Department of Physiology
Faculty of Science, Mahidol University

COURSE HANDBOOK

PHYSICAL FITNESS TESTING AND
EXERCISE PRESCRIPTION

(SCPS 661)
Credit Hour: 3(2-2-5)

1st Semester, 2017
# SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

(3 credits: 2-2-5)

1st Semester 2017 (AUG 16th - DEC 4th, 2017)

Department of Physiology, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Time</th>
<th>Topic</th>
<th>Instructor</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wed Aug-16</td>
<td>Orientation</td>
<td>09:00-10:00 a.m.</td>
<td>Course Orientation</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
</tr>
<tr>
<td></td>
<td>Lec 1-2</td>
<td>10:00 a.m. - 12:00 p.m.</td>
<td>Principle of Physical Fitness Testing and Exercise Prescription</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Fri Aug-18</td>
<td>Lec 3-4</td>
<td>09:00 - 11:00 a.m.</td>
<td>Risk Assessment, Safety of Exercise, and Pre-Exercise Testing Evaluation</td>
<td>Chatchai</td>
<td>Pr.401</td>
</tr>
<tr>
<td></td>
<td>Lab I</td>
<td>1:00 - 3:00 p.m.</td>
<td>Pre-Exercise Evaluation, First-Aid, and Cardio-Pulmonary Resuscitation (CPR)</td>
<td>Chatchai</td>
<td>B501/1</td>
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</table>

## Unit II. Neuromuscular Fitness

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Time</th>
<th>Topic</th>
<th>Instructor</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wed Aug-23</td>
<td>Lec 5</td>
<td>09:00-11:00 a.m.</td>
<td>Motor Control, Reaction Time, and Psychomotor Speed</td>
<td>Witchuda</td>
<td>Pr.401</td>
</tr>
<tr>
<td></td>
<td>Lab II</td>
<td>1:00-3:00 p.m.</td>
<td>Reaction Time, Psychomotor Speed, Flexibility, Agility, and Balance Tests</td>
<td>Witchuda</td>
<td>B501/1</td>
</tr>
<tr>
<td>Mon Sep-04</td>
<td>Lec 6-7</td>
<td>01:00-3:00 p.m.</td>
<td>Flexibility, Agility, Neuromuscular Coordination and Body Balance and Prescription</td>
<td>Vitoon</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Tue Sep-05</td>
<td>Lec 8-9</td>
<td>9:00 -11:00 a.m.</td>
<td>Muscle Strength, Power, and Endurance</td>
<td>Vitoon</td>
<td>Pr.401</td>
</tr>
<tr>
<td></td>
<td>Lec 10</td>
<td>11:00 a.m.-12:00 p.m.</td>
<td>Exercise Prescription for Training Muscle Strength, Power, and Endurance</td>
<td>Vitoon</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Wed Sep-07</td>
<td>Lec 11-12</td>
<td>08:00-10:00 a.m.</td>
<td>Electromyography (EMG)</td>
<td>Wattana</td>
<td>PTS 405</td>
</tr>
<tr>
<td></td>
<td>Lec 13</td>
<td>10:00-11:00 a.m.</td>
<td>Principle of Isokinetics</td>
<td>Wattana</td>
<td>PTS 405</td>
</tr>
<tr>
<td></td>
<td>Lab III</td>
<td>1:00-4:00 p.m.</td>
<td>EMG and Isokinetic Testing of Muscle Fitness</td>
<td>Wattana &amp; Pongchai</td>
<td>PTS</td>
</tr>
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</table>

## Unit III. Ergometric Exercise Testing of Anaerobic and Aerobic fitness

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Time</th>
<th>Topic</th>
<th>Instructor</th>
<th>Place</th>
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</thead>
<tbody>
<tr>
<td>Mon Sep-25</td>
<td>Lec 14-15</td>
<td>09:00-11:00 a.m.</td>
<td>Ergometry</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Wed Sep-27</td>
<td>Lec 16-17</td>
<td>09:00-11:00 a.m.</td>
<td>Principle of Testing Anaerobic Power and Anaerobic Capacity</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Fri Sep-29</td>
<td>Lab IV</td>
<td>09:00 a.m.-12:00 p.m.</td>
<td>Measurement of Anaerobic Power and Anaerobic Capacity</td>
<td>Ratchakrit</td>
<td>B501/1</td>
</tr>
<tr>
<td>Mon Oct-09</td>
<td>Lec 18-19</td>
<td>09:00-11:00 a.m.</td>
<td>Anaerobic Threshold</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Tue Oct-10</td>
<td>Lab V</td>
<td>09:00 a.m.-12:00 p.m.</td>
<td>Measurement of Anaerobic Threshold</td>
<td>Ratchakrit</td>
<td>B501/1</td>
</tr>
<tr>
<td>Wed Oct-11</td>
<td>Lec 20-21</td>
<td>09:00-11:00 a.m.</td>
<td>Principle of Direct and Indirect Calorimetry</td>
<td>Tepmanas</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Thu Oct-12</td>
<td>Lec 22-23</td>
<td>09:00-11:00 a.m.</td>
<td>Cardio-Respiratory Endurance</td>
<td>Tepmanas</td>
<td>Pr.401</td>
</tr>
<tr>
<td></td>
<td>Lec 24-25</td>
<td>1:00-3:00 p.m.</td>
<td>Exercise Prescription for Training Cardio-Respiratory Endurance</td>
<td>Tepmanas</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Tue Oct-17</td>
<td>Lab VI</td>
<td>09:00 a.m.-12:00 p.m.</td>
<td>Direct Measurement of VO₂ (Manual Method)</td>
<td>Tepmanas</td>
<td>B501/1</td>
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</tbody>
</table>

**Unit I. Introduction to Physical Fitness Testing and Pre-exercise Evaluation and Risk Assessment**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
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<th>Instructor</th>
<th>Place</th>
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<td>Ratchakrit</td>
<td>Pr.401</td>
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<tr>
<td></td>
<td>Lec 1-2</td>
<td>10:00 a.m. - 12:00 p.m.</td>
<td>Principle of Physical Fitness Testing and Exercise Prescription</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
</tr>
<tr>
<td>Fri Aug-18</td>
<td>Lec 3-4</td>
<td>09:00 - 11:00 a.m.</td>
<td>Risk Assessment, Safety of Exercise, and Pre-Exercise Testing Evaluation</td>
<td>Chatchai</td>
<td>Pr.401</td>
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<tr>
<td></td>
<td>Lab I</td>
<td>1:00 - 3:00 p.m.</td>
<td>Pre-Exercise Evaluation, First-Aid, and Cardio-Pulmonary Resuscitation (CPR)</td>
<td>Chatchai</td>
<td>B501/1</td>
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**6/10/2017**
<table>
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<tr>
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<th>Instructor</th>
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<tr>
<td></td>
<td>Lab VII</td>
<td>1:00-4:00 p.m.</td>
<td>PWC Test and Indirect Measurement of VO$_{2\text{max}}$</td>
<td>Tepmanas</td>
<td>B501/1</td>
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<tr>
<td>Tue Nov-07</td>
<td></td>
<td>09:00 a.m.-12:00 p.m.</td>
<td>Examination III</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
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**Unit IV. Anthropometry and Body Composition**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Time</th>
<th>Topic</th>
<th>Instructor</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Nov-14</td>
<td>Lec 26-27</td>
<td>09:00 - 11:00 a.m.</td>
<td>Anthropometry and Body Composition</td>
<td>Tepmanus</td>
<td>Pr.401</td>
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<tr>
<td></td>
<td>Lec 28</td>
<td>11:00 a.m.-12:00 p.m.</td>
<td>Exercise Prescription for Control of Body Composition and Weight</td>
<td>Tepmanus</td>
<td>Pr.401</td>
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<tr>
<td>Wed Nov-15</td>
<td>Lab VIII</td>
<td>9:00 a.m.-12:00 p.m.</td>
<td>Anthropometry and Body Composition Measurement</td>
<td>Tepmanus</td>
<td>B501/1</td>
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</table>

**Unit V. Clinical Aspect of Exercise Testing**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Time</th>
<th>Topic</th>
<th>Instructor</th>
<th>Place</th>
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</thead>
<tbody>
<tr>
<td>Mon Nov-27</td>
<td>Lec 29-30</td>
<td>10:00 a.m.-12:00 p.m.</td>
<td>Cardiac stress Test</td>
<td>Sirin</td>
<td>Pr.401</td>
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<tr>
<td>Tue Nov-28</td>
<td>Lab IX</td>
<td>1:30-3:30 p.m.</td>
<td>Cardiac stress Test</td>
<td>Sirin</td>
<td>RM</td>
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<tr>
<td>Mon Dec-04</td>
<td></td>
<td>09:00 a.m.-12:00 p.m.</td>
<td>Examination IV</td>
<td>Ratchakrit</td>
<td>Pr.401</td>
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PTS
Physical Therapy at Salaya

RM
Ramathibodi Hospital (Cardiology Unit, Department of Internal Medicine)

Pr.401
Department of Physiology, Faculty of Science, Mahidol University

B501/1
Department of Physiology, Faculty of Science, Mahidol University

Course Coordinator
Asst. Prof. Dr. Ratchakrit Srikuea
02-201-5518 091-890-4263 ratchakrit.sri@mahidol.ac.th
COURSE DESCRIPTION

Course name: Physical Fitness Testing and Exercise Prescription
Code: SCPS 661
Credits: 3 credits (2-2-5)
Student group/number:
M.Sc. (Exercise Physiology/4)
M.Sc. (Physiology/1)

Course Organizer: Asst. Prof. Dr. Ratchakrit Srikuea (ratchakrit.sri@mahidol.ac.th)
Room B502/1, Tel. 0-2201-5518
Department of Physiology, Faculty of Science, Mahidol University

Teaching Staff:

<table>
<thead>
<tr>
<th>Name</th>
<th>Teaching hour</th>
<th>Lecture</th>
<th>Lab</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Departmental Instructors:</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1. Assoc. Prof. Dr. Vitoon Sangsirisuwan</td>
<td>5</td>
<td>-</td>
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<td>5</td>
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<tr>
<td>2. Assoc. Prof. Dr. Chatchai Muanprasat</td>
<td>2</td>
<td>2</td>
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<td>4</td>
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<tr>
<td>3. Assoc. Prof. Dr. Tepmanas Bupha-intr</td>
<td>7</td>
<td>7</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>4. Asst. Prof. Witchuda Saengsavang</td>
<td>2</td>
<td>2</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>5. Asst. Prof. Ratchakrit Srikuea</td>
<td>9</td>
<td>6</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Guest Instructors:</strong></td>
<td></td>
<td></td>
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<tr>
<td>1. Assoc. Prof. Dr. Wattana Jalayondeja</td>
<td>3</td>
<td>3</td>
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<td>6</td>
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<tr>
<td>2. Asst. Prof. Dr. Sirin Apiyasawat</td>
<td>2</td>
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<tr>
<td>3. Mr. Pongchai Watcharakeunkhan</td>
<td>-</td>
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</table>
**Course Description:**

This course is set up for graduate students in Exercise Physiology and related fields. This course is concerned with principles, concepts, and approaches to the measurement of various components of physical fitness. Numerous test procedures are described on the basis of exercise physiology to assess the level of health, physical fitness, and performance of work and sports. The aim of this course is to offer the students the knowledge and skill of both non-exercise and exercise testing of physical fitness both in the field and in the laboratory. The course also provides the students with knowledge of the principles of exercise prescription for improving individual physical fitness components.

**Objectives:**

The course is designed for each student to:

1. Learn how physical fitness could be assessed by exercise tests on the basis of the fitness related to physiological characteristics in response to standardized exercise.
2. Know the theoretical background of various physical fitness tests and learn different test procedures with the knowledge on the principles of each test so as to understand the scope, aims, application, and limitations of the test procedures.
3. Be familiar with instruments generally used in fitness testing with the knowledge on the principles of performance, calibration, and recording techniques of various instruments and their applications.
4. Learn the principles and concepts of prescribing exercise programs for improving and maintaining various physical fitness components in subjects of different initial physical health and fitness conditions.

**Prerequisite:**

SCPS 666   Neuromuscular Exercise Physiology
SCPS 667   Cardiorespiratory Responses to Exercise and Environmental
SCPS 668   Metabolic Responses to Exercise and Environmental Stress

**Course Contents:**

The course is divided into five units starting unit an introductory part which informs about the principles of testing physical fitness and prescribing exercise programs for improving the fitness. Medical evaluation prior to exercise or test of physical activity readiness as the tool for pre-participation screening is also mentioned. The five units of the course are as follow:

- **Unit I:** Introduction to physical fitness testing and pre-exercise evaluation and risk assessment
- **Unit II:** Neuromuscular fitness
- **Unit III:** Ergometric exercise testing of anaerobic and aerobic fitness
- **Unit IV:** Anthropometry and body composition
- **Unit V:** Clinical aspect of exercise testing

In each unit, theoretical background including rationale of one (or more) physical fitness component is introduced. The principles, concepts, and methods of testing the component of physical fitness being focused are discussed. Measurement of each fitness component is experimentally practiced by students in the laboratory or in the field. Lecture on principles of
prescribing appropriate exercise program on the basis of exercise intensity, frequency, and duration for improving each fitness component for individuals is given at the end of each unit.

The study outline, behavioral objectives, and suggested readings for each lecture will be given by the responsible instructor.

**Instruction Time and Place:**

**Time:** Weekday
- Lecture 09:00 a.m.-12:00 p.m. / 1:00-4:00 p.m. or otherwise stated
- Lab 09:00 a.m.-12:00 p.m. / 1:00-4:00 p.m. or otherwise stated

**Place:**
1. Room Pr. 401 (Pr. Building) and B 501/1 (B Building)
   Department of Physiology, Faculty of Science, Mahidol University
2. Faculty of Physical Therapy, Salaya Campus, Mahidol University
3. Cardiology Unit, Department of Internal Medicine, Ramathibodi Hospital

**Evaluation:**
Performance of students who register for credit from this course will be evaluated on the following basis:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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</thead>
<tbody>
<tr>
<td>Examination</td>
<td>80 %</td>
</tr>
<tr>
<td>Lab report</td>
<td>10 %</td>
</tr>
<tr>
<td>Class/Lab attendance &amp; performance</td>
<td>10 %</td>
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</tbody>
</table>

The minimum grade for successful completion of this course is **B**.

**Class Policies:**
1. Students absent from class (for whatever reason) are responsible for securing missed material.
2. Late homework/report submission will not be accepted, unless having a legal excuse.
3. The only "legal" excuses for not attending class are: immediate sickness to you or your family (a doctor's excuse will be required), religious holiday, accident.
4. Any other excuses for missing exams, quizzes will NOT be accepted.

**Drop Policy:**
Department is no longer allowed to drop students who never attending.

**Academic Dishonesty:**
Dishonesty includes but is not limited to cheating, copying, plagiarism, trickery, submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

It is the critical philosophy of Mahidol University that academic dishonesty is an exclusively unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension in the particular subject, fail in all subjects or expulsion from the University.
Lec 1-2

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Principle of Physical Fitness Testing & Exercise Prescription
Instructor: Asst. Prof. Dr. Ratchakrit Srikuea
Teaching hour: Lecture 2 h
Lecture date/Time Aug 16th, 2017 / 10:00 a.m.-12:00 p.m.

Behavioral objectives
At the completion of this topic, student should be able to:

1. Define physical fitness and its components
2. Describe the benefits of physical fitness testing and the characteristics of effective testing
3. Discuss the validity and reliability of the tests conducted in laboratory and in the field
4. List factors to be considered in selection or construction of physical fitness tests
5. Explain the significance of exercise in fitness testing and describe the principles of the test
6. Describe the principles of exercise training and its significance on the improvement and maintenance of physical fitness

Lecture outline:

1. Definition and components of physical fitness
2. Principles of physical fitness testing:
   - Characteristics of effective testing
   - Type of physical fitness tests (laboratory vs. field)
   - Selection of the test
   - Testing order
   - General instructions during testing
3. Exercise testing:
   - Purpose and general principles of exercise testing
4. Principles of exercise prescription:
   - Guidelines of exercise prescription
   - Factors affecting improvement and maintenance of physical fitness

Teaching method and media: Two sessions of 55-min lecture using PowerPoint presentation
Evaluation: Written exam

Reference:
SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Risk Assessment and Safety of Exercise
Instructor: Assoc. Prof. Dr. Chatchai Muanprasat, M.D., Ph.D.
Teaching hour: Lecture 1 h
Lecture date/Time: Aug 18th, 2017 / 9:00-10:00 a.m.

Behavioral objectives
At the completion of this topic, student should be able to:
1. Precisely identify risks associated with exercise
2. Discuss risk factors needed to be assessed prior to exercise prescription
3. Discuss medical conditions that produce adverse effects of the exercise
4. Explain the process of risk stratification of patient
5. Discuss the level of supervision appropriate for patient at each risk category

Lecture outline:
1. Adverse effects of exercise in sedentary and unhealthy subjects
2. Medical conditions that complicate the exercise prescription
   - Cardiovascular disease
   - Hypertension
   - COPD
   - Diabetes
   - Elderliness
   - Musculoskeletal disorders
3. Risk stratification
4. Case studies
5. Exercise testing and participation recommendations based on risk classification

Teaching method and media: A session of 55-min lecture using PowerPoint presentation
Evaluation: Written exam

Reference:
Topic: Pre-Exercise Testing Evaluation
Instructor: Assoc. Prof. Dr. Chatchai Muanprasat, M.D., Ph.D.
Teaching hour: Lecture 1 h, Lab 2 h
Lecture date/Time: Aug 18th, 2017 / 10:00-11:00 a.m.
Lab date/Time: Aug 18th, 2017 / 1:00-3:00 p.m. (Lab I)

Behavioral objectives
At the completion of this topic, student should be able to:
1. Explain the definition, purpose and importance of pre-exercise testing evaluation
2. Discuss information needed to be collected prior to pre-exercise testing
3. Explain principle and significance of physical examination required for pre-exercise testing evaluation
4. Perform and interpret physical examination needed for pre-exercise testing evaluation
5. Discuss supervising implementation suitable for each risk category
6. Select an appropriate test protocol according to fitness and health status of the individual

Lecture outline:
1. Definition, purpose and importance of pre-exercise test evaluation
2. Information needed to be obtained through history taking
3. Physical examination
   - Importance
   - How to do it?
   - Interpretation
4. Risk stratification
5. Patient preparation
   - Protocol selection
   - Calibration of testing equipment

Teaching method and media: A session of 55-min lecture using PowerPoint presentation
Evaluation: Written exam

Reference:
Lec 5

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

**Topic:** Motor Control, Reaction Time, and Psychomotor Speed

**Instructor:** Asst. Prof. Dr. Witchuda Saengsawang

**Teaching hour:** Lecture 2 h, Lab 2 h

**Lecture date/Time** Aug 23rd, 2017 / 9:00-11:00 a.m.

**Lab date/Time** Aug 23rd, 2017 / 1:00-3:00 p.m. (Lab II)

**Behavioral objectives**
At the completion of this topic, students should be able to

1. Explain neural control of human movement
2. Define the term motor learning
3. Describe the type of reaction time
4. Explain basic concepts of psychomotor speed testing

**Lecture outline:**

1. Motor control
   - Sensory contribution of motor control
   - Central contribution of motor control
   - Motor learning

2. Reaction time
   - Anatomical basis for reaction time
   - Type of reaction time
   - Response time

3. Psychomotor speed
   - Definition and Examples
   - Motor skill tests and applications

**Teaching method and media:** Two sessions of 55-min lecture using PowerPoint presentation

**Evaluation:** Written exam

**References:**


Robert J. Kosinski, A literature review on reaction time (Online). Clemson University.

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Flexibility, Agility, Neuromuscular Coordination and Body Balance and Prescription
Instructor: Assoc. Prof. Dr. Vitoon Saengsirisuwan
Teaching hour: Lecture 2 h
Lecture date/Time: Sep 04th, 2017 / 01:00-3:00 p.m.

Behavioral objectives:
At the completion of this topic, student should be able to:

1. Define and describe the principles of training techniques for flexibility, speed, agility and balance
2. Discuss benefits and cautions of the training techniques for flexibility, speed, agility and balance
3. Formulate the exercise programs suitable for different clients to improve flexibility, speed, agility and balance.

Lecture outline:
1. Flexibility
   a. Muscle elasticity and length
   b. Nervous system activity
   c. Range of motion
2. Definition of agility, balance, neuromuscular coordination
3. Principles of training for flexibility, speed, agility and balance
   a. Techniques
   b. Benefits and cautions
4. Exercise prescriptions to improve flexibility, speed, agility and balance in special populations

Teaching method and media: Two sessions of 50-min lecture using PowerPoint presentation
Evaluation: Written exam

References:


SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Muscle Strength, Power, and Endurance
Instructor: Assoc. Prof. Dr. Vitoon Saengsirisuwan
Teaching hour: Lecture 2 h
Lecture date/Time Sep 05th, 2017 / 9:00-11:00 a.m.

Behavioral objectives
At the completion of this topic, student should be able to:

1. Define muscle strength, power, and endurance
2. Discuss factors affecting muscle strength, power, and endurance
3. Describe how to evaluate each component of muscular fitness
4. Discuss the training principles for muscle strength, power, and endurance
5. Describe the physiological bases underlying muscle adaptation following exercise training

Lecture outline:
1. Component and definition of muscular fitness
2. Factors affecting muscle strength, power, and endurance
3. Assessment of muscular fitness
4. Exercise training principles and physiological adaptations for muscle strength, power, and endurance

Teaching method and media: Two sessions of 50-min lecture using PowerPoint presentation
Evaluation: Written exam

References:


Lec 10

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Exercise Prescription for Training Muscle Strength, Power, and Endurance
Instructor: Assoc. Prof. Dr. Vitoon Saengsirisuwan
Teaching hour: Lecture 1 h
Lecture date/Time: Sep 05th, 2017 / 11:00 a.m.-12:00 p.m.

Behavioral objectives
At the completion of this topic, student should be able to:

1. Describe the basic training principles for muscle strength, power, and endurance
2. State cautions for avoiding injuries in a training program
3. Formulate the exercise programs for improving muscle strength, power, and endurance in various populations

Lecture outline:
1. Resistance training: principles and adaptations
2. Strength and endurance programs
3. Mode of weight training
   a. Strength training
   b. Power training
   c. Endurance training
4. Muscular conditioning methods
5. Weight training in special populations
6. Precautions for weight training

Teaching method and media: A session of 50-minute lecture using PowerPoint presentation
Evaluation: Written exam

References:

Topic: Electromyography (EMG)
Instructor: Asst. Prof. Dr. Wattana Jalayondeja
Teaching hour: Lecture 2 h, Lab 3 h
Lecture date/Time: Sep 6th, 2017 / 08:00-10:00 a.m.
Lab date/Time: Sep 6th, 2017 / 1:00-4:00 p.m. (Lab II)

Behavioral objectives:
At the completion of this topic, student should be able to:
1. Describe physiological basis of electromyography (EMG)
2. Describe principle of EMG measurement
3. Describe the processes to determine % MVC and Median Frequency of EMG
4. Explain two examples of EMG application
4. Discuss pros and cons of EMG

Lecture outline:
1. Physiological Basis and Concepts
2. Instrumentation
3. Demodulation Technique
4. EMG Analysis
5. Disadvantage of Surface EMG

Teaching method and media: Two sessions of 50-min lecture using PowerPoint presentation
Evaluation: Written exam

References:
Solderberg GL Selected topics in surface EMG for use in clinical setting, NIOSH, 1992. Ch 5, or http://www/cdc.gov/niosh/91-100.html
www.delsys.com/KnowledgeCenter/Decomposition%20of%20EMG%20signals.html
Topic: Principle of Isokinetics
Instructor: Asst. Prof. Dr. Wattana Jalayondeja
Teaching hour: Lecture 1 h, Lab 3 h
Lecture date/Time: Sep 6th, 2017 / 10:00-11:00 a.m.
Lab date/Time: Sep 6th, 2017 / 1:00-4:00 p.m. (Lab III)

Behavioral objectives:
At the completion of this topic, student should be able to:
1. Describe principle of isokinetics
2. Explain and interpret at least two essential variables from isokinetic measurement
3. Describe process of isokinetic machine setting

Lecture outline:
1. Principle of isokinetics
2. Terminology
3. Testing and training through isokinetic methods

Teaching method and media: A session of 50-min lecture using PowerPoint presentation
Evaluation: Written exam

Reference:
Lec 14-15
SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

**Topic:** Ergometry
**Instructor:** Asst. Prof. Dr. Ratchakrit Srikuea
**Teaching hour:** Lecture 2 h
**Lecture date/time:** Sep 25th, 2017 / 09:00-11:00 a.m.

**Behavioral objectives:**
At the completion of this topic, student should be able to:

1. Explain the basic principle of cycling ergometry and treadmill
2. List and discuss the advantages and disadvantages of various types of ergometers
3. Calculate the power output and determine mechanical efficiency

**Lecture outline:**

1. Ergometry and types of ergometer
2. Calculation of mechanical work and power
3. Exercise efficiency and running economy

**Teaching method and media:** Two sessions of 55-min lecture using PowerPoint presentation
**Evaluation:** Written exam

**References:**
Lec 16-17

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

**Topic:** Principle of Testing Anaerobic Power and Anaerobic Capacity

**Instructor:** Asst. Prof. Dr. Ratchakrit Srikuea

**Teaching hour:** Lecture 2 h, Lab 3 h

**Lecture date/Time** Sep 27th, 2017 / 09:00 -11:00 a.m.

**Lab date/Time** Sep 29th, 2017 / 09:00 a.m.-12:00 p.m. (Lab IV)

**Behavioral objectives**

At the completion of this topic, student should be able to:

1. Define the difference between power and capacity of metabolic process
2. Explain the significant of anaerobic energetic process on exercise performance
3. Identify biological indicators and discuss factors influencing anaerobic power and capacity
4. Describe the concept of ultra short-term and short-term anaerobic power and anaerobic capacity tests
5. Calculate anaerobic power and capacity with appropriate units of expression of a subject under noninvasive testing

**Lecture outline:**

1. Overview of the energy systems
2. Involvement of the energy systems during all-out exercise of different durations
3. Contribution of the anaerobic energy system on exercise performance
4. Biological indicators of anaerobic energetic process
5. Factors influencing all-out anaerobic performance
6. Anaerobic power and anaerobic capacity tests

**Teaching method and media:** Two sessions of 55-min lecture using PowerPoint presentation

**Evaluation:** Written exam

**References:**


SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

**Topic:** Anaerobic Threshold  
**Instructor:** Asst. Prof. Dr. Ratchakrit Srikuea  
**Teaching hour:** Lecture 2 h, Lab 3 h  
**Lecture date/Time** Oct 9th, 2017 / 09:00-11:00 a.m.  
**Lab date/Time** Oct 10th, 2017 / 09:00 a.m.-12:00 p.m. (Lab V)

**Behavioral objectives**  
At the completion of this topic, student should be able to:  
1. Define anaerobic threshold and related terms  
2. Explain the mechanisms of blood lactate increase during exercise  
3. Identify invasive and non-invasive methods of measurement of anaerobic threshold  
4. Describe how ventilation and gas exchange parameters indicate anaerobic threshold during an incremental-load exercise

**Lecture outline:**  
1. Introduction of anaerobic threshold and related terms  
2. Factors affecting lactate production during exercise  
3. Measurements of anaerobic threshold  
   a. Invasive method: blood lactate  
   b. Non-invasive methods: ventilatory gas exchange

**Teaching method and media:** Two sessions of 55-min lecture using PowerPoint presentation  
**Evaluation:** Written exam

**References:**  
Lec 20-21

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

**Topic:** Principle of Direct and Indirect Calorimetry

**Instructor:** Assoc. Prof. Dr. Tepmanas Bupha-Intr

**Teaching hour:** Lecture 2 h, Lab 1 h

**Lecture date/Time:** Oct 11th, 2017 / 09:00-11:00 a.m.

**Lab date/Time:** Nov 1st, 2017 / 9:00-10:00 a.m. (Lab VI)

**Behavioral objectives**

At the completion of this topic, student should be able to:

1. Compare the difference between aerobic and anaerobic fitness.
2. Describe the relationship between macronutrients and energy utilization.
3. Describe three component of energy expenditure (EE).
4. Explain the methods for the assessment of energy expenditure.
5. Explain how oxygen consumption and carbon dioxide production can estimate EE

**Lecture outline:**

1. Aerobic fitness
2. Energy expenditure and Its component
3. Measurement of energy expenditure
   - Direct calorimetry
   - Indirect calorimetry
     - Oxygen consumption (VO2)
     - Carbondioxide production (VCO2)
     - Respiratory exchange ratio (RER)
   - Non-calorimetric Techniques

**Teaching method and media:** Two sessions of 55-min lecture using PowerPoint presentation

**Evaluation:** Written exam

**References:**


Withers, *et al.* Determination of maximal oxygen consumption (VO2max) or maximal aerobic power :114-127.
Lec 22-23

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Cardio-Respiratory Endurance
Instructor: Assoc. Prof. Dr. Tepmanas Bupha-Intr
Teaching hour: Lecture 2 h, Lab 3 h
Lecture date/Time Oct 12th, 2017 / 09:00-11:00 a.m.
Lab date/Time Nov 1st, 2017 / 1:00-4:00 p.m. (Lab VII)

Behavioral objectives
At the completion of this topic, student should be able to:
  1. Define cardiopulmonary endurance and maximal O$_2$ uptake.
  2. Compare and contrast between direct and indirect methods of testing maximal O$_2$ uptake.
  3. State the criteria used to indicate the attainment of maximal O$_2$ uptake.
  4. Explain how to determine maximal O$_2$ uptake with sub-maximal exercise.
  5. Define physical work capacity at heart rate of 170 bpm.
  6. Explain how to use the Astrand-Ryhming nomogram to estimate maximal O$_2$ uptake.
  7. List factors that effect maximal O$_2$ uptake.

Lecture outline:
  2. Introduction: determinants of maximal O$_2$ uptake
  3. Tests of cardio-pulmonary endurance
  4. Methods of testing maximal O$_2$ uptake
     a. Maximal exercise testing: types of exercise
     b. Sub-maximal exercise testing to predict maximal O$_2$ uptake
  5. Factors effecting maximal O$_2$ uptake
  6. Cardiopulmonary fitness classification

Teaching method and media: Two sessions of 55-min lecture using PowerPoint presentation
Evaluation: Written exam

References:
Lec 24-25

**SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION**

**Topic:** Exercise Prescription for Training Cardio-Respiratory Endurance

**Instructor:** Assoc. Prof. Dr. Tepmanas Bupha-Intr

**Teaching hour:** Lecture (plus paper discussion) 2 h

**Lecture date/Time** Oct 12th, 2017 / 1:00-3:00 p.m.

**Behavioral objectives**

At the completion of this topic, student should be able to:

1. Determine the physiological improvement of cardio-respiratory endurance.
2. Develop the exercise program for the improvement of cardio-respiratory endurance.
3. Describe factors concerning the design of exercise program.

**Lecture outline:**

1. Objective of Exercise Training Program
2. Exercise Training Prescription
   a. Mode of Exercise
   b. Intensity of Exercise
   c. Duration of Exercise
   d. Frequency of Exercise
   e. Rate of Progression
3. Training Program

**Teaching method and media:** A 55-min lecture using PowerPoint presentation and a 55-min paper discussion

**Evaluation:** Report

**References:**


SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Anthropometry and Body Composition
Instructor: Assoc. Prof. Dr. Tepmanas Bupha-Intr
Teaching hour: Lecture 2 h, Lab 3 h
Lecture date/Time: Nov 14th, 2017 / 09:00-11:00 a.m.
Lab date/Time: Nov 15th, 2017 / 09:00 a.m.-12:00 p.m. (Lab VIII)

Behavioral objectives
At the completion of this topic, students should be able to:
1. Accurately identify various sites of anthropometric landmark.
2. Precisely measure some anthropometric variables.
3. Discuss the factors determining validity and errors of measurement.
5. Discuss the limitations for body composition assessment.
6. Apply the anthropometric data and body composition into practice

Lecture outline:
2. Anthropometry
   - Conventions and landmarks
   - Measured variables
   - Assumption and variables
   - Applications
3. Body composition
   - Models and equations
   - Methods and measurements
   - Laboratory methods
   - Field methods
4. Relationship between anthropometry variables and body composition
   - Lengths and breadths
   - Circumferences
   - Skin fold thickness
   - Pairs of variables
4. Application of the anthropometric data and body composition into practice

Teaching method and media: Two sessions of 55-min lecture using PowerPoint presentation
Evaluation: Written exam

References:
Lec 28

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

**Topic:** Exercise Prescription for Control of Body Composition and Weight

**Instructor:** Assoc. Prof. Dr. Tepmanas Bupha-Intr

**Teaching hour:** Lecture 1 h

**Lecture date/Time** Nov 14th, 2017 / 11:00 a.m.-12:00 p.m.

**Behavioral objectives**
At the completion of this topic, students should be able to:
1. Explain the current theory of control of body weight.
2. Discuss the effect of different mode of exercise and training on body weight.
3. Describe various forms of obesity
4. Discuss gender difference in the effect of physical activity on body fat.
5. Suggest correct mode of exercise for body builders.
6. Discuss the factors influencing bone density.

**Lecture outline:**
1. Exercise and body weight
   - Control of body weight
   - Exercise intensity and body weight
   - Frequency and duration of exercise
   - Resistance training and body weight
2. Exercise training and fat mass
   - Exercise intensity and body fat
   - Duration and frequency of exercise and body fat
3. Exercise training and fat free mass
   - Mode of training and fat free mass
4. Exercise training and bone mineral mass

**Teaching method and media:** Student presentation and discussion

**Evaluation:** Written exam

**References:**

SCPS 661: PHYSICAL FITNESS TESTING AND EXERCISE PRESCRIPTION

Topic: Cardiac Stress Test
Instructor: Asst. Prof. Sirin Apiyasawat, M.D.
Teaching hour: Lecture 2 h, Lab 2 h
Lecture date/Time: Nov 27th, 2017 / 10:00 a.m.-12:00 p.m.
Lab date/Time: Nov 28th 2017 / 1:30-3:30 p.m.

Behavioral objectives:
At the completion of this topic, student should be able to:
1. Recognize the concept and physiology of exercise stress test
2. Describe the normal and abnormal physiologic changes during the test
3. Recognize the clinical utilities of cardiac stress test
4. Identify the indications and contraindications of cardiac stress test
5. Identify the advantages and limitations of cardiac stress test
6. Recognize how the test is performed and how the test is interpreted
7. Recognize the current advance in stress test with additional imaging modalities and the currently available modalities

Lecture outline:
1. What is cardiac stress test?
2. The purposes of the test
3. Indications and contraindications
4. Normal and abnormal physiologic responses during exercise test
5. How to interpret the test
6. Clinical utilities of the test
7. Advantages and disadvantages of the test
8. Stress test with imaging modalities: advantage and availability

Teaching method and media: Two sessions of 55-min lecture using PowerPoint presentation
Evaluation: Written Exam

References: