DIGIHEALTH

Academic Development & Quality Assurance Center

Course Specification

PHTH 215 Kinesiology and Biomechanics

Faculty: Health Sciences
Department: Physical Therapy
Programme: BSc in Physical Therapy

BASIC INFORMATION

Course Title: Kinesiology and Biomechanics.

Course Code: PHTH 215.

Contact Hours: Lec – 3 Hr. Lab – 0 Hrs. Cln – 0 Hr. Cr – 3.

Prerequisites: None.

Academic Level/Semester: 2nd level Term: Fall.

1. COURSE OVERALL AIMS:

At the end of this course the student will gain information related to body mechanics, human motion, regional biomechanics (kinetics and kinematics) of joints of both axial and appendicular systems, in addition to different topics related to normal and pathological gait, and instrumentations used in gait analysis.

2. INTENDED LEARNING OUTCOMES OF THE COURSE (ILOS), AFTER COMPLETING THE COURSE STUDENTS WILL BE ABLE TO ACQUIRE THE FOLLOWING:

(a) Knowledge and Understanding skills
K.1-Identify the basic terms related to kinesiology and biomechanics.
K.2-Identify force, lever and pulley systems in the body.
K.3-Recognize Newton's laws of motion under linear and angular motion.
K.4-Recall relevant anatomical structures in hip, knee, ankle, foot, shoulder, elbow, wrist, hand, TMJ and spine.
K.5-Understand kinematics, kinetics, and pathomechanics of hip, knee, ankle, foot joints, shoulder, elbow, wrist, TMJ and spine.
K.6-Describe normal gait, gait cycle and determinants of gait.
K.7-Recognize kinematic and kinetic analysis of gait.
K.8-Identify different causes and patterns of pathological gait.

K.9-Recognize basic elements of balance and postural control, kinetics and kinematics of posture, and deviations from normal alignment.
(b) Intellectual skills
I.1- Distinguish between different types of force and lever systems.
I.2- Correlate skeletal muscles functions to their corresponding force and lever system.
I.3- Estimate the centre of gravity location in response to specific condition.
I.4- Analyse motion of different joint movement including hip, knee, ankle, foot, shoulder, elbow, wrist, hand, TMJ and spine.
I.5- Correlate major biomechanical disturbances with the suitable assistive, adaptive device.
I.6- Specify muscle and joint action during each phase of gait cycle.
I.7- Solve problem related to biomechanics.
I.8- Relate postural misalignment and gait deviation with the corresponding cause.
I.9- Explain major deviation misalignment from biomechanical point of view.
I.10- Decide correct body mechanics and safety measures during activity for, therapist and patient, based on biomechanical principles.
I.11-Assess balance, posture, gait, and locomotion based on biomechanical kinetic and kinematic principles.
(c) Professional and Practical skills
P.1- Implement basic mechanical principles to the body in order to assess body mechanics, apply and progress a therapeutic exercise and manual therapy program safely and effectively.
P.2- Calculate different parameters of gait cycle.
(d) General and Transferable skills
G.1-Communicate in an efficient oral and written manner.
G.2-Use the textbooks and internet efficiently and independently in preparation for lifelong learning.
G.3-Complete related assignment correctly.

3. WEEKLY DISTRIBUTION OF COURSE TOPICS: (THEORETICAL, CLINICAL, PRACTICAL…)

Week No.	Course Topic
Week No. 1	Definition of related terms. [Week 1.pdf] Center of gravity. Stability and equilibrium. Force systems. • Linear force system • Parallel force system • Concurrent force system • General force system
Week No. 2	Simple body machines/Lever system [Week 2.pdf] https://youtu.be/OEYjm5sJVMo

	• First class of lever • Second class of lever • Third class of lever The torque or moment of force Pulley system • Function of pulleys • Types of pulleys • Anatomical application Two joint muscle Motion and Newton's law. Types of motion. • Linear motion • Angular Motion • General Motion
Week No. 3	Biomechanics of the hip region. [Week 3 - 4 (HIP).pdf] Kinematics . https://youtu.be/eKLXTXP_I3Y • Definition • Function of the hip • Structures of the hip • Stability of the hip joint • ROM of the hip joint • Angles within the structure of the hip joint
Week No. 4	Biomechanics of the hip region. [Week 3 - 4 (HIP).pdf] • Loading characteristics on the hip joint Kinetic of the hip region. https://youtu.be/eKLXTXP_I3Y • Statics • Dynamics Pathomechanics of the hip joint: • Bone abnormalities • Muscle weakness • Joint dysfunction
Week No. 5	Biomechanics of the knee region.[Week 5 (KNEE).pdf] Kinematics https://youtu.be/ZNzfJCIEkQI and https://youtu.be/_q-Jxj5sT0g

	• Definition • Function of the knee • Structures of the knee • Stability of the knee joint • ROM of the knee joint • Screw home mechanism • Factors affecting screw home mechanism The patella • Functions • Q angle • Mechanism of load transmission by the intact and redundant articular cartilage Kinetics • Statics of the tibiofemoral joint • Dynamics of the tibiofemoral joint • Statics of the patellofemoral joint • Dynamics of the patellofemoral joint Pathomechanics of the knee joint • Bone abnormalities • Muscle weakness • Joint dysfunction
Week No. 6	Biomechanics of the ankle and foot region. [Week 6 - 7 (ANKLE).pdf] Ankle https://youtu.be/0R4zRSE_-40 • Definition • Structures of the ankle • Stability of the ankle joint • ROM of the ankle joint Foot • Structures of the foot
Week No. 7	Written exam. Biomechanics of the foot [Week 6 - 7 (ANKLE).pdf] Mechanism of the load transmission on the ankle and the foot. Causes of specific pathway of weight bearing forces. Kinetics of the ankle Statics • Two leg stance • One leg stance Dynamics • During gait Pathologies of the ankle
Week No. 8	Biomechanics of shoulder joint. [Week 8 - SHOULDER.pdf] Structures of the shoulder joint Shoulder biomechanics https://youtu.be/P90YEhsnOZQ

	• Glenohumeral joint • Glenohumeral and scapulothoracic rhythm • Requirements of full arm elevation • Ligaments function • Shoulder complex motion
Week No. 9	Biomechanics of elbow, wrist and hand joint. [Week 9 - Elbow - Wrist - Hand - TMJ.pdf] Elbow joint • Structures of the shoulder joint https://youtu.be/8ND0KT6Pq50 • Elbow biomechanics Wrist and hand • Structures of the wrist and hand • Hand and wrist biomechanics
Week No. 10	Problem solving/TBL Spine and TMJ biomechanics. [WEEK 10 - Spine.pdf] spine • General function of the vertebral column • Components of the vertebral column • Biomechanics of spine Temporomandibular joint (TMJ) • Structures of TMJ • Joint movement
Week No. 11	Biomechanics of gait. [Gait (Week 11 - 12 - 13).pdf] Normal gait https://youtu.be/KsdrmyxOyxM • Physiological definition • Mechanical definition Gait cycle • Definition • Phases of gait cycle • Gait cycle timing • Terms used to describe gait for observational analysis Determinants of gait Displacement of center of gravity • Determinants of gait or factors responsible for minimizing the displacement of center of gravity Kinematic Analysis of gait • Definition • Parameters • Angular displacement
Week No. 12	Biomechanics of gait. [Gait (Week 11 - 12 - 13).pdf] Kinetic analysis of gait https://youtu.be/KsdrmyxOyxM • Definition • Forces Pathomechanics of gait.

	• Causes of pathological gait • Pathological gait due to muscle weakness
Week No. 13	Research work and group discussion. [Gait (Week 11 - 12 - 13).pdf] Gait training. Assistive /adaptive devices used in gait training.
Week No. 14	Biomechanics of Posture. [WEEK (14) - Posture.pdf] • Definition • Postural control • Optimal posture • Analysis of posture • Mechanics of posture • Spondylometer
Week No. 15	Final written exam

4. A. TEACHING AND LEARNING METHODS

Illustrated lecture using personal computer and data show.
Problem solving/TBL [EXAMPLE TBL (PHTH 215) (Model Answer).docx]
Assignments.
Presentation/Group discussion

4. B- TEACHING AND LEARNING FACILITIES/ MATERIALS

Lecture halls
Audiovisual aids: Data-show
Anatomical models
Computers facilities
BAU medical library / Electronic library
Electronic database
Turnitin

MOODLE SUPPLEMENT

This course includes a moodle supplement. All lectures will be posted on moodle system at BAU the week before lecture. We will use Moodle for coursework submission, for announcements, and for various activities. https://moodle.bau.edu.lb

5. STUDENT ASSESSMENT METHODS, SCHEDULE AND GRADING:

Assessment No.	Type	To Assess	Start Week No.	Subm. Week No.	Weighting of Assessment
1	Written exam	Knowledge, intellectual, and professional skills		7	30 %
2	Problem solving/TBL	Knowledge, intellectual, general and transferable skills		10	20 %

	Read related documents posted on Moodle [EXAMPLE TBL (PHTH 215) (Model Answer).docx]				
3	Research work and group discussion	General and transferable skills	1	1-13	10 %
4	Final written exam	Knowledge, intellectual, and professional skills		15	40%
Total					100 %

6. LIST OF REFERENCES:

a) Course notes

Handout.

b) Essential Books (Text Books)

Hamilton, Nancy. Kinesiology : Scientific Basis of Human Motion / Nancy Hamilton, Wendi Weimar, Kathryn Luttgens. - 12th ed., International Editions. - New York : McGraw-Hill Companies, Inc., 2012.
Levine, David. Whittle's Gait Analysis / David Levine, Jim Richards, Michael W. Whittle. - 5th ed. - Edinburgh : Churchill Livingstone/ Elsevier, 2012.

c) Recommended books

Oatis, Carol A. Kinesiology : The Mechanics and Pathomechanics of Human Movement / Carol A. Oatis with Contributors. - 2nd ed., International Edition. - Philadelphia : Lippincott Williams & Wilkins, 2009
Barlett, Roger. Sports Biomechanics / Roger Barlett and Melanie Bussey. - 2nd ed. - London : Routledge Taylor & Francis Group, 2012.
Perry, Jacquelin. Gait Analysis : Normal and Pathological Function / Jacquelin Perry, Judiyh M. Burnfield; Illustred by Lydia M. Cabico. - 2nd ed. - New Jersey : Slack Incorporated, 2010.

d) General References

Students are advised to visit web pages related and which are not limited to:
http://accessphysiotherapy.mhmedical.com/book.aspx?bookid=1586
http://accessphysiotherapy.mhmedical.com/book.aspx?bookid=965
http://accessmedicine.mhmedical.com/book.aspx?bookid=1186
www.kinesiology.net
www.hk4health.co.uk
www.acsm.org