

Course Title: Introduction to Medical Geology

Course Code: MCS1402-MD

Course Type: Multidisciplinary

Credits: 3 (2-0-0-1)

Max. Marks: 100

COURSE OBJECTIVES

- Introduce the concepts and interdisciplinary scope of Medical Geology and its relevance to human health.
- Understand the distribution of essential and toxic elements, their exposure pathways, and associated environmental health hazards.
- Develop knowledge of risk assessment, mitigation strategies, and basic geospatial approaches linking geology and public health.

LEARNING OUTCOMES: After completing the course, students will be able to:

- Understand the relationship between geological materials, environmental processes, and human health.
- Identify sources of environmental health hazards and evaluate their impacts on water, soil, and public health.
- Apply knowledge of exposure pathways, risk assessment, and geospatial tools to address environmental health challenges.

Detailed Syllabus

Unit 1: Fundamentals of Medical Geology (15 Hours)

- **Introduction:** Definition, scope, and history of Medical Geology.
- **Geosphere-Biosphere Connection:** The interaction between geological materials/processes and health.
- **Essential and Toxic Elements:** Introduction to trace elements (essential vs. non-essential), their distribution in the Earth's crust, and food chain exposure pathways.
- **Hydrogeochemistry:** Water quality, hardness, trace elements in groundwater, and health impacts

Unit 2: Geological Sources of Health Hazards (15 Hours)

- **Naturally Occurring Elements (PHEs):** Health impacts of excess/deficiency of Arsenic (As), Fluoride (F), Iodine (I), Selenium (Se), and Mercury (Hg).
- **Case Studies:** Arsenic poisoning (Bangladesh/West Bengal), Fluorosis, Keshan disease (Se deficiency). Fluorosis in Doda-Kishtwar-Ramban Region. Rajouri (Badhaal Village)



Toxic Exposure Incident (2024-2025). Heavy Metal Contamination in Wular Lake and Dal Lake Sediments. Groundwater contamination in Srinagar.

- Field visit to one of the case study sites.
- **Mineral Dust and Fibres:** Health effects of asbestos, silica, and volcanic ash.
- **Radioactivity:** Radon in air and water, and its health risks.

Unit 3: Soil and Public Health Risk Assessment and Mitigation (15 Hours)

- **Soil and Health:** Geophagia (human ingestion of soil materials), soil trace elements, and their role in nutrition. Health effects of microbes in earth materials. Health effects of trace elements and metals in earth materials. Health Effects of Bioaccumulation of Trace Toxic Metals: Cd, Selenium, Zinc, and Arsenic. Land cover change and vector-borne diseases.
- **Environmental Degradation:** Anthropogenic impacts (mining, industrial activity) on geochemical environments and health.
- **Exposure Pathways:** How geologic materials enter the human body (inhalation, ingestion, skin contact).
- **Risk Management:** Public health strategies, mitigation techniques (e.g., defluoridation of water).

SUGGESTED READINGS

- Olle Selinus, B. J. Alloway, Essentials of medical geology: impacts of the natural environment on public health, Lewis Publishers, USA - 2005
- C. B. Dissanayake, Rohana Chandrajith, Introduction to Medical Geology, Lewis Publishers, USA - 2009
- Earth Materials and Health: Research Priorities for Earth Science and Public Health, National Academic Press, Washington D.C

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