CE 0732-1202

SURVEYING II LAB

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Lecturer

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University of Global Village (UGV), Barishal

BASIC COURSE INFORMATION

Course Title	**SURVEYING II LAB**
Course Code	**CE 0732-1202**
Credits	**01**
CIE Marks	**30**
SEE Marks	**20**
Exam Hours	**2 hours (Semester Final Exam)**
Level	**3rd Semester**

Course Title: Surveying II Lab

Covered Course: Surveying Sessional

COURSE CODE: CE 0732-1202
CREDIT: 01

CIE MARKS: 30

SEE MARKS: 20

CLO1 **Perform advanced surveying methods, including GPS, Total Station, and AutoCAD Land Survey, with accuracy and efficiency.**

CLO2 **Interpret and analyze spatial data using ArcGIS, Mouza maps, and Porcha documents to support land management and civil engineering projects.**

CLO3 **Apply modern surveying techniques to solve real-world engineering problems, such as site planning, infrastructure layout, and land boundary identification.**

CLO4 **Demonstrate the ability to plan and execute surveying tasks independently and collaboratively, integrating traditional and digital tools effectively.**

Sl.	Course Contents	Hours	CLOs
1	Global Positioning System (GPS)	10	CLO 1
2	Total Station	10	CLO 2
3	ArcGIS	10	CLO 3
4	Porcha	10	CLO 4
5	Mouza Maps	10	CLO 3
6	AutoCAD Land Survey	10	CLO 1

REFERENCE BOOKS:

1. B.C. Punmia, 2016, Surveying Volume 1– 16th Edition, Laxmi Pulications (P) Ltd.

2. B.C. Punmia, 2016, Surveying Volume 2– 16th Edition, Laxmi Pulications (P) Ltd.

3. B.C. Punmia, 2016, Surveying Volume 3– 16th Edition, Laxmi Pulications (P) Ltd.

WEEK	TOPIC	TEACHING-LEARNING STRATEGY	ASSESSMENT STRATEGY	CORRESPO-NDING CLO_S
01-02	Global Positioning System (GPS)	Lecture, Field Experiment	Individual instrument measuring	CLO1
03-04	Total Station	Lecture, Field Experiment	Individual instrument measuring	CLO3
05-06	ArcGIS	Lecture, Field Experiment	Individual instrument measuring	CLO1
07-08	Porcha	Lecture, Field Experiment	Individual instrument measuring	CLO2
09-10	Mouza Maps	Lecture, Field Experiment	Individual instrument measuring	CLO3
11-12	AutoCAD Land Survey	Lecture, Field Experiment	Individual instrument measuring	CLO2
13-14	Review Class	Lecture, Field Experiment	Individual instrument measuring	CLO3
15-16	Doubt Solving	Discussion		
17	Final Assessment	Lab Quiz, Practical exam	Written, Viva	CLO1

ASSESSMENT PATTERN

CIE- Continuous Internal Evaluation (30 Marks)

SEE- Semester End Examination (20 Marks)

SEE- Semester End Examination (40 Marks) (should be converted in actual marks (20))

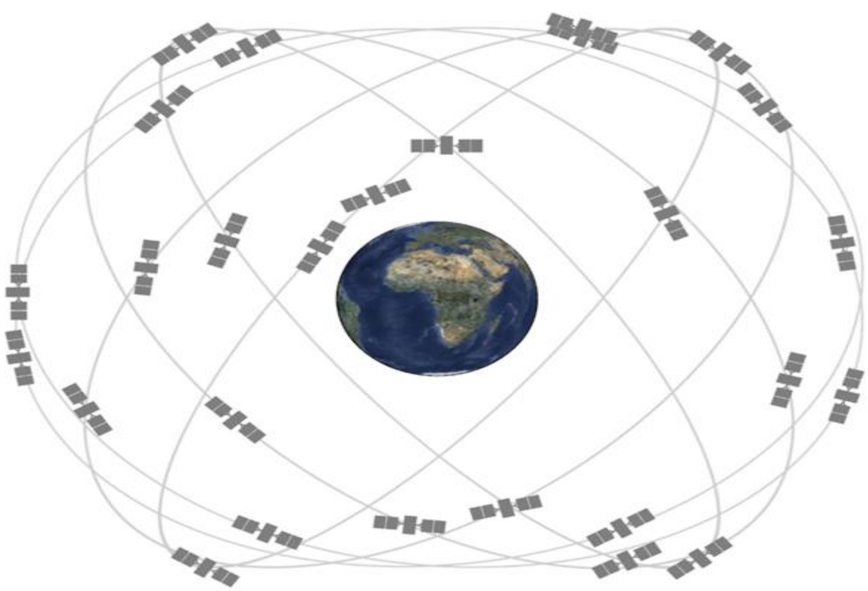
Bloom's Category	**Tests**
Remember	**05**
Understand	**07**
Apply	**08**
Analyze	**07**
Evaluate	**08**
Create	**05**

CIE- Continuous Internal Evaluation (100 Marks) (should be converted in actual marks (30))

Bloom's Category Marks (out of 100)	Lab Final (30)	Lab Report (10)	**Continuous lab performance** (30)	Presentation & Viva (10)	External Participation in Curricular/**Final Project Exhibition** (10)
Remember/**Imitation**	05		05	02	Attendance 10
Understand/**manipulation**	05	05	05	03	
Apply/**Precision**	05		05		
Analyze/**Articulation**	05		05		
Evaluate/**Naturalisation**	05	05	05		
Create	05		05	05	

WEEK 01-02

Fieldwork No. 1
Global Positioning System (GPS)



Introduction:

Global positioning system is a radio based navigation system used to determine exact position. It is a constellation of Earth orbiting satellites that can provide continuous three dimensional positioning 24 hours a day throughout the world. The first satellite was developed in 1960 to allow ships in the US Navy to navigate the oceans more accurately. GPS was originally intended for military applications but in the 1980 the government made the system available for civilian use. GPS provides location and time information in all weather anywhere on or near the earth.

Three segments for GPS

a) **Space segment:**

Minimum of 24 satellites currently 34 in Orbit around Earth at altitude 20,000 km transmit radio navigation Signals, Store and retransmit the navigation message sent by the control segment. The orbit position is constantly monitored and updated by the ground stations each satellite is identified by number and broadcast a unique signal. Each satellite has 6 orbits three satellites work for GPS, 4th satellite work for accuracy three satellites for 2D fix satellite Orbit distance 20,000 km orbital speed is 14000 km per hour 60 degree apart and 55 degrees with respect to equatorial plane.

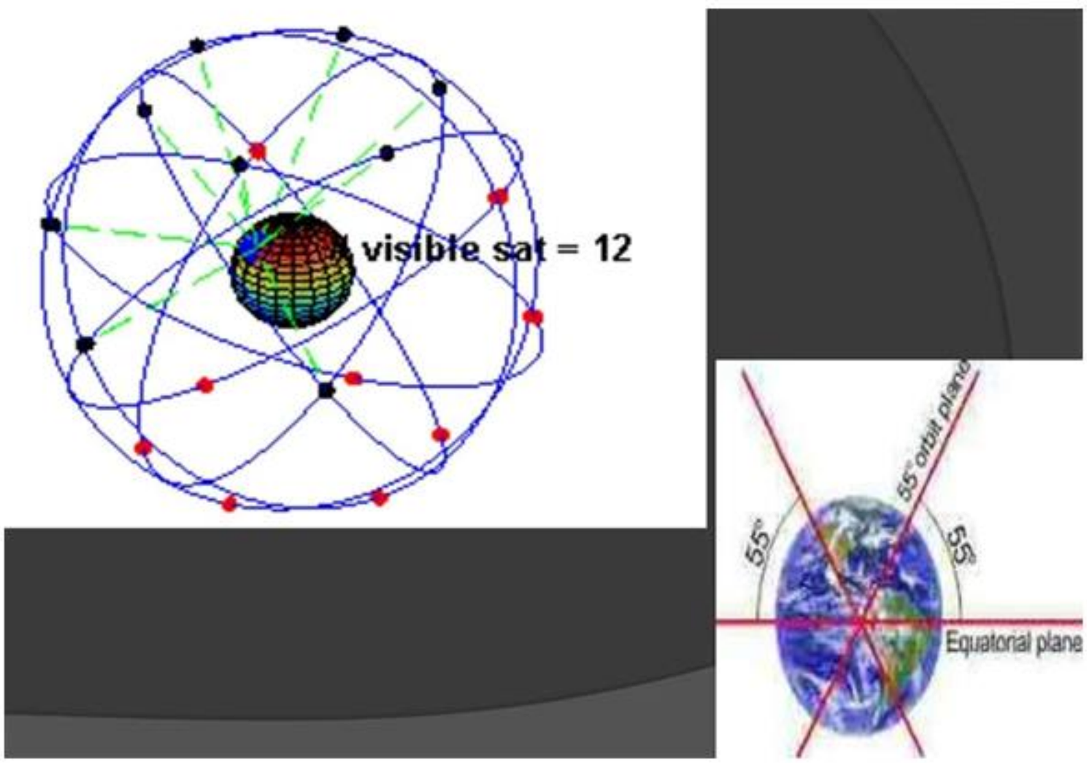


Figure: Space Segment System

Space segment satellite uses two types of signals to calculate distance

1) code phase ranging

2) carrier phase ranging

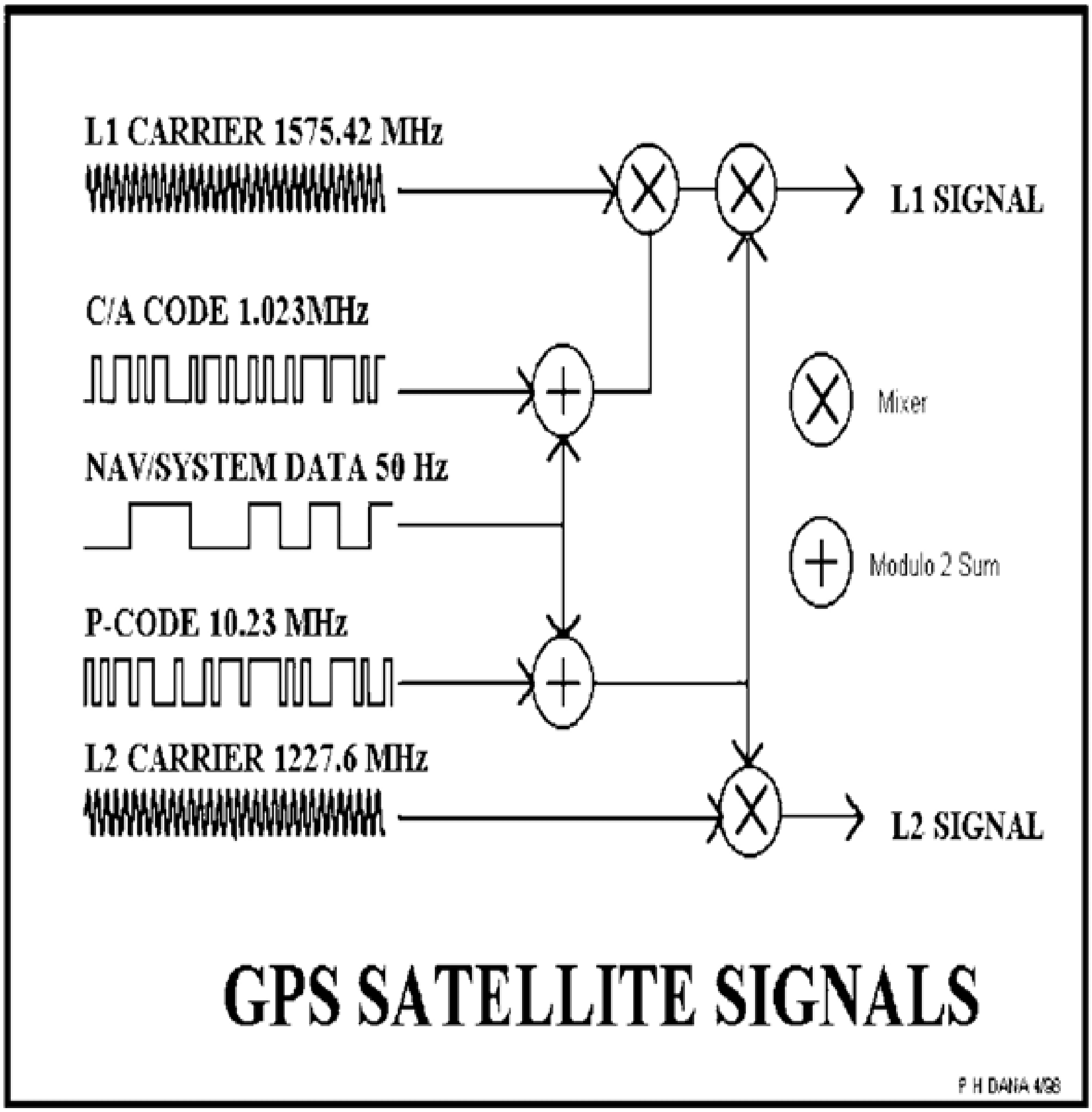


Figure: Space Segment Signals

b) Control Segment:

The control segment of the Global Positioning System is a network of ground stations that monitors the shape and velocity of the satellites' orbits. The accuracy of GPS data depends on knowing the positions of the satellites at all times. The orbits of the satellites are sometimes disturbed by the interplay of the gravitational forces of the Earth and Moon.

Monitor Stations are very precise GPS receivers installed at known locations. They record discrepancies between known and calculated positions caused by slight variations in satellite orbits. Data describing the orbits are produced at the **Master Control Station** at Colorado Springs, uploaded to the satellites, and finally broadcast as part of the GPS positioning signal. GPS receivers use this satellite Navigation Message data to adjust the positions they measure. If necessary, the Master Control Center can modify satellite orbits by commands transmitted via the control segment's ground antennas.

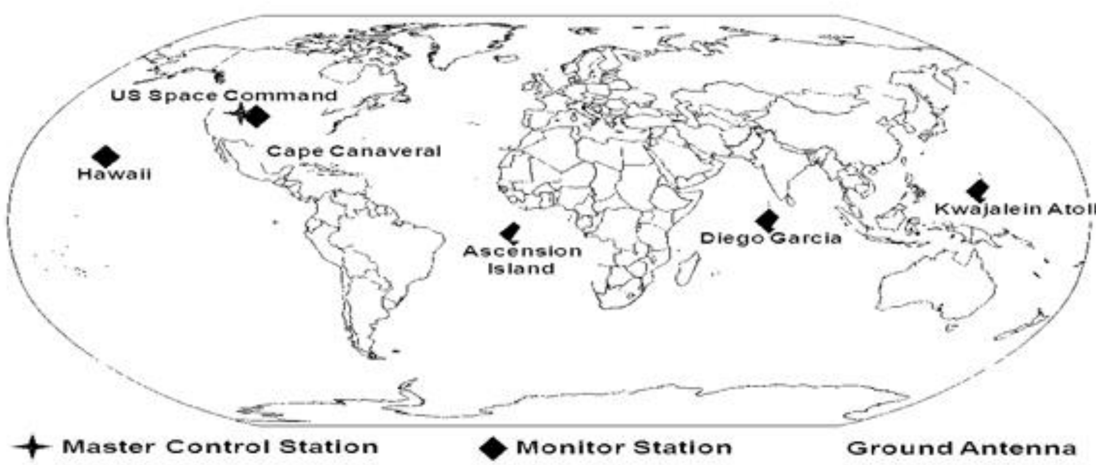


Figure: The Control Segment of the Global Position System

c) User Segment:

GPS receiver collects and processes signals from the GPS satellites use that information to determine and display the location, speed, time and so on. The accuracy and reliability is enhanced as the number of visible satellites increases. The typical receiver is composed of an antenna and preamplifier radio signal microprocessor control and display. Data recording unit and power supply records the timing signals from the visible satellites calculating their distances latitude-longitude elevation and time. Their position is updated on a second by second basis output to the receiver display device and stored by the receiver Logging unit.

Instruments:

1) Antenna and cables
2) Batteries and power cables
3) Tripods, adapters
4) Tape measures
5) Flashlights
6) Radios
7) Station log sheets
8) Writing apparatus (pens)
9) Station descriptions
10) Observing schedule and station lists
11) Traffic cones, safety equipment
12) Maps, keys, lock combinations.

Working Procedure:

The working of a global positioning system can be divided into three main parts, namely a ground station, a network of satellites, and a receiver.

1. Ground Stations

The ground stations of a global positioning system typically make use of multiple RADARs to monitor the position and the condition of the satellites present in outer space. The satellites tend to move in a fixed circular path around the earth and are susceptible to frequent wear and tear. The ground stations help to keep a check on the health of the satellites. The working of a global positioning system to detect the location of a particular object or place primarily depends on the position of the satellites, which is why the information regarding the position, distance, location, and health of a satellite is required to be processed and maintained by the RADARs available at the ground stations at every instant of time.

2. Satellites

A global positioning system typically comprises a network of 32 satellites orbiting the earth. 24 out of the 32 satellites are the core satellites; whereas, the remaining 8 are known as the emergency satellites. The emergency satellites are reserved to be used in case a malfunction or failure occurs in any of the core satellites. The average life span of a satellite is about 10 years. The satellites receive the signal broadcasted by the ground stations and transmit it back to the earth after processing.

3. Receiver

The receiver element of a global positioning system is nothing but the GPS chip that is present within the gadgets that we use in our daily life. This means that the mobile phones that we use, the smartwatches that we wear, and the navigation system installed in our vehicles serve to be the receiver and an integral part of the global positioning system. The receiver devices continuously receive signals from the satellites and help calculate the distance between the receiver devices and the network of satellites. The distance estimated with the help of four or more satellites present in outer space helps locate the exact position of an object, a device, or a person.

The working of a global positioning system involves simple steps. The first step involves the continuous transmission of the signal from the satellite to the GPS receiver. This transmission signal contains information regarding the current position of the satellite and the current time. The position of the satellite can be determined easily as the satellites tend to move in a fixed orbit. The signal that is received by the receiver devices is then processed and analysed. The main objective is to estimate the location of at least three satellites present in outer space and the distance of the receiver device from those satellites. Since the speed with which the signal travels between the satellite and the receiver is equal to the speed of light and the time taken by the signal to travel from space to earth and vice versa is noted with the help of a timing circuit, the calculation of distance can be done easily with the help of the speed and distance formula. The timing circuits used by some of the global positioning systems make use of atomic clocks; however, they can not be used for each and every GPS application due to the high cost. One of the prime concerns of using the satellites present in outer space to estimate the location of the objects present on the surface of the earth and to determine the current time is the relative nature of time. The relativity of time means that time tends to move faster for the objects that are present in outer space with respect to the objects that are present in the earth's atmosphere. This problem can be resolved easily by fetching signals from more than three satellites and processing the information extracted from the data received by all of them. This helps reduce the chances of miscalculation and misinterpretation of data by the receiver devices.

Applications of GPS system in civil engineering

The Global Positioning System (GPS) has gained massive popularity in many industries. Civil Engineering is one of the industries that largely rely on GPS data. Besides it often involves working in an unfriendly and complex environment that makes it for engineers to work smoothly. However, GPS provides real-time and accurate data hence boosting their productivity even in these harsh conditions.

Fleet management, earthmoving, and road construction largely depend on GPS devices for centimetre-level accuracy. Wireless communication is integrated on these devices to help GPS gather accurate data.

1. Environmental monitoring

Civil engineers monitor the environment keenly before setting up a project. This is because the environment can impact the project positively or negatively. Also, in the efforts to reduce environmental pollution, the government uses GPS to monitor pollution. Civil engineers have to make sure that the project can fit in the provided location before commencing with the project.

2. Land seismic surveying

Oil and gas exploration largely depends on GPS data. For example, civil engineers have to carry out subsurface geology first to identify the perfect spot to drill. Also, Marine seismic surveying can be applied by civil engineers as they seek to study the composition of the subsurface rocks. This is done by sending low-frequency acoustic energy below the subsurface rocks. Both land and marine seismic is falling under the same category of seismic engineering.

3. Deployment of equipment/ machines

Civil engineering usually incorporates large projects that rely on machines. The supervisors use GPS to track the location of these machines. Also, the can deploy the equipment to different sites.

4. Road transportation

Since there are high numbers of GPS receivers that are sold globally, the applications in road transportation are by the majority of the users of GPS. These applications can be for tracking of freight, commercial fleet management, public transport monitoring, services of a taxi, navigation and dispatch, emergency vehicle location and passenger information. The owners of private cars are also widely adopting the in-built GPS system in their cars and most of the manufacturers of the automobiles are into releasing newer vehicles that have an optional fitted GPS.

5. Rail and Shipping Transport

It is not to a surprise that both railways and shipping transport make use of GPS navigation widely. These applications include inshore and ocean navigation, approaching ports, dredging, docking and harbor entrance, AIS or Automation Identification System, VTS or Vessel Traffic Services, handling of cargo and hydrography.

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WEEK 03-04

Fieldwork No. 2
TOTAL STATION

Introduction:

A total station is an optical instrument used in modern surveying and archaeology as well as by Police Crime scene Investigators, private accident investigators and insurance companies to take measurements of scenes. it is a combination of an electronic Theodolite light an electronic distance metre (EDM) and software running on an external computer known as a data collector.

Beginning in about 1980 an EDM component which also had been improved to enable automatic readout was combined with an electronic theodolite to create a single instrument called the total station.

The functions of the distance and angle measuring components were controlled by an interface computer. Modern total station instruments can now make slope distance measurements, automatically display the results and also store the data in the Computer memory.

Components of a Total Station

Total Station is a compact instrument which weighs around 50 N to 55 N. It consists of a distance measuring instrument (EDM), an angle measuring instrument (Theodolite) and a simple microprocessor. The components used in Total station surveying are as follows:

1. A tripod is used to hold the total station
2. An electronic notebook used to record, calculate and even manipulate the field data
3. Prism and prism pole which can measure lengths up to 2 km and up to 6-7 km can be measured with triple prism
4. Batteries and Chargers
5. Data and Power cables
6. Tribraches

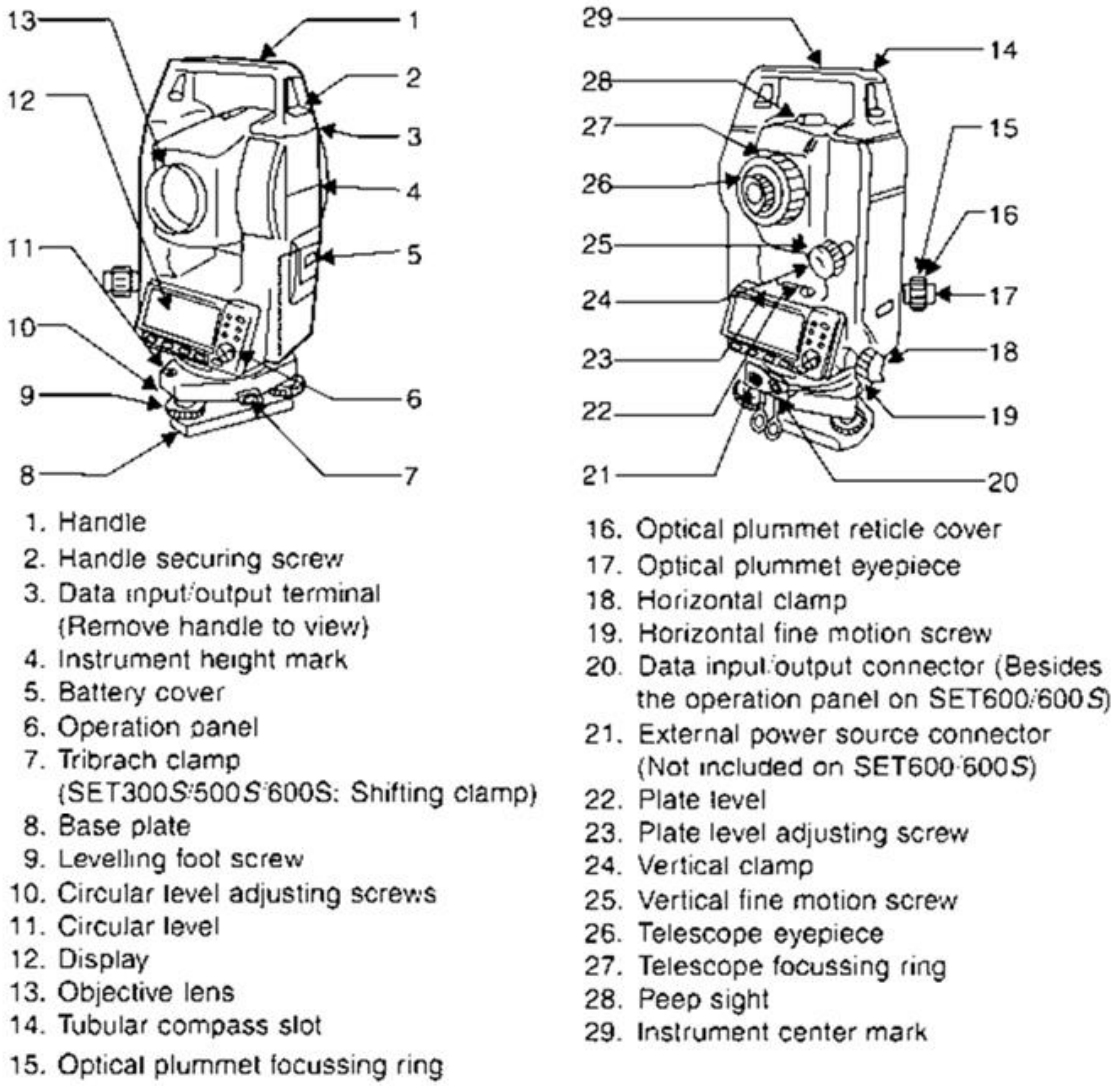

Figure: Basic Components of a Total Station

Working Procedures:

Leveling the Total Station

1. Leveling the Total Station must be accomplished to sufficient accuracy otherwise the instrument will not report results.
2. Leveling the instrument takes 30 to 45 minutes – make sure you can see all targets from the instrument station before going through the process

Tripod Setup

1. Tripod legs should be equally spaced
2. Tripod head should be approximately level
3. Head should be directly over survey point
4. Mount Instrument on Tripod
5. Place Instrument on Tripod
6. Secure with centering screw while bracing the instrument with the other hand
7. Insert battery in instrument before leveling

Focus on Survey Point

1. Focus the optical plummet on the survey point.
2. Leveling the Instrument
3. Adjust the leveling foot screws to center the survey point in the optical plummet reticle
4. Center the bubble in the circular level by adjusting the tripod legs

Leveling

1. Loosen the horizontal clamp and turn instrument until plate level is parallel to 2 of the leveling foot screws.
2. Center the bubble using the leveling screws- the bubble moves toward the screw that is turned clockwise ν Rotate the instrument 90 degrees and level using the 3rd leveling screw
3. Observe the survey point in the optical plummet and center the point by loosening the centering screw and sliding the entire instrument
4. After re-tightening the centering screw check to make sure the plate level bubble is level in several directions

Electronically Verify Leveling

1. Turn on the instrument by pressing and holding the “on” button (you should hear an audible beep)
2. The opening screen will be the “MEAS” screen. Select the [Tilt] function ν Adjust the foot level screws to exactly center the electronic “bubble”
3. Rotate the instrument 90 degrees and repeat.

Adjust Image & Reticle Focus

1. Release the horizontal & vertical clamps and point telescope to a featureless light background
2. Adjust the reticle (i.e. cross-hair) focus adjustment until reticle image is sharply focused

3. Point telescope to target and adjust the focus ring until target is focused
4. Move your head from side-to-side to test for image shift (i.e. parallax). Repeat the reticle focus step if parallax is significant
5. When the instrument operator changes the reticle focus may need to be adjusted

Calibrating the Instrument

Calibration must be completed before coordinates can be obtained

3 possible calibrations:

1. Backsight by angle: must know instrument coordinates and have a landmark/target at a known azimuth
2. Backsight by coordinate: must know instrument coordinates and have mirror target set on a position of known coordinates
3. Resection (triangulation): must have 3 or more mirror targets established at known 3D coordinates

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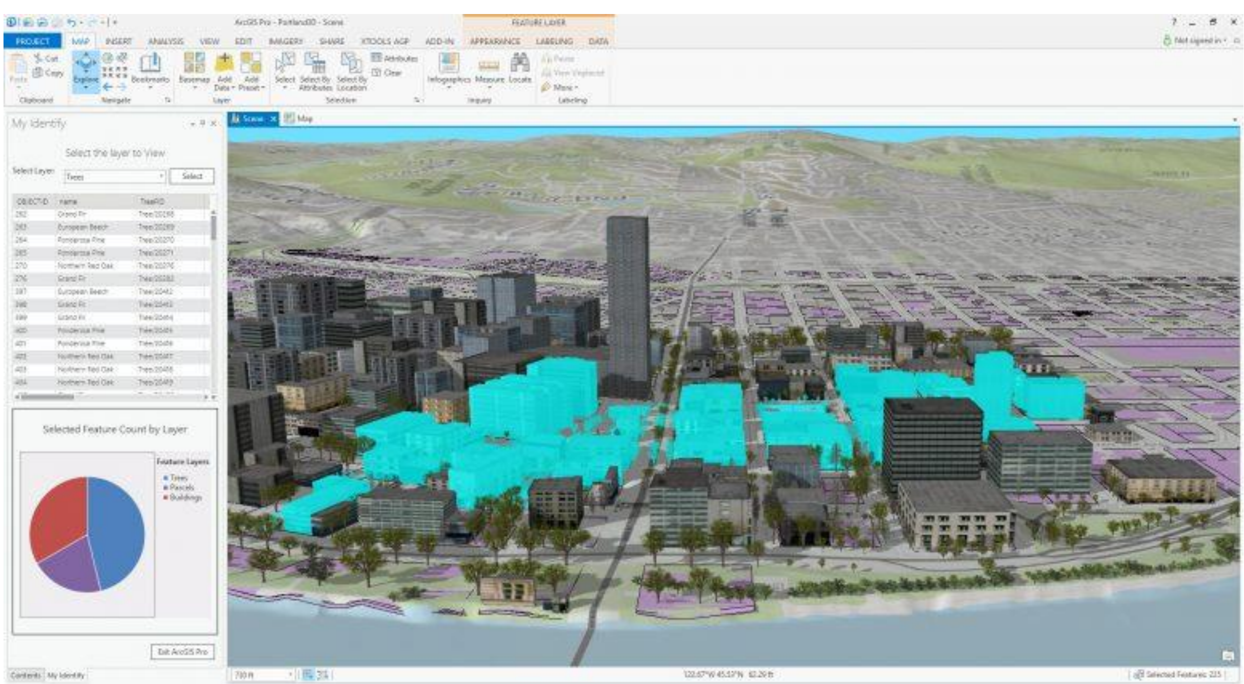
WEEK 05-06

Fieldwork No. 3
Introduction to ArcGIS



Lab 1. Introduction to ArcGIS

Purpose: To introduce you to map composition and printing in ArcGIS

To Do and Hand In: Compose, print, and hand in two maps, described below. Maps due in lab one week after assignment.

Data Source: S:\GEY430_630_Spr04\avintro

File Structures in ArcGIS

ArcGIS is a PC windows-based GIS program developed by ESRI. It is the most widely-used GIS software in the world. ESRI data are often stored in "**shapefiles".** Both the geometry and attributes of the cartographic objects are stored in these shape files. When you display, edit, save, or copy spatial data in ArcGIS, you are often working with and modifying shape files. There are usually three shape files associated with a feature layer, one for the geometry (with a .shp file extension, for example, lakes.shp), one with a .dbf file extension for tables (e.g., lakes.dbf), and one with a .shx extension, for housekeeping data. These files typically need to be in the same directory, and moved about together, as all three files are required to view and operate on the data.

ESRI also stores data for feature layers in ArcGIS as "**coverages**". A coverage is a collection of files in a subdirectory. These files contain both the graphic (location and shape data) and tabular (text, numbers, or other data) for variables of interest.

For example, in a coverage sub-directory named stream_st, I would have a number of files, e.g., a file named ARC, a file named ARF, a BND, etc. There are typically approximately nine files which will be in all coverages, although additional files and names of files would depend on the type of data. In a later lab we will go over the names and purpose for each file in the coverage; for now, don't worry about them.

Note that a shapefile and a coverage can have the same main file name, because the coverage is a subdirectory and not a single file, and the shapefiles have a common name, but different extensions, .shp, .shx, and .dbf . You can be fooled by this because some file browsing tools (like Windows Explorer) won't show the extension in some modes.

ESRI software stores data with both geographic elements, and tabular (or database) elements. Vector geographic elements are referred to as point, line (or arc), and polygon (for area) features. Raster geographic elements are referred to as cells, and are stored in "**grids**". ESRI by convention refers to grids and vector data as coverages for use with their ArcGIS Workstation product. Shapefiles and grids are used primarily with ArcGIS Desktop and related products. These coverages, grids, and shapefiles may be thought of as layers which represent point features (for example, well locations), line features (streams or roads), or polygon features (counties, wetlands, etc.).

We'll be working with ArcGIS in this course. ArcGIS is installed on the Windows XP machines in our lab.

Creating Your Working Directories

Before we begin, you should know how to create or move to working directories for yourself. Perhaps the easiest method is through the Windows Explorer tools. Open Windows Explorer  (see the back of this lab for more help, and then ask us as needed). You navigate the file/folder tree in the left pane, and display the contents in the right. By double clicking on a folder, you move to that level, "opening" it. Notice that a single click highlights the folder in blue, a double click opens it. You should copy all the files from S:\GEY430_630_Spr04 to your area. If you do not know how to do this, read the instructions at the back of this lab, and/or consult with the lab instructor. **Everyone should read the notes on copying coverage files using Windows Explorer at the back of this lab.**

It is important you copy the lab data to your area (H:drive the lab computers) and work in your area. All your work will then be saved there. From now on, we will refer to the drive that contains your working dataset as your DATADRIVE. For example, if the student drive on the lab computer is H:\ and we wish to work in the directory H:\avintro, I will refer to it as the directory DATADRIVE:\avintro.

You also may want to have backups, particularly for later labs, where the work is more involved. In our lab the ZIPDRIVE is D:\ and the writeable hard drive is H:\.   Please save your data in two places, e.g., on the lab computer's harddrive and one ZIP disk, or on a second ZIP disk.

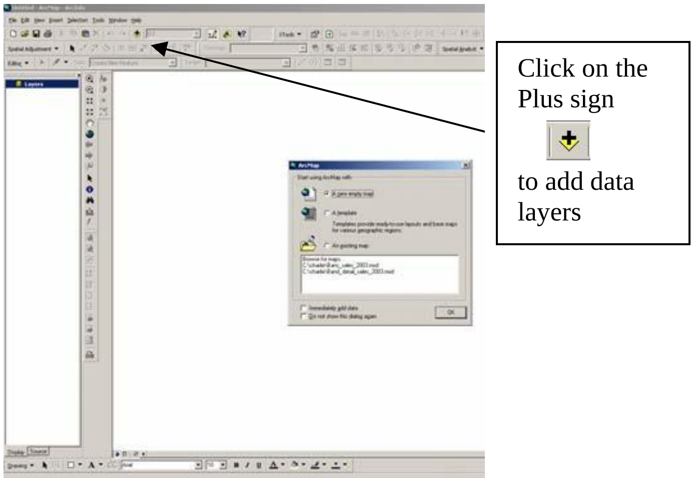
Starting ArcGIS

To start ArcGIS, click the start menu and select Programs > ArcGIS > ArcMAP,

leftclick on the ArcMAP icon, 

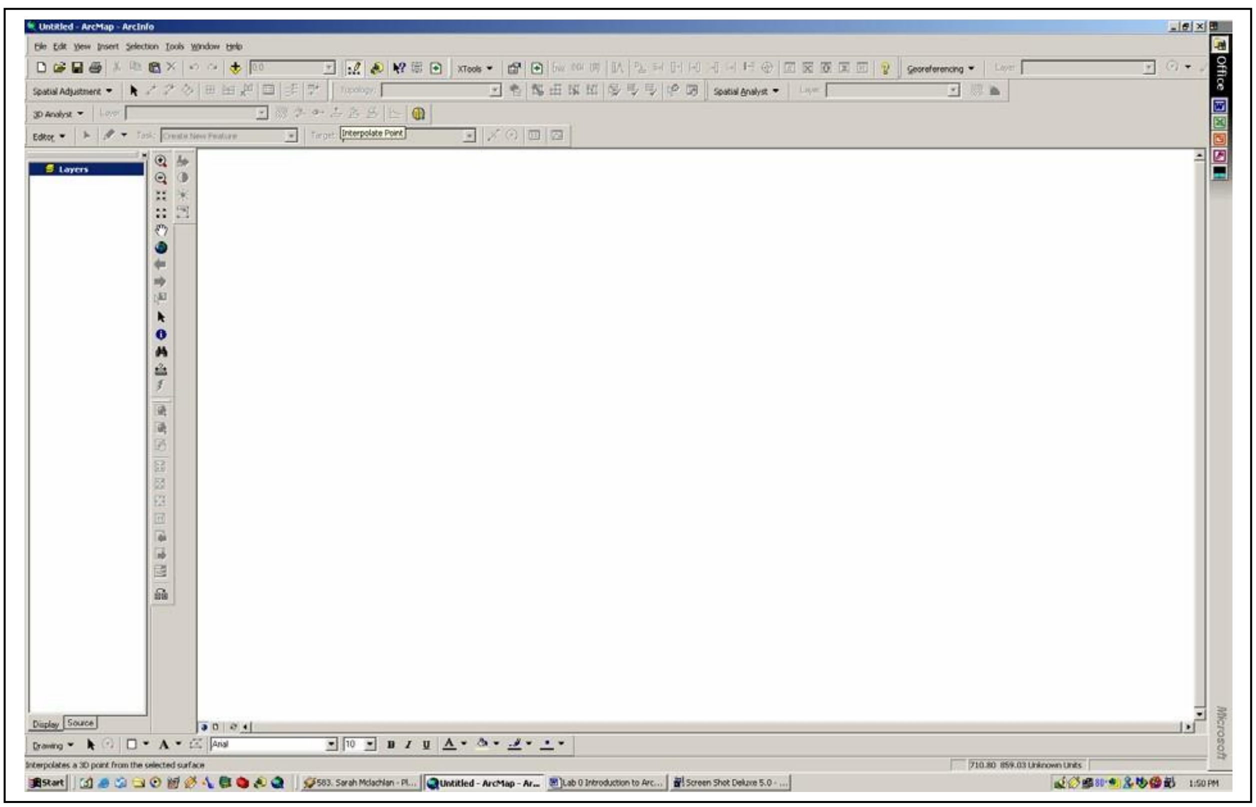
(the magnifying glass with the world inside).

BE PATIENT WHEN WAITING FOR ARCGIS TO START…IT MAY TAKE UP TO 10-15 seconds, depending on what else is running. If you click multiple times, you'll get multiple copies running, which will slow all copies down. After some rumblings, you will get an ArcMAP window.



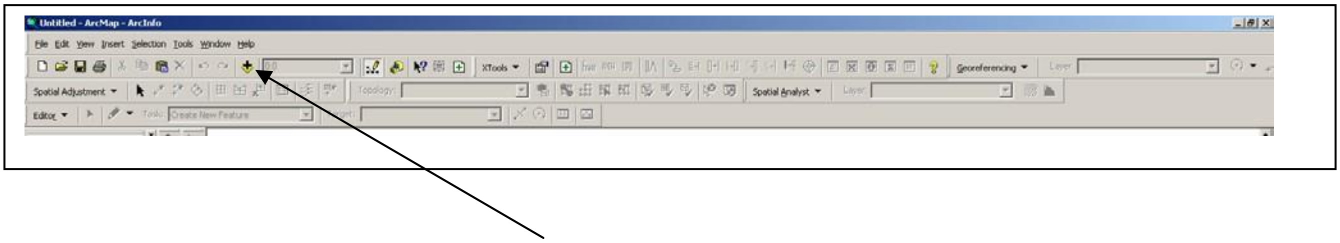
You will get a question, asking if you wish to create a new map or open an existing one. If you get these questions, answer **OK** to the New Empty Map request

You should have a panel that looks similar to the one below.



Displaying Shapefiles in ArcMap

Within ArcMap groups of data are organized into DATA FRAMES. A DATA FRAME layer view consists of themes that you wish to display. ESRI uses the word "**theme**" to denote one data layer, regardless of whether it is a shapefile, grid, coverage or other format. "Data Layer" and "Theme" are interchangeable, and both will be used throughout this course. Inside a Frame you may specify the layers to show, titles, map symbols, types of features, and order of display. The layer you choose should be automatically highlight when you enter ArcGIS. The layer that is active will have a color bar around it.



To add data layers to the map click on the 

Click to connect to folder button. Navigate the directory tree, clicking up and down, until you can see your DATADRIVE:\avintro directory and leftclick there.
Now, double click the shapefile named ROADS.shp. This will add this data layer to your map.

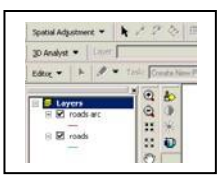
- A checkbox will appear in the layer window, in the vertical greybar on the left side. Single leftclick on the small checkbox next to the coverage name roads. You should see the road lines disappear. Click the roads layer off and on. See how it works.

Select the ROADS.shp with a Left click and then one Right click to bring up the context menu; select Remove. Select Edit > undo to bring the roads back.

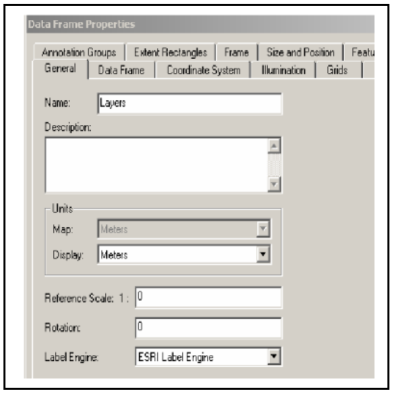
Define Units

For each Data Frame you will need to define the units (are the coordinates in inches, feet, meters, miles?). This step has two parts (1) the <u>coordinates of the data we are using</u> and (2) the <u>coordinate systems we wish to see on the screen</u>. For example, for a layer with units in meters you may wish to see distances in feet on the screen. Any distance or area measurements are converted "on the fly" and displayed on the screen. The original units are unchanged.

- <u>Right Click</u> on the Data Frame (not on an individual theme)



- Select PROPERTIES, and click on the General tab



Select **Miles** for the Display units

ADD Lakes to the Map

Now display a lakes theme from the lakes.shp shapefile, it should be in the DATADRIVE:\avintro directory. You should now have both roads and lakes on the map. Zoom into the contiguous U. S.

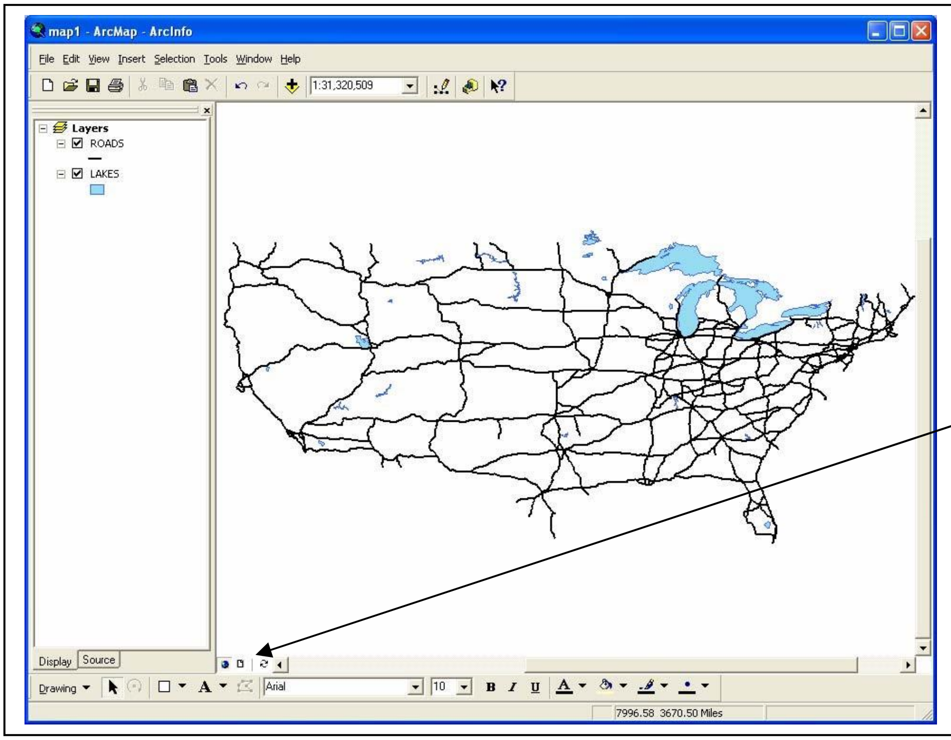
Changing the Legend

You may need to reset the colors or line symbols, either to view it better or when producing a printed map, as we will be printing on a black and white printer. Colors and symbols are set in the legend.

- Double-click on a layer picture, below the name of the layer. This will pop up the Symbol Editor. Select an option that makes sense, arterial roads. Try different options. Notice you can change the color and width of the line at this point. After changing options, you need to select the **OK** button on the lower right to apply your changes.
- Try selecting different colors, line weights, etc., for both the lakes.shp and roads.shp layers. .

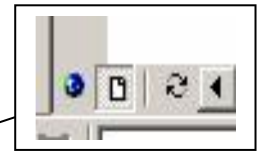
Unfortunately, programs/operating systems can be idiosyncratic, and will sometimes crash. It is a good idea to save your work now (you should save early and often). Go to the File-Save As option, and **make sure you are saving it to your area**. Note the default name of a project is blank. You should change the name to something more meaningful to you, and make sure you know where it is getting saved.

Your map should look something like the graphic below.



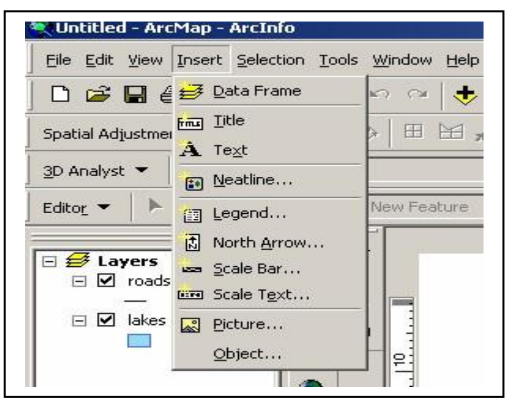
Now you are ready to Print

Click on the Print Layout button to prepare you map for printing.



The **Globe** button moves you back to the working Data Frame. The **Paper** button is where you set up printing. The **Circling Arrows** button refreshes (repaints) the screen

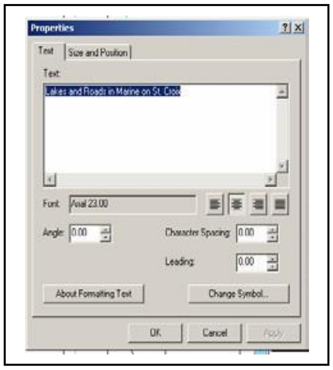
Data frames are used for processing. Layouts are used to make maps by displaying themes along with text, legends, north arrows, and other information.



Select the Insert Menu.

Select the Title

The title appears on the page. Type in a logical title, such as “U. S. Lakes and Roads”.



After the title is entered move you cursor to the title and left click to select the title (it will have a blue box around it) then right click to bring up the "Properties of the Title" window.

Here you can make other changes; for example Change Symbol is the button to use for increasing the text size or changing fonts.

Now lets add a North Arrow.

- First, use the Insert Menu to select the North Arrow.
- Pick one you like.
- Select **OK**
- The North Arrow is put on the page with a box around it. Dragging it to where you want it or increase the resize it by dragging a corner.

Add a scale bar as you did a north arrow.

Add a legend as you did the north arrow.

As you add the legend you get asked several question about number of columns, boxes, style, etc

Notice that the names above the legend boxes are the coverage or shapefile name. Often these aren't what we'd like. You can modify these names in the view <u>before</u> you create a legend in the layout. Do this by:

- *Right click on the layers.*
- *Select Properties*
- *From the General Tab change the Layer Name*
- *Select **OK***

You should do this for each layer you display, so that the legend will provide useful information.

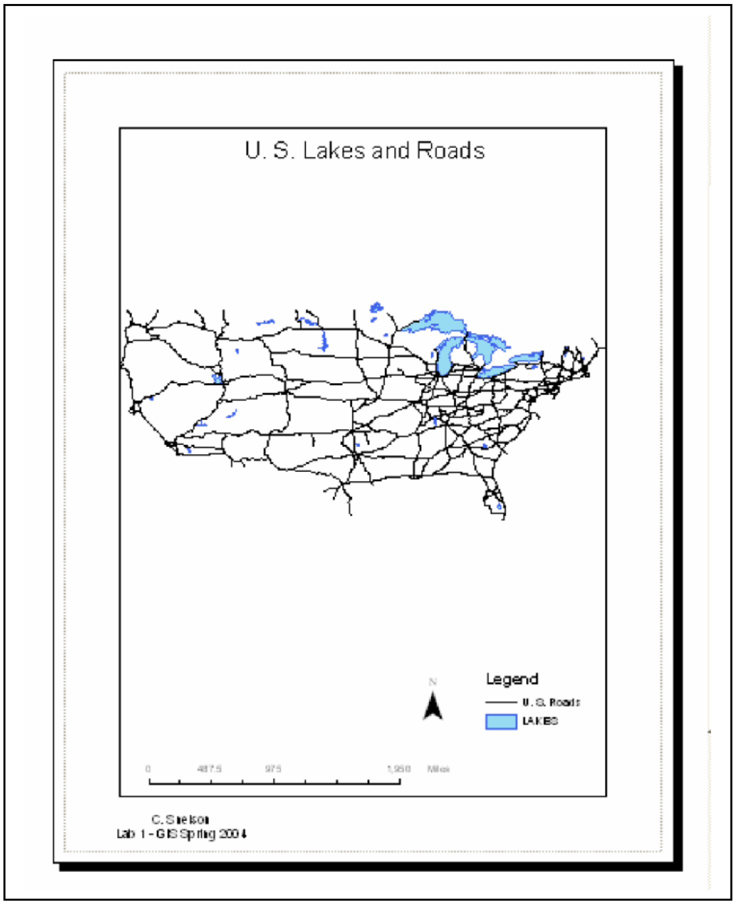
For now we will not change any thing in the legend. Just select Next and then Finish for the questions. The Legend appears on the page. Move it with to where you want it to appear (just like moving or resizing the North Arrow).

Finally add text to the Page with your name and date.

Once you have type in your text, left click on the Text. This will bring up a menu select **Properties.** Use **Change Symbol** to increase the font, perhaps to 18. Select **OK** then Apply and **OK.**

Move the text to a logical place on the page.

It should look like below



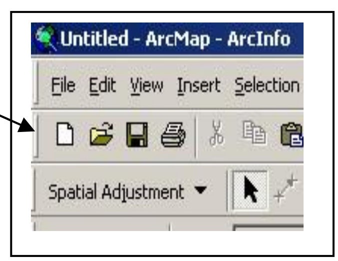
Now, once we have the theme and layout, we wish to save the map and print it. Save the project in the main ArcGIS window menu, under the FILE > SAVE AS option. Save in your area. Create a file name that makes sense to you. Lab 1 Assignment 1, might be nice.

To Print the Map, use the FILE > PRINT or the printer icon button

Make sure you are printing the "Print Layout " Page. You can print the "Data" Map but will not get the Title, North Arrow, etc.

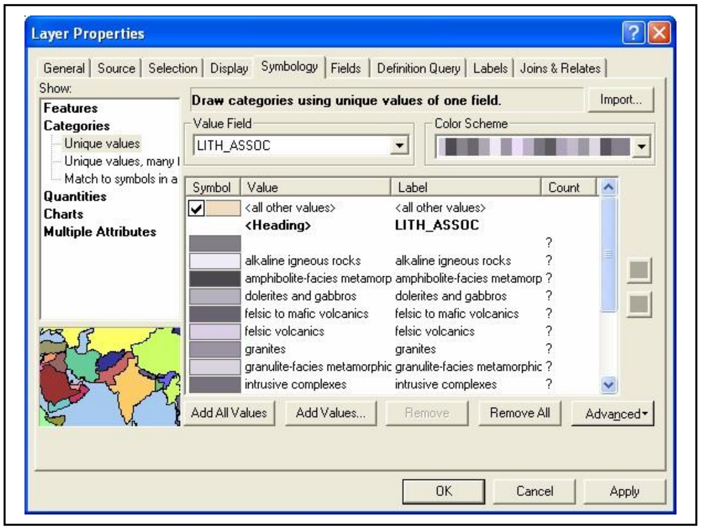
You may choose from several printer options. After selecting the appropriate printer, and selecting OK to leave the setup screen, all further printing should be directed to that printer.

Create a second map, File > New (or use the New Map button)



Use the DATADRIVE:\avintro\Aussie_Geology\geolpldd.shp as the layer to display. This is a map of the Geology of Australia.

After adding the data, Right click on the name of the layer (geolpldd) and select Properties. At the General Tab change the Name of the Layer to Geology of Australia. Then select the Symbology Tab. In the upper left select <u>Categories</u> then <u>Unique Values</u>.



Then select LITH_ASSOC using the down arrow next to the Value Field. Then click on the Add All Values. All the geology types will now be shown on the map. Uncheck the box to the Left of (all other values)

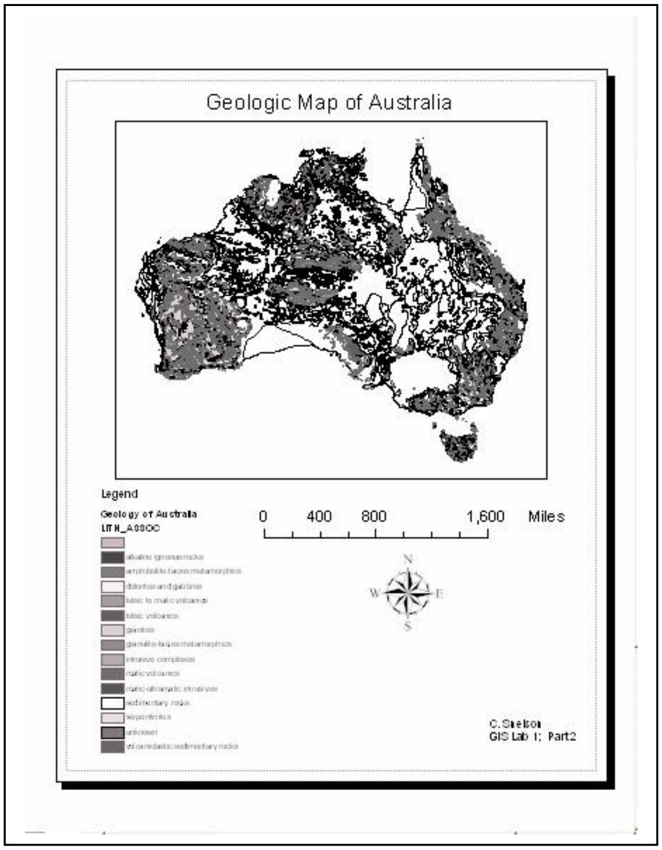
Change the color scheme for the map. We'll be printing on a black-and-white printer, so we'll need to change the fill colors appropriately.

Also, we'll try to set things up to use less ink, and print faster. Select a Black and White Color Scheme. Since the sedimentary rock value is such a large part of the map let's make it blank to make the map more read able.

- Left click twice quickly on the color box to the left of the sedimentary rock value.
- Select Hollow and then **OK**
- Finally, Select Apply and then **OK**

As before switch to the Print Layout view and add Title, legend, Scale Bar, North Arrow and your name/date. Practice selecting the map, title, legend and resizing each item. Move these objects around into a pleasing arrangement.

Your map should look something like below:



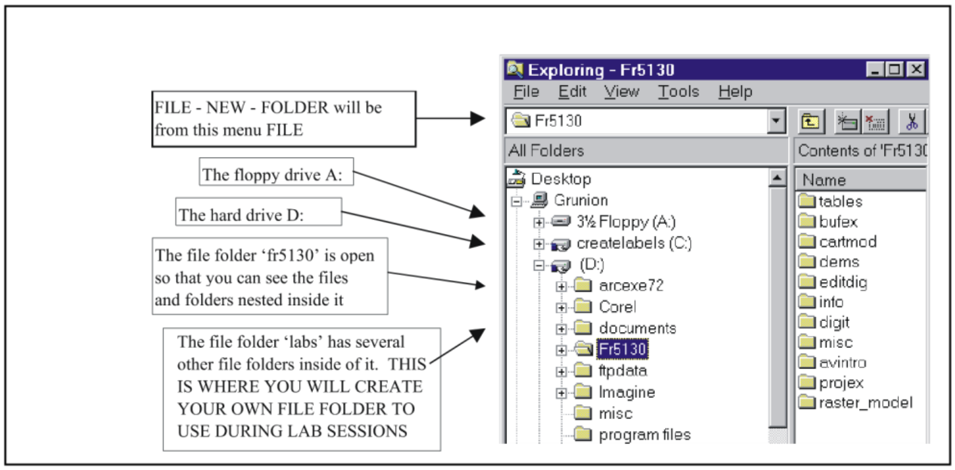
Save this map. File > Save As in your area. The map file includes only the directions on what and how to display your various themes, layouts, etc. ***The .mxd file doesn't include the data***. It contains pointers to where the feature (layer) data resides on disk. If you move to a new computer, the data may not be there, and when you try to load the project, ArcGIS will ask you where the data reside. If you work off of your area you shouldn't have to worry at all about this, as the *.mxd* files and data are all contained that area. However if you wish to copy them elsewhere, for example as backups, you have to save your feature data as well as the *.mxd* file to a diskette if you have created or modified any layers. Remember, if you are saving shapefiles, you must save all three for a feature layer (the *.shp*, the .dbf and the *.shx* file) into the same directory.

To Turn In:
Turn in two maps, the first with roads and lakes, the second with reclassified geology. Remember to include the following on these and all your future maps: 1) a title, including a description of the map and your name, 2) a north arrow, 3 scale bar, and 4) a legend. Points will be deducted if you don't have all these elements.

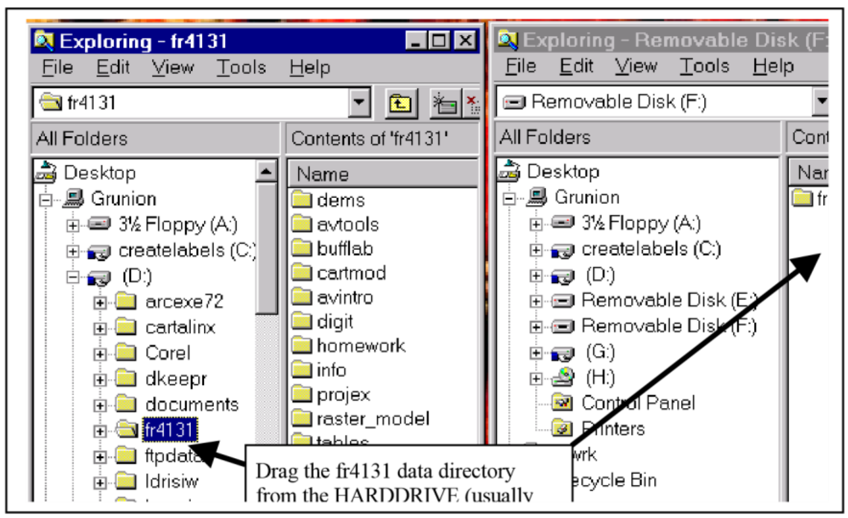
USING MICROSOFT EXPLORER TO NAVIGATE DIRECTORIES AND COPY FILES

This is the MicroSoft Windows Explorer window, available from START > PROGRAMS > ACCESSORIES > WINDOWS EXPLORER. You will use this file manager every lab session to click

By clicking on various folders in the left window, they "open", and you see their contents in the right window. You can click down a nested set of folders, and the path is expanded for you to view in the left pane of Windows Explorer. You can "navigate" through your files this way, and inspect what is in each folder.

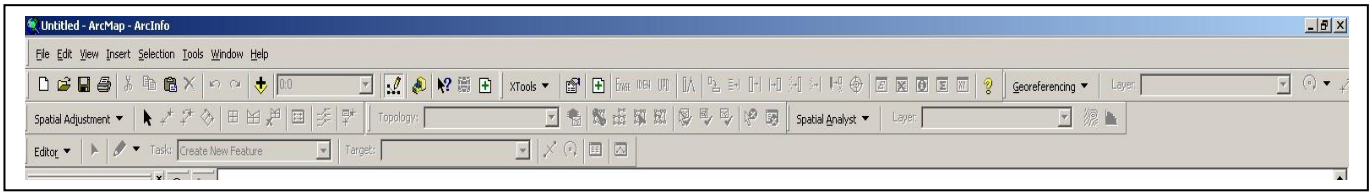


In order to copy a folder and all its contents, it is easiest to open two copies of Windows Explorer, and drag the folder between windows. Open a second copy of Windows Explorer (START-PROGRAMS-WINDOWS EXPLORER), and resize the two running versions to be side by side. Navigate to the DATADRIVE:\GEY430_630_Spr04 folder in the one of the Explorer copies running, and to the ZIP:\ in the right pane of the other copy of Windows Explorer. To drag, left click on the GEY430_630_Spr04 folder, and continuously holding the mouse button down, drag it to the right window pane. The files should be copied.



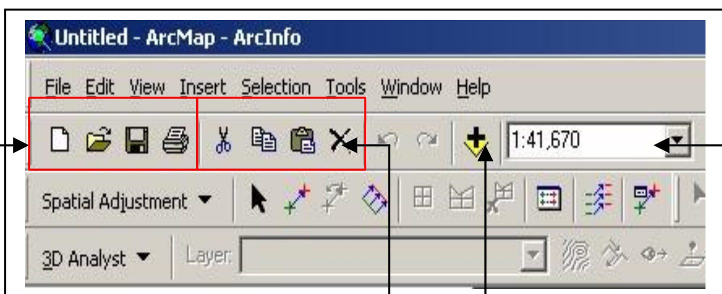
IMPORTANT NOTE: you CANNOT copy coverage directories by themselves and expect them to work; Arc/Info coverages store some data in the coverage directory, and some in an associated INFO directory at the same level in the directory structure. You need to copy the entire directory structure one level up.

ArcGIS Buttons & Menus



Note: ArcGIS Menu and Buttons are all "customizeable", meaning you can move them anywhere on the screen. You can also turn groups of buttons on an off with the Tools Menu by Selecting the Customize Submenu.

For our class we have elected to "lock the menus". This allows instruction and handouts easier to be consistent with your display.



The left side of the Menu

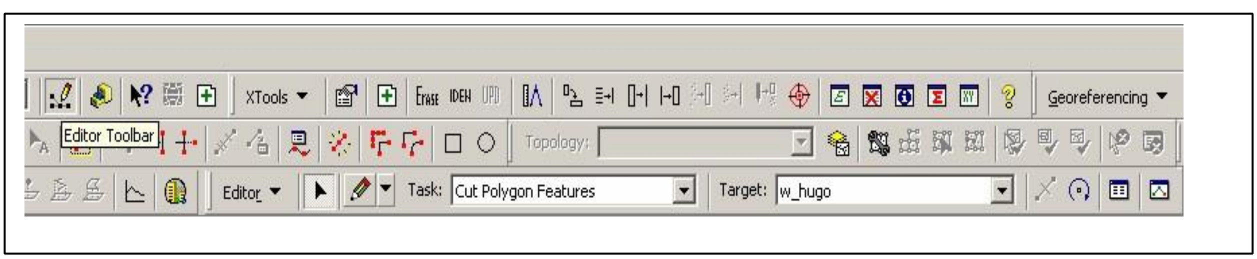
New Map
Open Existing
Save
Print

Cut
Copy
Paste
Delete

Add Layer

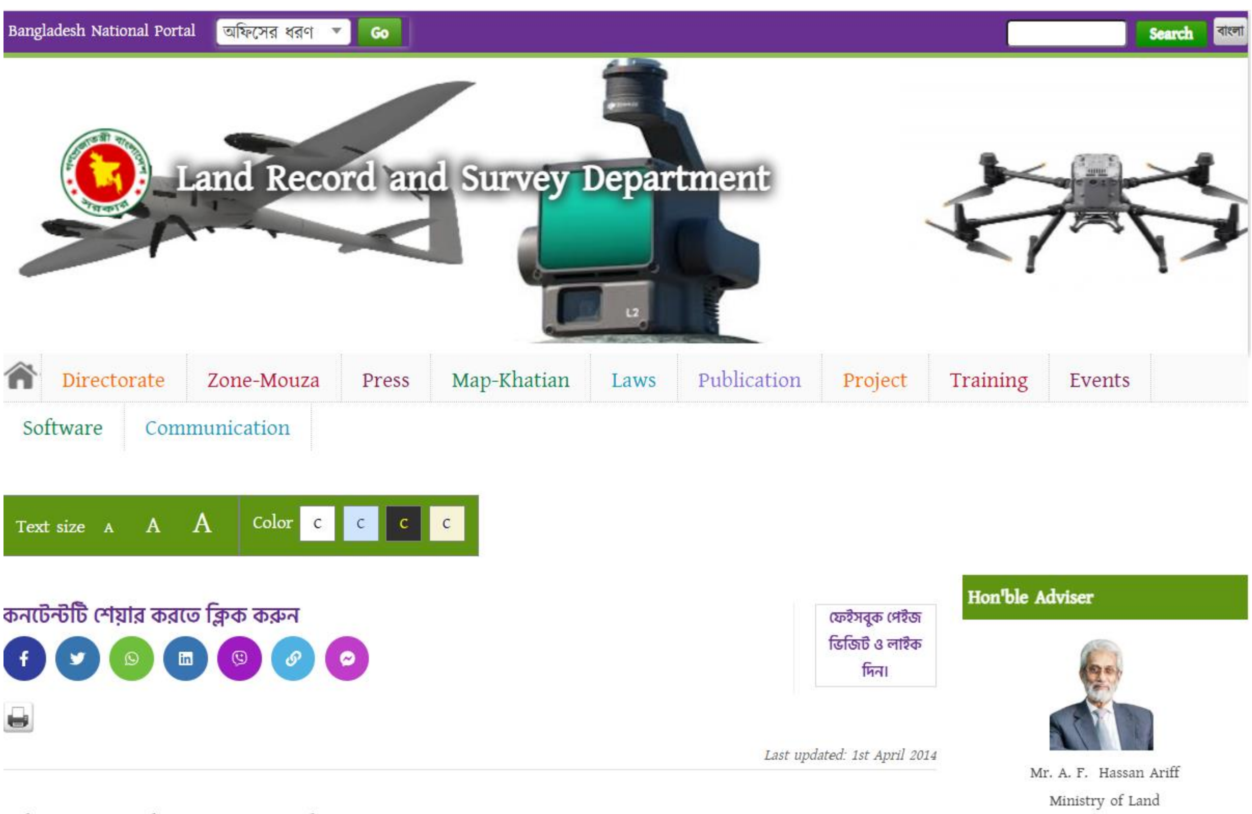
Scale *(select a scale or enter a value)*

The right side of the Menu



WEEK 07-08

Fieldwork No. 4
Porcha



Introduction

Porcha, also known as a Record of Rights (ROR), is a vital legal document that reflects the ownership and details of a parcel of land. It serves as evidence in property disputes, helps in land transactions, and ensures the rightful ownership of the land. This lab manual provides a step-by-step guide to understanding and preparing a Porcha.

Objectives

To understand the components of a Porcha.

To learn the process of gathering land-related data.

To practice documenting land ownership and measurement details accurately.

To familiarize with the official forms and formats used in Porcha preparation.

Materials Required

Survey maps and records

Measuring tapes and survey instruments

Land ownership documents (deeds, khatians, mutation papers)

Official forms for Porcha

Computer with document preparation software

Printer and scanner

Steps for Preparing Porcha

Step 1: Collect Preliminary Information

- Obtain the plot number, khatian number, and relevant details from the landowner.
- Collect previous Porcha copies and related legal documents, such as sale deeds and mutation records.
- Verify the plot's classification (residential, agricultural, commercial, etc.).

Step 2: Survey the Land

- Conduct a detailed survey of the land using chain surveying or plane table methods.
- Record measurements and identify landmarks, boundaries, and adjacent plots.
- Prepare a sketch or map showing the land layout.

Step 3: Verify Records

- Cross-check collected data with official land records maintained at the local land office or union parishad.
- Ensure there are no discrepancies in ownership, boundaries, or classification.

Step 4: Document Preparation

- Draft the Porcha using the official format. Include:
- Owner’s name and address
- Plot and khatian numbers
- Area and boundaries of the land
- Land classification
- Encumbrance or mortgage details (if any)

Step 5: Review and Authentication

- Review the drafted Porcha for accuracy and completeness.
- Obtain authentication from the local land office or authorized official.

Step 6: Final Documentation

- Print and sign the finalized Porcha.
- Provide copies to the landowner and retain a record for future reference.

KHATIAN No. - 1065

Page No. 1

Division: Sylhet District: Sylhet P.S: South Surma Mouza: Lakkibasha JL No.1 Rs No. 1

Name and address of the owner or non cultivated tenant	Share	Revenue	Dag No.	Nature of Land		Total Area of Plot		Share of Khatian within plot	Area of Land according to share		Occupation or other comment
1	2	3	4	Agri 5(Kha)	Non-Agri 5(ka)	Acre 6(Kha)	6(ka)	7	Acre 8(Kha)	Deci 8(ka)	9
Owner: Julfu Ahmed Father: Mahmud Miah Vill: Lakkibasha	1.00		6409	Sail			1900	0.578		1100	GOVT OF PEOPLES REPUBLIC OF BANGLADESH UPOJELA DHAKIN SURMA GOVT SETTLEMENT OFFICE BRANCH
Note or or change-wise Case No……and year	1.00	Accept Family Planning						Net Land:	0	1100	

This is to certify that this Khatian was prepared under Section 144(7) of the State acquision and Tenancy Act, 1950 and also under rule 32 and 33 of the Rules made in 1955, under the same Act and such Khatian was prepared and finally published between 2003-2018.

[Signature]
Oshim Bhuson Saha
Assistant settlement officer
Dhakin Surma Sylhet.

20/1/21

GOVT SEAL
SETTLEMENT OFFICE

Print Settlement Office, Dhaka Date: 04/01/2021 Computer Code: 22935890-273121
Bangladesh Form No. 5462 (Modified)

Figure: Porcha

Precautions and Best Practices

Accuracy: Ensure all measurements and details match official records to avoid disputes.

Clarity: Use clear language and unambiguous descriptions.

Verification: Regularly update and cross-check records with the local land office.

Security: Store Porcha and related documents securely to prevent damage or loss.

Frequently Asked Questions

1. What is the validity of a Porcha?

   Answer: Porcha remains valid unless there are changes in ownership or other legal aspects.

2. Who can issue a Porcha?

   Answer: It is issued by authorized officials at the land office.

3. What if there is an error in the Porcha?

   Answer: Contact the local land office to initiate a correction process.

Conclusion

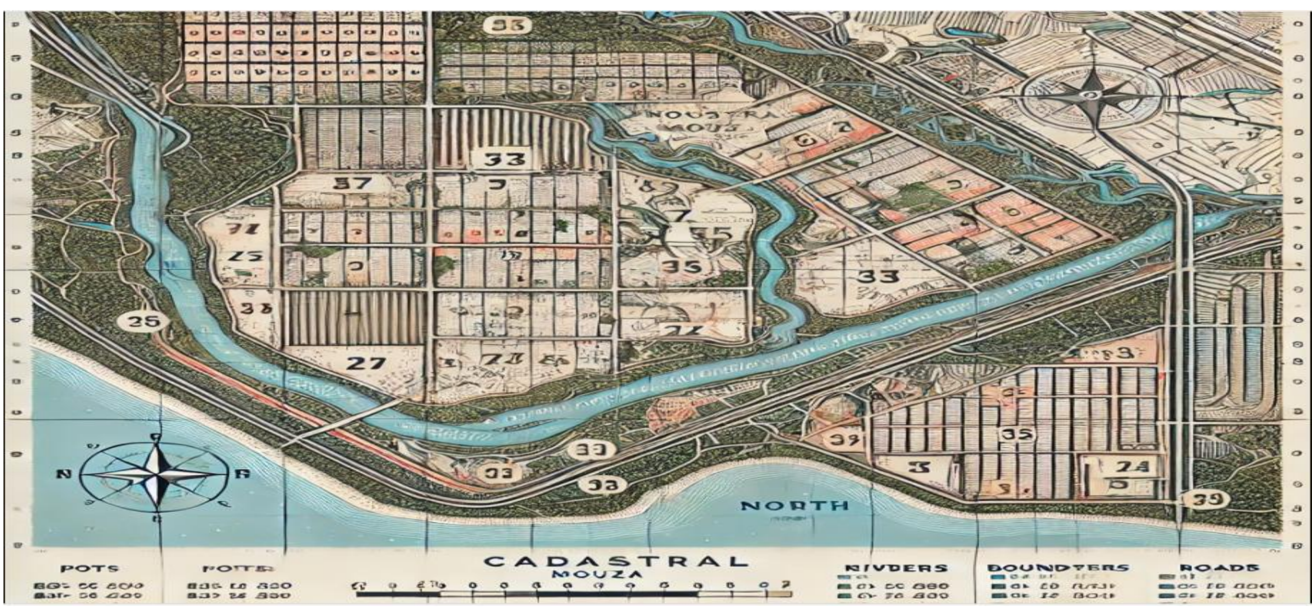
Preparing a Porcha is an essential skill for land management and property documentation. By following this manual, students can gain hands-on experience in creating accurate and legally valid records of land ownership.

UNIVERSITY OF GLOBAL VILLAGE

WEEK 09-10

Fieldwork No. 5

MOUZA MAPS



Introduction

A Mouza map is a detailed cadastral map that delineates individual plots within a mouza (village or locality). It is an essential tool for land administration in Bangladesh, aiding in property ownership verification, land-use planning, and dispute resolution. This lab manual outlines the procedure for preparing and interpreting a Mouza map, tailored to the Bangladeshi context.

Objectives

- To understand the components and significance of a Mouza map.
- To learn the process of surveying and mapping land parcels within a mouza.
- To practice preparing and analyzing Mouza maps for land management.
- To adhere to official standards and formats used in Bangladesh for Mouza mapping.

Materials Required

- Existing cadastral records and Mouza maps
- Survey instruments (e.g., total station, theodolite, plane table, measuring tapes)
- Official Mouza map templates
- Graph paper or GIS/mapping software
- Reference documents (e.g., ROR, khatians, mutation papers)
- Printer and scanner

Steps for Preparing a Mouza Map

Step 1: Gather Preliminary Data

- Obtain the latest Mouza map and cadastral survey records from the local land office.
- Collect information on plot numbers, khatian numbers, and land classifications.
- Identify landmarks and adjacent mouzas for reference.

Step 2: Conduct a Field Survey

- Visit the mouza and conduct a comprehensive survey using total stations, theodolites, or plane tables.
- Record accurate measurements of plot boundaries, natural features, and infrastructure (e.g., roads, canals).
- Note any changes or discrepancies from existing records.

Step 3: Plot the Data

- Plot the surveyed data onto graph paper or digital mapping software.
- Ensure the map includes a clear scale, north arrow, and legend.
- Label each plot with its respective number, dimensions, and area.

Step 4: Verify and Cross-Check

- Cross-check the drafted Mouza map with official records for consistency.
- Validate plot ownership and boundaries by consulting local landowners and officials.
- Resolve discrepancies by revisiting the site if necessary.

Step 5: Finalize the Map

- Prepare the finalized Mouza map using official symbols and standardized formatting.
- Include necessary details such as landmarks, natural features, and plot boundaries.
- Obtain verification and authentication from the local land office.

Step 6: Documentation and Distribution

- Print and distribute authenticated copies of the Mouza map to stakeholders (e.g., landowners, local authorities).
- Retain a digital backup for future updates and reference.

Precautions and Best Practices

Accuracy: Ensure precise measurements to avoid future disputes.

Standardization: Use official symbols, legends, and scales approved by the Bangladesh land administration.

Community Involvement: Engage local stakeholders to ensure accuracy and address concerns during the survey.

Data Security: Securely store survey records and maps to prevent loss or unauthorized alterations.

Frequently Asked Questions

1. What is the standard scale for a Mouza map in Bangladesh?

   Typically, Mouza maps use a scale of 16 inches to 1 mile, but local variations may apply.

2. Who is responsible for preparing Mouza maps?

   Mouza maps are prepared by the government's survey department or licensed surveyors.

3. How often should a Mouza map be updated?

   It is recommended to update Mouza maps periodically, especially after significant changes in land ownership or use.

Conclusion

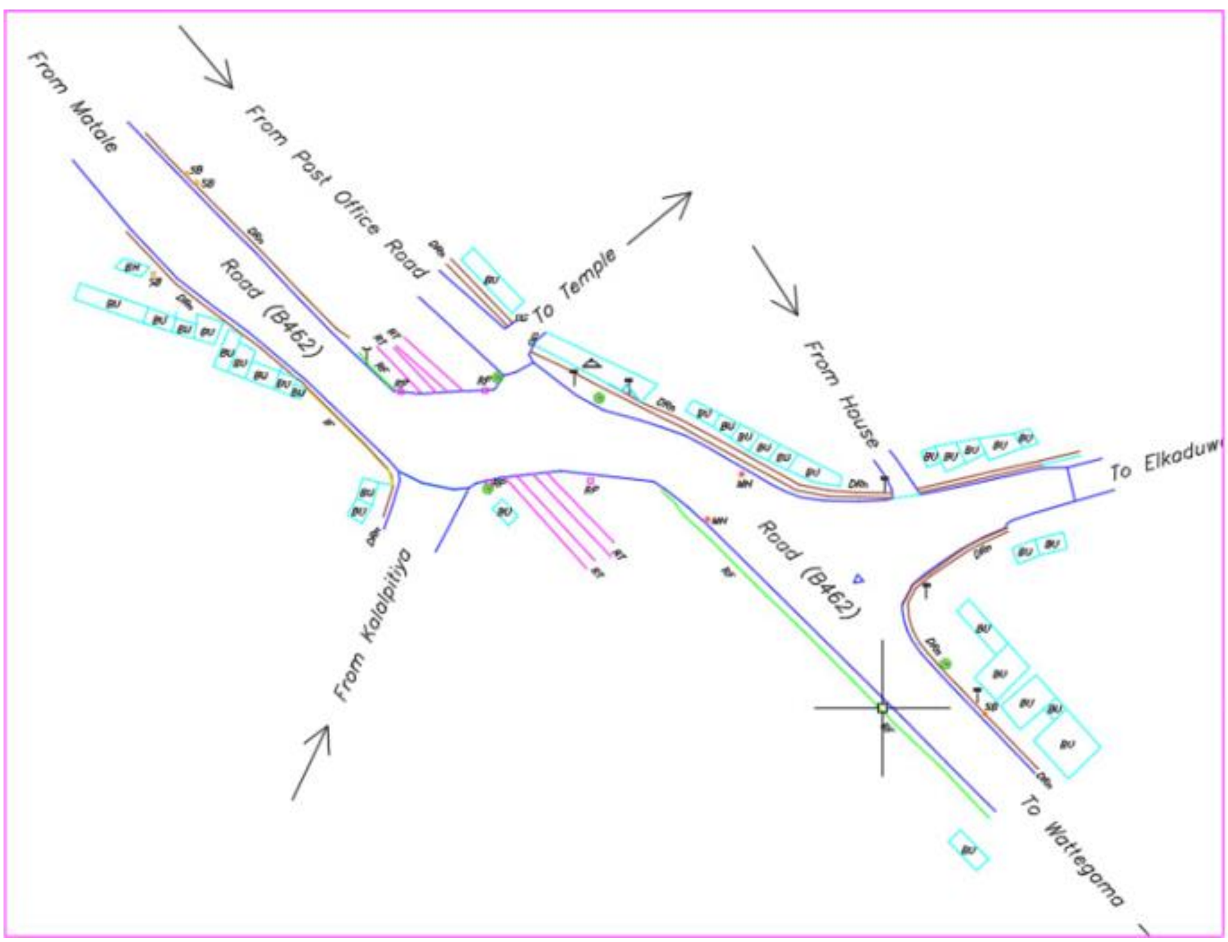
Preparing a Mouza map is an integral part of land management and administration in Bangladesh. This manual provides a systematic approach to creating accurate and legally compliant Mouza maps, ensuring students are well-prepared for professional land surveying roles.

UNIVERSITY OF GLOBAL VILLAGE

<u>WEEK 11-12</u>

Fieldwork No. 6

AutoCAD LAND SURVEY



Introduction

AutoCAD is a powerful tool for land survey and drafting that allows for precise mapping, analysis, and documentation. This lab manual provides a step-by-step guide to performing land surveys and drafting them using AutoCAD. The focus is on integrating survey data into AutoCAD for accurate land parcel mapping and professional presentation.

Objectives

- To understand the basics of AutoCAD for land survey applications.
- To learn how to import and work with survey data in AutoCAD.
- To create and modify land parcel drawings using AutoCAD tools.
- To generate professional-quality maps and layouts.

Materials Required

- Computer with AutoCAD software installed
- Survey data (coordinates, distances, angles)
- Total station or GPS equipment
- Digital storage device (USB, external hard drive)
- Reference land maps or cadastral records

Steps for AutoCAD Land Survey

Step 1: Setting Up AutoCAD

- Open AutoCAD and create a new drawing.
- Set the drawing units (e.g., meters, feet) and ensure the workspace is suitable for drafting (e.g., "Drafting and Annotation").
- Save the file with an appropriate name.

Figure: Setting up AutoCAD

Step 2: Importing Survey Data

- Collect survey data in a format compatible with AutoCAD (e.g., CSV, DXF).
- Use the "Import" function or external plugins to bring survey data into AutoCAD.
- Verify that all points, lines, and features are correctly imported.

Figure: Importing Survey Data

Step 3: Drafting Land Parcels

- Use tools such as "Line," "Polyline," and "Arc" to draw land boundaries based on survey data.
- Apply snapping tools for precise alignment and connections.
- Label plots with plot numbers, dimensions, and area using the "Text" and "Dimension" tools.

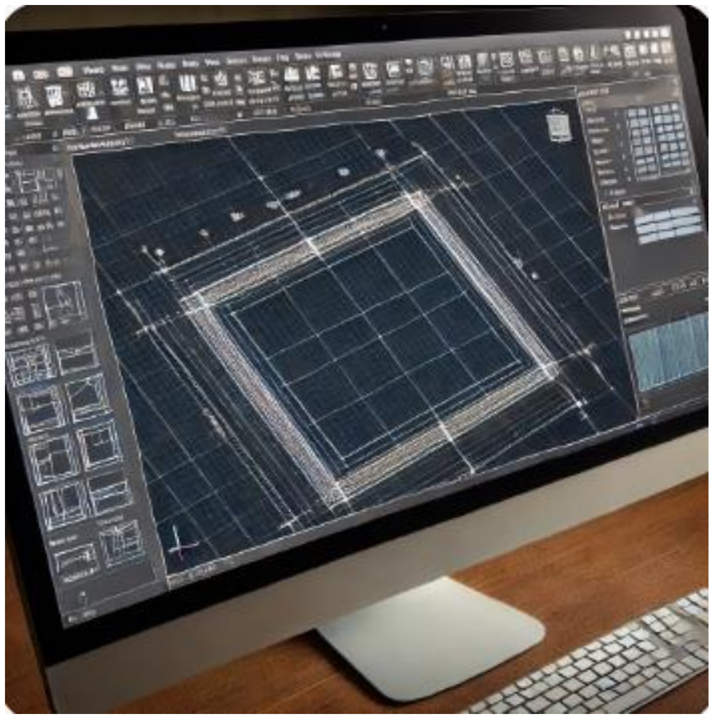


Figure: Drafting Land Parcels

Step 4: Modifying and Annotating the Map

- Edit boundaries, add additional features (e.g., roads, landmarks) as needed.
- Use layers to differentiate between various elements like roads, plots, and landmarks.
- Annotate the map with north arrows, scales, and legends for clarity.

Step 5: Creating a Layout

- Switch to the "Layout" tab to prepare the map for printing.
- Insert a title block and include project details such as the map title, date, and scale.
- Adjust the viewport to fit the map within the layout space.

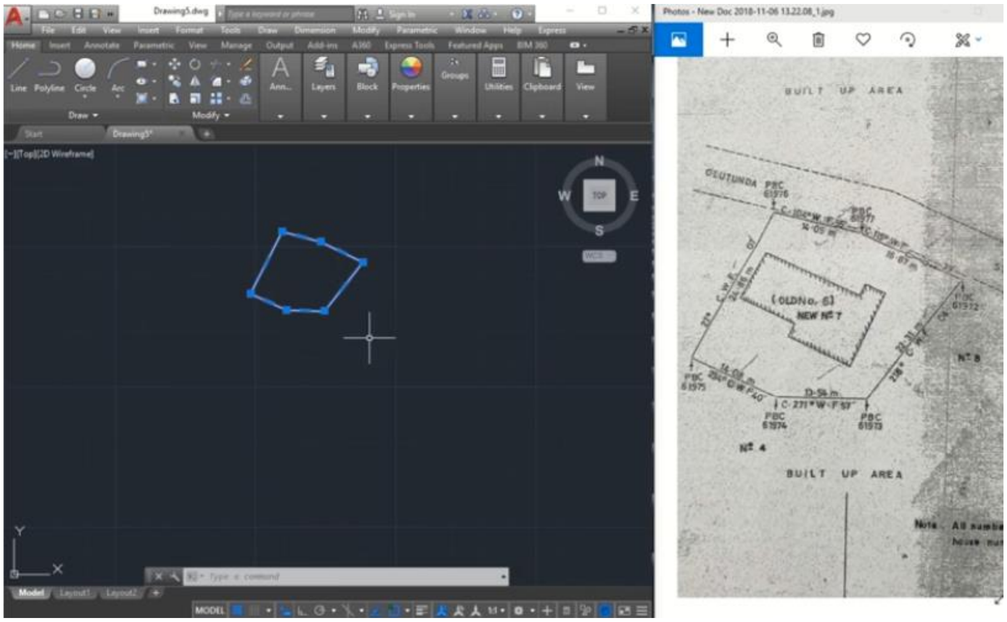


Figure: Creating a layout

Step 6: Finalizing and Printing

- Review the drawing for errors or missing elements.
- Plot the drawing using a suitable plotter or export it as a PDF for digital use.
- Save the final version in DWG format for further edits and backup.

Precautions and Best Practices

Data Accuracy: Ensure that survey data is accurate and complete before importing into AutoCAD.

Layer Management: Use distinct layers for different elements to maintain clarity and organization.

Backup Files: Save copies of your work frequently to avoid data loss.

Professional Standards: Follow standard conventions for scales, symbols, and annotations.

Conclusion

Using AutoCAD for land surveys streamlines the process of drafting, analyzing, and presenting land-related data. This manual equips students with practical skills to create professional land maps and supports efficient land management practices.

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WEEK 15-16

DOUBT SOLVING

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WEEK 17

FINAL

ASSESSMENT