

## Biomechanical aspects of balance and postural control

October 2019- February 2020

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### Objectives:

1. The students will understand the basic concepts of balance and postural control.
2. The students will acquire knowledge about the mechanisms that determine postural abilities in the human body.
3. The students will acquire knowledge about balance abilities of different populations.
4. The students will acquire skills of assessing balance by different biomechanical tools.

### Course Program:

#	Date	Topic	References
1	31.10.19	Introduction: basic concepts and laws – biomechanics Basic concepts of balance and postural control	Lecturer 10
2	7.11.19	The vestibular systems in the human body	4, 11
3	14.11.19	The visual system and postural control	1, 19
4	21.11.19	The somatosensory system and postural control	3, 7
5	28.11.19	Postural development in toddlers	6, 23
6	5.12.19	Postural abilities among children and youth	5
7	12.12.19	Postural abilities among adults	13, 16,18
8	19.12.19	Postural abilities during injury	14, 15
9-10	26.12.19	Postural ability among special populations	12, 17, 21
11	9.1.20	Field tests for balance assessment	4, 8
12	16.1.20	Practical exercise of field assessment	
13	23.1.20	Balance improvement programs – theoretical aspects	6, 12, 22
14	30.1.20	Balance improvement programs – practical aspects	9

### **Short Course Description:**

The course will include 14 sessions, each addressing a specific topic. The course will be taught in both class and online materials and tasks for practice and self-evaluation. In addition to the availability of the on-line modules, study materials will be discussed and exercised in class sessions.

### **Student Workload**

30 contact hours + home workload 5 ECTs

### **Student Obligations:**

1. To read the online materials addressed in all online modules
2. To report to the online tasks
3. To write a report about the content and practical applications of a research paper
4. To present a practical training or test from a research article

### **Assessment Criteria:**

1. 30 % final examination
2. 25 % written report of research paper
3. 20 % online assignments
4. 25% class presentation

### **References:**

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3. Beith, I, D. (2012). **Reflex control of ipsilateral and contralateral paraspinal muscles.** *Exp Brain Res* 218:433–440. DOI 10.1007/s00221-012-3032-9123.
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10. Jancová J. (2008). **Measuring the balance control: systematic review.** *Acta Medica (Hradec Kralove)* 51(3):129-137.
11. Khana, S., & Changb, R. (2013). **Anatomy of the vestibular system: A review.** *NeuroRehabilitation* 32: 437–443. DOI:10.3233/NRE-130866
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13. Maki, B.E., & McIlroy, W.E. (2006). **Control of rapid limb movements for balance recovery: age-related changes and implications for fall prevention.** *Age Ageing* 35 Suppl 2:ii12-ii18.
14. McKeon, P.O., & Hertel, J. (2008). **Systematic review of postural control and lateral ankle instability, part I: Can deficits be detected with instrumented testing.** *J Athl Train* 43(3):293-304. doi: 10.4085/1062-6050-43.3.293
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16. Melzer, I., Benjuya, N., & Kaplanski, J. (2004). **Postural stability in the elderly: a comparison between fallers and non-fallers.** *Age Ageing* 33(6):602-7.
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