Planetary Geology

(Module ESC-10019)

Module Overview:
"Planetary Geology" studies geological processes on Planet Earth and compares them with those observed on other planetary bodies in our Solar System.

Planetary geology is a fast evolving subject with new information coming from the Magellan mission to Venus, Spirit and Opportunity rovers on Mars and the Galileo mission to the Jovian satellites among others and several other planetary missions ongoing. Specific topics covered on the course include:

- solar system origin and formation;
- the geology of planet Earth, plate tectonics, volcanoes and earthquakes;
- impact cratering and the geology of our Moon;
- the geology of Mars and Venus;
- the geology of the satellites of Saturn, Jupiter, Uranus and Neptune;
- planetary surface processes (wind, water, ice, tectonics, gradational, impacts, volcanism etc.)

The IT/Numeracy dimension to the module comes in the practical classes with manipulation of planetary surface images and digital elevation models, interpretation of planetary images using presentation software and production of a web page on an aspect of planetary geology.

Module Availability:
"Planetary Geology" is available as part of the IT/Numeracy Stream of the Complementary Studies Programme (CSP). It runs during the Spring Semester when it is taught at the following times:

- Lectures : Wednesday 9.00-10.00 am
- Practical classes [Alternate Weeks]: Wednesday 10.00-11.00 am (repeated 11.00 am-12.00 noon and 12.00-1 pm)

The module is available to all students as part of the CSP programme.

An equivalent version of this module, called "Geology of the Planets", is available to Science Foundation Year (SFY) students.

Module Content:
Lectures:

Week	Title and Description
1	Introduction : Overview of course structure and arrangements for practical classes. Introduction to planetary geology and solar system formation.
2	Comets, meteorites and asteroids : The space travellers of our solar system hold some important clues to planetary origin, structure and composition.
3	Remote sensing : Images of planetary surfaces provide the main source of information about them. Find out how they are acquired and processed to give us something that we can study and interpret.
4	Internal Structure of the Earth : Using earthquake waves and the Earth's gravity we can image what is going on inside our planet and what this implies for other planets.
5	Plate Tectonics and Volcanism : The outer shell of the Earth is divided into several tectonic "plates". These all move relative to each other and influence the way the surface is deformed and the type and location of volcanoes and earthquakes.
6	Surface Processes : The actions of wind, water, ice and the movement of material downslope all modify the planetary surfaces. Learn how to identify the different landforms they produce.
7	Impact Cratering and the Geology of the Moon : Impact craters are the most common process of modifying planetary surface. The Moon's geology will be examined, as well as it's origin - itself probably due to a giant impact.
8	Geology of Venus: Venus is commonly regarded as being the Earth's twin but the reality is quite different. Just what is going on under the clouds of sulphuric acid?
9	Geology of Mars : Mars hosts a treasure trove of geological features including a volcano three times the height of Everest, a canyon 4000 km long and evidence of massive floods.
10	Geology of the Jupiter System : The Galilean satellites of Jupiter are four very contrasting worlds forming their own minature solar system from the volcanic Io, icy Europa, tectonic Ganymede and geologically dead Callisto.
11	Geology of the Saturn System : The satellites of Saturn are many and varied including the giant Titan, larger than Mercury. Find out about these strange, icy worlds.
12	Geology of Uranus and Neptune Systems is even stranger. At the outer limits of our solar system what where thought to be balls of ice.

Practical classes:

Weeks	Title
2 or 3	Writing Web Pages
4 or 5	Digital Terrain Modelling
6 or 7	Image Processing
8 or 9	Landform Interpretation
10	[Trouble-shooting web-site exercise - if necessary]

Assessment:

The assessment of this course will be based upon the following components:

Description	Weighting	Deadline
Four short in-course tests	10% each	Weeks 4, 7 ,10 & 12
Meteorites web page	10%	Two weeks after practical
Landform PowerPoint	10%	Two weeks after practical
Virtual poster on an aspect of planetary geology	40%	End week 12

In addition, students will receive informal feedback on their progress during practical classes

Recommended Reading and Further Information:

- Greeley, R. Planetary Landscapes, Chapman & Hall
- Beatty, J.K., Peterson, C.C. & Chaikin, A. (Editors) The New Solar System, Cambridge
- Rothery, D.A., Satellites of the Outer Planets: Worlds in their own right, Oxford

For further information and questions about this module please email:

geo@esci.keele.ac.uk