DISCIPLINE SPECIFIC CORE COURSE - DSC-19
Crustal Evolution through Time

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSC-19 Crustal Evolution through Time	**4**	**3**	**1**	**0**	**12th pass with science**	**Studied Earth System Science and Equivalent**

Learning Objectives

1. To understand the origin and early differentiation of the Earth using geochemical and geochronological proxies.
2. To study the formation and significance of early crustal rocks such as TTG suites and greenstone belts.
3. To analyze the evolution of Earth's atmosphere, hydrosphere, and lithosphere including major events like the Great Oxidation Event (GOE).
4. To examine supercontinent cycles and regional crustal evolution with special focus on the Indian craton and the Himalayas.

Learning Outcomes

After completing the course students will be able to:

1. Explain the origin and differentiation of early Earth using mineral evolution, geochemical, and geochronological proxies.
2. Identify and analyze the formation of TTG suites, greenstone belts, and their role in early crustal tectonics.
3. Describe the Archean-Proterozoic transition, including the Great Oxidation Event, and relate it to early Earth dynamics and environmental evolution.
4. Interpret supercontinent cycles and assess crustal evolution in global and regional contexts, with a focus on the Indian craton and the Himalayas.

THEORY (45 hours)

UNIT – I **(10 hours)**

Origin of the Earth and initial Earth: common perceptions. Evolution of minerals and early differentiation. Geochemical and geochronological proxies

UNIT – II **(10 hours)**

Origin of Tonalite-trondhjemite-granite (TTG) suite of rocks and granites. Greenstone belts and related tectonics

UNIT – III **(12 hours)**

Geological time scale and Archean-Proterozoic boundary; Evolution of early atmosphere and hydrosphere; Great Oxidation Event (GOE), Early geodynamics of the Earth; initiation of plate tectonics and related debates

UNIT – IV **(13 hours)**

'Supercontinent' cycles, crustal evolution and proxies. Drawing link between evolution of lithosphere, atmosphere, hydrosphere and biosphere.

Crustal evolution of the Indian craton, The Himalayas: evidence of dynamic crustal evolution

Tutorial: **(15 Hours)**

Exercises related to theory. Petrogenetic plots, Tectonic discrimination diagrams

Essential/recommended Readings

Plate Tectonics and Crustal Evolution by Kent C. Condie 4th Edition Oxford: Butterworth/Heinemann

Suggestive Readings

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