

Postgraduate Institute of Medical Sciences (PGIMS) UNIVERSITY OF PERADENIYA



Master of Science in Exercise and Sport Sciences (M.Sc. ESS)

1. INTRODUCTION

At present, no university in Sri Lanka offers courses leading to a degree of Master of Science (M.Sc.) in Exercise and Sport sciences. There are large numbers of instructors/teachers in government schools, government institutes and the private sector, who will benefit from courses targeted to improve their knowledge and skills in the areas of sports and exercise sciences.

There is also a dearth of locally trained individuals capable of conducting research in the field of exercise and sport sciences, and therefore adversely affecting the progress of this field of science, in our country. This degree is planned to fill this gap.

The degree program will provide students with an understanding of the modern principles and disciplines of exercise and sport sciences, including the concepts of maximizing performance and minimizing conditions that might adversely affect performance.

2. AIMS AND OBJECTIVES

This course will be offered under course unit system. The curriculum is planned for students preparing to teach physical education or to enter related professional sports coaching areas. At the end of the course students should be able to;

- Apply basic knowledge in anatomy, physiology, biochemistry, nutrition, psychology biomechanics and management to scenarios related to sports.
- Maximize sports performance of trainees under field situations by applying the knowledge of human body to different exercise levels, physiological and metabolic responses to exercise and regular training.
- Perform basic exercise testing in healthy individuals as well as clients with ill health when requested by medical practitioner.
- Conduct basic exercise programs in resistance and endurance training in developing health related fitness in clients.
- Perform independent research and demonstrate relevant literature search and presentation skills.

3. PROGRAMME ELIGIBILITY

Applicants for admission to the program must have successfully completed a bachelor's degree in any subject from an institution acceptable to the PGIMS and the University of Peradeniya.

4. PROGRAMME FEE

Type of students	Program fee (M.Sc. ESS)
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Local candidates	Rs. 300,000.00
SAARC Countries	US \$ 2,000.00
Other countries	US \$ 4,000.00

Program fee can be paid in four installments (*25% at the registration and the other 75% within six months of registration.*) Other payments including registration fee, medical fee, examination fee and deposits (science and library) should be paid according to the procedure stipulated by the PGIMS.

5. THE PROGRAMME STRUCTURE AND DURATION

Course work, shall be conducted over a period of 15 weeks each. The total duration of the degree, including examinations, shall be about 12 months. Satisfactory completion of a minimum of 30 credits of course works with a GPA of not less than 3.00 is required for the successful completion of the degree. The research component shall be equivalent to six credits' Students are required to carry out a research project as an academic/research institution where suitable facilities are available. The project could be carried out over a period of six months. After successful completion of the research project, the student shall be eligible for the award of the M.Sc. in Exercise and Sport Sciences degree - SLQF Level 10.

Programme Summary

Course Code	Course Title	Lecture hours	No. of Credits
PART I (15 credits)			
ESS 501	Exercise Bioenergetics	30	2
ESS 502	Cardiovascular system in exercise	15	1
ESS 503	Ventilation in exercise	15	1
ESS 504	Musculo-skeletal system in exercise	15	1
ESS 505	Neurological control of exercise	15	1
ESS 506	Endocrine system in exercise	15	1
ESS 507	Exercise Biomechanics	15	1
ESS 508	Environmental influence on exercise	15	1
ESS 509	Principles of exercise training	30	2
ESS 510	Age and sex in sport and exercise	30	2
ESS 511	Clinical exercise physiology	15	1
ESS 512	Measurement of Physical fitness	30	2
ESS 513	Sport psychology and sport medicine	30	2
ESS 514	Sports management	15	1
ESS 515	Filed experiences in sports	45	3
ESS 516	Independent study	45	3
ESS 517	Research and Statistics in sports sciences	30	2
Total		405	27
PART III - RESEARCH PROJECT			
ESS 518	Research Project	6 months	3

6. PROGRAMME CONTENTS

Course Code: ESS 501

Course Title: Exercise Bioenergetics

Credit value: 2

Prerequisites: None

Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Students should be able to apply basic knowledge in biochemistry, nutrition and energy metabolism to scenarios related to sports

Time allocation (Hours): Lectures 30

Course Content:

- Energy, and the basic energy systems, The anaerobic threshold: fact or misinterpretation?
- Nutrients: building blocks of energy: carbohydrates, fats and proteins
- Digestion and absorption of carbohydrates, The role of carbohydrates in the body
- Digestion and absorption of fats, The role of fats in the body
- Digestion and absorption of proteins, the role of proteins in the body
- Vitamins and minerals, Water and Electrolyte Balance, Dietary guidelines
- Body composition and sport performance, assessing body composition, Measurement and application for weight loss, weight standards, achieving optimal weight
- Eating disorders and the female athletic triad, Genetics and human performance: natural selection and genetic modification.

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25%
End of course examination	75%

Recommended Reading:

Advanced Sports Nutrition (2006) by Dun Benardot (Human Kinetics), Diets Designed for Athletes by Maryann Karinch, Practical Sport Nutrition (2007) by Louis Burke

Course Code: ESS 502

Course Title: Cardiovascular system in Exercise

Credit value: 1

Prerequisites: None

Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in cardiovascular functions and its changes to scenarios related to sports

Time allocation (Hours): Lectures [13] Practical [4]

Course Content:

- Basic anatomy and physiology of cardiovascular system
- Defining the role of cardiovascular system in human performance
- Models for understanding the determinants of exercising muscle oxygenation and arterial blood pressure
- Cardiovascular regulation during exercise and implications for human performance
- Cardiovascular limitations to human performance
- Cardiovascular limitations to human performance: impact on oxygenation on muscle metabolic contractile function
- Long-term improvement in cardio respiratory endurance
- Evaluating cardio respiratory endurance capacity
- Factors affecting cardiovascular responses to aerobic training

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Physiological Aspects of Sports Training and Performance by Jay Hoffman (Human Kinetics), Clinical Exercise Science by Jie King, Biochemistry Primer for Exercise Science by Michael Houston

Course Code: ESS 503
Course Title: Ventilation in Exercise
Credit value: 1
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in respiratory system, carriage and gas exchange functions and its changes to scenarios related to sports

Time allocation (Hours): Lectures [13] Practical [4]

Course Content:

- Basic anatomy and physiology of pulmonary system
- Pulmonary ventilation, perfusion, gas exchange and control of breathing
- Pulmonary circulation and lung fluid homeostasis
- Respiratory regulation of acid-base balance
- Airway responses during exercise
- Energy cost of the work of breathing during exercise
- Gender differences in pulmonary function
- Pulmonary responses to exercise and limitations to human performance
- Human performance and maximal aerobic power

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Physiological Aspects of Sports Training and Performance by Jay Hoffman (Human Kinetics), Clinical Exercise Physiology by Jonathan K. Ehrman, Paul M. Gordon

Course Code: ESS 504
Course Title: Musculo-skeletal system in exercise
Credit value: 1
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in structure and function of skeletal system, muscles and joints, and their adaptations to scenarios related to sports

Time allocation (Hours): Lecture [13] Practical [4]

Course Content:

- Structure and function of skeletal muscle,
- Structure and function of bones,
- Joints of the body- types of joints, types of joint movements,
- Muscle-tendon mechanics,
- Skeletal muscle and exercise,
- Mechanisms of gains in muscle strength,
- Muscle soreness and fatigue,
- Central and neuromuscular fatigue

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Structure and Function of Muscular Skeletal System by James Watkins, Physiological Aspects of Sports Training and Performance by Jay Hoffman (Human Kinetics), Clinical Exercise Physiology by Jonathan K. Ehrman, Paul M.Gordon

Course Code: ESS 505
Course Title: Neurological control of exercise
Credit value: 1
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in structure and function of nervous system and their adaptations to scenarios related to sports

Time allocation (Hours): Lectures [15]

Course Content:

- An overview of the nervous system
- Structure and function of the nervous system
- Central nervous system
- Peripheral nervous system
- Sensory-motor integration
- Motor response
- Neuromuscular adaptations to exercise
- Maximal exercise: is it limited centrally or peripherally?

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Neuromechanics of Human Movement by Roger M. Enoka, Motor Behaviour and Human Skill by Jan P. Pick

Course Code: ESS 506
Course Title: Endocrine system in exercise
Credit value: 1
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in the actions of the endocrine secretions to scenarios related to exercise and sports

Time allocation (Hours): Lectures 15

Course Content:

- The endocrine glands and their hormones
- Hormonal response to exercise
- hormonal effects on metabolism and energy
- Hormonal effects on fluid and electrolyte balance during exercise
- Anatomy of the gastrointestinal tract
- Effect of exercise on gastrointestinal function

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Exercise Endocrinology by Katrina T. Borer (2003, Human Kinetics)

Course Code: ESS 507
Course Title: Exercise Biomechanics
Credit value: 1
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge of biomechanics to scenarios related to exercise and sports

Time allocation (Hours): Lecture [13] Practical [4]

Course Content:

- Fascicle-tendon interactions in natural human movement
- Muscle specificity, movement specificity, intensity specificity within the movement
- How to analyse motion, Phenomenological methods, Biomechanical methods
- Analysing functional phases
- Biomechanical principles

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Biomechanics of Sport and Exercise by Peter M. McGinnis, Biomechanics and Biology of Movement by Bennon M Nigg, Brian R. Macintosh, Sport Mechanics for Coaches by Gerry Carr, Applied Anatomy and Biomechanics in Sport by Timothy R Ackland, Bruce C. Elliott

Course Code: ESS 508
Course Title: Environmental influences on Exercise
Credit value: 1
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge of thermoregulation and other physiological responses to environmental changes to scenarios related to exercise and sports

Time allocation (Hours): Lecture [13] Practical [4]

Course Content:

- Concepts in physiological regulation: a thermoregulatory perspective
- Physiology of acute heat exposure, with implications for human performance in the heat
- Physiology of acute cold exposure, with implications for human performance in the cold
- Physiological adaptations to hot and cold environments
- The physiology of water immersion
- Diving physiology: free diving, breathing apparatus, saturation diving
- Altitude physiology: the impact on human performance, Human adaptations to altitude and hypoxia: ethnic differences, chronic adaptation and altitude training
- Physiological considerations of human performance in space
- Do humans have selective brain cooling
- A critical core temperature and the significance of absolute work rate
- Do training-induced plasma volume changes improve athletic performance

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Performing in Extreme Environments by Lawrence E. Armstrong, Physiology of Sport and Exercise by Jack H. Wilmore, David L. Costill, Exertional Heat Illness by Lawrence E. Armstrong, Diving Science by Michael B. Strauss, Igor V. Akenov

Course Code: ESS 509
Course Title: Principles of Exercise training
Credit value: 2
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in principles of training to maximize sports performance of trainees under field situations.

Time allocation (Hours): Lecture [28] Practical [4]

Course Content:

- Principles of individuality, specificity, reversibility, progressive overload, hard/easy, periodization
- Resistance training programs: Training needs analysis
- Selecting the appropriate number of sets
- Periodization of training
- Types of resistance training, Anaerobic and aerobic power training programs, Interval training, Continuous training, Interval-circuit training
- Cardiac and vascular adaptations to endurance training
- Endurance training and cardiac output
- Respiratory system adaptations to training
- Neuromechanical adaptations-neural adaptations to resistance and power training, overtraining and overreaching
- Tapering for peak performance
- Detraining, optimizing and enhancing human performance through nutrition

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Overtraining Athletes: Personal Journeys in Sport by Sean O. Richardson & Mark B. Andersen,
 Developing Effective Physical Activity Programs by Lynda B. Ransdell

Course Code: ESS 510

Course Title: Age and Sex in Sport and Exercise

Credit value: 2

Prerequisites: None

Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in gender differences and age variations to scenarios related to sports

Time allocation (Hours): Lecture [30]

Course Content:

- Physical performance in prepubescent and adolescent males and females: limitations, benefits and problems
- The physiology of ageing in active and sedentary humans
- Body size and composition: Growth and development of tissues
- Body size and composition
- Physiological responses to acute exercise
- Physiological adaptations to exercise training, Sport performance
- Special issues, Exercise, work and stress in adolescent and adult women
- Performance in the pregnant woman: maternal and fetal consideration
- Physiological bases of health-enhancing physical activity for postmenopausal women
- Physically demanding trades: can women tolerate heavy workloads? Are women narrowing the gender gap in elite sport?

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Physical Activity Instructions of Older Adults 2005 by C. Jessie and Debra J Rose, Youth Development and Physical Activity: Linking Universities and Communities by Don Hellison, Nick Cutforth, Children's Exercise Physiology by Thomas W. Roland, Physical Fitness and Wellness: Changing the Way You Look, Feel, and Perform by Jeerold S. Greensberg, George B. Dintiman, Women's Health and Fitness Guide by Michele Keyyles, Brenda S. Wright

Course Code: ESS 511
Course Title: Clinical Exercise in Physiology
Credit value: 1
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in principles of clinical exercise physiology to advise their clients on benefits of exercise on health and also to formulate exercise prescriptions for their clients

Time allocation (Hours): Lecture [15]

Course Content:

- Sedentary living is a direct cause of many chronic health conditions and mortality
- Why is a sedentary lifestyle non-physiological – an evolutionary perspective
- Pathophysiological consequences of a sedentary lifestyle
- Medical clearance, Exercise and rehabilitation of people with diseases
- Forms of cardiovascular diseases
- Understanding the disease process, determining individual risk

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Clinical Exercise Physiology by Jonathan K. Ehrman, Paul M. Gordon, Exercise Prescription: A practical approach to the ACM Guidelines 2007 by David P. Swain and Brian C. Leutholtz

Course Code: ESS 512

Course Title: Measurement of Physical fitness

Credit value: 2

Prerequisites: None

Core/optional: Core

Aims: This course aims to provide an opportunity for students to acquire knowledge and skills on mental health.

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge anatomy, physiology and biochemistry to formulate and apply tests in laboratory as well as field situations to measure various aspects of exercise performances

Time allocation (Hours): Lecture [16] Practical [28]

Course Content:

- Laboratory and field tests for estimation of oxygen consumption
- Measurement of strength/ speed/ endurance/ flexibility/ agility
- Laboratory and field tests for measurement of endurance
- Measurement of flexibility
- Measurement of agility
- Formulation of norms,
- Individual assessment of the aerobic-anaerobic transition by measurements of blood lactate,
- Talent identification

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Measurement and Evaluation of Human Performance (2005) James R. Morrow, Allen W Jackson, Functional Testing in Human Performance by Michael P Reiman, Robert C. Manske, Physical Activity Assessments for Health-Related Research by Gregory J. Well, Principles of exercise testing and interpretation (2005) by Karlman Wasserman

Course Code: ESS 513
Course Title: Sport Psychology and Sport Medicine
Credit value: 2
Prerequisites: None
Core/optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in psychology and sports medicine to scenarios related to exercise and sports

Time allocation (Hours): Lecture [28] Practical [4]

Course Content:

- Communication (Theories of communication, communication disorders)
- Theories of learning in sport
- Motivation (introduction to motivation and theory of motivation)
- Anxiety and stress in sport
- Aggression in sport
- Emotions
- Personality
- Social psychology
- Gender studies; Gender theory, concept of sex, gender and doing-gender
- Attention, concentration and memory
- Self-awareness
- The basics of exercise-related injuries and their treatment
- The principles and practice of first aid in sports

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Foundations of Sport and Exercise Psychology by Alan S Kornspan, Sport Psychology for Coaches by Damon Burton, Thomas D. Raedeke, Coaches Guide to Sport Psychology by Rainer Martens, Biomechanics of Musculoskeletal injury by William C. Whiting, Peripheral Nerve injuries in the Athletes by Joseph H. Feinberg and Neil Spielholz

Course Code: ESS 514
Course Title: Sport Management
Credit value: 1
Prerequisites: None
Core/ Optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in sports management to filed situations in managing sports

Time allocation (Hours): Lecture [15]

Course Content:

- General business management
- Sports management
- Sports marketing
- Sponsoring
- Advertising
- Financing of sports events
- Principles of human resource management
- leadership skills

Assessment:

Type of assessment	Percentage marks
Continuous Assessment	25
End semester written examination	75

Recommended Reading:

Principles and practice of sport management by Lisa P. Masteralexis, Carol Barr, Mary Hums, The Business of Sports by Scott Rosner

Course Code: ESS 515
Course Title: Field experience in Sports
Credit value: 3
Prerequisites: None
Core/ Optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply basic knowledge in sports management to field situations in managing sports

Time allocation (Hours): Lecture [15] Practical [60]

Course Content:

- History & development of selected sports
- International & National management structure of selected sports
- Sport promotion & marketing
- Rules of selected sports-theory
- Officiating-practical, Measurement-practical
- Talent identification of selected sports-theory & practical
- Components of fitness-theory and practical
- Principles of training
- Techniques & tactics training selected sports – theory & practical
- Mental preparation
- Match practice- theory and practical
- introduction to periodization of sports
- Short term planning

Assessment:

Type of assessment	Percentage marks
Assessment	30
End semester written examination	40
Practical examination	30

Recommended Reading:

Measurement and Evaluation of Human Performance (2005) James R. Morrow, Allen W Jackson,
 Functional Testing in Human Performance by Michael P Reiman, Robert C. Manske, Physical Activity
 Assessments for Health-Related Research by Gregory J. Well

Course Code: ESS 516
Course Title: Independent Study
Credit value: 3
Prerequisites: None
Core/ Optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Do literature search using textbooks, journals and also internet and write essays on topics related to sport sciences.

Time allocation (Hours): Practical [90]

Course Content:

- Students are expected to do a literature survey and write the extended essays on topics related to exercise and sport sciences.
- Students are guided by supervisors in order to learn literature search skills using internet, journals and text books, and also writing of literature reviews.
- The topics should be selected in consultation with the supervisors.
- Students are expected to spend 30 hours for each of the essay.

Assessment:

Type of assessment	Percentage marks
Assignment	30

Course Code: ESS 517
Course Title: Research and Statistics in Sport Sciences
Credit value: 2
Prerequisites: None
Core/ Optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Apply knowledge in basic statistics and research methodology to research in sport sciences

Time allocation (Hours): Lecture [30]

Course Content:

- Introduction to research in sport sciences
- Research methodology,
- Appropriate methods for collection, analysis and interpretation of scientific data related to exercise
- Basic statistics

Assessment:

Type of assessment	Percentage marks
Assessment	25
End semester written examination	75

Recommended Reading:

Research methods in Physical Activity by Jerry R. Thomas

Course Code: ESS 518
Course Title: Research Project
Credit value: 6
Prerequisites: None
Core/ Optional: Core

Intended Learning outcomes:

On successful completion of the course the students should be able to:

- Develop a research proposal
- Describe data summarizing
- Prepare data collection forms and collect data
- Analyze data
- Produce research report

Time allocation (Months): 12**Course Content:**

The project will consist of a self-directed course of supervised study either of a:

- 1. Systematic review of a significant public health issue
OR
- 2. Collection and analysis of secondary data on a topic of public health significance
OR
- 3. Field investigation of a community health problem in Sri Lanka

Each student will be supervised by a member of the University staff with an interest or experience in the topic selected. For 1, above, the involvement of Faculty of Medicine library staff would be advisable. For 2, above, co-supervision from the institution supplying the data is recommended, For 3, above, an experienced researcher with knowledge of research governance and ethics would be recommended.

In all cases the supervisor should review and agree a formal protocol for the study with the student prior to any further work on the dissertation topic. Research data should be managed in accordance with the PGIMS research governance procedures.

Assessment:

Type of assessment	Percentage marks
Oral presentation	40%
Research report	60%

7. PROGRAMME COORDINATOR

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8. ADDITIONAL REQUIREMENTS

This program will be conducted during weekends.