

Biophysics and Physiology of High-Altitude Mountaineering

Course Title:	Biophysics and Physiology of High-Altitude Mountaineering
Credits:	3
Full Marks:	100
Pass Marks:	60
Total Teaching Hours:	60

This intensive 17-day course takes place as a field lab intended to introduce students to the basic principles of biophysics and physiology of high-altitude environments in the world's greatest natural laboratory – the Nepalese Himalayas! Students travel from Kathmandu to Tumlingtar to begin a 14-day fully supported trekking expedition to Makalu Basecamp (elevation 15,750 feet) with daily lectures and experiments taught by Dr. Aaron Shupp, MD. Students will keep lab notebooks and participate in discussions and presentations throughout the course. After the trek, students will return to Kathmandu for a recap and final evaluation. A brief pre-trip study guide will be sent to students prior to arrival in Nepal that will be based primarily on the textbook: *Going Higher: Oxygen, Man, and Mountains* by Charles Houston, 5th Edition. ISBN-10: 0898866316

Objectives

On the completion of this course, the students will be able to:

- Understand and explain the role of oxygen in supporting life through a historical perspective of physiologic discoveries
- Describe the anatomy of the human cardiopulmonary system and how oxygen is distributed and utilized through respiration, circulation, and metabolism
- Understand the categories and pathophysiology involved in the etiologies of mountain sickness
- Describe the process of acclimatization and how it relates to the prevention and treatment of altitude sickness
- Demonstrate the ability to keep a field laboratory notebook to collect data, provide analysis, and report findings of physiologic experiments conducted at altitude

Content

Title	Details	Hours
Understanding the Atmosphere	a. Barometric Pressure b. Vacuum c. Oxygen as a Component of Air	5
How the Body Gets Oxygen	a. Respiration and Oxygen Transport b. Circulation and Blood c. Cells and Tissues	10
Mountain Sickness	a. What is Mountain Sickness? b. Cellular and Vascular Responses to Hypoxia c. AMS and HACE d. Ophthalmic Conditions at Altitude e. HAPE f. Chronic and Subacute Mountain Illness	15
Acclimatization and treatment of Mountain Sickness	a. History of High-Altitude Mountaineering b. Physiologic Changes of Acclimatization by Organ System c. Acclimatization Strategy d. Medical Interventions for Mountain Sickness e. Genetics of High-Altitude Performance	15
Laboratory Experiments	Students will conduct physiology experiments using pulse oximeters, Gamow Bag, and other instruments to understand the physiology of human acclimatization and the effects of environmental hypoxia	15