

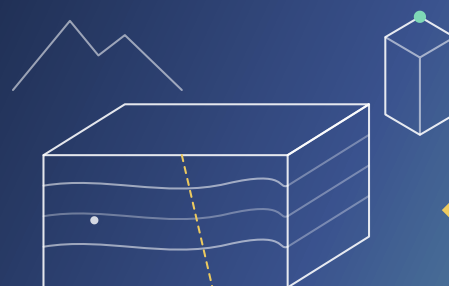
Module code

SPG-3413

Type of module

Undergraduate: Geosciences – Elective

Igneous and Metamorphic Petrogenesis



Modular credits

4

Total student
engagement

56 hours

Prerequisite

**SPG-1201 Introduction
to Crystallography and
Mineralogy**

Anti-requisite

None

Aims

To equip students with advanced knowledge and skills to interpret the formation and evolution of igneous and metamorphic rocks. It integrates geochemical, thermodynamic, and isotopic approaches to understand petrogenesis and explores Earth's history, tectonics, and resources using modelling and experimental petrology.

Module learning outcomes (MLO)

On successful completion of this module, a student will be expected to be able to:

MLO 1

Analyse the evolution of Earth across different regions and geological timeframes, and key petrogenetic processes on Earth and other planets.

MLO 2

Apply thermodynamic principles to analyse magmatic and metamorphic systems, and Interpret data from scientific papers to investigate petrogenetic reactions.

MLO 3

Organise information from research articles and critically analyse their findings, and assess temperatures and pressures of rock formation using geochemical data.

MLO 4

Critique methodologies in professional publications related to petrogenesis, and develop models or simulations to predict magmatic or metamorphic processes.

MLO 5

Propose innovative approaches to study petrogenetic systems using modern tools like isotopic analysis or experimental petrology.

Module contents

Origin of elements and minerals on Earth, exploring Earth's interior, geothermal-geobarometric gradients, mantle: the Earth's thermal engine, formation of rock textures

Fundamentals of thermodynamics, the phase and lever rules in igneous and metamorphic systems

Phase equilibria, unary, binary, ternary systems

Processes of magma generation, differentiation and crystallisation of magma

Chemical petrology, magma types, behaviour of elements in magmatic processes

Modelling magmatic processes, batch and fractional melting and differentiation, mantle metasomatism

Magmatic environments

Metamorphism, metamorphic agents, metamorphic zones, isograds and facies

Metamorphic reactions

Metamorphic phase equilibria, petrogenetic grids (AFM, ACF plots) and study of reactions

Metamorphism of mafic, ultramafic, and pelitic rocks

Assessment

50%

Examination

50%

Coursework

Examination
50%

Class test
25%

15%

Examination — 50% **Weekly practical reports — 5%** **Class test — 25%** **Project report and presentation — 15%**
Assignments and activities — 5%

Formative assessment

Weekly practicals,
discussion and
feedback

Summative assessment

COMPONENT	WEIGHTING
Examination	50%
Coursework	50%
Individual	30%
Weekly practical reports	5%
Class test	25%
Group	20%
Project report and presentation	15%
Assignments and activities	5%

Graduate attributes and skills

Programme learning objectives (PLO) addressed

2

PLO 2 (Application of Scientific Methods and Data Analysis)

4

PLO 4 (Critical Thinking and Problem-Solving Skills)

7

PLO 7 (Independent Learning and Professional Development)

3

PLO 3 (Integrated Laboratory, Field, and Technical Skills)

6

PLO 6 (Communication and Collaboration Skills)

Sustainability concept addressed

4

SDG 4 Quality Education

7

SDG 7 Affordable and Clean Energy

13

SDG 13 Climate Action

Digital skills/software used (not limited to)

Application software (e.g. Microsoft Excel, Mineral and Rock Classification Apps)

Organisational tools (e.g. Notion, Canvas)

Advanced digital tools (e.g. AI-assisted analysis tools)

Micro-credentialling option

Yes, 4 MCs

Stackable towards GenBESTARI Undergraduate Degree Programme or other relevant Lifelong Learning Programmes

No

Document details

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