Universidad Zaragoza

Year : 2020/21

26001 - Kinesiology and human biomechanics

Syllabus Information

Academic Year: 2020/21
Subject: 26001 - Kinesiology and human biomechanics
Faculty / School: 127 - Facultad de Ciencias de la Salud
Degree: 276 - Degree in Occupational Therapy
ECTS: 8.0
Year: 1
Semester: Annual
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, autonomous work and study, and exams.

4.2.Learning tasks

This course is organized as follows:

- **Lectures** (2.5 ECTS: 62 hours). 2 hours/week throughout the course. The sessions will include presentations by the professor and debates for the whole group based on the topics of the course.
- **Practice sessions** (1 ECTS: 25 hours). 1 hour/week, from October to May. The methodology will be active participatory with work in small groups that will carry out practical activities that allow to know and apply the techniques of kinesiological analysis
- **Autonomous work and study** (4.5 ECTS: 122 hours). Follow-up of the work that will consist of the individual elaboration of logos of the locomotor apparatus. Valuing the ability of autonomous work, transcription and quantitative interpretation. Individual work delivery: Senior member, at the end of the first semester. Lower member, deadline for delivery: last week of the month of April. For the rest of the indicated activities, the student should be

responsible for the resolution of problems of Biomechanics, creation of structured work schemes, personal study throughout the course as an indispensable means to achieve the expected learning results and the progressive acquisition of competences

- **Exams**. Midterm exam at the end of the first semester. Final exam in June. Oral exam (if you do not pass the practice by continuous evaluation): June

4.3.Syllabus

This course will address the following topics:

SECTION I: BIOMECHANICS

- Topic 1. INTRODUCTION TO KINESIOLOGY. Definition and concept of Kinesiology. Historical development of Kinesiology. Objectives of Kinesiology.
- Topic 2. INTRODUCTION TO BIOMECHANICS. Static and dynamic, Kinetics and Kinematics. Magnitudes biomechanics.
- Topic 3. FORCES. Definition and representation of forces. Topic s of measurement. Composition and resolution of forces. Moment of force. Application to muscle forces.
- Topic 4. MOVEMENT. Definition and classification. Linear and angular kinematics. Newton's laws of motion. Application to the analysis of human movement.
- Topic 5. WORK, POWER AND ENERGY. Concept of work, power and energy. Potential energy and kinetic energy. Measurement Topic s.
- Topic 6. LEVERS AND PULLEYS. Levers. Concept. Classification. The principle of levers. Anatomical levers. Pulleys. Concept. Types of pulleys. Anatomical pulleys. Applications in Occupational Therapy.
- Topic 7. BALANCE AND STABILITY. Center of gravity of the human body. Line of gravity. Support base. Balance. Types of balance. Stability of equilibrium: factors influencing this stability.

SECTION II: ANATOMICAL AND PHYSIOLOGICAL BASIS OF HUMAN MOVEMENT

- Topic 8. BONES. Composition, structure and function. Mechanical laws governing bone growth.
- Topic 9. JOINTS. Concept and structural classification of joints. Joint stability. Orientation axes and planes of movement. Factors affecting range of motion. Assessment of the range of motion. Methods for measuring joint mobility: Goniometry. Study of active and passive mobility.
- Topic 10. SKELETAL MUSCLES. Structure and properties. Structural and functional classification of muscles. Muscle contraction. Types of muscle contraction. Muscular biomechanics. Muscle Testing: Techniques of Manual Examination
- Topic 11. NEUROMUSCULAR BASIS OF HUMAN MOVEMENT. Voluntary and reflex movements. Proprioceptive neuromuscular facilitation.
- Topic 12. CADENAS. Kinetic chains: Concept and Classification. The kinetic chain as facilitator of the movement.

SECTION III: KINESIOLOGY OF THE UPPER EXTREMITY

- Topic 13. KINESIOLOGY OF THE SHOULDER. Structure and movements of the shoulder joints, its breadth and the factors that limit. Movements of the shoulder girdle. Muscles involved in the movements of the shoulder and girdle: location, features and functions. Measurement and evaluation of joint and muscle of the shoulder complex.
- Topic 14. KINESIOLOGY OF THE ELBOW. Forearm and elbow joints: structure and movements. Muscles involved in movements of the elbow and the pronosupination: location, features and functions. Measurement and evaluation of joint and muscle of elbow and pronosupination.
- Topic 15. KINESIOLOGY OF THE WRIST. Structure and movements. Muscles involved in them: location, features and functions. Measurement and evaluation of joint and muscle of the wrist.
- Topic 16. KINESIOLOGY OF THE HAND. Structure and movements. Muscles involved in movements of the joints of the last four fingers: location, features and functions. The thumb: movements. Motor muscles of thumb: location, features and functions. Gripping. Muscles involved in different types of grip. Evaluation of joint and muscle of the fingers.

SECTION IV: KINESIOLOGY OF THE LOWER EXTREMITY

- Topic 17. KINESIOLOGY OF THE HIP. Structure and movements. Articular coaptation factors. Muscles involved in the movement of the hip: location, features and functions. Measurement and evaluation of joint and muscle of the hip. Relationship between hip joint, pelvic girdle and lower spine.
- Topic 18. KINESIOLOGY OF THE KNEE. Structure and movements. Lateral and cruciate ligaments: their physiology. Transverse, anteroposterior and rotational stability of the knee. Muscles involved in the movement of the knee: location, characteristics and function. Measurement and evaluation of joint and muscle of the knee.
- Topic 19. KINESIOLOGY OF THE ANKLE. Structure and movements. Anteroposterior and transverse stability.

Muscles acting on ankle movements: location, features and functions. Measurement and evaluation of joint and muscle of the ankle.

- Topic 20. KINESIOLOGY OF THE FOOT. Structure and movements. Muscles acting on the foot movements: location, features and functions. Muscle and joint analysis of the movements of the foot. The plantar vault: its architecture. Plantar arches. Distribution of static loads and deformations of the plantar arch. Exploration of the foot.

SECTION V: KINESIOLOGY OF THE TRUNK

- Topic 21. KINESIOLOGY OF THE SPINE. Structure and joints of the spine. Intervertebral disc structure. Spinal curves. Functional divisions of the spine. Muscles involved in the movement of the spine: location, features and functions. Global movements of the spine. Compressive forces on the disc. Behavior of the intervertebral disc in the elementary movements.
- Topic 22. KINESIOLOGY OF THE CERVICAL SPINE. Division, structure and movements. Functional assessment of the muscles involved in movements of the cervical spine and head. Exploration of the cervical spine.
- Topic 23. KINESIOLOGY OF THE THORACIC SPINE. Structure and movements. Movements of the ribs around the cost-vertebral joints. Muscles involved in trunk movements: location, features and functions. Exploration. Antagonism-synergy of the diaphragm and abdominal muscles.
- Topic 24. KINESIOLOGY OF THE LUMBAR SPINE. Structure and movements. Range of motion of the lumbar spine. The intervertebral disc: mechanisms and compression of lumbar nerve root. Functional assessment of the muscles involved in the movements of the lumbar spine. Exploration of the lumbar spine.
- Topic 25. KINESIOLOGY OF THE PELVIC GIRDLE. Joint structure of the pelvis. Movements of the pelvic girdle: muscles involved. Anteroposterior and transverse stability of the pelvis. Position influence on the joints of the pelvic girdle.

SECTION VI: KINESIOLOGICAL ANALYSIS OF MOTOR SKILLS

- Topic 26. APPROACH TO THE KINESIOLOGICAL ANALYSIS OF MOTOR SKILLS.. Laboratory techniques for motion analysis: visual analysis, kinematic analysis, kinetic analysis techniques.
- Topic 27. KINESIOLOGY OF STANDING POSTURE. Evolution and development of the erect posture. Polygon lift in standing position. Alignment of body segments. Muscle activity in standing position. Neuromuscular mechanisms for maintaining upright posture. Principles of good posture.
- Topic 28. BACK SCHOOL. Definition. Lifting loads. Manipulation of an object located higher than the head. Sitting and lying positions. Distribution of the workspace. Prevention of workplace fatigue.
- Topic 29. KINESIOLOGY OF NORMAL HUMAN GAIT. Concept. The gait cycle: phases and periods. Energy expenditure during walking: optimization mechanisms. Gait kinetics. Gait kinematics. Muscle actions during walking.
- Topic 30. KINESIOLOGY IN EXERCISE PROGRAMS. Muscular Strength. Muscular Endurance. Flexibility. Exercises and principles to increase strength and muscular endurance. Exercises and principles of flexibility.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Facultad de Ciencias de la Salud web https://estudios.unizar.es/estudio/ver?id=109.

4.5.Bibliography and recommended resources

As support, course material, as well as the bibliography and other useful material, will be posted on the web of the course http://wzar.unizar.es/acad/cinesio/inicio.html