



Faculty of Rehabilitation

Tehran University of Medical Sciences & Health Services
Enghelab Street, Pich-e-Shemiran

Tehran – IRAN Po.Box

Tel: +98 21 77530670

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Course Description

Islamic Republic of Iran



Ministry of Health, Treatment & Medical Education



Tehran University of Medical Sciences & Health Services

School of Rehabilitation

PhD Degree, Physical Therapy Program

2014

Course Description Guide



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Introduction

Physiotherapy needs to extensive education, research and treatment in universities, clinics and research centers. Also, for the physiotherapy to be independent of the others, to compensate for the lack of masters in universities, to promote scientific level of the lecturers in this field and to help in the assessment and treatment of patients, PhD physiotherapy is presented.

1. Definition and purpose:

PhD physiotherapy is referred to a curriculum that includes the education after the master degree. The purpose of this degree is to train professionals that are dominant on this science and are able to work according to the advanced treatment techniques and research methodology. They have high skills for education and research.

2. Primary pedestal

Primary pedestal of the PhD physiotherapy is a research and having an experience in one of the fields, including, neuromuscular, musculoskeletal, cardiovascular or biomechanics. Also, education is a mean to fill the educational gaps of the students to reach its purposes.

3. Duration of PhD

Maximally up to 4.5 years. The student will not be able to continue, if he or she cannot terminate the courses or present the thesis credit.

4. Process

PhD physiotherapy include in the educational and research phases according to the regulation of the supreme council of planning:

a. Educational phase

The courses in this phase consist of optional and compulsory courses. The compulsory course consists of 10 credits and 27 credits is for the non-core. The students have to



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pass 10 to 11 credits of the non-core credits according to their thesis and supervisor view.

The acceptance period of the educational phase is 2 to 5 semesters.

b. Research phase

This phase consists of a 24 credit thesis. The students have to determine their thesis subjects maximally up to a semester after passing the comprehensive exam, with the supervisory agreement and educational council.

4. Entrance requirements

They must have a certificate of the master of science in physiotherapy from any university approved by the Ministry of Health, Treatment & Medical Education.

The other requirements are in accordance with the regulation of the PhD curricula.

Examine lessons and multiply

- Physiotherapy for various disorders, including Electrotherapy, therapeutic exercise, orthosis and prosthesis, measurement and evaluation (MMT) (Multiply 4).
- Electroneurophysiology including, exercise physiology, muscle and nerve neurophysiology (Multiply 2).
- Normal and abnormal biomechanics (Multiply 2).

5. Roles and abilities

According to the comprehensive program of the PhD physiotherapy, the alumni have many educational and research abilities so that they are able to study in research or clinics, and present more qualified educational or rehabilitative roles.

6. Necessity and importance

At the present, most of the medical treatments are based on the scientific data. Thus, physiotherapy assessment of the available methods and innovation of the new rehabilitation techniques, needs skilled researchers. In addition to research, training the alumni to educate efficiency the science to the students is a necessity for rehabilitation schools. The establishment of the PhD physiotherapy is to train these skilled persons.



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Table A. Optional Courses (Non- core)

Code	Course Title	Prerequisite	Credit(s)			Hour(s)		
			Theo.	Prac	Total	Theo.	Prac.	Total
01	Analysis of the sensorymotor systems	-	3	-	3	51	-	51
02	Motor control	-	3	-	3	51	-	51
03	Advanced anatomy and physiology of the cardiopulmonary system	-	3	-	3	51	-	51
04	Physiotherapy in musculoskeletal injuries	-	2	1	3	34	34	68
05	Physiotherapy in sports injuries	-	2	-	2	34	-	34
06	Biochemistry	-	2	-	2	34	-	34
07	Pharmacology in rehabilitation	-	2	-	2	34	-	34
08	Histology	-	1	1	2	17	34	51
09	Introduction to animal lab	-	1	1	2	17	34	51
10	Tissue biomechanics	-	2	-	2	34	-	34
11	Manual therapy	-	1	2	3	17	68	85
Total					27			544

Each M.Sc. The student has to pass 10 to 11 credits of above courses, suitable for his/her thesis, by the agreement of her/his supervisor



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Table B. Compulsory Courses

Code	Course Title	Prerequisite	Credit(s)			Hour(s)		
			The.	Prac.	Total	The.	Prac.	Total
12	Physiologic Basis of Therapeutic Exercise	-	2	-	2	34	-	34
13	Advanced muscle and nerve physiology	-	2		2	34		34
14	Occupational biomechanics	-	2		2	34		34
15	Electrophysiology	-	1	1	2	17	34	51
16	Seminar	-	2	-	2	34	-	34
17	Thesis	-	-	-	24	-	-	-
Total					34			187

24 credit thesis is related to research phase



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Course Description

Course Title: Analysis of the sensorimotor systems

Course Code: 01

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	3		3
Hour (s):	51	0	51

Purpose:

The students acquire more comprehensive information about the sensory motor systems and are familiarized with the analysis of the information.

Outlines:

1. Description: identification and discussion about the physiological mechanisms of a specific movement disorder due to the neurological injuries, and application of these mechanisms in physiotherapeutic treatments.
2. Systematic plasticity within the central nervous system, learning in the central nervous system, morphological changes in the central nervous system during learning, adaptation of the central nervous system to an injury at various levels, denervation, types of disuse, ...



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Course Description

Course Title: Motor control

Course Code: 02

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	3	0	3
Hour (s):	51	0	51

Purpose:

To familiar the students with the motor system and how the movements controlled by the cortex and other centers.

Outlines:

Sensorimotor information processing within the cortex and subcortical structures and brain stem, interconnection between these areas and various areas within the cortex during development and maturation of the systems involved in normal and abnormal movements include in:

1. Motor programming within developing and matured brain, and effective factors for motor programming such as peripheral factors and sentiment, ...
2. System and information processing within cortex, subcortical structures and head stem
3. Feedback: feedback loops, short and long circuits generated due to feedback during repair, recovery, development and plasticity, neurophysiologies study of different sensory feedbacks, and psychological factors that involve feedback...
4. Functional recover of the brain after injuries such as injury, hemorrhage and...



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References:

5. Scientific bases of human movement. Barbara A. Gowitzke, Morris Milner, the latest edition.
6. Muscles Alive: Their Functions Revealed by Electromyography – John V. Basmajian, Carlo J. DeLuca, the latest edition.
7. Applied Exercise Physiology Richard A. Berger, the latest edition.



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Course Description

Course Title: Advanced anatomy and physiology of the Cardio-pulmonary system

Course Code: 03

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	3	0	3
Hour (s):	51	0	51

Purpose:

To familiar the students with the advanced anatomy and physiology of the Cardio-pulmonary system

Outlines:

- Heart anatomy and microanatomy, heart muscle properties, vascular anatomy and histology, pulmonary anatomy histology and respiratory ways
- Heart physiology, mechanic and the control of its function, electrocardiography, vascular physiology, blood physiology and blood circuits
- Respiration physiology including, gas exchange between the lungs and environment, ventilation and respiration control, lung mechanic (relationship between pressure and volume, relationship between pressure and air passage within air pathways, ...)



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Course Description

Course Title: Physiotherapy in musculoskeletal injuries

Course Code: 04

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	1	3
Hour (s):	34	34	51

Purposes:

The students learn treatments including, physiotherapy in musculoskeletal injuries

Outlines:

Study of the various types of congenital, acquired and traumatic disorders of the musculoskeletal system, new physiotherapeutic treatment for these disorders, a study of various types of the deformities due to the musculoskeletal injuries and how to prevent or rehabilitate these deformities, study of the effective factors in repairing of the injuries of the musculoskeletal system

References:

1. Muscles Alive: Their Functions Revealed by Electromyography – John V. Basmajian, Carlo J. DeLuca, the latest edition.
2. Musculoskeletal disorders
3. Skeletal Muscle in Health and Disease, the latest edition, by: David A. Jones, Joan M. Round.



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Course Description

Course Title: Physiotherapy in sports injuries

Course Code: 05

Prerequisite Title(s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour(s):	34	0	34

Purposes:

Familiarization of the students with the various sports injuries and their physiotherapeutic treatment

Outlines:

- Physical assessment, athlete status (strength ...), physical conditioning, protective devices...
- Prevention and physical treatment of muscular, articular, and bone injuries during sports
- Study of the factors inducing sports injuries, study of the injuries specific to a sport
- Study of the preventive methods
- Treatment and physiotherapy for sports injuries, therapeutic exercises appropriate for a specific sport to minimize the adaptive changes, study the effects of sports devices on the occurrence of the injury

References:

1. Sports Injury: Assessment and Rehabilitation. By: David C. Reid, the latest edition.
2. Arnheim's Principles of Athletic Training: A Competency-based Approach, By: Daniel D. Arnheim, the latest edition.
3. Sports physical therapy, Barbara Sanders, Appleton & Lange, the latest edition.
4. Orthopedic physical therapy (North of America).



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Course Title: Biochemistry

Course Code: 06

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour (s):	34	0	34

Purposes:

The students are familiarized with the basis of biochemistry, metabolism and vital signs.

Outlines:

Molecular basis of alive beings, ingredients, biomolecules and cells, water, electrolytes and acid and alkali balance, phosphorus and calcium metabolism, biochemistry of the contractile tissue and muscular contraction, biologic oxidation, biochemistry of the nervous tissue, proteoglycans, collagen, enzymatic bioenergetics.



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Course Title: Pharmacology in Rehabilitation

Course Code: 07

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour (s):	34	0	34

Purpose:

Familiarization of the students with the medications that are related to rehabilitation

Outlines:

- Receptors, pharmacokinetics and pharmacokinetics, absorption and diffusion, drug formation
- Agonists of Ach receptors
- Antagonists of Ach receptors
- Drugs that activate adrenoreceptors
- Drugs that inhibit adrenoreceptors
- Prostaglandins
- Bronchodilators
- An introduction to the medications of the CNS
- Tranquilizer drugs, hypnotics
- Anti-epilepsy drugs
- Local anesthetics
- Muscule relaxants
- The medications used for Parkinson and movement disorders
- Analgesics and antagonists
- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Adrenocorticosteroids and the antagonists of adrenocortical
- Disinfectants and antiseptics

References:

1. Physiotherapy pharmacology. By: Eddy, Lynne, the latest Edition.



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Course Title: Histology

Course Code: 08

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	1	1	2
Hour (s):	17	34	51

Purpose:

The students acquire comprehensive information about the characteristics of various tissues of the body

Outlines:

Familiarization with the cell properties, epithelium, connective tissue, blood, muscle.
Nervous system

Familiarization with the histology of the organs responsible for blood circuit, lymph, skin, digestion, respiration, urinary, endocrine glands, reproductive glands, special sense organs

References:

1. Text/Atlas of Histology. By: C. Roland Lesson, Thomas Lesson, Anthony Paparo, the latest edition.
2. Basic human histology. By: Dr. Rojhan, the latest edition.



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Course Description

Course Title: Introduction to animal lab

Course Code: 09

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	1	1	2
Hour (s):	17	34	51

Purpose:

Familiarization of the students with well known laboratory animals and how to study them in the lab

Outlines:

Familiarization of the students with well known laboratory animals (Rat, cavy, rabbit, cat, ...), how to mew them, how to work with them, the physiology of the laboratory animals.



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Course Description

Course Title: Tissue Biomechanics

Course Code: 10

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour (s):	34	0	34

Purpose:

Familiarization with the biomechanics principles of musculoskeletal tissues.

Outlines:

Familiarization with the musculotendinous structure and its biomechanic, the biomechanic and pathomechanic of the connective tissue, the biomechanic and pathomechanic of the bone, biomechanic and pathomechanic of muscular tissue, the biomechanic and pathomechanic principles of the joints.

References:

1. Clinical Biomechanics: Musculoskeletal Actions and Reactions. By Richard C. Schafer, the latest edition.
2. Basic Biomechanics. By: Susan Hall, the latest edition.
3. Joint Structure and Function: A Comprehensive Analysis, Pamela K Levangie, Cynthia C Norkin , the latest edition.



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Course Description

Course Title: Manual Therapy

Course Code: 11

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	1	23	
Hour (s):	17	68	85

Purpose:

Familiarization with various types of mobilization and manipulation of the joints.

Outlines:

Familiarization with the principles of the manual therapy and indication for different injuries of the limbs and spine, practice of mobilization for the joints of the limbs and spine, practice of manipulation for the peripheral joints and spinal joints, manual therapy protocols for musculoskeletal injuries.

References:

1. Rational Manual Therapies. By: John V. Basmajian, Richard E. Nyberg, the latest edition.
2. Maitland's Vertebral Manipulation: Management of Neuromusculoskeletal Disorders. By: EllyHengeveld, Kevin Banks, the latest edition.
3. Maitland's Vertebral Manipulation: Management of Neuromusculoskeletal Disorders. By: EllyHengeveld, Kevin Banks, the latest edition.
4. Aspects of manipulative therapy. By: E. F. Glasgow, the latest edition.
5. Grieve's Modern Manual Therapy. By: Jeffrey D. Boyling, Gwendolen A. Jull, the latest edition
6. Textbook of Orthopaedic Medicine: Diagnosis of soft tissue lesions. By: James Henry Cyriax, Margaret Coldham, the latest edition.



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Course Description

Course Title: Physiologic Basis of Therapeutic Exercise

Course Code: 12

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour (s):	34	0	34

Purpose:

The students are familiarized with the physiologic basis of therapeutic exercise

Outlines:

Part a.

1. The principles of physiologic and mechanics for study of the human movements, in particular for posture, movement and training, the responses of the body to exercise, including the study of the physiologic changes on cardiovascular and pulmonary system.
2. The responses of the body to exercise, including the study of the muscular changes, metabolism, energy, heat, environment and the changes in the endocrine glands.
3. How to increase the strength and endurance. Assessment of the above factors using related laboratories.

Part b.

Study of the physiologic effects of therapeutic exercise on different injuries along with the body responses.



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Course Title: Advanced muscle and nerve physiology

Course Code: 13

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour (s):	34	0	34

Purpose:

The students are familiarized with the advanced neural mechanisms that produced movements. Also, they are familiarized with the action of the skeletal muscles.

Outlines:

How information are regulated, transmitted and processed in the central nervous system, study of the neural activities at three levels, spinal, brain stem and cortex, study of the neural and chemical activities in synapses, study of the spinal reflexes and role of the spine in movements, the role of the brain stem, basal ganglis, reticular formation and vestibular system in movements, brain stem reflexes, cortical and cerebellar control of movements, the physiology of the brain stem and midbrain reflexes, neuropsychology of the movement (movement perception, the effect of external stimuli such as sound, light ..., speech, feedback and the other psychologic factors the affect movement), study of the motor control models, the histology of the muscles, molecular structure of the muscle, chassification of the muscles according to action, kinetic and kinematic of the muscles, mechansim of contraction and the proposed theories of propagation in muscle fibers, force development in muscle fibers and the whole muscle, effect of fatigue on muscle activity.



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Course Title: Occupational Biomechanic

Course Code: 14

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour(s):	34	0	34

Purpose:

The students are familiarized with the usage of biomechanics in promotion of the occupational status of the people.

Outline:

- Study and discussion about the biomechanical factors that have an effect on the job performance, so that musculoskeletal injuries are prevented.
- Study of the anatomic and physiologic limitations during work, workplace and tools, ergonomic regulations in occupational design, design of the tools and the foot or hand controls...
- The causes of fatigue in terms of human factors, the principles of transport through the hands...

References:

1. Applied kinesiology and biomechanics. By: Clayne R. Jensen, Gordon W. Schultz, Blauer L. Bangerter, the latest edition.



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Course Title: Electrophysiology

Course Code: 15

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	1	1	2
Hour (s):	17	34	51

Purpose:

The students learn the different methods of electrophysiology in research.

Outline:

A survey of the techniques that are used for the biomechanic and kinesiology studies, study of the theoretical basis of the kinesiology electromyography of the muscles during various movements in natural and unnatural postures, and how different group of the muscles work in this postures.

References:

1. Muscles Alive: Their Functions Revealed by Electromyography – John V. Basmajian, Carlo J. DeLuca, the latest edition.
2. Electromyography in Clinical Practice: Clinical and Electrodiagnostic Aspects of Neuromuscular Disease. By: Michael Jeffrey Aminoff, the latest edition.
3. Practical Electromyography. By: Ernest W. Johnson, William S. Pease, the latest edition.



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Course Title: Seminar

Course Code: 16

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	2	0	2
Hour (s):	34	0	34

Outline:

The students present a seminar about the advances and new researches in one of the fields of neuromuscular, musculoskeletal, cardiopulmonary or biomechanics.



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Course Title: Thesis

Course Code: 17

Prerequisite Title (s): None

	Theo.	Prac.	Total
Credit (s):	-	-	24
Hour (s):	-	-	

Purpose:

Application of the learned theories to issue practical and useful solutions of the health problems and promote efficiency in sports physiotherapy

Description and outlines:

Students design, perform and complete their own research in various fields of physiotherapy under the supervision of their supervisor according to the educational regulation of the supreme council of planning.

References:

According to the supervisor

Appraisal method:

According to the educational regulation of the supreme council of planning.