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ECOL 572: ENVIRONMENTAL INFORMATICS AND MODLING

eLearning Module

Course Teacher

Prof. S Jayakumar

Dept. of Ecology & Environmental Sciences

Pondicherry University

Puducherry, India

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Content

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1. General Information

Course Code	:	ECOL - 572
Course Title	:	Environmental Informatics and Modeling
Number of Credits	:	4.0 ECTS
Course duration	:	18 Weeks
Level	:	Postgraduate
Course Teacher	:	Prof. S. Jayakumar
Prerequisite	:	Basic understanding on Mathematics (school higher level), English language skill, computer operation (Windows/Mac).

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2. Course description

This course provides the fundamentals of environmental informatics, different types of database management system, spatial data structure, how to extract information from different data sources such as air borne data, space borne data, climate data, GPS, topographical maps and how to convert them into digital form. It also teaches the students how to integrate and analyse the trend and pattern. It also introduces the students the concept of weightage, how to assign class weightage and layer weightage. The fundamentals of spatial modelling and how to perform modelling to identify the suitability and vulnerability. It also introduces the components of an information system and of remote sensing. This course also demonstrates data collection using GPS, Map reading, DBMS, 2D analysis and 3D analysis

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3. Course goals

The main aim of the course is to provide students what is environmental informatics and modeling and how can it be accomplished. The objectives of the course are to provide the important aspects of DBMS, to explain how do extract information from various datasets, to provide a fundamental understanding on how to integrate data, perform analysis and interpret the outputs, to provide the students to know about the basic components of information system, to make them understand how to perform suitability and vulnerability modeling and to demonstrate 2D and 3D data analysis.

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4. Course outcome

By the end of the course, successful students will:

1. Know the significance of environmental informatics and its relevance to the natural resources management.
2. be familiar with various database management systems
3. be able to retrieve data from DBMS through query
4. know the different types of information extraction
5. be able to conceptualize the types of thematic maps required and the appropriate source of data to prepare the different types thematic maps in both analog and digital formats
6. be able to think spatially to manage the natural resources
7. be familiar with the concept and framework of information system.
8. know the concept of 2d and 3d data analysis.

5. Course structure

5.a. Course Content

Week - 1	Introduction to environmental informatics
	Environmental data, sampling, primary and secondary data
Week - 2	Data sources, data quality and standards
Week - 3	Introduction to database management system
Week - 4	Significance of DBMS and spatial data structures
Week - 5	Resource information extraction – air borne, space borne and data
	Resource information extraction from topomap and climate data
Week - 6	Digital database creation
	Introduction to data analysis and visualization
Week – 7	Data integration, trend analysis, pattern analysis
Week – 8	Understanding data layers and weightage
Week – 9	Spatial environment and spatial analysis
	Introduction to spatial modeling
Week – 10	Environmental suitability and vulnerability modeling
Week – 11	Structure and components of information system
Week – 12	Working with GPS and data handling
Week – 13	Map reading and information extraction
Week – 14	2d data analysis
Week – 15	3d data analysis

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5. Course structure

Understanding the fundamentals of environmental informatics and modeling in natural resources management

5.b. Mode of delivery

In-Class Lectures

PULSE
PONDICHERRY UNIVERSITY LEARNING SYSTEM

On-line lectures

Microsoft OneDrive

Microsoft Teams

Students will get enrolled in Pondicherry University Learning Management System and the classes will be handled in hybrid mode

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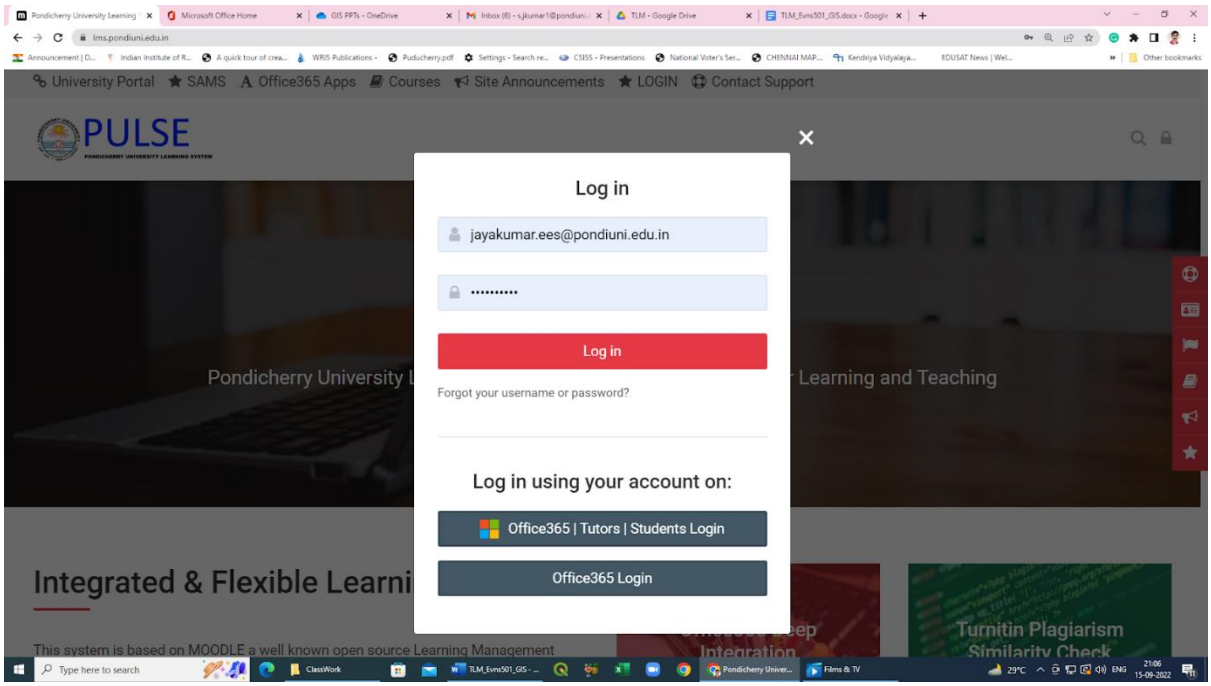
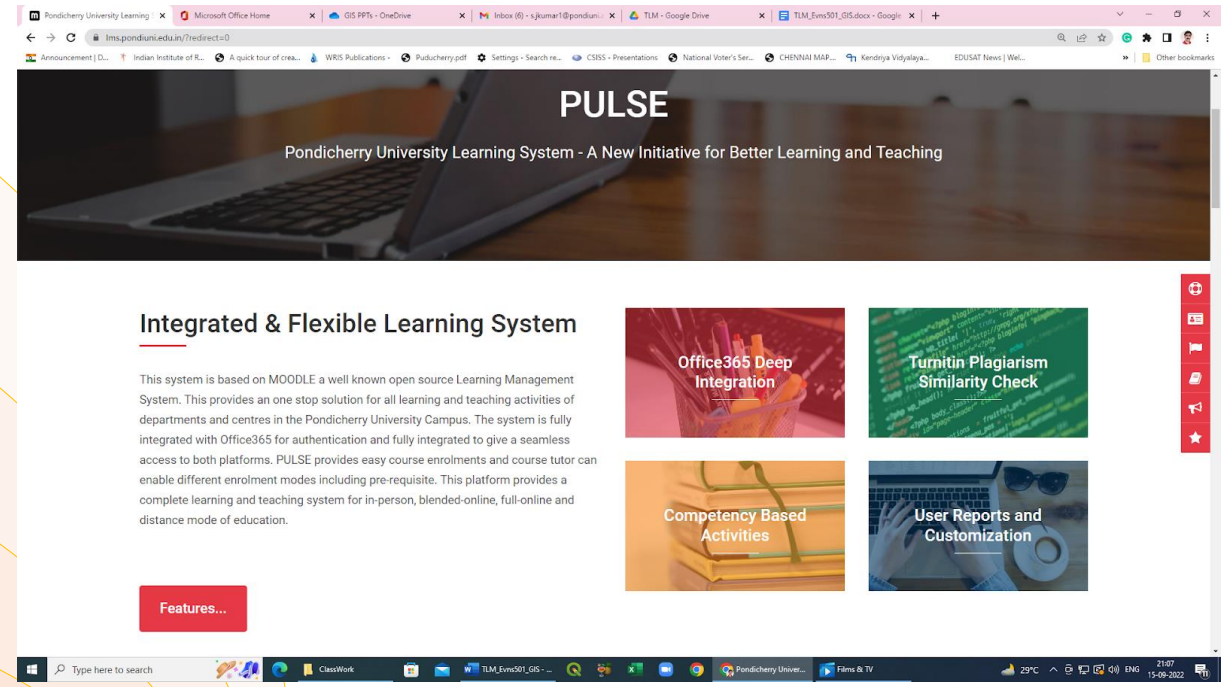
Pondicherry University Learning Management System (https://lms.pondiuni.edu.in/)





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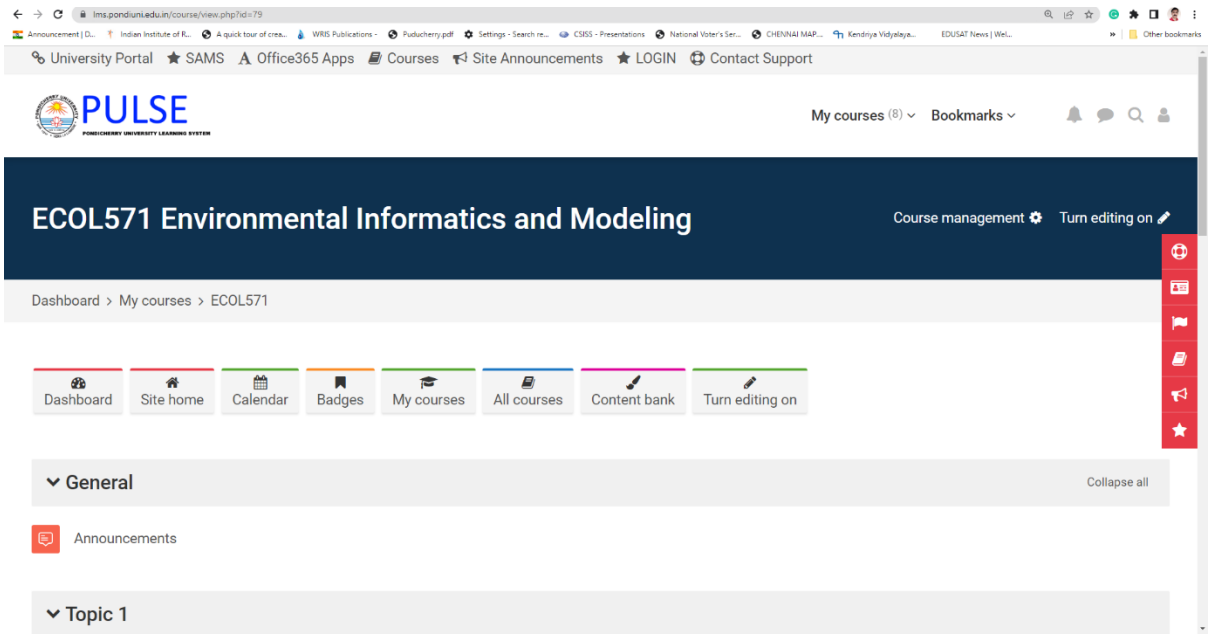

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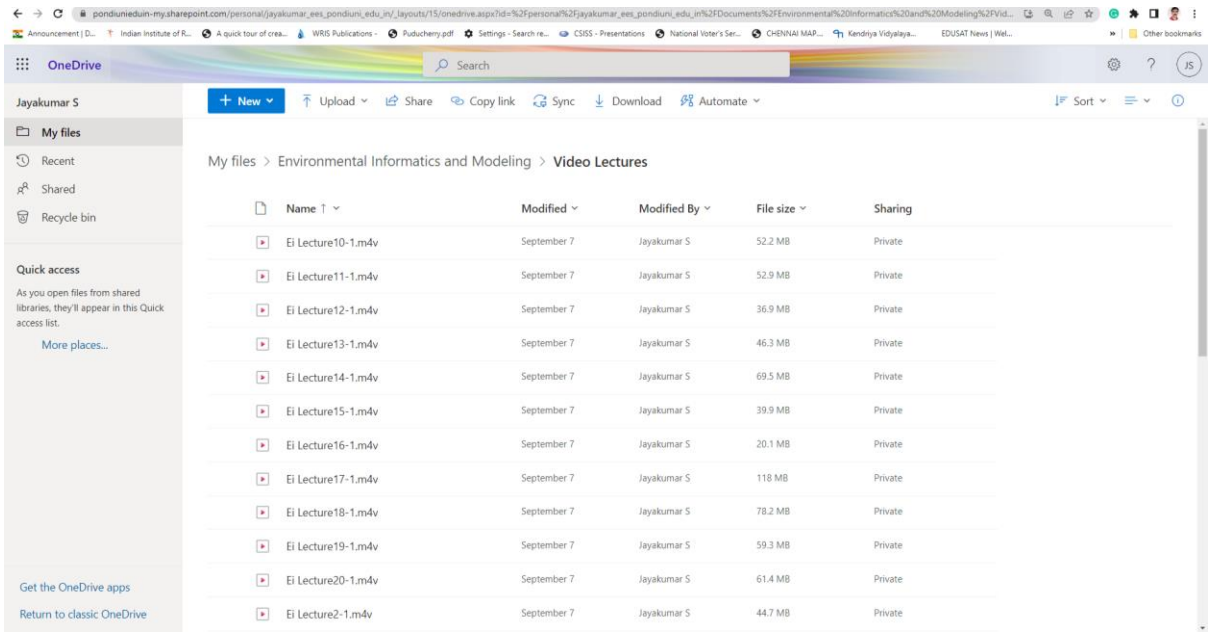
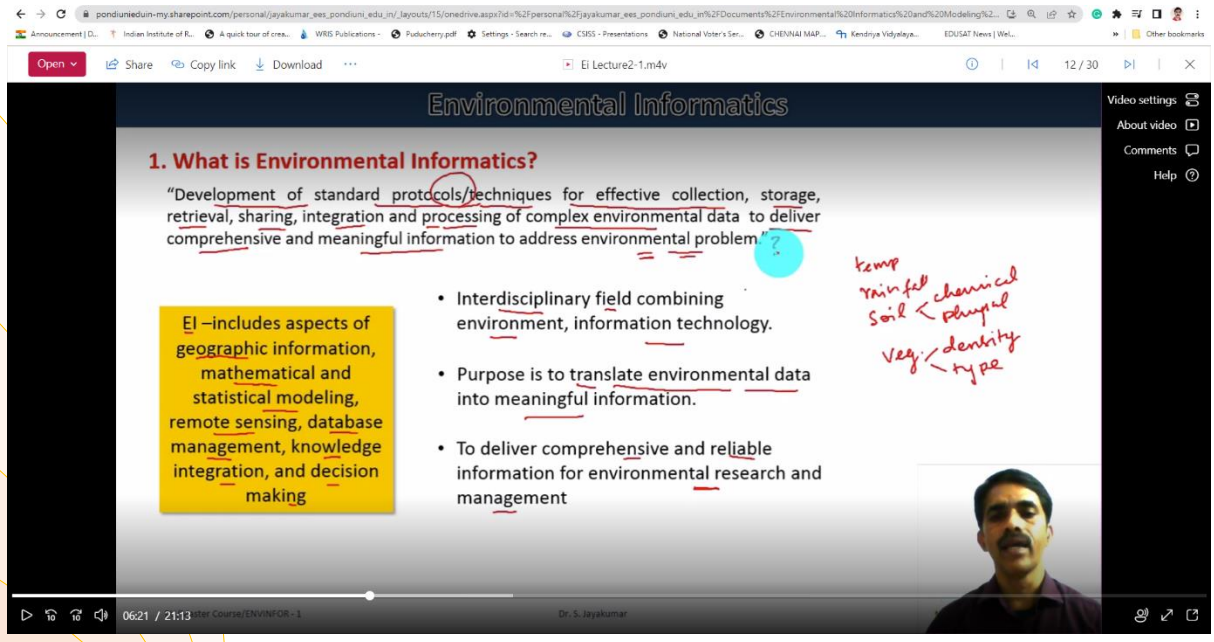
Video Lectures stored in Microsoft One drive



Introduction to Environmental Informatics



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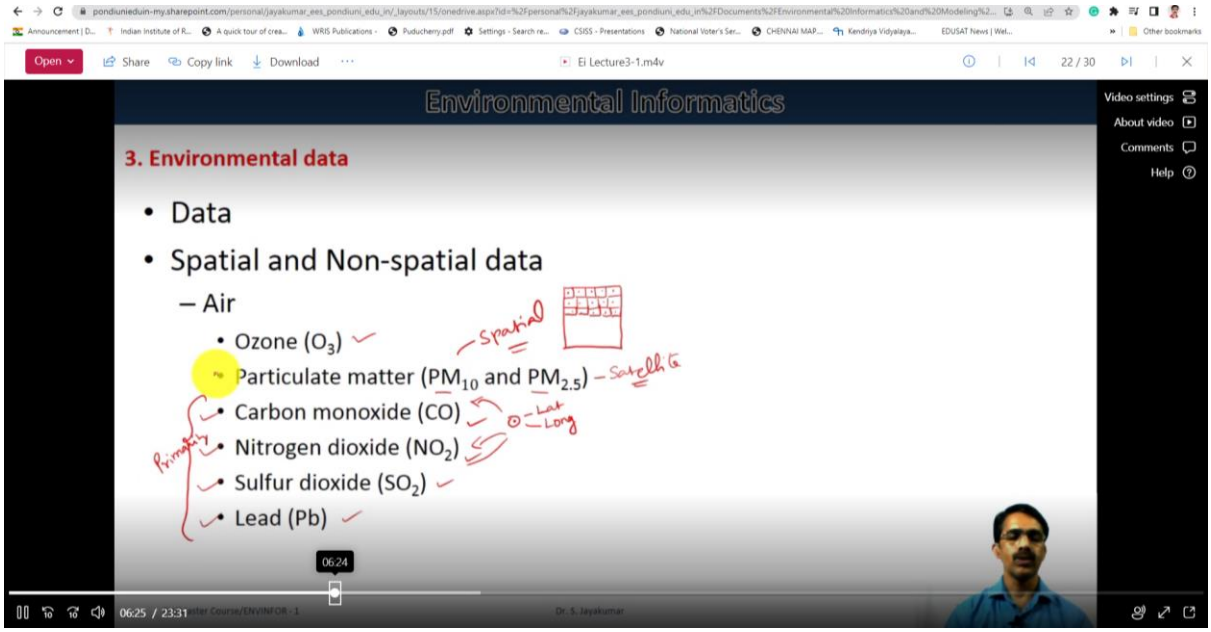
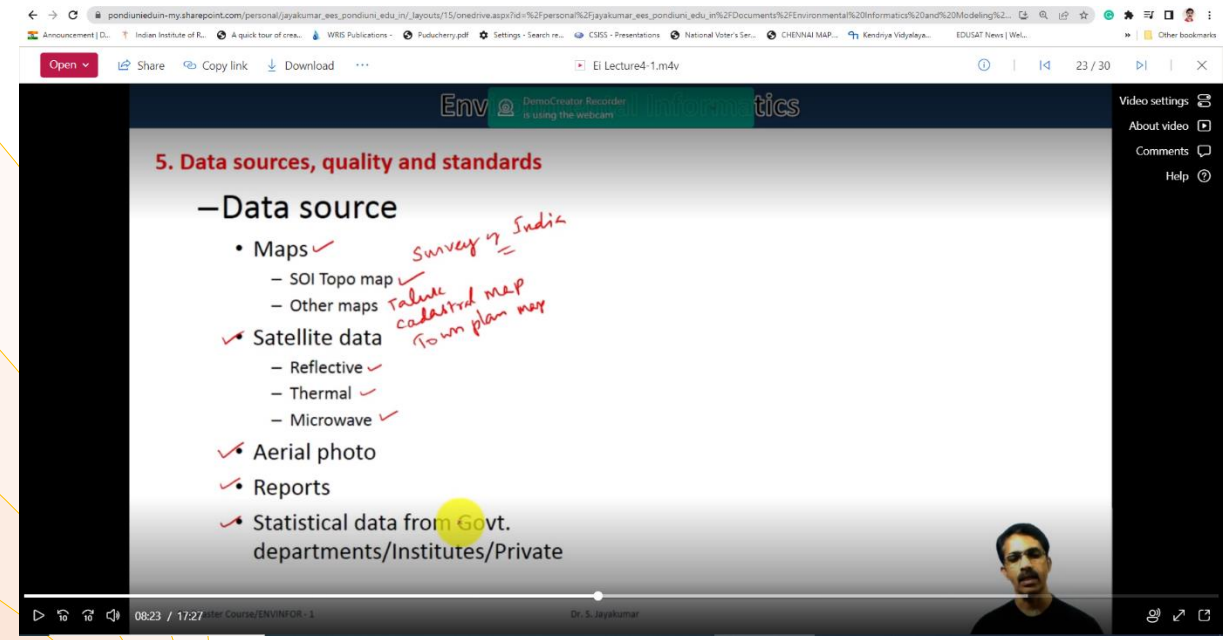
Environmental Data



Data Sources, quality and data standards



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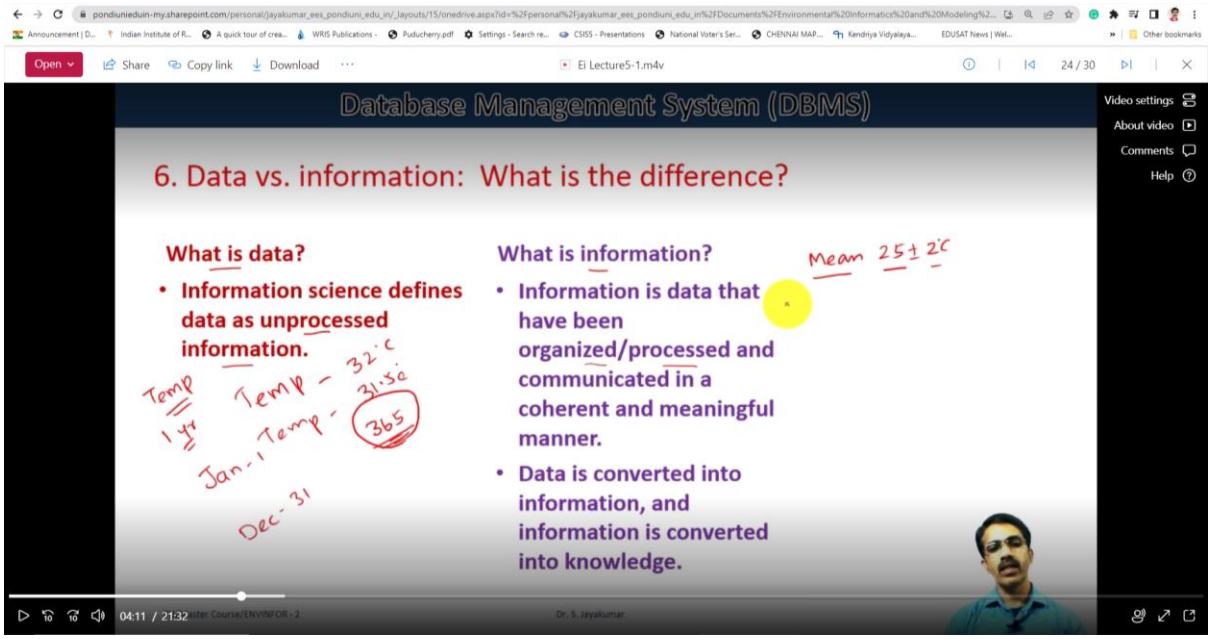
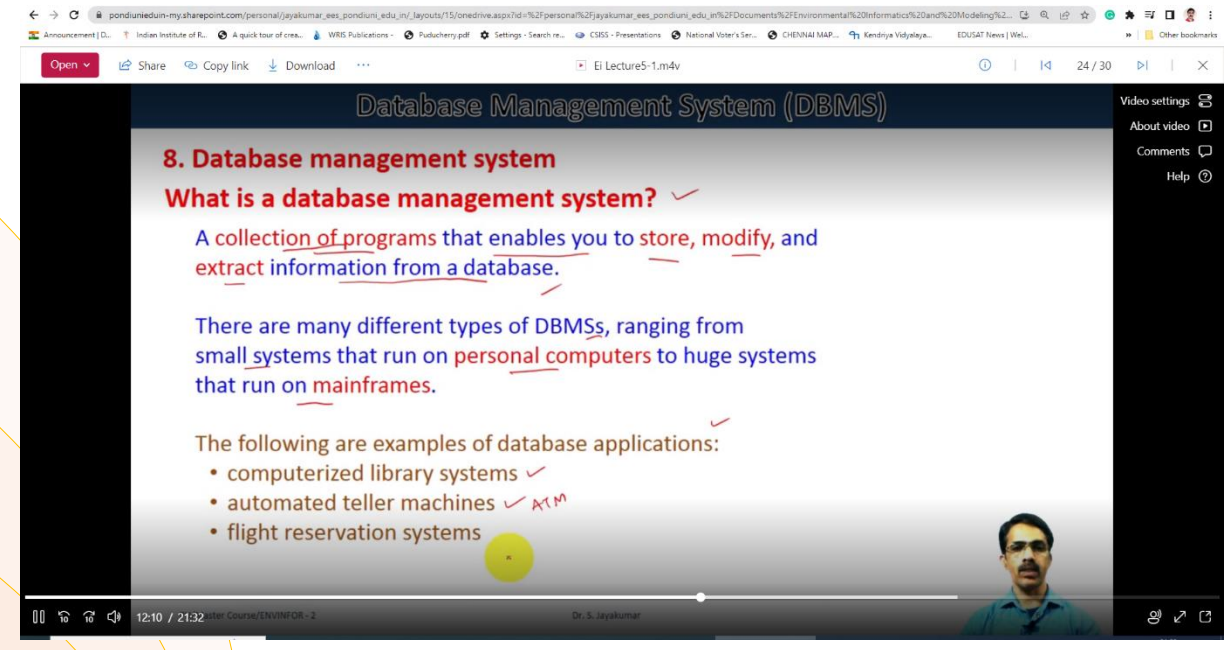
Data vs Information



Database management system



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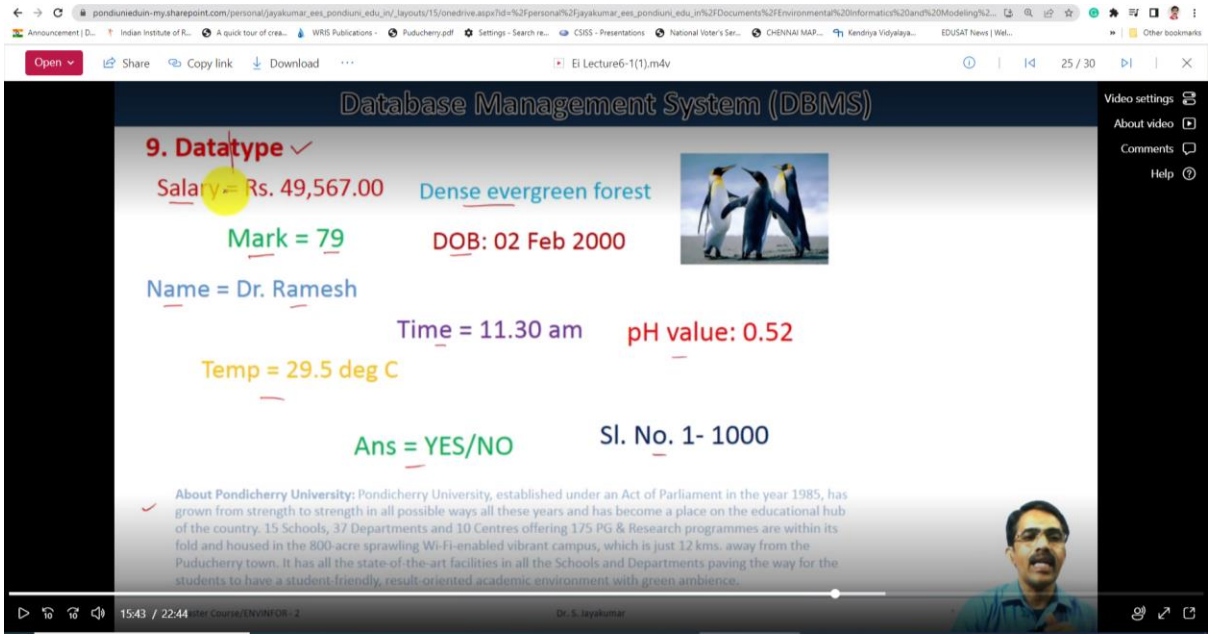
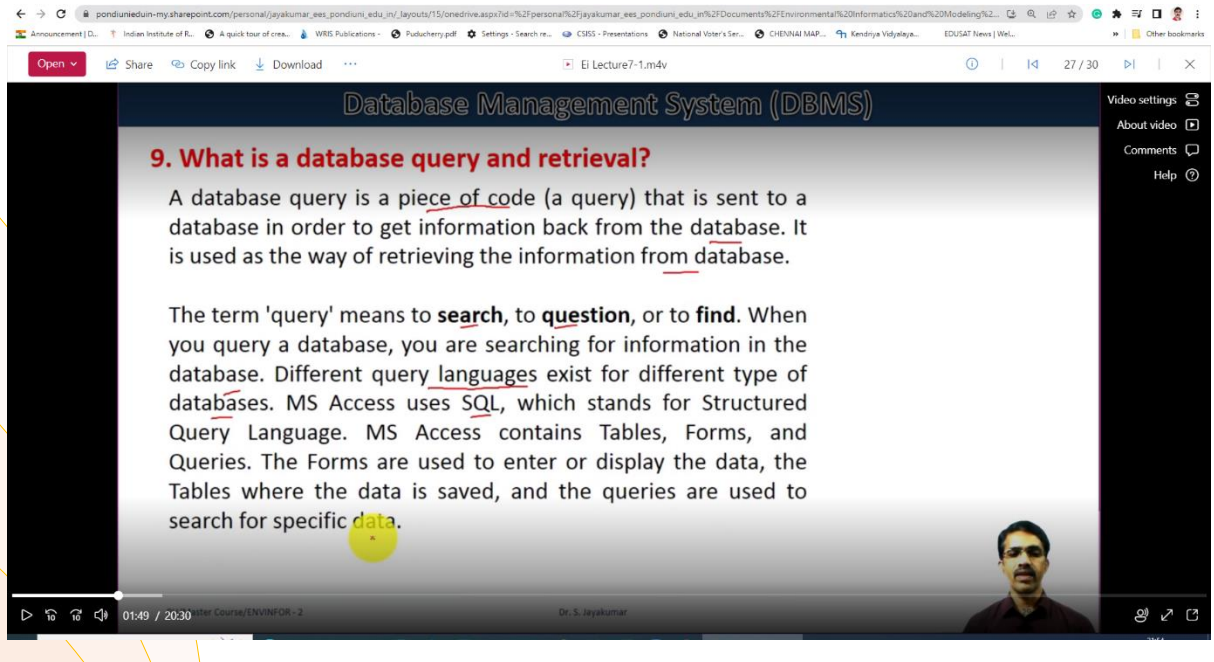
Data types



Database query and retrieval



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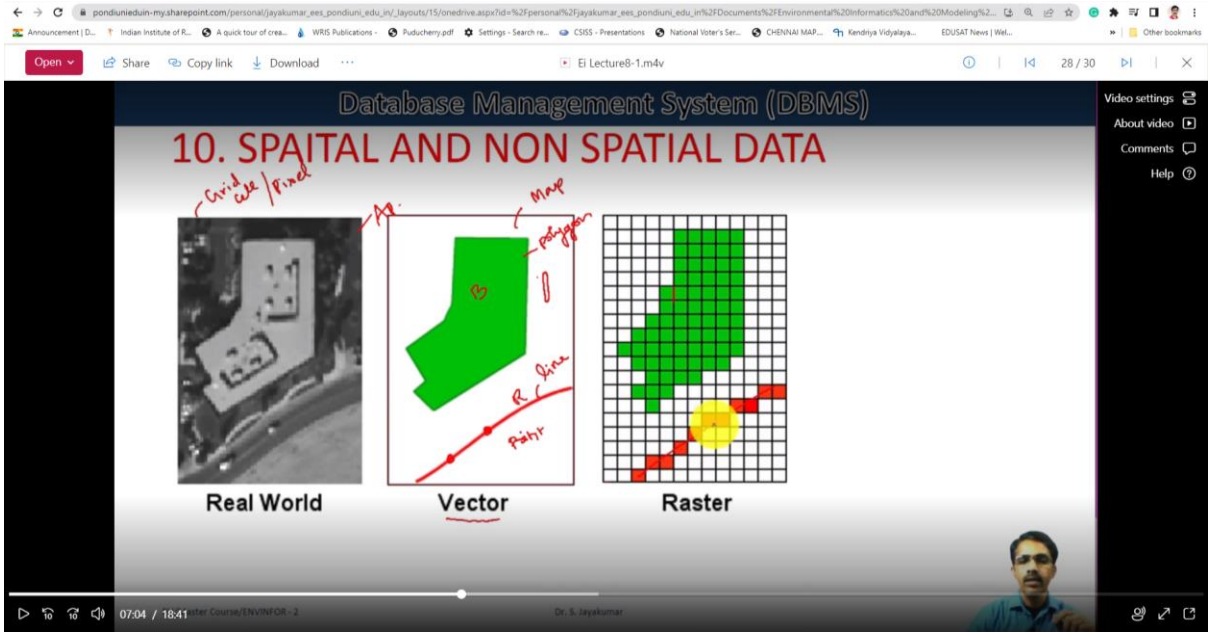
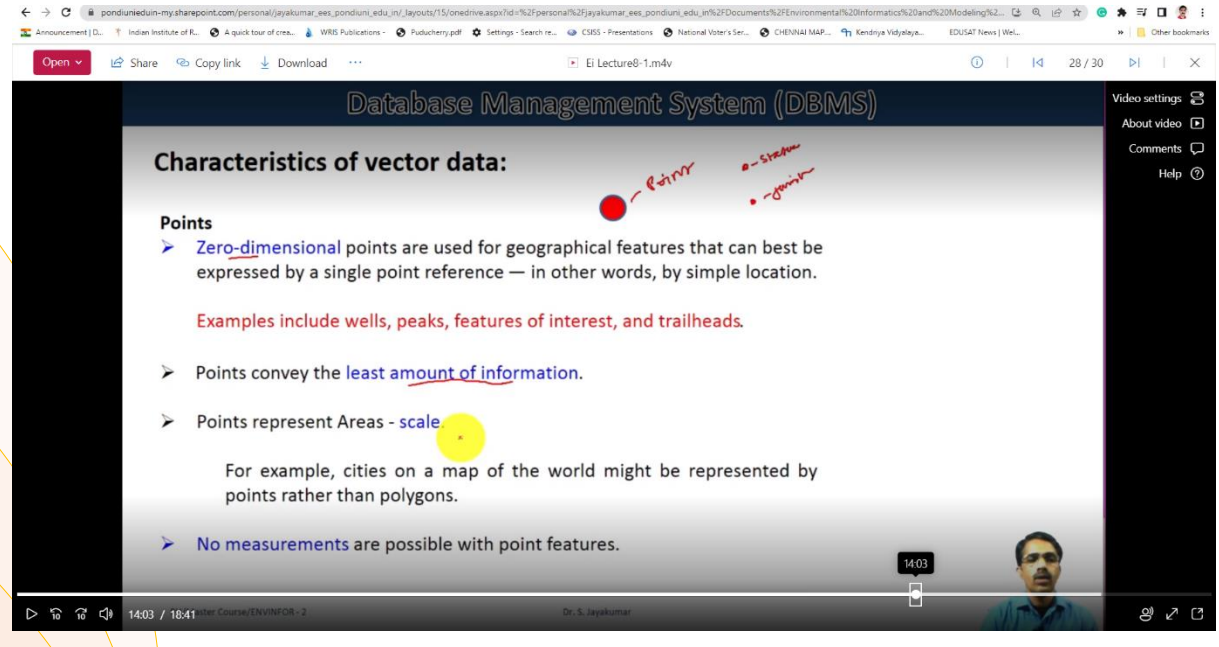
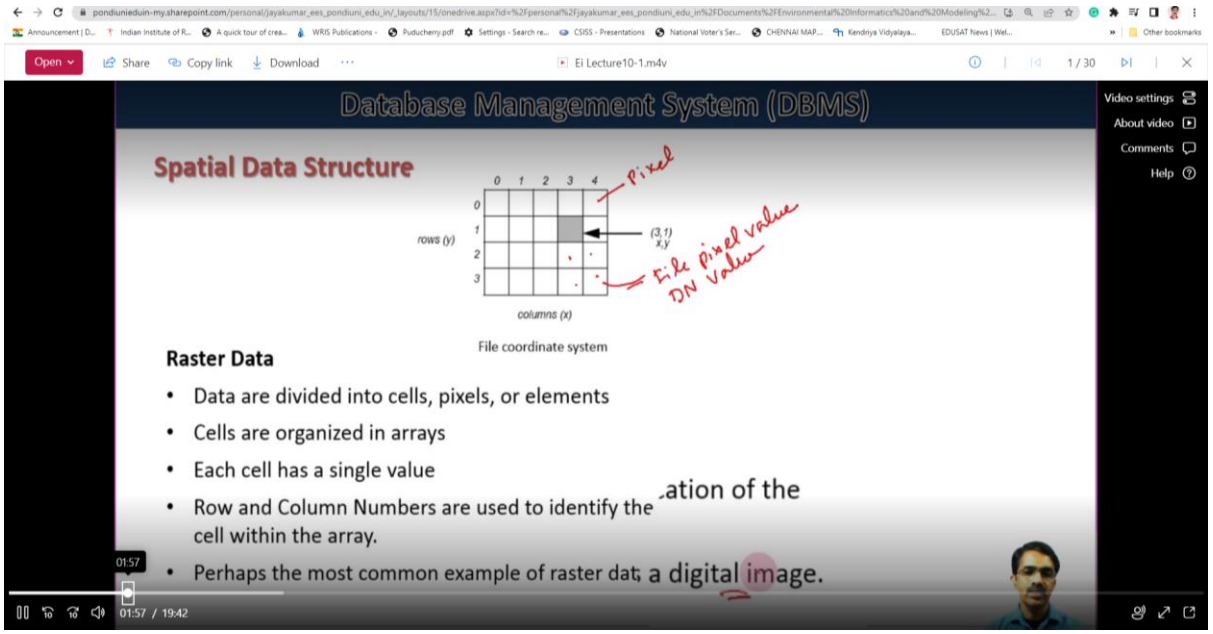
Spatial and Non-spatial data



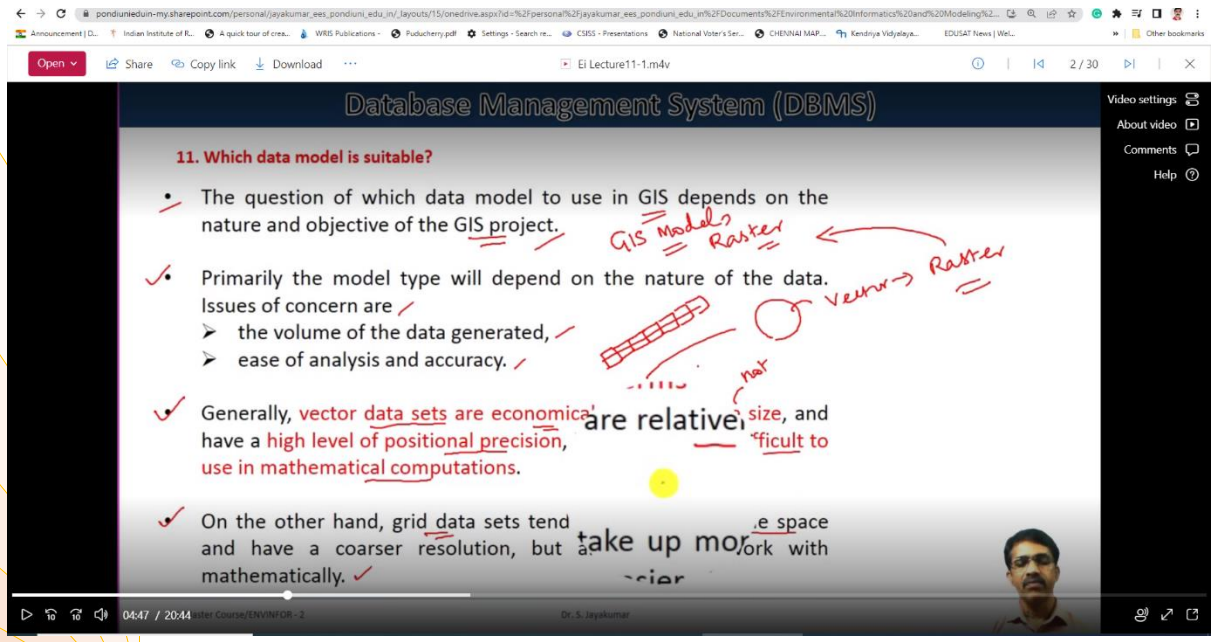
Characteristics of vector data



Spatial data structure



Which data model is suitable?



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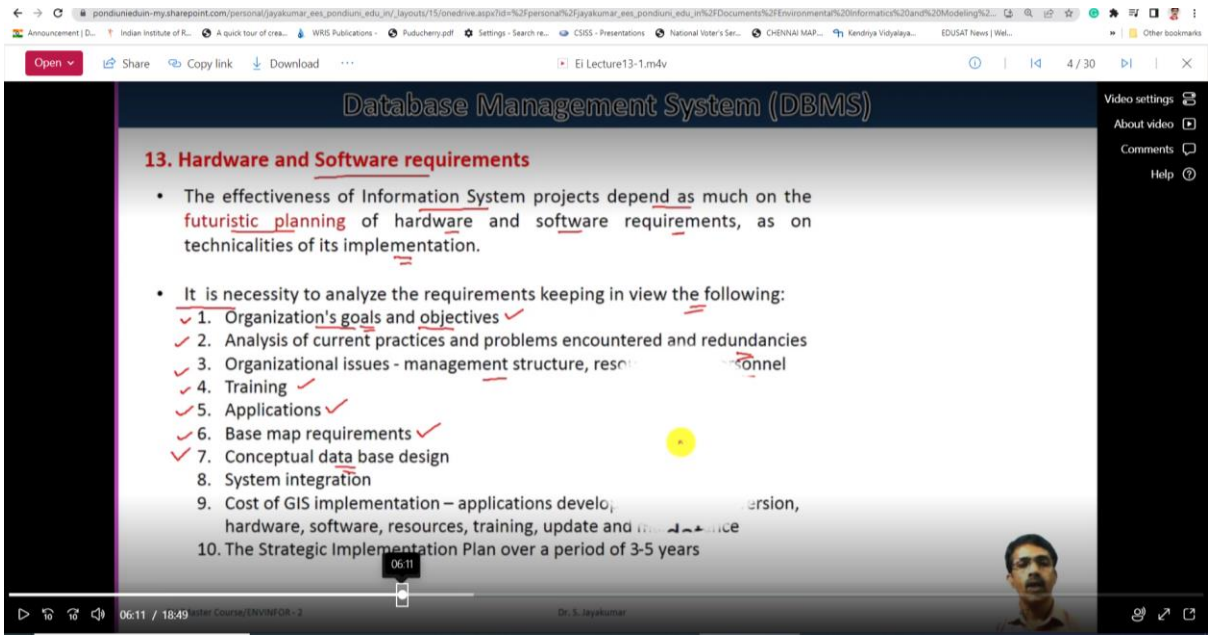
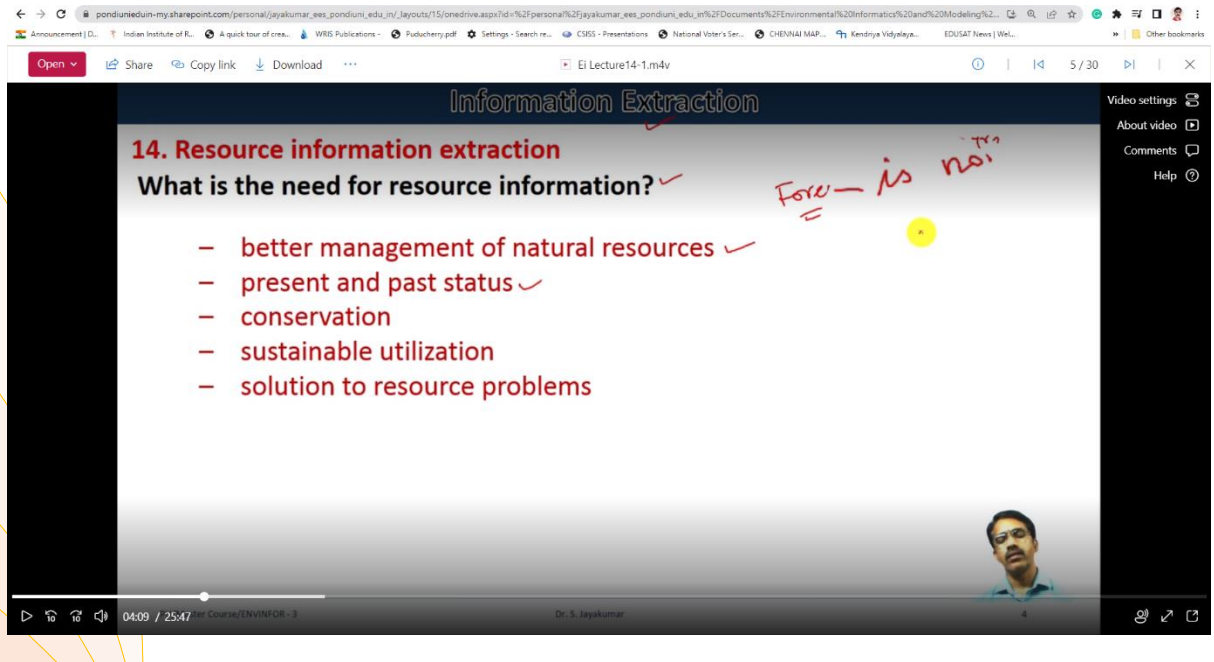
Hardware and software requirements



Resource information extraction



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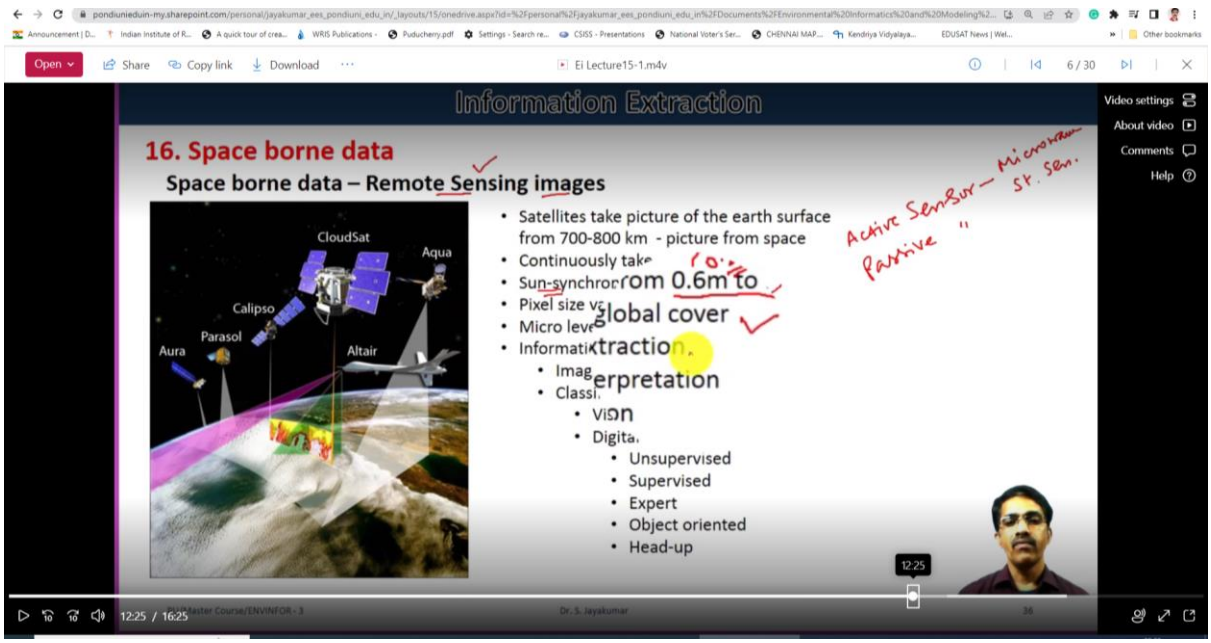
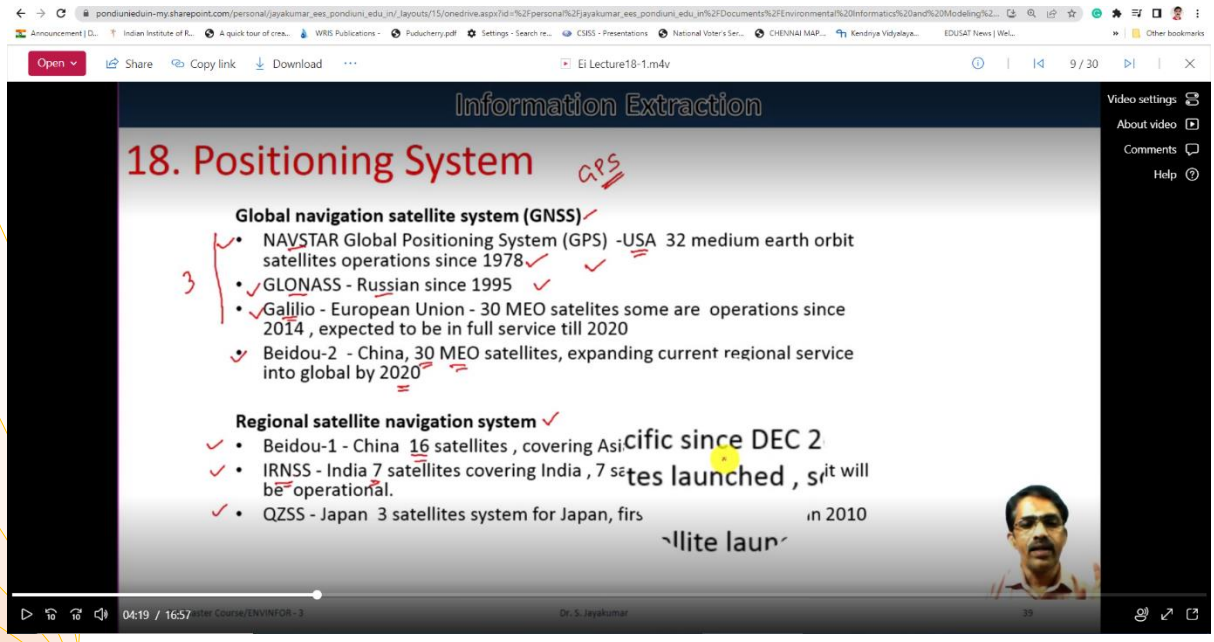
Space-borne data



Positioning system



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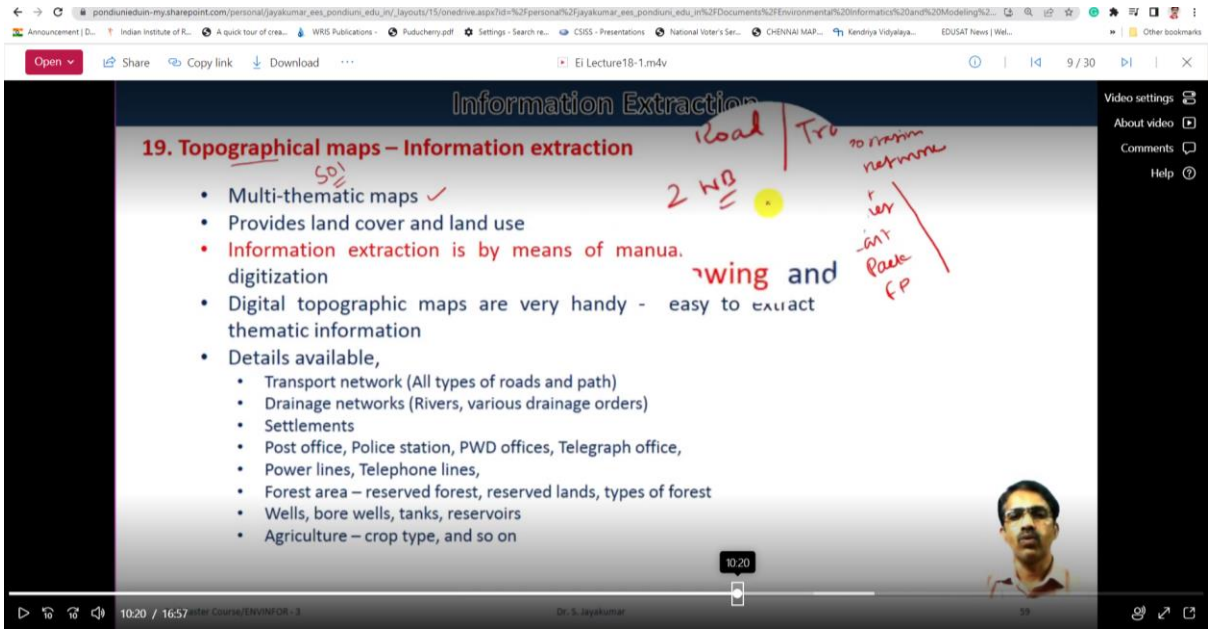
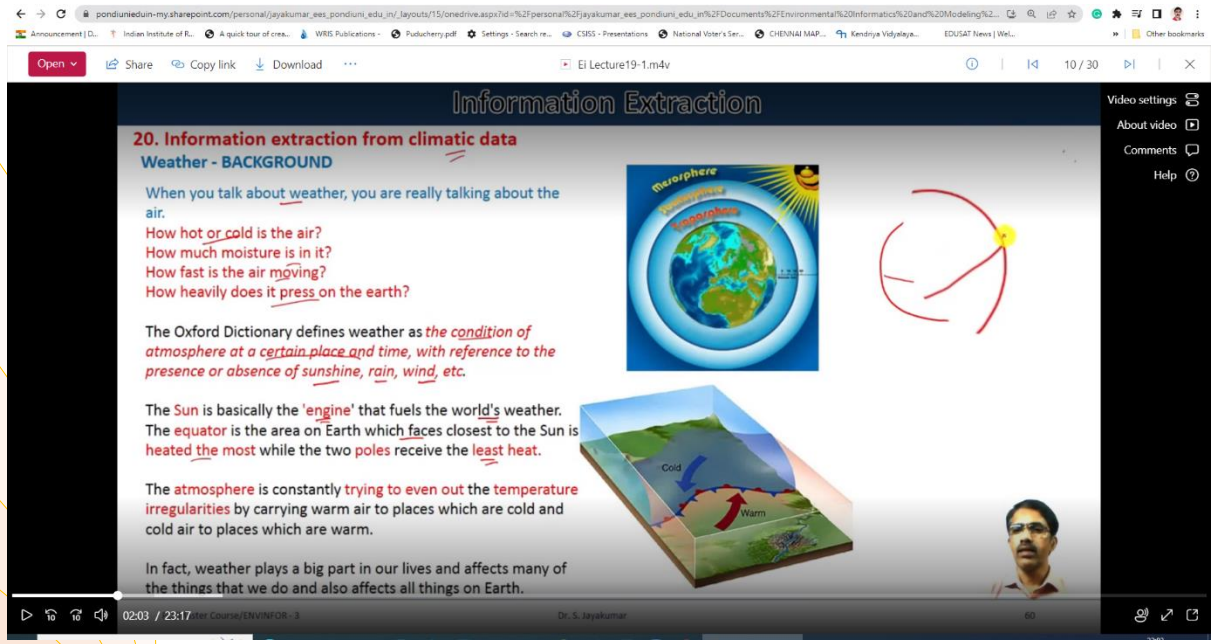
Information extraction from topographic map



Information extraction from climatic data



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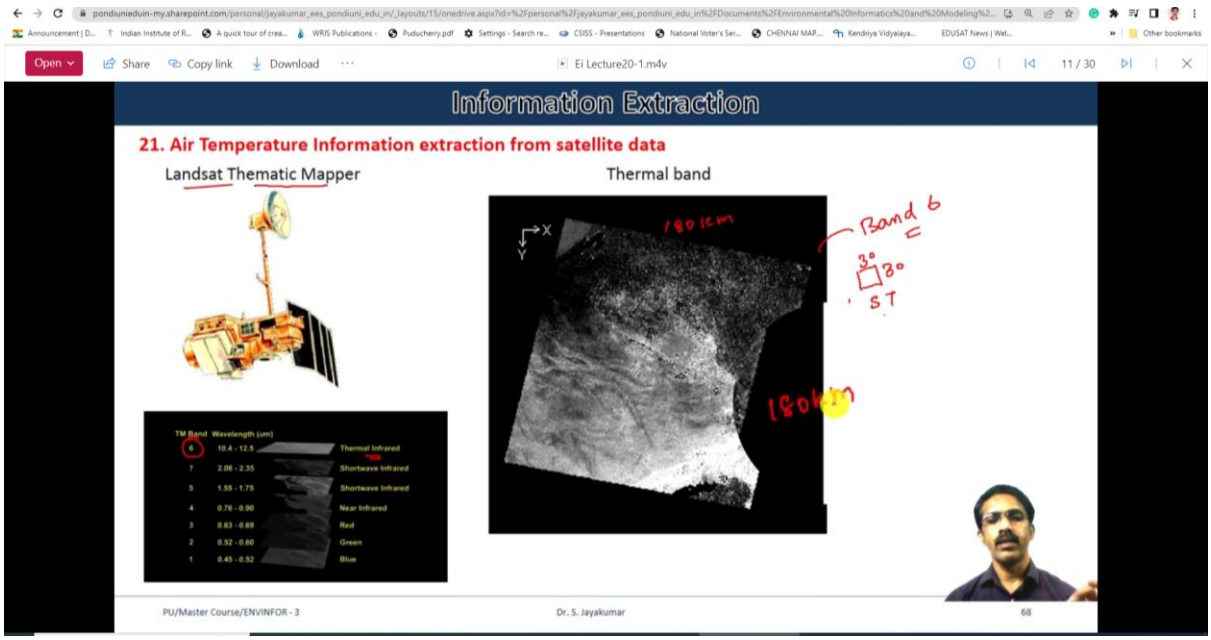
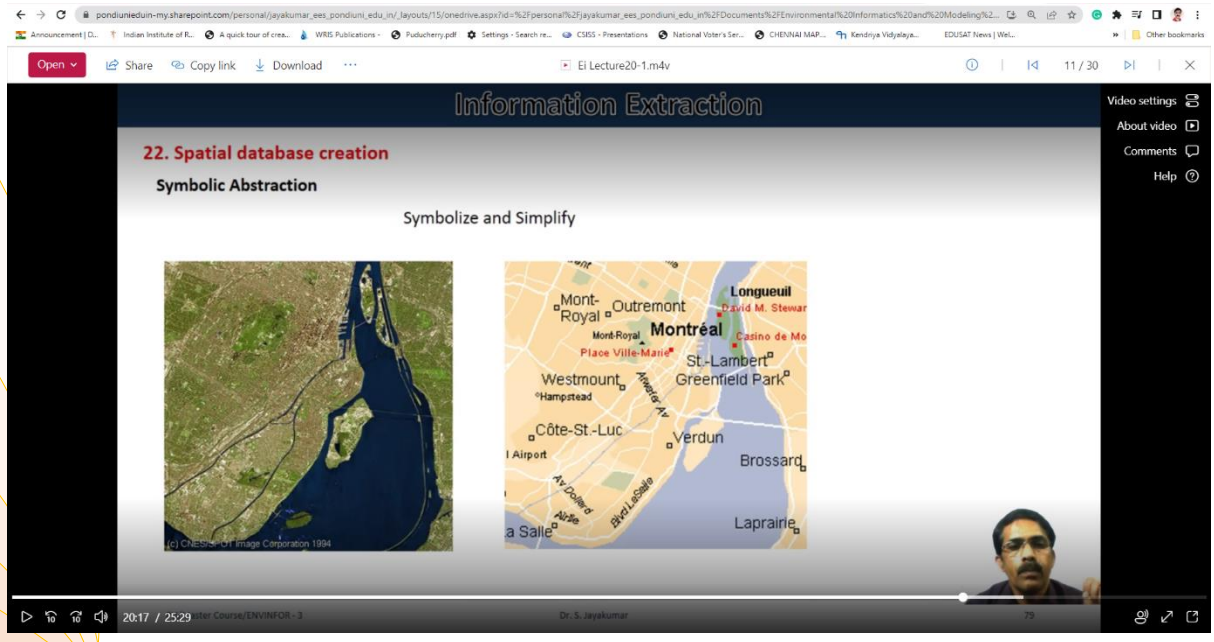
Surface temperature extraction from satellite data



Spatial database creation



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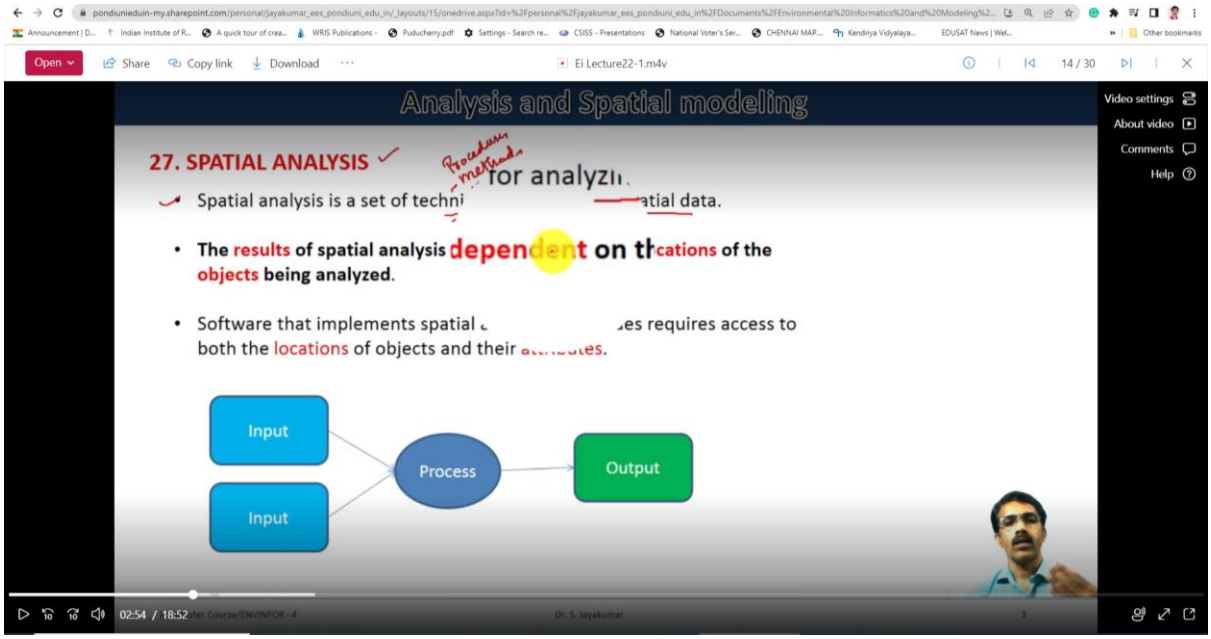
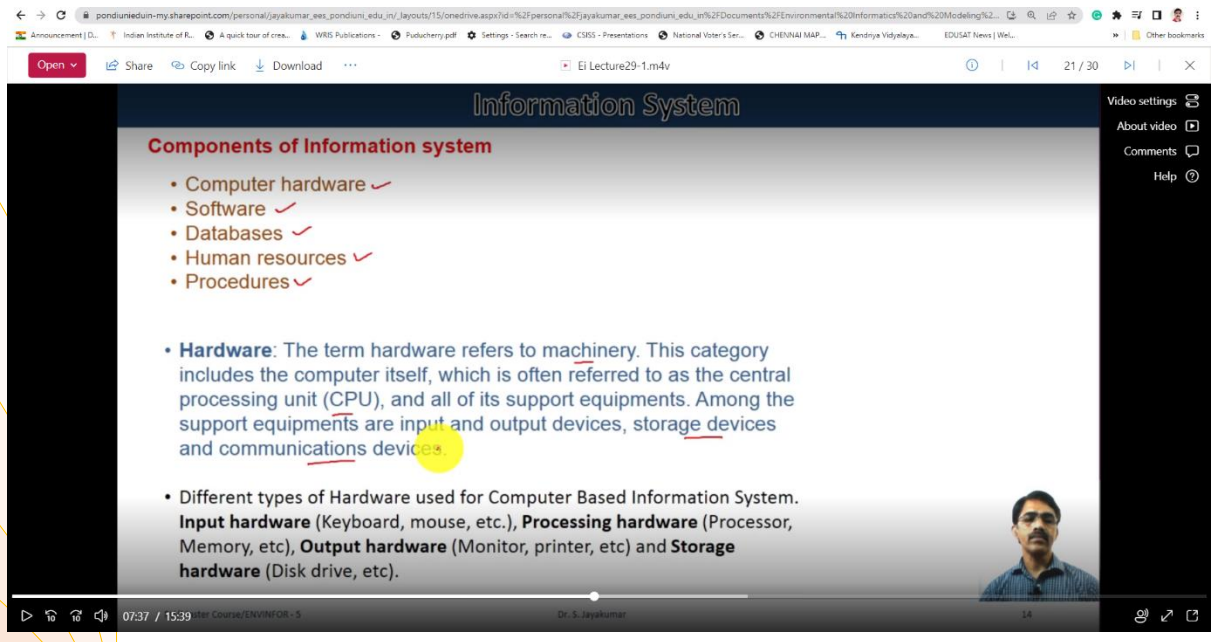
Spatial data analysis



Components of Information system



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5. Course structure

5.c. In-class discussion

The main focus of discussion would be to understand the database management system, basic structure and function of information system

5.d. In-class assignments & field assignment

To understand information extraction from different data sources, basic framework of data collection, sampling, data quality standards

5.e. Reading and discussion of assigned papers for seminars

To understand the application of environmental informatics in various sectors, how do institutions make use of environmental informatics for better management of resources, how do people benefit of it, how to improve the information system more robust and user friendly.

5.f. Group project presentation

Ability to make presentation, effective communication, critical interpretation of data, response to audience

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Ability to make presentation, effective communication, critical interpretation of data, response to audience

6. Course Assessment

Type of assessment	Percentage of Marks
In-class discussion	5
Assignment	5
Seminars	10
Group projects	10
Internal assessment test (MCQ types)	10
Final assessment	60
Total	**100**

7. References

1. Bungartz, HJ, Kranzlmuller D and Weinberg, V 2019. Advances and New Trends in Environmental Informatics: Managing Disruption, Big Data and Open Science Springer Publication. ISBN-13: 978-3030076191.

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5. Maguire, D., Batty, M., Goodchild, M., (Eds.) 2005, GIS, Spatial Analysis, and Modeling, Esri Press, 496 pages, ISBN-13: 978-1589481305.

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7. Jorgensen, S. E., Chon, T-S., Recknage, F. A., 2009. Handbook of Ecological Modeling and Informatics, WIT Press, 448 pages, ISBN-13: 978-1845642075.