

# **DEPARTMENT OF GEOGRAPHY**

## **LAB MANUAL**



## **INSTRUMENTS**

## **STANDARD OPERATING PROCEDURE**



**DEPARTMENT OF GEOGRAPHY  
DAYANAND POSTGRADUATE COLLEGE  
HISAR- 12500**

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## **GENERAL FACTS ABOUT THE LABS**

### **Infrastructure and Maintenance**

Department of Geography has four laboratories named as Remote Sensing and GIS lab, GL-1, GL-2 and GL3 (Cartographic and Morphometric Labs). We have our own scanner cum printer and Wi-Fi system. The Department has its separate store for equipment maintenance in a proper way. Each lab is maintained by individuals Lab attendant for its cleanness and distribution of equipment's to the students.

### **Purchasing Procedure**

Any demand requirement or discrepancy is raised by the Lab attendants, brought in the notice of Principal, application is written then order form is filled, Quotation invited signed by purchase committee and then the lowest priced items is purchased as per GST rules. All procedure is executed through college " Central Purchase and Maintenance Committee of the college.

### **General Utilization Procedure**

Students are divided into groups for both Undergraduate and Postgraduate courses for smooth running of practical classes in labs. The related equipment's are issued on daily basis to the students with signatures as per their schedule and then return after making their practical sheets. Separate registers for equipment are maintained by Lab attendants day to day and issued to different Labs whom needed. Models are prepared in our Lab by the students for participating in District and State Level Science Exhibitions..

**LIST OF LABORATORIES INSTRUMENTS OR EQUIPMENT'S**

<b>Sr. No.</b>	<b>Name of instruments/ Items</b>	<b>No. of Items</b>
1.	Satellite Images (IRS ID LISS III, Image No. 44012 and 44016, Scale= 1: 50000)	04
2.	Aerial Photographs (Scale= 1: 50000, Area: Rohtak , Haryana, Run No. 76, 77, 78 82, 83, 87)	26
3.	Computer Systems	13
4.	Software (Arc GIS 10.2)	01
5.	Combo Printer, Scanner and Copier	01
6.	Magnifying Glasses	17
7.	Globes	08
8.	Trough Compass	08
9.	Prismatic Compass	14
10.	Engineering Chain	10
11.	Sprit Level	05
12.	Alidades	19
13.	Measuring Tapes	04
14.	Thermometers	13
15.	Weighing Machine	01
16.	Digital Planimeter	01
17.	Planimeter Sliding Bar Pattern	05
18.	Aneroid Barometer	05
19.	Global Positioning System (GPS)	01
20.	Slide cum Strip Projector	01
21.	Projector Screen	01
22.	Overhead Projector	01
23.	Wind Vane	01
24.	Pocket Stereoscope	07
25.	Mirror Stereoscope	03
27.	Hygrometer	01
28.	Rain gauge	02

## INSTRUMENTS AND THEIR UTILIZATION JUSTIFICATIONS

Sr. No.	Item Type/Numbers	Specification	Justification
1.	Satellite Images	LISS III	BA 6 <sup>th</sup> Sem M.Sc.3 <sup>rd</sup> and M. Sc. 4 <sup>th</sup> semester practical work for Remote Sensing and GIS
2.	Toposheets	Quarter Degree Toposheets	BA I, M. Sc.1 <sup>st</sup> and M. Sc. 2 <sup>nd</sup> practical work
3.	Aerial Photograph	Indian Air Force	BA 6 <sup>th</sup> semester and M. Sc 3 <sup>rd</sup> semester practical work for Aerial Photograph Interpretation
4.	Portable Projector	Portable with multi-tasking	Used for BA Classes
5.	Stereoscope	Pocket & Mirror	BA III and M. Sc 3 <sup>rd</sup> Semester Practical (Used for Image Interpretation)
6.	Rota meter	Portable	BA I Practical (Area Calculation)
7.	Prismatic Compass	Portable	Survey in BA III
8.	ARC GIS Software		M. Sc 2 <sup>nd</sup> year students practical report
9.	Smart Board		All Classes

## GLIMPSE OF INSTRUMENTS OR EQUIPMENT'S



**Weather Instruments**



**Geographical Kit, Slide cum Strip Projector**



**Models, Globe and Rain Gauge**



**Mirror and Pocket Sterioscope and Aerial Photographs**



**Mirror Sterioscope, Satellite Imageries and Digital Planimetre**

**UTILIZATION PROCEDURE OF INSTRUMENTS WITH PRACTICAL SYLLABUS  
(UG CLASSES)**

**Paper Code-GEOG (102)**

**(Maps and Scale)**

**List of Exercise:**

1. Introduction to cartography
2. Map and their types
3. Map Scale (Methods of Expressing a scale, Conversion of statement of Scale into R.F. and Vice-versa, Plain Scale, Comparative Scale, Diagonal Scale)
4. Measurement of distance and areas on maps
5. Enlargement and Reduction of maps

**Cartography:** Cartography the art and science of graphically representing a geographical area, usually on a flat surface such as a map or chart. Cartography is the creation and the study of maps and charts - the difference being that maps apply to land and charts are for marine areas. In the 20th century it has diversified as it becomes more relevant in an increasingly digital modern world.

**Maps and Their Types:** A map is a symbolic representation of selected characteristics of a place, usually drawn on a flat surface. Maps present information about the world in a simple, visual way.

**Purpose of Maps:**

The purpose of maps lies chiefly in navigation and in helping cultures determine new trade routes. Throughout history, governments have put a priority on creating detailed, accurate maps. Today, the term "map" also refers to visual representations of various ideas and concepts

**Statement of Scale:** The scale of a map may be indicated in the form of a written statement. For example, if on a map a written statement appears stating 2 cm represents 20 km, it means that on that map a distance of 2 cm is representing 20 km of the corresponding ground distance. It may also be expressed in any other system of measurement. It is the simplest of the three methods. However, it may be noted that the people who are familiar with one system may not understand the statement of scale given in another system of measurement.



Another limitation of this method is that if the map is reduced or enlarged, the scale will become redundant and a new scale is to be worked out.

**Representative Fraction (R. F.):** The second type of scale is R. F. It shows the relationship between the map distance and the corresponding ground distance in units of length. The use of units to express the scale makes it the most versatile method. R. F. is generally shown in fraction because it shows how much the real world is reduced to fit on the map. For example, a fraction of 1: 50,000 shows that one unit of length on the map represents 50,000 of the same units on the ground.

**Linear Scale:** The Third type of scale shows map distances and the corresponding ground distances using a line bar with primary and secondary divisions marked on it. Hence, like the statement of scale method, this method also finds restricted use for only those who can understand it. However, unlike the statement of the scale method, the graphical scale stands valid even when the map is reduced or enlarged. This is the unique advantage of the graphical method of the map scale.

**Conversion of scale:** - If we have carefully read the advantages and limitations of the different methods of scale, then it will not be difficult for you to convert the Statement of Scale into Representative Fraction and vice-versa.

**Measurement of area on maps: -**

Being a student of geography, it is necessity to know the method of area measurement.

**Easy and Famous method: -**

**Square method:** - This is the very simple method of computation of area. In this method graphs are made on map and the blocks into the map are counting and calculate them.

**INSTRUMENT USED:**



**Rotameter For Distance Measurement**



**Planimeter For Distance And Area Measurement**

**Paper Code-GEOG (102)**  
**(Representation of Physical Features)**

**List of Exercise**

1. Introduction of Topographical Sheets (Topo-sheets Indexing)
2. Convectional Signs
3. Relief Representation (Contour, Hachure, Hill Shading)
4. Representation of Topographical features by contour
5. Profile

**Toposheet:** In modern mapping, a topographic map is a type of map characterized by large-scale detail and quantitative representation of relief, usually using contour lines. Traditional definitions require a topographic map to show both natural and man-made features.

**Toposheet Indexing:** These sheets are produced at different scales. In order to identify a map of a particular area, a numbering system has been adopted by the Survey of India

**Degree Sheet:** Each section is further divided into 16 sections (4 rows and 4 columns) each of  $1^\circ$  latitude  $\times$   $1^\circ$  longitude. The sections start from Northwest direction, run column wise and end in Southeast direction.

**Half Degree Sheet:** The  $1^\circ \times 1^\circ$  sheets are further subdivided into four parts, each of  $30'$  latitude  $\times$   $30'$  longitude. These are identified by the cardinal directions NE, NW, SE and SW.

**Quarter Degree Sheet:** A  $15' \times 15'$  sheet can be divided into 4 sheets, each of  $7(1/2)'$  and are numbered as NW, NE, SW and SE

**India and Adjacent countries Topo Sheets:** These were printed by Survey of India on 1:250,000; 1:50,000 and 1:25,000 scales. Technically they were based on Everest Datum and Polyconic Projection.

**Conventional Signs:** On the topographical map their used many kinds of signs for different type physical and cultural features. These signs are known as conventional signs.

**Relief Representation:** There are various methods of relief presentation. Each method has its specific features.

**Profile:** A relief profile is a line which shows the rise and fall of the surface of the ground along a chosen line on a map.

**Serial Profile:** These are made by drawing a series of profile or parallel profiles for showing features like a coastline; edges of plateau; a series of spurs; a transverse profile of a river

**Superimposed Profile:** When a series of profile are superimposed on a single plane it is called as superimposed profile

**Projected Profile:** In the superimposed profiles, the successive parallel profiles are placed on a common base line. However, the lower parts of the profiles are hidden behind the higher intervening altitudes

**Composite Profile:** If the superimposed profile of a landform is viewed carefully one can discern at the farthest end of such a profile, a summit line, the skyline which provides a general outline of the concerned landform features as viewed from a distance.

### **Paper Code-GEOG (202)**

#### **(Representation of Climatic Data)**

#### **List of Exercise:**

1. Measurement of Temperature
2. Measurement of Rainfall
3. Measurement of Air Pressure
4. Measurement of Humidity
5. Representation of Temperature and Rainfall
6. Isoleth (Interpolation, Isotherms, Isobars, Isohyets, Contours)
7. Weather Map and their interpretation
8. Chain and Tape Survey

#### **Instrument Used**



**Weather Instruments**

## Survey Instruments



Chain



Tape



Arrow



Ranging Rod



### Paper Code-GEOG (204) (Maps and Projections)

#### List of Exercise

1. Introduction of Map projection
2. Cylindrical Map projection
3. Conical Projection
4. Zenithal Projection
5. Convectional Projection
6. Plane Table Survey

**A map projection:** is a systematic transformation of the latitudes and longitudes of locations from the surface of a sphere or an ellipsoid into locations on a plane.

**Plain Table Survey:** Plane Table Surveying is a graphical method of survey in which the field observations and plotting are done simultaneously. It is simple and cheaper than theodolite survey. It is most suitable for small scale maps

**Methods of Plane Table:** 1. Radiation 2. Intersection 3. Traversing

**Instrument Used:**



**Paper Code-GEOG (302)**

**(Distribution Maps and Diagrams)**

**List of Exercise:**

1. Principles of map design and layout
2. Symbolization: point, line and area symbols
3. Distribution Maps
4. Prismatic Compass Survey

**Principal of map design and layout:** The term 'map' is used to describe digital or analog output from a GIS that shows geographic information using well-established cartographic c  
**Map symbolization** is the characters, letters, or similar graphic representations used on a map to indicate an object or characteristic in the real world

**Distribution maps:** indicate the distribution of any particular feature in an area. A qualitative map expresses the absence or presence of various features of land, such as vegetation. A qualitative map is a quantitative map, which expresses information with numbers

**Prismatic Compass Survey:** A prismatic compass is a navigation and surveying instrument which is extensively used for determining course, waypoints and direction, and for calculating bearings of survey lines and included angles between them

### **Instruments Used**



**Paper Code-GEOG (304)**

**(Remote Sensing and Field Survey Report)**

### **List of Exercise**

1. Demarcation of Fiducial Mark, Fiducial Axis, Principal Point, Conjugate Principal Point, Flight line
2. Determination of Scale of aerial photograph
3. Interpretation of Single Vertical Photograph
4. Use of Stereoscope and Identification of Features
5. Identification of Features on Satellite imagery

**The principal point:** is the optical or geometric center of the photograph. It is the image of the intersection between the projection of the optical axis

**Determination of scale on an aerial Photograph:** Scale: the ratio of the distance between two points on a photo to the actual distance between the same two points on the ground

**Stereo Vision Test:** - The word "stereo" comes from the Greek word "stereos" which means firm or solid. With stereo vision you see an object as solid in three spatial dimensions--width, height and depth--or x, y and z.

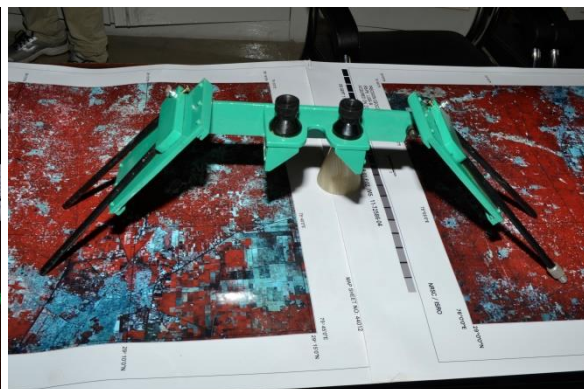
**Lens Stereoscope:** Lens Stereoscope is also called as pocket stereoscope because of its size and easy transportability. Eye base was fixed. Lens is used in pocket stereoscope is Plano-convex lens. Pair of magnifying lenses are used to keep eyes working independently and their line parallel. The height of pocket stereoscope is 10 cm. It has Plano convex lenses with upper side flat and focal length 100mm

**Mirror Stereoscope:** - Mirror Stereoscope is also called as reflecting stereoscope. It provides view of entire overlap by an arrangement of prisms and mirrors with increased distance to about 15 to 20cms. In addition, binoculars, attached with the mirror stereoscope, provide 3X to 8X magnification.

**Interpretation of Aerial photographs:** Identification, mapping and interpretation of Natural and Cultural features: Photographic interpretation is “the act of examining photographic images for the purpose of identifying objects and judging their significance”.

**Elements of interpretation:** Location, Size, Shape, Shadow, Tone/Color, texture, Pattern, height and depth, Site/Situation/ Association.

### Instruments Used



**UTILIZATION PROCEDURE OF INSTRUMENTS WITH PRACTICAL SYLLABUS  
(PG CLASSES)**

**Paper Code: GEOG 105  
(Cartographic Methods in Geography)**

**Exercise**

1. Climate data representation by diagrams and maps: - Line and bar graph - Poly graph - Rainfall deviation diagram - Climograph (Taylor and Foster's) - Hythergraph - Isoleth - Wind rose diagram
2. Diagrams: Types and properties of diagrams representing socio-economic data: - One dimensional diagram - Bar diagram: Simple bar, multiple bars, comparative bar - Two-dimensional diagram- pie diagram proportional circle, rectangle, square. - Three-dimensional diagram- Sphere, cube, curbsi
3. Distribution maps - Dot method - Choropleth – monovariate and bivariate
4. Miscellaneous diagrams and graphs - Trend graph - Age and Sex pyramid - Flow diagram, cartogram and accessibility maps

**Paper Code- GEOG 205  
(Morphometric Analysis)**

**Exercise**

1. Interpretation of toposheets: (a) Physical features and (b) Cultural features. 1. Profile Analysis: Transverse and Longitudinal a) Serial Profiles b) Superimposed Profiles c) Composite Profiles d) Projected Profiles e) Longitudinal or valley Thalweg Profile.
2. Linear Aspects of streams: a) Relationship between stream order and stream Number b) Relationship between stream order and Average stream length. 3. Areal Aspects of streams: a) Drainage Frequency b) Drainage Texture/Density
3. Relief Aspect of Streams a) Area Height Curve b) Altimetric frequency curve c) Hypsographic Curve d) Hypsometric Integral Curve e) Clinographic or clinometric curve
4. Slope Analysis a) Wentworth's Method of Average Slope b) G. H. Smith's Method of Relative Relief.

**Instrument Used**





**Rotameter**



**Planimeter**

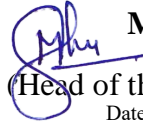
### **Remote Sensing and GIS LAB**

**Paper Code: GEOG 306(B), GEOG 405 (B)**

#### **List of Exercise**

1. Familiarization with GIS software, data input
2. Georeferencing
3. Creating Subset
4. Making FCC
5. Resolution Merge
6. Creation of Shapefile and Geo-Database
7. Digitization
8. Creation of Thematic Layers
9. Displaying attribute data on map
10. Preparing Layout of Thematic Map
11. **GIS software** (Arc GIS 10.2)



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