

Indian Institute of Technology, Kanpur

Proposal for a New Course

1. Course No: SPA629M

2. Course Title: *Introduction to Geology: Measuring the Heartbeat of a Planetary Body*

3. Lectures per week: $L=3$, *Tutorial:* $T=0$, *Laboratory:* $P=0$, Additional hours: $(0-2)=0$ (A), Credits $(3*L+2*T+1*P+A) = 5$

Duration of Course: *Half Semester*

4. Proposing Department: *Space, Planetary and Astronomical Sciences and Engineering*

5. Proposing Instructor: *DPGC Convener, SPASE*

6. Other Instructors who may teach this course:

7. Course Description

(A) Objectives: The course is aimed at providing the basic understanding of key geology concepts. It would prepare the students in taking geology intensive courses in planetary science that may include observational techniques and tools for interpretation.

(B) Contents:

1. Mineral and rock formation [6 lectures]

Magma generation, crystallization (nucleation and growth), Igneous, sedimentary and metamorphic rocks, Mineral deposits, Meteorites, Rocks and Minerals in thin-sections under microscope.

2. Geological time scale and Geological Clocks [4 lectures]

The time units on various planetary bodies (Earth, Moon, Mars), the need, the way to measure time, radioactivity, isotope systems, role in understanding various planetary processes

3. Geological processes and Geological cycles [8 lectures]

Magmatism (volcanism & plutonism), Evolution of atmosphere, Tectonism, Impact cratering, Weathering/Erosion by Wind, Water, Ice and Radiation, Atmospheric Envelope, Atmosphere Surface Interactions in Geologic Cycles, Plate tectonics, Mantle convection, Seismicity, Geological landscapes created by various processes.

4. The relationship of Rocks/Minerals with life [2 lectures]

Mineral and rock formation as an energy source, Biomineralization, Mineral and Rocks as food for lifeforms, Minerals and rocks as biomarkers, Minerals and rocks as basic building

blocks of life.

(C) Pre-requisites, if any: *None*

(D) Short summary for including in the Courses of Study Booklet:

This course serves as a primer for taking up a wide variety of geoscience courses probing the formation, evolution, destruction of minerals, rocks and the various landscapes on various planetary bodies (planets, satellites, comets, asteroids).

7. Recommended Books:

Cornelis Klein, Barbara Dutrow / *Manual of Mineral Science*, 23rd Edition / John Wiley & Sons, ISBN: 978-0-471-72157-4 February 2007 704 Pages

McSween, Jr, H. Y., Moersch, J. E., Burr, D. M., Dunne, W. M., Emery, J. P., Kah, L. C., & McCanta, M. C. / *Planetary Geoscience*/ 2019/ Cambridge: Cambridge University Press / ISBN-10 : 1107145384 ISBN-13 : 978-1107145382 / 350 pages

Alan P. Dickin / *Radiogenic Isotope Geology* / Third Edition (2018) / Publisher : Cambridge University Press / ISBN-10 : 9781107492127, ISBN-13 : 978-1107492127/ 498 pages

8. Any other remarks:

Dated: Proposer:

Dated: DUGC/DPGC Convener:

The course is approved/not approved

Chairman, SUGC/SPGC

Dated: