

Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

Expected Implementation in Academic Year (New format)	
Semester/Trimester/Others (specify approx. Start/End date)	
Course Author * Faculty proposing/revising the course	Caroline Bouvet
Course Author Email	CarolineBouvet@ntu.edu.sg
Course Title	Volcanology
Course Code	ES4904
Academic Units	3
Contact Hours	39
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	ES1003 Solid Earth; ES2002 Earth Materials; ES3003 Introduction to Geochemistry; ES3004 Introduction to Geophysics
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

You will learn the foundations of volcanology as a science, will discover the state-of-the-art tools that are available for research, and will apply and therefore build a new set of skills related to these tools.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Better appraise the scale of volcanic eruptions and their underlying mechanisms
ILO 2	Link and integrate various sources/types of information (e.g. petrologic, field, monitoring, modelling data)
ILO 3	Use standard volcanological techniques to analyse natural datasets
ILO 4	Recognize challenges in forecasting volcanic eruptions and their impacts

Course Content

We will explore the main concepts and techniques of modern volcanology. The course includes a combination of basic and applied science that draws expertise from physics and chemistry, but also from natural hazards. We will analyze natural sample datasets and monitoring data of active volcanoes. Lectures will be complemented with labs making use of analytical and experimental laboratories and involving numerical simulations. Four broad topics will be covered: - Magmatic petrology applied to volcanology (weeks 2-4) - Volcano geophysics (weeks 5-7) - Physical volcanology (weeks 8-10) - Volcanic hazards and risks (weeks 11-13)

Reading and References (if applicable)

Nil

Planned Schedule

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
1	Introduction	1,4	In-person		
2	Building of magma reservoirs	1,2,3,4	In-person	Introduction to thermodynamics	
3	Volcano plumbing systems	1,2,3,4	In-person	Geothermobarometers applied to magmatic systems	
4	Magma transfers and residence times	1,2,3,4	In-person	Geospeedometers applied to volcanic systems	
5	Volcano seismology	1,2,3,4	In-person	Identifying different type of events and give basic interpretation	
6	Volcano geodesy and infrasound	1,2,3,4	In-person	Extracting source information and characteristic based on GPS and InSAR	
7	Looking at volcano monitoring data all together	1,2,3,4	In-person	Running real-time scenario combining different type of data	
8	Physical properties of magmas	1,2,3,4	In-person	Calculations of magma densities and viscosities	
9	Bubble nucleation and growth, and eruptions	1,2,3,4	In-person	Measurements of sample porosities and permeabilities	
10	Eruptive deposits	1,2,3,4	In-person	Investigating eruption styles based on magma properties and physical processes	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
11	Source reconstruction from deposits	1,2,3,4	In-person	Estimating eruption source parameters from available field data	
12	Hazard modelling	1,2,3,4	In-person	Numerical modelling of one or more volcanic hazards	
13	Volcanic risk and impacts	1,2,3,4	In-person	Understanding how volcanic hazards affect society, and how we calculate risk.	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lecture	Lectures will pass on the theoretical knowledge required to understand the different components of the Volcanic system and the related scientific methods employed to investigate and monitor it.
Labs	The labs will be based on real world practical problems and will challenge students to research outside of the classroom to solve the issues faced in the labs. Students will have the opportunity to use some of the state of the art equipment available and will write synthetic reports of their findings.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Others([class participation])	1,2,3,4	1,2,4,8,10	20		Individual		
2	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Volcano Petrology Assessment)	1,2,3,4	1,2,4,5,8,10	20				
3	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Volcano Geophysics Assessment)	1,2,3,4	1,2,4,8,10	20		Team		
4	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Physical Volcanology Assignment)	1,2,3,4	1,2,4,5,8,10	20		Team		
5	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Volcanic Hazards and Risks Assessment)	1,2,3,4	1,2,4,8,9	20		Individual		

Description of Assessment Components (if applicable)

Formative Feedback

Formative feedback will be provided:

Component 1: Instantly through quiz scores and through active discussions.

Components 2-5: within 2 weeks of the assignment submission / test date.

General feedback will be given on request as part of the end of course review.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
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Course Policy

Policy (Academic Integrity)

Policy (General)

Policy (Absenteeism)

Policy (Others, if applicable)

As a student of the course, you are required to abide by both the University Code of Conduct and the Student Code of Conduct. The Codes provide information on the responsibilities of all NTU students, as well as examples of misconduct and details about how students can report suspected misconduct.

The University also has the Student Mental Health Policy. The Policy states the University's commitment to providing a supportive environment for the holistic development of students, including the improvement of your mental health and wellbeing. These policies and codes concerning students can be found in the following link:
<http://www.ntu.edu.sg/SAO/Pages/Policies-concerning-students.aspx>

Last Updated Date: 16-04-2026 11:57:11

Last Updated By: Ang Samantha