

PG8108 Geophysical Inversion 2026:

A. Overview of course content:

Seismic and electromagnetic modeling:

- Kirchhoff integral
- Basic ray theory.
- Finite-difference modeling

Depth migration

- One-way wave equation methods (Gazdag, explicit FD)
- Kirchhoff methods (including Gaussian beam and angle migration)
- Reverse-time migration
- Least-squares migration
- Tomography

Seismic inversion

- Linearized Bayesian inversion
- Least squares and minimum norm pseudo inverse
- Full waveform inversion
- Steepest descent, conjugate gradient, Gauss-Newton
- Sparse inversion (3D SRME)
- Focal mechanisms

Electromagnetic inversion

- CSEM inversion
- MT inversion
- Contrast-source inversion

Joint inversion

- Gravity and magnetic inversion
- Simultaneous inversion of seismic, EM and gravity data
- Geometrical and petrophysical constraints
- Statistical inversion and Bayesian networks.
- Basic machine learning

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B. Literature:

1. Seismic modeling

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2. Electromagnetic modeling

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3. Depth migration

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4. Seismic inversion

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5. Electromagnetic inversion

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6. Joint inversion

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