

APPLIED SEISMOLOGY

Our expertise and knowledge are in the application of seismology to the understanding and imaging of both natural and anthropogenic deformation and fracturing processes in rock and brittle materials, at a range of scales from acoustic emission testing in the laboratory up to microseismic monitoring in the field and regional-scale earthquakes.

Today, we strive to expand the range of applications using acoustic and seismic imaging and source analysis techniques and also integrate new technologies from areas such as photonics, astronomy and data science with geophysical imaging. This is achieved through collaboration with our clients, research and industrial partners in all areas of engineering, environmental, earth and material sciences.

For more information on any of our products or services, please visit our website at:

appliedseismology.co.uk

Applied Seismology Consulting (ASC) has over 20 years of experience in applying the methods and analyses of seismology to a wide range of engineering applications, including fracture imaging and material deformation processes, at all scales from regional earthquake site characterisation to microseismic and acoustic emission studies in the lab. Services are targeted at supplying an integrated work package along the full data path from sensor array design and data acquisition to data processing and interpretation.

We have used the knowledge and experience gained through ASC's range of projects and applications over the years to put together a series of practical and relevant training courses. These training courses are provided at different levels ranging from the basic level to advanced and can be delivered in-house (at our UK office or at the client's office) or alternatively delivered remotely online. ASC can also provide and deliver custom training courses.

Seismic Processing Basics

Seismic, microseismic and acoustic monitoring is a unique tool to image fracture and deformation processes in rocks and brittle materials. This course guides the attendee through the main steps in the processing of seismic events:

- Project setup and array design;
- Seismic event detection;
- Waveform processing, manual and automated phase picking;
- Event location;
- Analysis and exporting of results.

The course includes hands-on tutorials using ASC's InSite seismic processor. A 1-week licence is included in the course for the revision of the example data sets.

Advanced Seismic Processing

This course is designed for those that have followed the Seismic Processing Basics course and now wish to use the advanced tools in the InSite software to extract more information from the seismic record or using the advanced processing options for working on challenging datasets. The course includes the following subjects:

- Optimising autopicking;
- Velocity model calibration;
- Location of events through complex velocity models;
- Locating events without picking;
- Source Mechanisms;
- Advanced analysis: fracture geometry, uncertainty analysis.

The course includes hands-on tutorials using ASC's InSite seismic processor. A 1-week licence is included in the course for the revision of the example data sets.

Fracture imaging and Geological storage

EXAMPLE AREAS OF APPLICATION

- Risk assessment in planning stages of large civil infrastructure.
- Monitoring of structure health and integrity
- Safety monitoring for induced seismicity.
- Stability and risks on geological storage infrastructure
- Imaging of impact of mining operations on structures and surface
- Validation and input into predictive geomechanical models
- Environmental vibration impact of energy and transport infrastructure
- Imaging of paths for fluid migration in geological reservoirs and geological storage

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Identifying, locating and characterising fractures, natural or induced, is a subject of interest in many research areas, from earth to material sciences and industrial applications such as civil engineering, geological storage and energy. This course will provide an overview on the application of acoustic and seismic monitoring in the investigation and imaging of fracturing processes both natural and induced. The course includes hands-on tutorials, processing real-life monitoring projects at different scales, from the laboratory to reservoir scales using ASC's InSite seismic processor. A 1-week licence is included in the course for the revision of the example data sets.

The course may be of particular and relevant interest to those working in the Carbon capture and storage (CCUS) and Geothermal sectors. It is also intended for those with some background in seismic processing and/or interested in extracting more information from their seismic data.

Course objectives:

- Overview of fracture imaging as applied to the areas of Geothermal and CCUS;
- Understand the induction of fractures and generation of acoustic and seismic events;
- Understand how the seismic waveform record is used to reconstruct the source;
- Extract information from seismic catalogues about the geometry and nature of associated fractures;
- Understand the use of active surveys to image fracturing processes.

Introduction to seismology

Earthquakes are natural phenomena that have impacted society since the earliest stages of human settlement. The industrial society, with engineering operations for construction and the exploitation of natural resources have introduced new levels of risk with the potential of triggering or inducing man-made seismic events.

This course presents an overview of the seismic process:

- Earthquake generation and transmission;
- The earthquake cycle;
- Seismic monitoring and detection;
- Parameters characterising events and seismicity;
- Induced seismicity;
- Seismicity at different scales, from tectonic earthquakes to acoustic emissions.

The course is intended for those with some background in geophysics, geology, environmental sciences, mining and civil engineering and those interested in gaining a general understanding of seismic and microseismic events, how they are monitored and studied and how the data processing techniques are applied in both industry and research.

PROFESSIONAL DEVELOPMENT

Provide non-specialist staff with an overview and general understanding of the application of seismic and acoustic monitoring and analysis to their area of expertise.

APPLY

Use advanced commercial software through hands-on training using real-world examples and case studies from a range of seismic monitoring applications.

EXPERT-LED

Courses are taught by ASC geophysicists with many years of experience in the processing and interpreting of seismic data at all scales.

Seismic Array design

The success of a seismic or acoustic monitoring project relies on deploying an optimally designed network of sensors or seismic stations. The course discusses the main variables that impact the performance of the seismic array, such as type of instruments, number of receivers and geometry.

The course includes hands-on exercises to simulate the performance of arrays in different scenarios and engineering applications.

Geophysical imaging

An overview for non-specialists of the main geophysical methods applied to the imaging of the near-surface and engineering structures:

- Seismic surveying and VSP;
- Ground Penetrating Radar;
- Gravimetry;
- Well-logging;
- Resistivity;
- Electromagnetic methods.

InSite short courses

A series of short 2-hour courses for users of the InSite seismic processing software, exploring advanced or lesser-known tools such as:

- Source Scan location;
- Velocity model calibration in InSite-HF;
- Tool orientation;
- Optimising event location.

Custom courses

ASC can also provide custom, bespoke courses to meet your specific training requirements. Please contact us with your requirements. Such custom courses could include for example:

- Custom/bespoke InSite training courses;
- Acoustic Emission and ultrasonic monitoring and data processing;
- Wave propagation and rock physics.
- Data science and machine learning.



For more information on any of our products or services, please visit:

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