M4 Advanced Research Methods

Degree Programme	M.Sc. Sports, Exercise and Human Performance
Module	**Advanced Research Methods**
Module Number	M4

1	**Basic information**
Semester	1+2
Credit points (CP)	20
Workload (h) - total	600
Duration of module	2 semesters
Status of module	mandatory Module

2	Profile

Objective of the module/integration into the curriculum

The aim is to acquire in-depth methodological competencies complementary to the contents of modules 1 to 3, in order to be able to apply them jointly in later modules in specialized research fields.

Content of Module

In this module, advanced statistical techniques (multilevel methods, structural levelling models, Big Data, etc.) for the analysis of experimental data and alternative data sources will be taught. In addition, this module will deepen methodological skills for expe-rimental analysis of human movements in the areas of kinematic analysis, dy-namic analysis of movements and also measurement of electromyographic and neuroscience data. Thus, further experimental possibilities of measurement are introduced and applied (e.g., fNIRS, EEG, etc.). These experimental skills can be taught to the students due to the excellent conditions in the movement laboratory. Since computational models are increasingly being developed for the explanation and in-depth analysis of experimental measurement data with theoretical models, the development and application of such movement science models will also be deepened in the courses of the module.

Learning outcomes

Students learn modern methods with which human motion can be analyzed. Complex data sets are generated, which are analyzed automatically using advanced statistical techniques. Motion analysis is performed theoretically and on practical examples, with particular emphasis on inverse dynamics methods. Modern computer technology is used to test theories of movement control and neural processing in the field of sensorimotor functions on forward dynamic models. For this purpose, the students use current research results from the participating fields of work and international journals.

3	Module Structure					
Components of module						
No.	Course type		Course	Status (mandatory/ elective)	Workload (h)	
					Attendance (h)/SWS	Individual study time (h)
1	S		Analysis of Complex Datasets Employing Advanced Statistical Methods 1	m	(30) 2	30
2	S		Analysis of Complex Datasets Employing Advanced Statistical Methods 2	m	(30) 2	15
3	S		Inverse Dynamics of Human Movement	m	(60) 4	45
4	S		Forward dynamics	m	(60) 4	45
5	S		Neurodynamics of Human Movement 1	m	(30) 2	15
6	S		Neurodynamics of Human Movement 2	m	(30) 2	30
7	P		Inter-module self-study	m		180
Options within the Module						
*In general, Forward dynamics is always offered as seminar 3, on demand and request, further elective courses for methodological deepening are also possible.						

4	Examination concept				
Degree-Relevant Examination(s)					
No.		Type	Duration/ Length	course no.	Weighting for Module Grade
1		Written Exam	60 min	1+4	50%
2		Written Exam	60 min	2+3	50%
Weighting of Module Grade for Final Overall Grade		10%			
Required Coursework					
No.	Type			Duration/ Length	course no.
1	Short and extensive coursework is required for preparation, realization and post-processing. Short and extensive coursework includes e.g. protocols (1-2 pages) and written/oral assignments (approx. 10 pages/10-15 minutes), poster presentation or written seminar paper. The depending type of coursework will be announced at the beginning of the seminar. Length and extent are oriented on the respective content. Max. 2 of the mentioned coursework requirements will be demanded per seminar, e.g., one protocol and one oral examination.				1

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5	CP - Distribution	
Attendance (= time of presentness)	LV No. 1	1 CP
	LV No. 2	1 CP
	LV No. 3	2 CP
	LV No. 4	2 CP
	LV No 5	1 CP
	LV No. 6	1 CP
Degree-Relevant Examination(s)	PL No. 1	3 CP
	PL No. 2	3 CP
Required Coursework	SL No. 1	1,0 CP
	SL No. 2	0,5 CP
	SL No. 3	1,5 CP
	SL No. 4	1,5 CP
	SL No. 5	1,0 CP
	SL No. 6	0,5 CP
Sum CP		20 CP

6	Requirements
Module related participation requirements	none
Credit points	The credit points for the module are awarded when the module has been successfully completed, i.e. when it has been demonstrated that the learning outcomes assigned to the module have been achieved.
Attendance	In all courses, 100% attendance is recommended. An attendance of 80% is required, as it is necessary to guide the students in an interactive way to extensive knowledge and competence growth. Students who exceed the number of permitted absences will forfeit their right to take exams.

7	Module offer	
Cycle/Timing	2-semester module, starting in WiSe each year	
Module Coordinator/ Faculty	Prof. Dr. Heiko Wagner	FB 07

8	Mobility/Recognition
Usability in other study programs	none
Module title	see title
English Translation of module component of field 3	are in English

9	Additional Information