



भारतीय प्रौद्योगिकी
संस्थान
(भारतीय खनि विद्यापीठ)
धनबाद

IIT
ISM

**INDIAN INSTITUTE
OF TECHNOLOGY**
(INDIAN SCHOOL OF MINES)
DHANBAD

GPC510 - Well logging

Semester - Winter 2025; Lecture-1

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INSTRUCTOR

- **Name:** Partha Pratim Mandal
- **HDR:** PhD, Curtin University
- **Background:** Geophysics, Rock-physics, Reservoir Geomechanics & Petroleum Engineering
- **Industry Experience:** 8+ years in oil & gas industry
- **Research Focus:** Petrophysics, Geomechanics, rock physics, CCUS, and green hydrogen
- **Interests:** Scientific adventure, STEM, mentoring, start-up development
- Visiting scientist (CSIRO), External consultant, Vice-president ASEG WA branch, ARMA social media coordinator
- Webpage: <https://parthapmandal.com/>

INTRODUCE YOURSELF

- **Name:**
- **Background:**
- **Interests:**
- **Motivation:**

TEACHING OUTLINE

Week 1

Tutorial 1 – Introduction, teaching overview, and assessment

Tutorial 2 – Well log definition, history, log format, types, units

Tutorial 3 – Borehole effects, environmental impacts

AGENDA

- Introduction
- Objectives
- Assessment
- Case study
- Python installation
- Reference books

INTRODUCTION

- Study of rocks – Outcrop, surface geophysics, and drilling data



SEDIMENTARY ROCK

Sedimentary rocks are formed from deposits of pre-existing rocks or pieces of once-living organism that accumulate on the Earth's surface. If sediment is buried deeply, it becomes compacted and cemented, forming sedimentary rock. These rocks often have distinctive layering or bedding and create many of the picturesque views of the desert southwest. Sedimentary rocks are classified into three groups: **Clastic**, **Biologic**, and **Chemical**.

Cementation: The process by which clastic sediments become lithified or consolidated into hard, compact rocks, usually through deposition or precipitation of minerals in the spaces among the individual grains of the sediment.

Compaction: The process of consolidating fine-grained sediments into rock.

Lithification: The conversion of loose sediment into solid sedimentary rock. Several processes, including compaction of grains, filling of spaces between grains with mineral cement, and crystallization act to solidify sediment.

OBJECTIVES

- Learn different types of well logging tools, tool design, borehole effects and application
- Aware of usability of each tool's function in resource characterization (hydrocarbon, mineral exploration, geothermal, groundwater, etc)

ASSESSMENT

- Group based case study work & presentation – 20 marks
- Demo tool design concept assignment & viva – 10 marks
- Mid semester – 28 marks
- End semester – 42 marks

CASE STUDY

- Instructor will create group with 4 members
- Do the case study and make a group presentation for 15 minutes + 5 minutes Q & A
- Schedule – 1st week of April
- Case study – Available week 2 with instruction and log data

PYTHON PACKAGE

- Installation of anaconda
[<https://www.anaconda.com/products/distribution>]
- Pathways to start basic python learning – Software carpentry [<https://software-carpentry.org/lessons/>]
- Python for Everybody [<https://www.py4e.com/lessons>].
Complete lessons 3 to 8
- Introduction to Python in Earth Science Data Analysis –
Maurizio Petrelli

REFERENCE BOOKS

- Bateman, R, M., Open Hole Log Analysis and Formation Evaluation
- Serra, O., Fundamentals of Well Log Interpretation

END OF LECTURE

Optical fiber sensor
data collection



H_2 - CH_4 blend
Underground
Storage Reservoir



Geochemistry
analysis



DNA analysis



Subsurface
simulation
experiments

Thank you

Acid formation (H^+ , H_2S)