Liverpool John Moores University

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Title:	Muscle-Tendon Mechanics
Status:	Definitive
Code:	**7039SPOSCI** (119908)
Version Start Date:	01-08-2013
Owning School/Faculty:	Sports Sciences
Teaching School/Faculty:	Sports Sciences

Team	Leader
Constantinos Maganaris	Y

Academic Level:	FHEQ7	**Credit Value:**	20.00	**Total Delivered Hours:**	24.00
Total Learning Hours:	200	**Private Study:**	176		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	12.000
Practical	12.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Laboratory report (1500 words)	50.0	
Essay	AS2	Essay (1500 words) and a viva defence.	50.0	

Aims

This module aims to introduce the main biomechanical characteristics of human muscles and tendons and the implications for human movement, performance and biomechanical testing. The mechanical parameters and behaviour of these tissues of the human body in-vivo will also be examined in response to chronic loading and disuse in order to understand basic musculoskeletal mechanisms and adaptations

underpinning changes in whole-body function and performance.

Learning Outcomes

After completing the module the student should be able to:

1	Critically appraise current literature on muscle-tendon mechanics and adaptations
2	Analyse, evaluate and adapt methods used for the study of musculoskeletal system function in practice, research and development.
3	Apply current strategies and methods for improving performance in sports and rehabilitation applications.
4	Research, evaluate and summarise information related to muscle-tendon structure and function.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Experimental report	2	4
Essay	1	3

Outline Syllabus

The module content includes:
1. Muscle:
Muscle contraction and force generation
Muscle sarcomere and muscle fibre architecture
Human muscle architecture: Implication for function and methods of study
Force-length and force-velocity properties of muscle
Adaptations of muscle structure and function to chronic use and disuse
Muscle strength: theoretical and measurement considerations

2. Advanced EMG measurements
Assessment of agonist and antagonist muscle activation

3. Tendon
Moment arms and lever systems in the human musculoskeletal system
Tendon structure and Material properties
Human tendon mechanical properties in-vivo
Adaptation of human tendons to chronic use and disuse

Learning Activities

This module provides two hours of direct contact per week for 12 weeks in terms of lectures and lab-based work that will respectively cover the theoretical and practical background required.

Learning activities include:

1. Attend lectures on theoretical concepts and research topics
2. Complete coursework tasks
3 Complete prescribed reading
4. Complete experimental/laboratory tutorials

References

Course Material	Book
Author	Zatsiorsky, V. M.; Prilutsky, B. I.
Publishing Year	2012
Title	Biomechanics of Skeletal Muscles
Subtitle	
Edition	
Publisher	Human Kinetics
ISBN	0-7360-8020-1

Course Material	Book
Author	Nigg, B. M.; Herzog, W.
Publishing Year	2007
Title	Biomechanics of the musculo-skeletal system
Subtitle	
Edition	3rd Edition
Publisher	Wiley
ISBN	0470017678

Notes

Cutting edge equipment in our Biomechanics labs will be used for obtaining the skills to study the mechanical behaviour of the human muscle-tendon in-vivo.
This includes:
- Ultrasound scanners for visualizing human muscles and tendons in-vivo
- Electromyography for recording muscle activity
- Isokinetic dynamometry for quantifying muscle force
- Electric and magnetic stimulators for evoking muscle contraction bypassing volitional control
- A fully equipped gait lab and a unique instrumented staircase for the study of the musculoskeletal system and the behaviour of muscles and tendons in daily locomotor tasks.