# Elektrik Stimülasyonu: Fizyoterapistler İçin Anahtar

# CK4Stim Projesi ve Kılavuz


**PROF.DR. NİLÜFER ÇETİŞLİ KORKMAZ**

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TÜRKİYE ULUSAL AJANSI
TURKISH NATIONAL AGENCY

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# FİZYOTERAPİ VE REHABİLİTASYONDA ELEKTRİK STİMÜLASYONU İÇİN KLİNİK ANAHTAR

# CLINICAL KEY FOR ELECTRICAL STIMULATION IN PHYSIOTHERAPY AND REHABILITATION

MESLEKİ EĞİTİM İŞBİRLİĞİ ORTAKLIKLARI

KA220-VET COOPERATION PARTNERSHIPS IN VOCATIONAL EDUCATION AND TRAINING

PROJE NO: 2021-1-TR01-KA220-VET-000032970

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PAMUKKALE UNIVERSITY 1992 DENİZLİ

UNIVERSITAS CRAIOVENSIS

MUSTAFA KEMAL ÜNİVERSİTESİ HATAY - 1992

SÜLEYMAN DEMİREL ÜNİVERSİTESİ S.Demirel 1992

1993 BAŞKENT UNIVERSITY

ŠIAULIŲ VALSTYBINĖ KOLEGIJA

MAKÜ BURDUR MEHMET AKİF ERSOY ÜNİVERSİTESİ

# KA220

- Katılımcı kurum/kuruluşlara **uluslararası işbirliği deneyimi ve kurumsal kapasite gelişimi için fırsatlar** sunar.
- İşbirliği için Ortaklıklardan **yüksek kaliteli yenilikçi çıktılar** üretmeleri beklenmektedir.
- İşbirliği Ortaklıkları, **açık ve somut bir ihtiyaç analizine** dayanmalıdır.
- Analizde belirlenen ihtiyaçlara cevap vermeye yönelik **somut, ulaşılabilir, ölçülebilir hedefler** belirlemelidir.

- **Ana Eylem 2: Yenilik ve İyi Uygulama Değişimi için İşbirliği (KA2)**
- **28/02/2022**

**27/08/2024**

- **30 ay**

**213.320,00 Euro**

# Amaçlar

- Değerlendirme ve tedaviye yönelik **elektriksel stimülasyon** yaklaşımlarındaki mevcut eğitim içeriklerini toplamak
- Bunları Avrupa boyutunda fizyoterapistlerin spesifik rehabilitasyon gereksinimlerine uyarlamak,

bu şekilde

- Günümüzde ve gelecekte ihtiyaç duyulan işe özgü becerilerin geliştirilmesi desteklenecektir.
- mükemmellik için dijital eğitim yoluyla sürekli mesleki eğitim ve öğretim ile.

# Amaçlar

- Bu yönler, Avrupa genelinde mesleki ağların gelişimini destekleyerek, fizyoterapi ve rehabilitasyon alanında Avrupa mesleki eğitiminde beceri ve temel bilgilerin kazanılmasına katkıda bulunacaktır.
- En iyi uygulamaları paylaşmak ve yeni ve standartlaştırılmış **elektriksel stimülasyon protokolleri ve teknolojilerinin kullanımını** teşvik etmek ve
- Fizyoterapistlerin (akademisyen, eğitmen, klinik fizyoterapist, mentor veya diğer personel olarak) mesleki gelişimlerinin desteklenmesi uluslararasılaşma stratejisi ile gerçekleştirilebilir.

# Amaçlar

**Ortaklar dijital teknolojileri uluslararası amaçlar için kullanarak**

- ✓ öğretim,
- ✓ öğrenme,
- ✓ değerlendirme ve
- ✓ Mesleki Eğitim ve Öğretim alanına katılım ve
- ✓ ES yaklaşımlarındaki deneyimlerini artıracak.


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# Teşekkürler...

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Hatay Mustafa Kemal University
Hatay/TÜRKİYE

Suleyman Demirel University
Isparta/TÜRKİYE

Šiauliai State University of Applied Sciences
Siauliai/LITHUANIA

Burdur Mehmet Akif Ersoy University
Burdur/TÜRKİYE

# Teşekkürler…

- Ortak olarak işbirliği içinde olacak,
- Projenin olumlu ve uzun süreli etkiler getirmesi açısından
- katılımcılar Üniversiteler ve Ulusal Fizyoterapist dernekleri.

**Türkiye Fizyoterapistler Derneği**

Order of Physiotherapists in Romania

Lithuanian Physiotherapy Association

Estonian Association of Physiotherapists

# PR1 - İhtiyaçların Belirlenmesi

Türkiye, Romanya, Litvanya ve Estonya'dan toplam 203 fizyoterapist

Bunlardan

- 72'si devlette çalışıyor,
- Özel sektörde 100 fzt ve
- 31'i akademik personel olarak çalışıyor

| Countries | Government n% | Private n% | Academic n% |
|---|---|---|---|
| **Türkiye** | 24 (25.3%) | 45 (47.4) | 26 (27.4%) |
| **Romania** | 5(16.7%) | 23(76.6%) | 2(6.7%) |
| **Lithuania** | 24 (77,5%) | 7 (22,5%) | 0 (0.0%) |
| **Estonia** | 19 (40.4%) | 25 (53.2%) | 3 (6.4%) |
| **General** | 72 (35.5%) | 100 (49.3%) | 31 (15.3%) |
| **Total** | 72 (35.5%) | 100 (49.3%) | 31 (15.3%) |

# PR1 - Bilgi Düzeyi (Level of Knowledge)

Sağlıklı kas, denerve kas ve kas kasılması için elektrik stimülasyonunun kullanılması durumunda **“orta”** düzeydedir.

Fizyoterapistlerin çoğu **(%47,8)** kas kasılmasını sağlamak için elektriksel stimülasyonun kullanılması konusunda **"orta"** düzeyde bilgiye sahip olduklarını belirtti.

Fizyoterapistlerin **%10,8'i temel bilgiye** sahipti.

- Üst motor nöron lezyonu hakkında **“biraz” (%35)** veya **“orta” (%32,5)** düzeyde bilgiye sahip oldukları,
- en çok tercih edilen akımlar ise **NMES (%50,7) ve FES (%29,6)** oldu.
- Denerve kasları tedavi etmek için fizyoterapistlerin en çok **NMES'i (%40,4)** tercih ettiği,

daha düşük seviyelerde **galvanik akımı (%34), EMS'yi (%28,1)** ve diğerlerini tercih ettiler.

# PR1 – Beceri Seviyesi (Level of Skill)

Elektrik stimülasyonunu uygulamadaki beceri düzeyi **orta düzeyde** görünüyor,

Fizyoterapistlerin yaklaşık **%50'si "orta"** (%35), "iyi"(14,8) ve "çok iyi" (%2,5) dereceleriyle yanıt verdi

Fizyoterapistlerin %10,8'inin **FES uygulaması hakkında bilgisinin** olmaması,

Fizyoterapistlerin %17,7'sinin **uygulama becerileri konusunda** farkındalığı yoktu ve

**%35,0'ının sınırlı becerilere** sahip olması, **beceri düzeyinin geliştirilmesi gereken bir yön** olduğunu gösterdi.

# PR1- Yönetim ve Tutum Seviyesi (Level of Management & Attitude)

Katılımcıların **%6,4'ü spor travmatolojisi** konusundaki bilgi düzeylerini “iyi”, %1,5'i ise “çok iyi” olarak değerlendirdi ve

**Pediatrik rehabilitasyonda** “iyi” için **%3,9** ve “çok iyi” için %2,5,

Tercih edilen akımlar arasındaki **dağılımın oldukça geniş** olduğu gözlendi.

Bu durum **uygulamada standardizasyonu zorlaştırmaktadır**

Fizyoterapistlerin yaklaşık **%25'inin** (%19,7-sıklıkla ve %5,4-her zaman) **iyileşmeye paralel olarak akım tipini değiştirmeyi** alışkanlık haline getirdiği, elektriksel stimülasyonun **sınırlı bir hasta popülasyonunda etkili ve amaçlı kullanıldığını** öne sürdü.

# Müfredat Oluşturma

# Faz 1

## FAZ 1-> PR1/Müfredat Hazırlama->1.-7. aylar

**Modül 1:** Sağlıklı & denerve kas fizyolojisi (SDU & UCV),

**Modül 2:** Akımlar (SDU & UCV & SVK),

**Modül 3:** Sağlıklı kaslar için ES (BU & SVK & PAU),

**Modül 4:** Denerve kaslar için ES (BU & HMKU & MAKU & PAU),

**Modül 5:** Re-innerve kaslar için ES (HMKU & MAKU & PAU)

**PAÜ koordinasyonunda hazırlandı ve her ortak modüllerde yer aldı.**

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| Topics | Partners |
|---|---|
| **Module 1: Healthy & Denervated Muscles Physiology** | SDU&UCV |
| | |
| 1.1. Healthy muscle physiology | UCV |
| | |
| 1.2. Pathophysiology of the muscle | UCV |
| | |
| 1.3. Denervated muscle physiology | SDU |
| | |
| 1.4. Re-innervated muscle physiology | SDU |
| | |
| 1.5. Healthy nerve innervation | UCV |
| | |
| 1.6. Pathophysiology of the nerve | UCV |
| | |
| 1.7. Degenerated nerve physiology | SDU |
| | |
| 1.8. Regenerated nerve physiology | SDU |

# PPT&Video Sunum (PR2)

# Kılavuz Kitap (PR3)

| **Module 2: Currents Used for Electrical Stimulation** | SDU&UCV&SVK |
|---|---|
| | |
| 2.1. Galvanic Current | UCV |
| | |
| 2.2. Low Voltage Current | SDU |
| | |
| 2.2.a. Faradic Current | |
| | |
| 2.2.b. Russian Current | |
| | |
| 2.2.c. Sinusoidal Current | |
| | |
| 2.2.d. Diadynamic Current | |
| | |
| 2.3. Ultra-Reiz Current | SDU |
| | |
| 2.4. Microcurrent Stimulation | SVK |
| | |
| 2.5. Transcutaneous Electrical Stimulation | SVK |
| | |
| 2.6. Mid Frequency Current | UCV |
| | |
| 2.6.a. Interferential Current | |
| | |
| 2.7. High Voltage Pulsed Galvanic Stimulation | SDU |
| | |
| 2.8. Functional Electrical Stimulation | SVK |
| | |
| 2.9. Magnetic Field Stimulation | UCV |


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| Module 3: Electrical Stimulation for Healthy Muscles | BU&SVK&PAU |
|---|---|
| | |
| 3.1. For patients with neurologic problems | PAU |
| | |
| 3.2. For patients with COPD | BU |
| | |
| 3.3. For patients with scoliosis | BU |
| | |
| 3.4. For patients with disuse atrophy | BU |
| | |
| 3.4.a. In bed | |
| | |
| 3.4.b. In brace | |
| | |
| 3.5. Strengthening of healthy muscle | SVK |
| | |
| 3.5.a. In adults | |
| | |
| 3.5.b. In elders | |
| | |
| 3.5.c. In children | |
| | |
| 3.6. For patients with orthopedic problems | SVK |
| | |
| 3.7. For patients with sport injuries | SVK |
| | |

# PPT& Video Sunum (PR2)

# Kılavuz Kitap (PR3)

| Module 4: Electrical Stimulation for the De-Innervated Muscles | HMKU&BU&MAKU&PAU |
|---|---|
| | |
| 4.1. Before atrophy presence | HMKU |
| | |
| 4.2. After atrophy presence | HMKU |
| | |
| 4.3. Neuropraxia | BU |
| | |
| 4.4. Axonotmesis | BU |
| | |
| 4.5. Neurotmesis | BU |
| | |
| 4.6. First 21 days | MAKU & PAU |
| | |
| 4.7. 21 days – 3 months | MAKU & PAU |
| | |
| 4.8. After 3 months | MAKU & PAU |
| | |

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# PPT&Video Sunum (PR2) Kılavuz Kitap (PR3)

| | |
|---|---|
| **Module 5: Electrical Stimulation for the Re-Innervated Muscles** | HMKU&MAKU&PAU |
| | |
| 5.1. With the presence of atrophy | HMKU |
| | |
| 5.2. In initial phase | PAU |
| | |
| 5.3. In chronic phase | HMKU |
| | |
| 5.4. In later phases | MAKU & PAU |
| | |
| 5.5. Electrophysiological test | PAU |

# PR – 2 PPT

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## Module 4: Electrical Stimulation for the De-Innervated Muscles

### 4.3. Neuropraxia

**Zeliha Ozlem YURUK, PT.PhD.Prof.**

Başkent University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, TÜRKİYE

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## Module 2 : Currents Used for Electrical Stimulation

### 2.9. Magnetic Field Stimulation

**Ligia RUSU, MD.Prof., Eva Nicoleta ILIE, PT.PhD.Assist.Prof.,**

**Oana Bianca BUDEANCĂ-BABOLEA, PT.PhD.**

University of Craiova, Faculty of Physical Education and Sports, Department of Physical Therapy and Sports Medicine, Craiova, ROMANIA

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## Module 4: Electrical Stimulation of Denervated Muscle

### 4.8. After 3 Months

**Fatma Nur ALCIN, PT.MSc.Lect.*, Betul SOYLEMEZ, PT.MSc.Lect.**, Nilufer CETISLI-KORKMAZ, PT.PhD.Prof. *****

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## Module 5. Electrical Stimulation for the Re-innervated Muscles

### 5.3. In the Chronic Phase

**Yasemin KARAASLAN PT.PhD.Asst.Prof., Esra DOGRU HUZMELI PT.PhD.Asoc.Prof.**

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## Module 2: Currents Used for Electrical Stimulation

### 2.5. Transcutaneous Electrical Stimulation

**Dovydas GEDRIMAS, PT.MS, Vaida ALEKNAVIČIŪTĖ-ABLONSKĖ, PT.PhD**

Šiauliai University of Applied Sciences, Faculty of Healthcare, Department of Rehabilitation, Šiauliai, LITHUANIA.

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## Module 5: Electrical Stimulation for the Re-Innervated Muscles

### 5.5. Electrophysiological tests

**Furkan BILEK, PT.PhD.Assist.Prof.*, Nilufer CETISLI-KORKMAZ, PT.PhD.Prof.****

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**Pamukkale University, Faculty of Physiotherapy and Rehabilitation, Denizli, TÜRKİYE

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## Module 2: Currents Used For Electrical Stimulation

### 2.7. High Voltage Pulsed Galvanic Stimulation

**Mehmet DURAY, PT.PhD.Asst.Prof.**

Süleyman Demirel University, Faculty of Health Science, Department of Physiotherapy and Rehabilitation, Isparta, TÜRKİYE

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## Preface
## Electric Currents and Modulation

**Fatih CETISLI, PhD.Prof.**

Pamukkale University, Department of Civil Engineering, Denizli, TÜRKİYE

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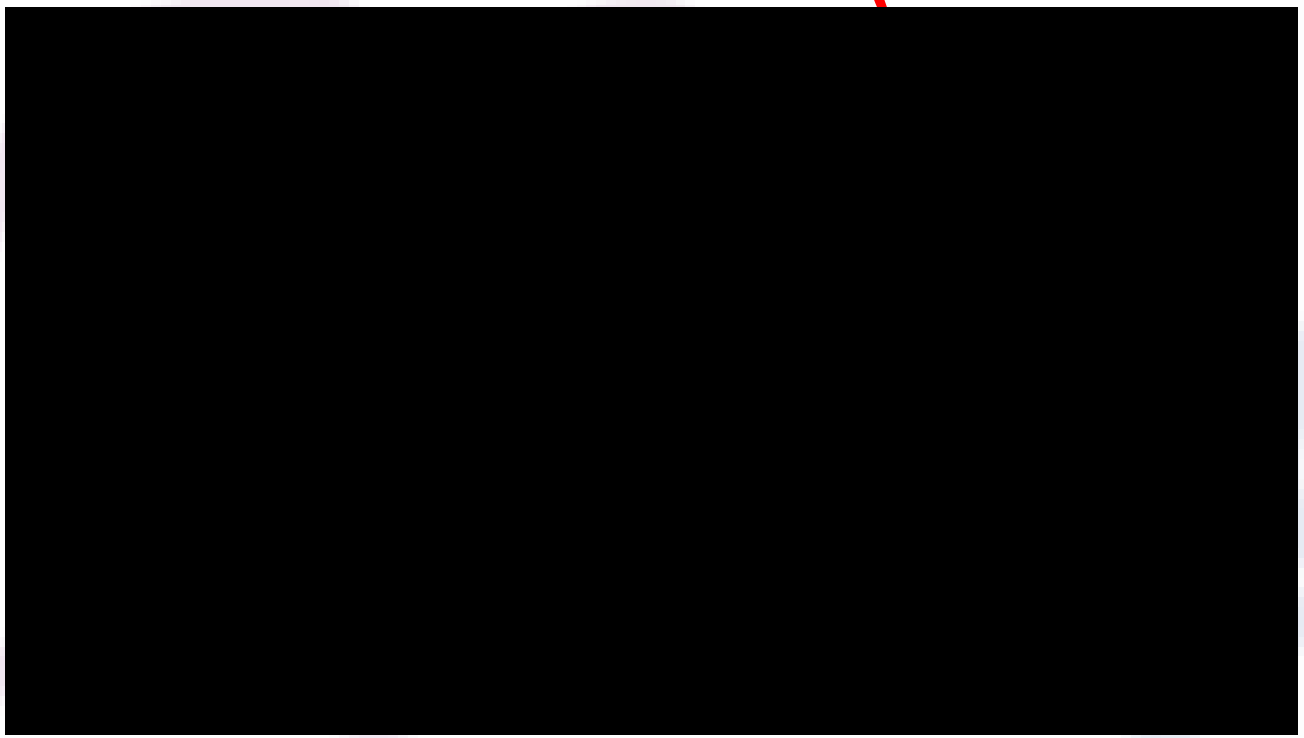
# PR2 – SUNUM (PRESENTATION)



# PR3 – KILAVUZ KİTAP (GUIDEBOOK)

## TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION

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### 1. Transcutaneous Electrical Nerve Stimulation

Transcutaneous electrical stimulation (TES) is a technique to artificially activate motor nerves and muscles. It can be used for rehabilitation or the restoration of lost motor functions, e.g., in subjects with brain or spinal cord lesions. Apart from selectively activating motor nerves and muscles, TES activates sensory fibers and pain receptors, producing discomfort and sometimes pain.[1] It is used in various clinical settings to treat diverse acute and chronic pain conditions, and although clinical studies of its long-term efficacy have yielded variable results, it has become popular with both patients and health professionals of different disciplines, including physiotherapists, midwives, nurses and doctors.[2]

## ELECTRIC CURRENTS AND MODULATION

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### 1. Electric Currents

There are two opposite electric charges, namely "positive and negative charges". An atom is neutral if the number of positively charged protons and negatively charged electrons are equal. The amount of positive or negative charge that a substance carries due to the unequal number of protons and electrons is called "electric charge" (Coulomb).[1]

## MAGNETIC FIELD STIMULATION

Ligia RUSU[1]
Eva Nicoleta ILIE[2]
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### 1. Introduction

A magnetic field is produced by an electric current or electric field. The magnetic field produced

## ELECTRICAL STIMULATION AFTER REINNERVATION IN LATER PHASES

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### 1. Introduction

Peripheral nerve injury (PNI) is a very common condition and is often encountered in limb trauma patients.[1] According to Sunderland (1951), PNI is divided into five degrees according to the degree of injury and loss of function.[2] The first degree describes a conduction block, which is a physiological interruption of nerve conduction along the axon at the site of injury, with an intact nerve structure and without Wallerian Degeneration. Self-repair is expected in first degree injuries. The second degree is characterized by axonal interruption, intact endoneurium, and Wallerian Degeneration. In cases with second-degree injury, self-repair of the nerve is observed at a rate of about 1 mm per day. The third, fourth, and fifth degrees include injury to the endoneural tubes,

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# PR3 – KILAVUZ KİTAP (GUIDEBOOK )

## DENERVATED MUSCLE PHYSIOLOGY

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### 1. What Is Denervation?

Denervation is a condition that usually develops due to damage to the central or peripheral nervous system. The skeletal muscles in human body, work voluntarily and contract or relax

## ELECTRICAL STIMULATION FOR THE RE-INNERVATED MUSCLES IN THE CHRONIC PHASE

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### 1. Introduction

Muscle re innervation is an important clinical goal in physiotherapy and rehabilitation. Ideal re-innervation is expected 1-3 months after denervation, functional re-innervation may take up to 1 year, but re-innervation is not expected after 3 years. The re-innervation time depends on the level of the lesion and its distance from the target organ.[1] The "chronic phase" process occurs days or months after injury. The aim of the physiotherapy and rehabilitation methods should be conservative to eliminate or minimize secondary changes while waiting to see how much functional

## ELECTROPHYSIOLOGICAL TEST

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### 1. Introduction

The diagnosis of neurological diseases or nerve damage is made by anamnesis, clinical symptoms and electrophysiological tests.[1,2] The definitive diagnosis of peripheral neuropathies is made by electrophysiological tests. These tests are frequently used to detect the integrity of the peripheral nerve-muscle complex and to determine nerve conduction velocity.[2,3] The purpose of using electrophysiological tests is to determine the amount of motor and sensory nerve fibers and the motor fiber conduction velocity of the nerve, thus determining the current function of the nerve.[1,2] Electrophysiological test methods are examined in two groups as invasive and non-invasive test methods. Needle electromyography (n-EMG) is given as an example of invasive electrophysiological tests. The transmission rate, amplitude and latency of the stimulus are recorded with the n-EMG method.[3,4]
There are non-invasive electrophysiological test methods frequently used by physiotherapists in

## NEUROPRAXIA

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### 1. Introduction

#### 1.1. Peripheral Nerve Injury

The peripheral nervous system consists of cranial, spinal, and autonomic nerves. The system connects the central nervous system to the limbs and organs. Peripheral nerve injury (PNI) is a type of motor, sensory, and autonomic disorder caused by damage to the structure of peripheral nerves. The incidence of PNI caused by trauma is approximately 5%, including brachial plexus and root injuries.[1]
After PNI, varying degrees of damage occur in the peripheral nerves.[2] The Seddon and Sunderland classification systems are widely used to define PNIs. Seddon classified PNIs as neuropraxia, axonotmesis, and neurotmesis. Sunderland made a more detailed classification and divided PNIs into 5 stages (Table 1).[2]

**Table 1.** Seddon and Sunderland classification systems.[2]

| Seddon | Sunderland | Injury | Spontaneous recovery | Nerve conduction study | Electromyography |
|---|---|---|---|---|---|
| Neuropraxia | Grade I | Focal segmental demyelination | Yes | Partial/complete conduction block proximally. Preserved conduction block distally even | Normal morphology and poor MUAP recruitment. Abnormal |


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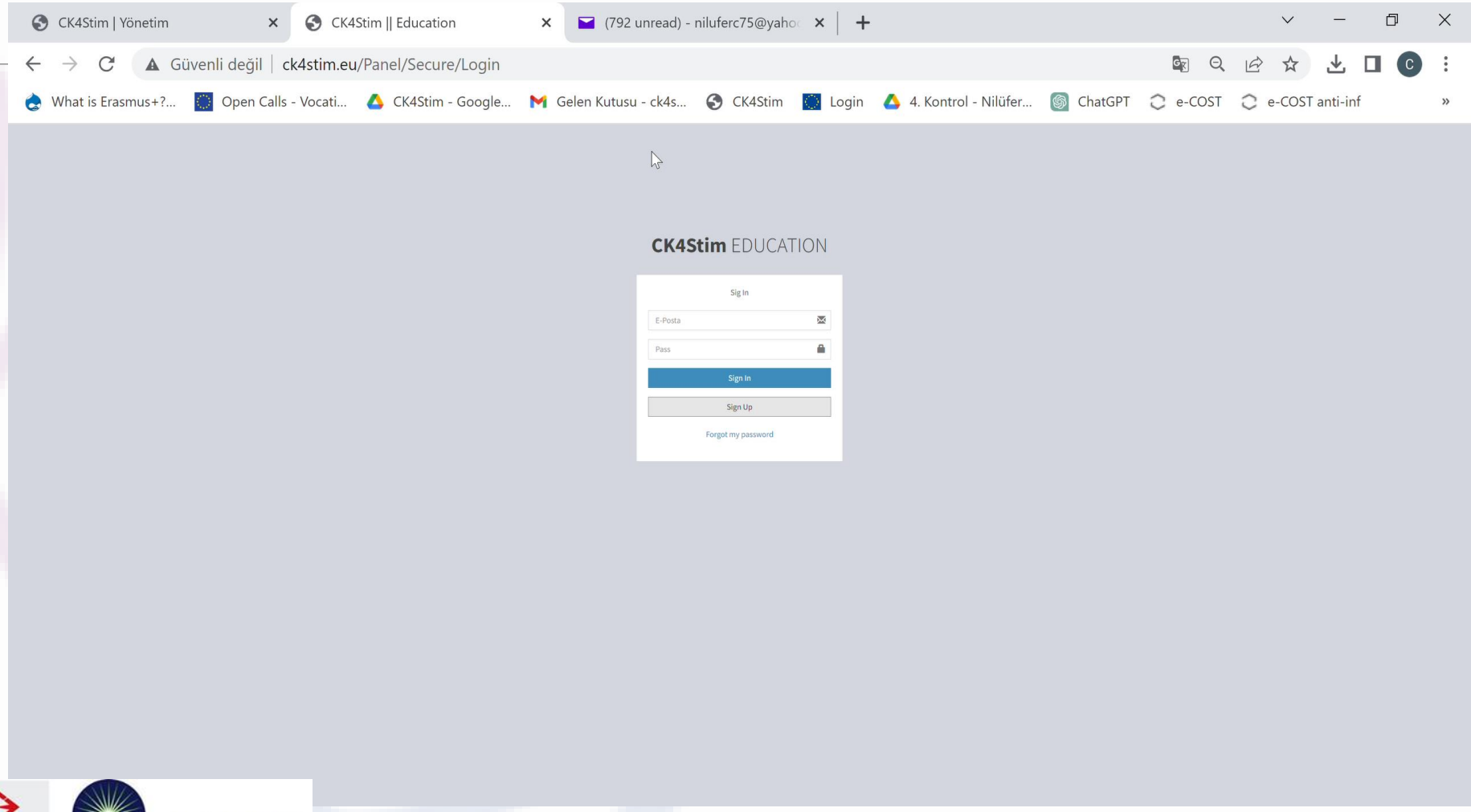
# Çevrimiçi Eğitim Materyallerine & Kursuna Kayıt

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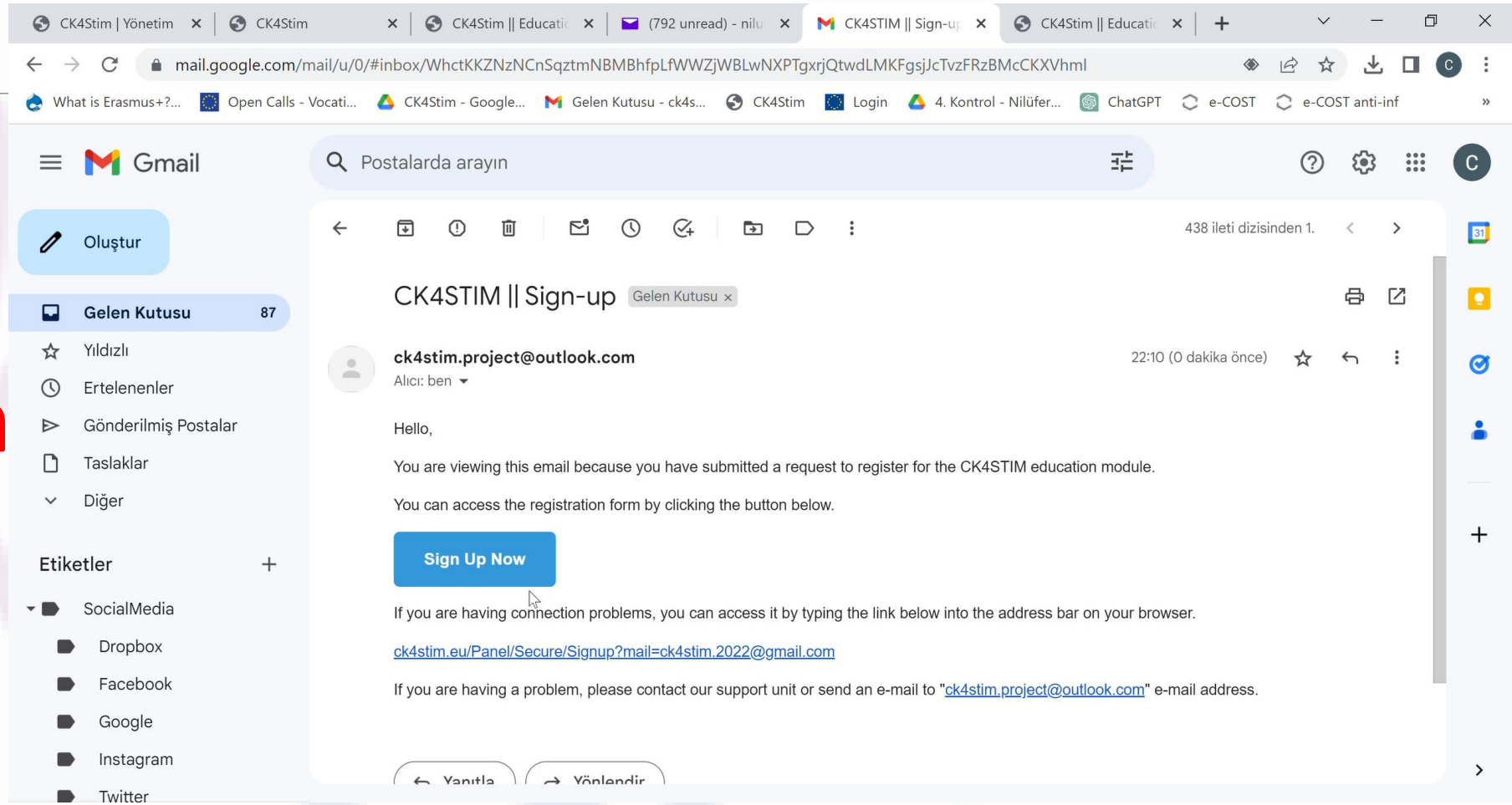

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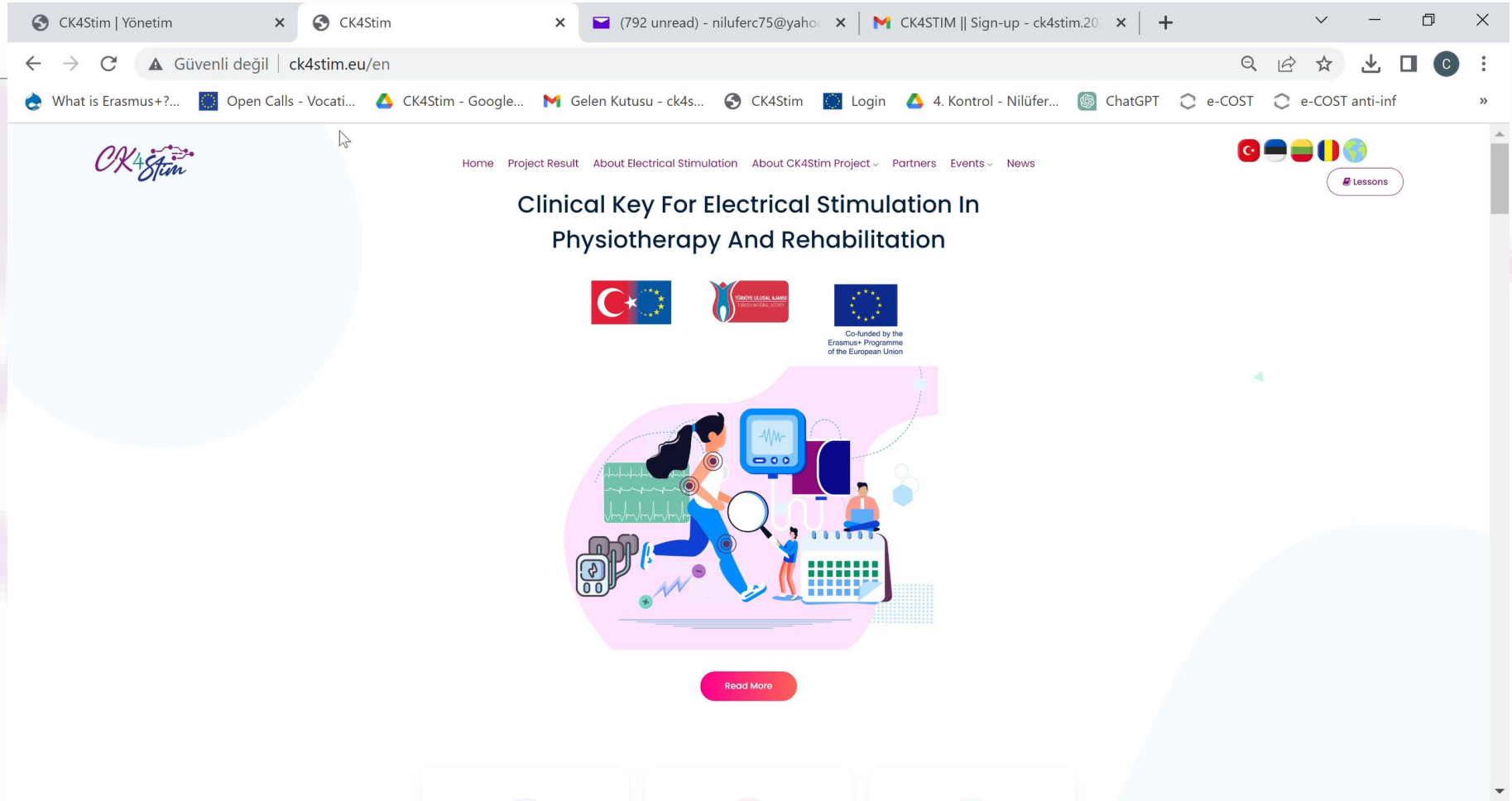

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# Mulţumiri…
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