III. CURRICULUM FORM

Program Name: MECHANICAL ENGINEERING, THESIS MASTER'S PROGRAM	Course Code: MNMU 7049
	Course Name: Advanced Biomechanics

Semester	Theory	Practice	Lab	Credit	ECTS	Course Language	Course Type
2	3	0	0	3	6	ENGLISH	Elective

Admission Requirements	Course does not have the condition considered.		
Compulsory Attendance	**Theory**	**Practice**	**Lab**
	70%	0%	0%
Course Teacher(s)	ASSIST.PROF.DR. YUNUS ZİYA ARSLAN		
Course Content	Mechanical and computational models of musculoskeletal system. Hill type muscle models. Musculoskeletal modeling and simulation in Opensim software. EMG-driven muscle models. Optimization approaches for force-sharing problem in musculoskeletal models. Projects.		
Course Learning Outcomes	To develop analysis and computational skills for musculoskeletal models. To describe, compare, and evaluate selected musculoskeletal models and methods. To develop skills in planning, conducting, and critically reviewing biomechanics research.		
Teaching and Learning Methods	Lecture, presentation, discussion, project.		

Assessment System	Number	Contribution (%)
Assignments	3	20
Presentation	0	0
Mid-term Examinations (including time for preparation)	1	10
Project	0	0
Clinical Practice	0	0
Laboratory	0	0
Field Work	0	0
Other Applications	0	0
Quiz	0	0
Term Paper/ Project	0	0
Portfolio Study	0	0
Reports	0	0
Learning Diary	0	0
Thesis/ Project	0	0
Seminar	0	0
Final Exam	1	70
Other	0	0
Total	5	100
The Weight of the In-Term Assignments in the Final Grade	4	30
The Weight of the End of Term Exam in the Final Grade	1	70

Continuous Improvement in the Context of the courses (questionnaires, interviews, and so on.) Front Shown Measurement and Evaluation Tools and Objectives :	Opinions of the students concerning teaching methods and the contents of the lectures are received via interviews during semester.

ECTS

Activities	Number	Time (Hour)	Credit Workload
Class Hours	14	3	42
Working Hours out of Class	14	3	42
Assignments	3	14	42
Presentation	0	0	0
Mid-term Examinations (including time for preparation)	1	10	10
Project	0	0	0
Clinical Practice	0	0	0
Laboratory	0	0	0
Field Work	0	0	0
Other Applications	0	0	0
Final Examinations (including preparatory year)	1	14	14
Quiz	0	0	0
Term Paper/ Project	0	0	0

Portfolio Study	0	0	0
Reports	0	0	0
Learning Diary	0	0	0
Thesis/ Project	0	0	0
Seminar	0	0	0
Other	0	0	0
Total Workload			150
Total Workload / 25			6
ECTS Credit of Course			6

Weekly Course Contents

week	Theoretical Topics	Practice Topics
1	Introduction to various mechanical and computational musculoskeletal models.	
2	Hill type muscle models.	
3	Hill type muscle models.	
4	Musculoskeletal modeling and simulation in Opensim software.	
5	Musculoskeletal modeling and simulation in Opensim software.	
6	EMG-driven muscle model.	
7	EMG-driven muscle model.	
8	Optimization approaches for force-sharing problem in musculoskeletal models.	
9	Optimization approaches for force-sharing problem in musculoskeletal models.	
10	Project works.	
11	Project works.	
12	Project works.	
13	Project works.	
14	Project works.	

Relationship of Proficiency Program with Course Learning Outcomes		**Point**
No	**Program Competencies**	
1	The ability to deepen and improve his/her knowledge by relying on undergraduate qualifications in a field on expert level.	5
2	The ability to grasp the interaction between Mechanical Engineering field and other disciplines.	5
3	The ability to apply the theoretical and practical information gained on expert level in Mechanical Engineering field and the ability to solve problems that require expertise using scientific research methods.	5
4	The ability to fictionalize, develop a solution algorithm, solve, evaluate the results of and apply these to a problem in Mechanical Engineering field independently.	4
5	The ability to develop new strategic approaches and solving problems by taking responsibility when unforeseen circumstances occur in applications in Mechanical Engineering field.	5
6	The ability to evaluate knowledge on Mechanical Engineering field critically, to be able to direct learning and to manage advanced studies in Mechanical Engineering field independently.	5
7	The ability to transfer the knowledge of his/her own studies and current developments in Mechanical Engineering field to groups working in the same field and other fields visually, verbally and in the written word.	5
8	The ability to be able to communicate via speech or writing in at least one foreign language.	5
9	To teach and check the social, scientific and ethical values by supervising these values during the collection, analysis and dissemination of data in Mechanical Engineering field.	1

Contribution Level: 1 low, 5 high.

Contribution of Learning Outcomes on Program Competency	Since the fundemental aspects of mechanical engineering will be benefited for the advanced biomechanics topics, the course's contribution to the first, second and third program competencies is 5. In this course, simulation and modeling of the musculoskeletal systems will be developed and analyzed. Therefore, the course's contribution to the fourth program competency is 4. Since the advanced biomechanical problems will be analyzed and solved in this course, and the results will be presented to the audience, the course's contribution to the fifth, sixth and seventh program competencies is 5. Since the language of instruction is English, contribution to the eighth competency is 5. Since, data collection is not included in the context of the course, course's contribution to the ninth program competency is 1.