being measured. The lines are known as legs and the points as stations.

USE

Traverse surveys are used where site conditions make the chain triangulation method impossible e.g where the survey is of as large area and details are not required.

TYPES:

1) Closed traverse – when the frame work form a closed figure (or when the traverse

connects two stations whose position are known). This type of traverse is used for surveying lakes or other areas across which known check line can be run. Such traverse is easily checked, as the survey starts and finishes at the fixed points.

2) Open traverse – a traverse whose starting and finishing stations do not coined or are not both fixed or known points. This type of traverse is used to survey rivers e.t.c. To enable the work to be checked, sights are taken on to some reference objects, such as well defined landmarks

Note:

a) Chain traverse √

b) Compass traverse √

c) Theodolite traverse √

Terms:

a) Bearing – the term bearing refers to the angle between the line and the north -south line or median.

b) Whole - circle bearing - the bearing from north to the leg is measured in a clockwise direction and the angle from the north line right round to the leg is known as a whole – circle bearing (as W.C.B)

A N

N N

A

WCB

O Of

WCB OA

O Of WCB

OA O of OA

A

Forward and Back Bearing: with A as the starting station of traverse and the direction of the survey being forward B, the angle between north and AB at A is known as the forward bearing of AB. The angle between north and AB at station B is known as the back bearing of AB, this should differ from the forward bearing by exactly 180^0.

The forward and back bearings of a leg will differ by 180^0 except there is local attraction. The presence of metal, metallic ores or electric currents will divert the compass needle from the north– south line, and thus cause the readings taken to be inaccurate. Stations should therefore be chosen so that they are beyond the influence of this attraction.

Correction for Effects of Local Attraction:

Line Bearing Diff of FB and BB

AB 60^0 180^0

BA 240^0

BC 120^0 180^0

CB 300^0

CD 210^0 178^0 (-2^0)

DC 32^0

DA 317^0 182^0 (-2^0)

AD 135^0