



Recommended pre-sessional tests and reading resources for MSc Geophysics

This document includes:

- (1) links to four Maths diagnostic tests that offer holders are *strongly encouraged* to complete to test and refresh their Maths knowledge ahead of the start of teaching;
- (2) a list of recommended textbooks, especially for students needing a refresher in Earth Sciences or Maths/Physics;
- (3) a suggested general reading list providing introduction to the various courses of the programme.

1. Maths diagnostic tests and self-study resources

Find below links to four diagnostic tests, for you to check your knowledge on these four foundation maths topics.

If you are stuck on any question you can click 'reveal answer', which will show you advice and the steps to complete the question (you may need to scroll down to see the advice). You can then try again a similar question by clicking 'try another question like this one'.

We will not cover these topics as part of the Maths Refresher course in teaching week 1, and it is assumed that you will self-study if you need to. You can use the resources suggested for revision and/or self-teaching. If you have questions on any of these, you can [request an appointment for maths support](#), or email the Student Learning Service at: sls@abdn.ac.uk.

You may find the facts and formulae leaflets of MathCentre useful while doing your practice/revisions:

[Facts and Formulae](#) and [Probability and Statistics Facts Formulae and Information](#).

These additional two leaflets may be useful for the Maths Refresher course and throughout your MSc programme:

[More Facts and Formulae](#) and [Mechanics Facts and Formulae](#).

Basic Algebra

Diagnostic test for [Basic Algebra Manipulations](#).



Further resources: Workbook 1 Basic Algebra of [HELM](#) as well as [Solving Linear Equations](#), [Solving Quadratic Equations](#), [Partial Fractions](#), [Logarithms](#) and [The Logarithmic Function](#).

Trigonometry

Diagnostic test for [Trigonometry](#).

Further resources: workbook 4 Trigonometry of [HELM](#).

Vectors and polar coordinates

Diagnostic test for [Vectors and Polar Coordinates](#).

Further resources: workbook 9 Vectors (sections 9.1, 9.2, 9.3 and 9.4) of [HELM](#), as well as [Polar Coordinates](#).

Basic Probabilities and Stats

Diagnostic test for [Basic Probabilities and Statistics](#).

Further resources: workbooks 35 Sets and Probability and 36 Descriptive Statistics of [HELM](#).

Regression Analysis

Further resources: The [statstutor website](#) has short handouts on simple and multiple regression analysis:

- Simple linear regression: [Teach Yourself 1](#), [Teach Yourself 2](#), [Reliability of SLR](#)
- Multiple linear regression: [Teach Yourself](#)

HELM also has a [workbook 43.1 on Regression](#).



2. Recommended reading (Background Mathematics and Geology)

These readings are highly recommended for students who feel they may need a refresher in Physics/Maths or in Earth Sciences, prior to starting the MSc Course:

- Stroud, K. A. & Booth, D. J. 2013. Engineering Mathematics (7th Edition), Palgrave Macmillan.
- Grotzinger, J. P. & Jordan, T. H. 2014. Understanding Earth (7th Edition), W.H. Freeman.

3. Suggested topical reading list

Earth Physics and Processes:

- Allen, P.A. & Allen, J.R. 2005. Basin analysis: principles and applications to petroleum play assessment (3rd Edition). Oxford, Wiley-Blackwell, 560 pp.
- Turcotte, D. L. & Schubert, G. 2014. Geodynamics (3rd Edition). Cambridge University Press, 636 pp.

Time Series Analysis:

- Gubbins, D. 2004. Time Series Analysis and Inverse Theory for Geophysicists. CUP, 272 pp.
- Lyons, R. G. 2010. Understanding Digital Signal Processing (3rd Edition). Prentice Hall, 984 pp.

Near Surface and Field Geophysics:

- Milsom, J. & Eriksen, A. Field Geophysics (4th Edition), Wiley.
- Kearey, Brooks & Hill. An Introduction to Geophysical Exploration (3rd Edition), Blackwell.
- Telford, W.M., Geldart, L. P. & Sheriff, R. E. Applied Geophysics
- Everett. Near Surface Applied Geophysics, CUP
- Reynolds JM. An introduction to applied and environmental geophysics, Wiley

Seismology and Seismic Reflection Processing, Imaging and Interpretation:

- Shearer, P.M. 2009. Introduction to Seismology (2nd Edition), CUP.
- Aki, K. & Richards, P. G. 2002. Quantitative Seismology (2nd Edition), University Science Books.
- Lay, T & Wallace, T. C., 1995, Modern Global Seismology, Elsevier.
- Helffrich, G., Wookey, J. & Bastow, I. 2003. The Seismic Analysis Code: A Primer and User's Guide, CUP .
- Sheriff, R.E. & Geldart L.P. 1995. Exploration Seismology (2nd Edition). Cambridge, CUP, 628 pp.
- Yilmaz, O. 2001. Seismic Data Analysis, Society of Exploration Geophysicists, 2027 pp.

Borehole Geophysics:



- Rider, M. & Kennedy, M. 2011. The geological interpretation of well logs (3rd Edition). Sutherland, Rider-French Consulting Ltd, 440 pp.

Machine Learning in Geophysics:

- Andreas C. Müller, Sarah Guido, Introduction to Machine Learning with Python: A Guide for Data Scientists, O'Reilly Media, 2016
- Géron Aurélien, Hands-On Machine Learning with Scikit-Learn, Keras, and Tensorflow: Concepts, Tools and Techniques to Build Intelligent Systems, O'Reilly Media, 2019.
- Bishop, Christopher M., Pattern Recognition and Machine Learning. New York :Springer, 2006.
- Francois Chollet, Deep Learning with Python, Manning, 2017.
- Cranganu Constantin, Henri Luchian, and Mihaela Elena Breaban, Artificial Intelligent Approaches in Petroleum Geosciences, Springer International Publishing, 2015.
- Siddharth Misra, Hao Li, Jiabo He, Machine Learning for Subsurface Characterization, Elsevier, 2020

Project disertation writing:

- Strunk, W. & White, E. B. (2000). The Elements of Style. 4th ed. New York: Longman
- Turabian, K. L. (2018). A Manual for Writers of Research Papers, Theses, and Dissertations. 9th ed. Chicago: The University of Chicago Press