"FROZEN EDGE" MOUNTAIN MEDICINE & SAR COURSE

MODULE I

Physics and Physiology of Altitude

- Gas Laws (Dalton and Henry), oxygen cascade, hypobaric hypoxia, and acclimatization mechanisms (erythropoiesis and ventilation).

- Introduction to Altitude Disorders: Management of Acute Mountain Sickness (AMS), Cerebral Edema (ACE), and High-Altitude Pulmonary Edema (HAPE). Descent protocols and use of portable hyperbaric chambers.

- Medicine in Extreme Environments: Management of chronic diseases at altitude and specific pharmacology (Acetazolamide, Dexamethasone, Nifedipine).

MODULE II

Winter Hazards and Rescue

- Avalanche Risk: Basic snow science, European avalanche hazard scale, and snowpack stability testing.

- Avalanche Rescue: Technical use of avalanche transceivers (AVA), probe, and shovel. Triage of buried patients and excavation protocols.

- Introduction to Search and Rescue (SAR): Organizing search operations, search phases, and survivor/rescuer psychology.

MODULE III

Survival and Life in Cold Environments

- Mountaineering in cold climates: Layer theory, moisture management, and thermogenic nutrition.

- Winter survival techniques: Priorities (Rule of 3), obtaining water and fire in adverse conditions.

- Snow shelters: Building snow caves, igloos, and trenches. Managing condensation and CO2.

- Extreme weather: Reading clouds, fronts, the Venturi effect, and calculating wind chill.

- Signaling: Using V-A-D signals, signal mirrors, improvised helipads, and ground-to-air codes.

MODULE IV

Cold Medicine and Remote Traumatology

- Physiology of heat exchange: Mechanisms of heat loss (conduction, convection, radiation, evaporation) and metabolic response.

- Hypothermia and cold injuries: Swiss classification of hypothermia, rewarming protocols, and management of frostbite (1st to 4th degree).

- Winter sports injuries: Biomechanics of trauma in skiing and climbing. Ligament injuries and crush syndromes.

- Management of trauma in the wilderness: Adapted MARCH/XABCDE protocol, fracture stabilization with improvised methods, and remote hemorrhage control.

MODULE V

Integration and Practice

- Improvisation in nature: Creating stretchers with ropes/backpacks and splints with insulating pads.

- Scenarios and case studies: Simulation of multiple casualty incidents (MCI) in the mountains and analysis of real accidents for critical decision-making.

- Scenario: "The Avalanche in the North Couloir"

- Context: A group of three mountaineers have been caught in a small avalanche of wet snow while descending a couloir at 2,800m. The weather is worsening (40 km/h wind, reduced visibility). The nearest refuge is a 3-hour hike away. The helicopter cannot fly due to weather conditions.

1. The Victims (Students/Mannequins)

- Victim A (The "Screamer"): Presents an open fracture of the tibia and fibula with active (not massive) bleeding. He is conscious, very anxious, and screaming in pain. He suffers from mild hypothermia (evident shivering).

- Victim B (The "Silent One"): Found partially buried. Unconscious (GCS 8). Noisy breathing. Presents with a traumatic brain injury (TBI) and signs of moderate hypothermia. Unresponsive to verbal stimuli.

- Victim C (The "Unharmed" in Shock): Physically unharmed, but in a state of panic. Attempts to move Victim A erratically and hinders rescue efforts. It is a critical source of distraction.

2. Simulation Objectives for Students

- Scene Safety: Identify if there is a risk of a second avalanche before intervening.

- Initial Triage: Apply the STARD (Simple Triage and Rapid Treatment) protocol. Who do you attend to first? (Priority: Victim B via airway management, but control bleeding in Victim A).

- Remote damage control: Use of tourniquet or compression bandage on Victim A. Basic airway management and neutral positioning of Victim B.

- Environmental management (Hypothermia): Wrapping of victims (ground insulation, vapor barrier, heat pack).

- Improvisation: Constructing a snow anchor to secure a stretcher or using skis/poles to stabilize Victim A's fracture.

MODULE VI

- Orientation and Progression with Victims (This section focuses on movement logistics and technical navigation under stress).

- Navigation in reduced visibility conditions: Use of map, compass, and altimeter (triangulation and reverse bearings). Navigation with GPS and applications (Gaia/Outdooractive) in battery-saving mode. "Whiteout" techniques (rope progression to avoid losing direction in fog). - Logistics of improvised evacuation: Route assessment:

Slope, snow conditions, and exposure to falls. Load distribution within the rescue team (who carries the first-aid kit, who pulls the stretcher). Effort management and personnel rotations to prevent rescuer exhaustion.

- Stretcher/weight progression techniques: On snow: Construction of sleds with skis or improvised pulkas with mattresses and tarpaulins. On technical terrain: Techniques for securing the stretcher with friction knots (Prusik, Machard) and simple pulley systems (3:1) to overcome obstacles or crevasses. Handrails and human chains: Efficient patient movement across chaotic terrain of boulders or scree slopes.

- Communication and decision-making while moving: Radio communication protocol (phonetic alphabet, brevity). Turn-back points: Determining when it is safer to stop and bivouac than to continue progressing.

- Application in the Simulation Scenario. The Route Challenge: After stabilizing Victim A and Victim B, the instructor provides GPS coordinates. The group must: Plot the safest escape route on the map, avoiding slopes greater than 30º (avalanche risk). Construct a means of transport (e.g., a stretcher with two backpacks and two poles) for Victim A. Move both victims 200 meters across uneven terrain, maintaining thermal insulation and constant monitoring of their level of consciousness.

END OF COURSE