

## Syllabus for 150 hr. Electrodiagnostic Program

### Course Objectives:

- 150 hour post-graduate education for Doctors of Chiropractic, Osteopathic Physicians, and Medical Doctors
  - This course is designed to increase a physician's knowledge and understanding of Electrodiagnostic Studies and their significance and the basic ability to perform them
  - It is designed to help the physician gain a better understanding of the anatomy and physiology of the peripheral nervous system, lesions of peripheral nerves and evaluation/diagnosis of peripheral lesions and interpretation of the study results.

### Course Schedule:

- Saturday: 8 am – 6 pm (lunch from 12 pm – 1 pm)
- Sunday: 8 am – 2 pm

Lead Instructor: George Petryk, DC, DACNB, FACFN, FABES

Assistant Instructor: C. Robert Humphreys MS, DC, DACNB

Guest Instructor: Jon Block, DC, CNIM

### Required Texts:

1. **Electromyography and Neuromuscular Disorders (Preston and Shapiro)**  
ISBN: 0-7506-7492-X
2. **Atlas of Human Anatomy (Netter)**
3. **Atlas of Electromyography [Kindle Edition] (A. Arturo Leis, Vicente C. Trapani)**

### Highly Recommended Texts:

1. **Electrodiagnostic Medicine (Dumitru)**  
ISBN: 1-56053-071-5
2. **Electrodiagnosis in Diseases of Nerve and Muscle: Principle and Practice (Kimura)**  
ISBN: 0-19-512977-6
3. **Myelopathy, Radiculopathy and Peripheral Entrapment Syndromes (Durrant and True)**  
ISBN: 0-8493-0036-3
4. **EMG Basics (Gnatz)**  
ISBN: 0-9663-4225-9

### Instruction Methods:

- Power Point
- Didactic Lecture
- Practical/Hands-on training

Dates: See attached registration form

**Module 1: Introduction, Patient Exam, Brachial Plexus Anatomy** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	<p>Introduction:</p> <ul style="list-style-type: none"> <li>• Instructors</li> <li>• Course overview</li> <li>• Review of course policy and procedures as well as attendance requirements</li> <li>• How and where to make up a missed class</li> <li>• Rules for safety and Universal Precautions</li> </ul>
9 am – 10 am	<p>Expectations and Requirements</p> <ul style="list-style-type: none"> <li>• What should you expect from this course and from your instructors</li> <li>• What we (instructors) expect from the student(s)</li> </ul>
10 am – 11 am	<p>Examination of Patient</p> <ul style="list-style-type: none"> <li>• Evaluation of potential NCV/EMG patient</li> <li>• Subjective symptoms</li> <li>• Objective findings (incl. radiology)</li> </ul>
11 am – 12 pm	<p>Brachial Plexus</p> <ul style="list-style-type: none"> <li>• Anatomy of the Brachial Plexus</li> <li>• General review of nerve roots/trunks/divisions/cord</li> <li>• Detailed review of the C5 nerve root and the first branches off of it</li> <li>• Detailed review of the C6 nerve root and the first branches off of it</li> <li>• Detailed review of the upper trunk</li> <li>• Detailed review of the C7 nerve root and the first branches off of it</li> <li>• Detailed review of the C8 nerve root and the first braches off of it</li> <li>• Detailed review of the middle trunk</li> </ul>
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	<p>Brachial Plexus continued</p> <ul style="list-style-type: none"> <li>• Detailed review of the C8 nerve rot and the first branches off of it</li> <li>• Detailed review of the C7 nerve root and the first branches off of it</li> <li>• Review of the lower trunk</li> <li>• Review of the Divisions</li> <li>• Review of the cords and what muscles are innervated from the cord</li> </ul>
2 pm – 3 pm	<p>Median Nerve Anatomy</p> <ul style="list-style-type: none"> <li>• Nerve roots, trunks, divisions and cord that make up the Med. Nerve</li> <li>• Details of the branches that innervate what muscles</li> </ul>
3 pm – 4 pm	<p>Median Nerve Anatomy and Entrapments</p> <ul style="list-style-type: none"> <li>• Anterior Interosseous Entrap., Lig. of Struthers, Pronator</li> </ul>
4 pm – 5 pm	<p>Median Nerve Entrapments (finish up) EMG evaluation of the Median Nerve</p>
5 pm – 6 pm	EMG Demonstration Lab

Sunday:

8 am – 9 am	<p>Radial Nerve Anatomy</p> <ul style="list-style-type: none"> <li>• Review the roots, trunk, division and cord that make up the Radial Nerve</li> </ul>
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	<ul style="list-style-type: none"> <li>• Details of the branches and what muscles they innervate</li> </ul>
9 am – 10 am	Radial Nerve Entrapments <ul style="list-style-type: none"> <li>• Location and identification of radial nerve entrapments</li> </ul>
10 am – 11 am	Demonstration Lab <ul style="list-style-type: none"> <li>• EMG evaluation of the Radial Nerve</li> </ul>
11 am – 12 pm	Ulnar Nerve Anatomy <ul style="list-style-type: none"> <li>• Review Roots, Trunk, Division and Cords</li> <li>• Branches and the muscles they innervate</li> <li>• Common Entrapments</li> </ul>
12 pm – 1pm	EMG Demonstration Lab <ul style="list-style-type: none"> <li>• Demonstration of an Ulnar EMG</li> </ul>
1 pm – 2 pm	Open Lab: students begin practicing needle EMG

**Module 2: Lumbosacral Plexus** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review of Previous Modules with Q & A
9 am – 10 am	Lumbosacral Plexus Anatomy Review roots of: Iliohypogastric, Ilioinguinal, Genitofemoral, Femoral, Obturator, Lat. Fem Cut., Sup. Glut. Nerve, Inf. Glut. Nerve, Sciatic and Pudendal, Peroneal and Tibial nerves
10 am – 11 am	Presentation of Root Lesions (L1-S1)
11 am – 12 pm	Review of the Sciatic Nerve <ul style="list-style-type: none"> <li>• Roots</li> <li>• Sciatic Nerve Lesions</li> <li>• Clinical Presentations</li> </ul>
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	EMG testing of the Semitendinosus, Semimembranosus, Biceps Fem. Long., Biceps Fem. Short.
2 pm – 3 pm	EMG testing of the Tibial Nerve: Gastroc (medial and lateral heads), Popliteal, Soleus, Tib. Post., Abd. Hal., Abd. Dig. Min., Flex. Dig. Long., and Flex. Hal. Long.
3 pm – 4 pm	Review of Tibial Nerve Entrapments (i.e. Tarsal Tunnel)
4 pm – 5 pm	EMG testing of the Peroneal Nerve <ul style="list-style-type: none"> <li>• Roots (L4 &amp; L5)</li> <li>• EMG eval. of the: Tib. Ant., Ext. Dig. Long., Ext. Hal. Long., Peroneus Tertius, Ext. Dig. Brevis.</li> </ul>
5 pm – 6 pm	Review common entrapments of the peroneal nerve <ul style="list-style-type: none"> <li>• Fib. Head.</li> <li>• Anterior Tarsal Tunnel</li> </ul>

Sunday:

8 am – 9 am	Review of Lumbosacral Plexus (roots, peripheral nerves) EMG demonstration
9 am – 10 am	Review of the Femoral Nerve and its nerve root origins Review muscles that are innervated by the Fem. Nerve Review potential lesions of the Fem. Nerve

10 am – 11 am	EMG Eval of the Vast. Lat., Vast. Med., Rect. Fem.
11 am – 12 pm	Review of the roots (L2-L4) and innervations of the Obturator Nerve (Add. Brev., Add. Long., Gracilis, Add. Magnus Discuss Lesions of the Obturator Nerve Review the roots of the Gluteal Nerves (both Sup. and Inf.)
12 pm – 2 pm	EMG of Glut. Med., and Glut. Max. EMG demonstration of the aforementioned muscles

**Module 3 Cranial Nerves, Facial and Upper Extremity EMGs** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review of Previous Modules and Q & A Cadwell Representatives and Equipment Review
9 am – 10 am	Review Anatomy of Cervical and Lumbar Paraspinals EMG demonstration of the cervical and lumbar Paraspinals
10 am – 12 am	Review Cranial Nerves 5, 7 and 12 EMG of Frontalis, Masseter, Obic. Oris and the Tongue Break Into Groups and familiarize yourself w/ equipment Review of Supplies and creating a functional “Work Station”
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	Anatomy and Pathology of Dorsal Scap. Nerve Lab: EMG of Dorsal Scap. Nerve using Rhomboid Maj./Min, Lev. Scap.
2 pm – 3 pm	Anatomy and Pathology of Long Thoracic Nerve Lab: EMG of Serratus Ant. Anat. And Pathology of Suprascapular Nerve Lab: EMG of Suprapinatus, Inf. Spinat.,
3 pm – 4 pm	Anat. and pathology of Subscap., and Thoracodorsal Nerve Lab: EMG of Lat., Teres Maj. Anat. and pathology Axillary Nerve Lab: EMG Deltoid, Teres Minor
4 pm – 5 pm	Anat. and Pathology of Musculocutaneous Nerve Lab: EMG of Biceps Anat. and Pathology of Radial Nerve Lab: EMG Triceps (medial/lateral head), Brachioradialis, Ext. Digitorum
5 pm – 6 pm	Open Lab: repeat EMGs of the day

Sunday:

8 am – 9 am	Review and Q & A. Open Lab: practice EMGs of previous day
9 am – 10 am	Anat. and Pathology of Ulnar Nerve Lab: EMG Flex. Carp. Uln., First Dorsal Int., 3 <sup>rd</sup> and 4 <sup>th</sup> Lumbricals, Add. Dig. Min.
10 am – 11 am	Anat. and Pathology of Median Nerve (Struther’s Lig., Pronator Teres Synd., CTS) Lab: EMG APB, Pronator Teres
11 am – 12 pm	Lab: EMGs (repeat and practice EMG of muscles learned during this module.
12 pm – 1 pm	Lab: practical continued
1 pm – 2 pm	Lab: practical continued

**Module 4 Lower Extremities and Paraspinal EMGs** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review of Previous Modules, Q & A and quizzes
9 am – 10 am	Anatomical review of Lumbosacral Plexus, Common Peroneal and Tibial Nerves as well as Root Lesions
10 am – 11 am	Anat. and Pathology of Sciatic Nerve Lab: EMG Semitendinosus, Semimembranosus, Bicep. Fem. Long., Bic. Fem. Short
11 am – 12 pm	Continuation of Lab (Bicep. Fem Short and Long) Anat. and Path. of the Tibial Nerve
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	Continuation of Pathology of Tibial Nerve Lab: EMG of Lat and Med Head of Gastroc., Tib. Post., Add. Hall., Abd. Dig. Min.
2 pm – 3 pm	Anat and Pathology of Common Peroneal Nerve Lab: EMG of Tib. Ant., Peron. Long. EDB
3 pm – 4 pm	Anat and Pathology of Femoral Nerve Lab: EMG of Vast. Lat., Vast. Med., Rect. Femoris
4 pm – 5 pm	Anat and Pathology of Obturator Nerve Lab: EMG Adduc. Magnus, Glut. Med., Glut. Max.
5 pm – 6 pm	Cervical and Lumbar Paraspinals Lab: EMG of the paraspinal muscles

Sunday:

8 am – 9 am	Review and Q & A
9 am – 10 am	Open Lab: Practice of EMGs learned the previous day
10 am – 11 am	Open Lab: Practice of EMGs learned the previous day
11 am – 12 pm	Cranial Nerve EMG (CN 5,7 and 12): Anatomy and Pathology of Cranial Nerves Lab: EMG of the Frontalis, tongue, Massater, and Obliq. Oris, and the Tongue
12 pm – 1 pm	Lab: complete muscles and review of weekends material
1 pm – 2 pm	Lab: continue practical

**Module 5 Components of NCV** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review of Previous Modules, Q & A and quizzes
9 am – 10 am	Keys to a Good NCV Study (things that you need to know when performing an NCV) Components of an NCV Motor and Sensory Studies
10 am – 11 am	Sensory Studies: Review of the Anatomical Sensory Distribution of the Upper and Lower Extremities Motor Studies Evaluation of components of NCV
11 am – 12 pm	Preparation and setting up your station Temperature and it's affect on studies (Temperature Gradient Studies) Age based considerations and adjustments

	Wave Form Morphology
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	Demonstration of Median Anti Sensory and Motor NCVs Lab: Practice Median Motor and Sensory Studies
2 pm – 3 pm	Continue Lab Explain and demonstrate F Wave Lab continues with students performing F Waves (Median Nerve)
3 pm – 4 pm	Demonstration of Ulnar Anti Sensory and Median Nerves Lab: Practice Ulnar Motor and Sensory Nerve as well as F Wave Demonstration of Radial Sensory and Motor Nerves
4 pm – 5 pm	Explain and Demonstrate Other Upper Extremity Motor Studies (Axil. Motor, Musculocut. Motor and Suprascap. Motor)
5 pm – 6 pm	Lab: Ax, MC and Suprascap. Motor Nerves

Sunday:

8 am – 9 am	Review and Q & A and Quiz Explain and Demonstrate Peroneal Motor, Sural Anti Sensory and F Wave studies Also demonstrate Peroneal TA Study as an alternative
9 am – 10 am	Explain and Demonstrate Tibial Motor and Anti Sensory Studies Explain and Demonstrate Tibial F Wave
10 am – 11 am	Explain and Demonstrate H Reflex Lab: Practice Peroneal Motor , Anti Sensory and F Wave
11 am – 12 pm	Lab: Continue practice of F Wave then Tibial Motor, Sural Anti Sensory Studies
12 pm – 1 pm	Lab: Continue Sural Anti Sensory Study and H Reflex Explain the following additional tests: Plantar, Saphenous, Lat. Fem. Cut. and Femoral Motor Nerve Studies
1 pm – 2 pm	Lab: continued practical

***Module 6 Anatomy of a Nerve, Basics of Wave Forms and Interpretation / Montage***

(Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review of Previous Modules, Q & A and quizzes Anatomy of a Nerve <ul style="list-style-type: none"> <li>• Epineurium</li> <li>• Perineurium (tensile strength)</li> <li>• Endoneurium (compresses forces)</li> </ul> Vasculature of a Peripheral Nerve
9 am – 10 am	Classification of Nerve Injuries <ul style="list-style-type: none"> <li>• Neurapraxia</li> <li>• Axonotmesis</li> <li>• Neurotmesis</li> </ul> Wallerian Degeneration Terminology: Sweep Speed, Milliseconds, Gain, Micovolts)

	<p>Basic Wave Form Morphology</p> <ul style="list-style-type: none"> <li>• Baseline</li> <li>• Depolarization/Repolarization</li> <li>• Positive and Negative Spikes/Directions</li> </ul> <p>Discuss End Plate Noise</p> <ul style="list-style-type: none"> <li>• Directionality</li> <li>• Frequency</li> </ul>
10 am – 11 am	<p>Discuss Insertional Activity</p> <ul style="list-style-type: none"> <li>• What is Insertional activity</li> <li>• Needle Placement in the Muscle</li> </ul> <p>Spontaneous Potentials</p> <ul style="list-style-type: none"> <li>• What do Spontaneous Potentials Indicate</li> <li>• Directionality</li> <li>• Duration</li> <li>• Frequency</li> </ul>
11 am – 12 pm	<p>Spontaneous Potentials Continued</p> <ul style="list-style-type: none"> <li>• Grading Spontaneous Potentials</li> <li>• Fibrillation Potentials</li> <li>• Sharp Waves</li> <li>• Comparisons</li> <li>• Fasciculations</li> </ul>
12 pm – 1 pm	Lunch
1 pm – 2 pm	<p>Morphology Continued</p> <ul style="list-style-type: none"> <li>• Cramp Discharge</li> <li>• Complex Repetitive Discharge</li> <li>• Myotonic Discharge</li> <li>• Neuromyotonia</li> <li>• Myokymia</li> <li>• Doublets – Triplets - Multiplets</li> </ul>
2 pm – 3 pm	<p>Prepare Upper Extremity Montage</p> <p>Lab: students will break into groups and practice Montages of the Upper Extremity</p>
3 pm – 4 pm	<p>Lab: continue upper extremity montage</p> <p>Prepare Lower Extremity Montage</p>
4 pm – 5 pm	Lab: students will break into groups and practice Montages of the Lower Extremity
5 pm – 6 pm	Review of Montages and review of Differential Diagnosis of Peripheral Entrapments

Sunday:

8 am – 9 am	Review and Q & A and Quiz
9 am – 10 am	<p>Analysis of Motor Unit</p> <ul style="list-style-type: none"> <li>• Voluntary Activity vs. Involuntary</li> <li>• Duration and Amplitude</li> <li>• Serrations</li> <li>• Amplitudes</li> <li>• Number of Motor Units</li> </ul> <p>Firing Patterns</p> <p>Interference Patterns</p>

	Activation Recruitment Abnormalities <ul style="list-style-type: none"> <li>• Axonal Loss (acute and chronic)</li> <li>• Demyelinating</li> <li>• Myopathic Waveforms</li> </ul> UMNL Polyneuropathies
10 am – 11 am	Lab: practice complete upper extremity study from start to finish (NCVs, F Waves, and EMGs)
11 am – 12 pm	Lab: practice complete upper extremity study from start to finish (NCVs, F Waves, and EMGs)
12 pm – 1 pm	Introduction to SEP, Review of Sensory Pathways (from periphery to cortex), using the International 10-20 system
1 pm – 2 pm	Recording Montage SSEP of the Upper Extremity (Median and Ulnar Nerve), Recording Montage of the Lower Extremity (Peroneal and Tibial Nerve)

***Module 7 IOM, SSEP and BAER Studies*** (Dr. Jon Block will be guest speaker for IOM and Drs. Petryk/Humphreys primary instructors )

Saturday:

8 am – 9 am	Review, Questions/Answers and Quiz Demonstrate Upper and Lower Limb SSEP
9 am – 10 am	Demonstrate Upper and Lower Limb SSEP (continued)
10 am – 11 am	Introduction of Intra Operative Monitoring (IOM), Clinical and surgical use of Evoked Potentials (EPs), Principles of SEP
11 am – 12 pm	Review Sensory Pathway from periphery to Cortex, Using the International 10-20 System, Stimulation methods/characteristics: methods and sites, Amplifiers, Filters, Averaging
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	Spontaneous EMG, Triggered EMG, Trans Cranial Evoked Potentials
2 pm – 3 pm	IOM continued: normal vs. abnormal SEP, differential diagnosis of root, cord, brain stem or cortical lesions
3 pm – 4 pm	Anesthesia considerations, Review of EMGs (normal spontaneous activity vs. abnormal activity)
4 pm – 5 pm	Bipolar vs. Referential Montages, filters, techniques
5 pm – 6 pm	Review of surgical BAER, Multi-Modality techniques for surgical monitoring, Q&A

Sunday:

8 am – 9 am	Lab: students perform 3 upper SSEPs
9 am – 10 am	Lab: students perform 3 lower SSEPs
10 am – 11 am	Review the Auditory Pathway (brain stem to temporal cortex)
11 am – 12 pm	Overview of BAER
12 pm – 1 pm	Demonstration of BAER Discussion of Evaluation of Results: absolute latency, inter-wave latency and side-to-side latency difference.



1 pm – 2 pm	Practice BAER and record data Calculate inter-wave latency differences and side – side differences
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**Module 8 Nerve Pathologies** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review, Q&A
9 am – 10 am	Discuss and Review Polyneuropathies
10 am – 11 am	Discuss and Review Small Fiber Neuropathies <ul style="list-style-type: none"> <li>• Diabetic</li> <li>• Toxic</li> <li>• Drugs</li> <li>• Hereditary</li> </ul>
11 am – 12 pm	Polyneuropathies/Neuropathies Continued <ul style="list-style-type: none"> <li>• Metabolic - Endocrine</li> <li>• Nutritional</li> <li>• Idiopathic</li> </ul>
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	Lab:
2 pm – 3 pm	Case Studies: the students will be presented case studies to aid in
3 pm – 4 pm	Case Studies
4 pm – 5 pm	Case Studies
5 pm – 6 pm	Case Studies

Sunday:

8 am – 9 am	Review and Q & A
9 am – 10 am	Report Writing
10 am – 11 am	Open Lab Open Lab: time for students to complete the necessary number of EMGs and NCVs
11 am – 12 pm	Open Lab Open Lab: time for students to complete the necessary number of EMGs and NCVs
12 pm – 1 pm	Open Lab: Open Lab: time for students to complete the necessary number of EMGs and NCVs
1 pm – 2 pm	Lab: open lab practical

**Module 9 Practice and Review** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review, Q&A
9 am – 10 am	Open Lab (practice EMG/NCV and complete required studies)
10 am – 11 am	Open Lab (practice EMG/NCV and complete required studies)
11 am – 12 pm	Open Lab (practice EMG/NCV and complete required studies)
12 pm – 1 pm	Lunch Break
1 pm – 3 pm	Review: Brachial Plexus, Median Nerve, Ulnar Nerve, Radial Nerve, common entrapments

3 pm – 4 pm	Common entrapments continued. Review Lumbosacral Plexus, Peroneal Nerve Tibial Nerve, common entrapments
4 pm – 5 pm	Continue review of common neuropathies, radiculopathies
5 pm – 6 pm	Continue review with case studies

Sunday:

8 am – 9 am	Review and Q & A
9 am – 10 am	“Mock” Practical Examination
10 am – 11 am	“Mock” Practical Examination
11 am – 12 pm	“Mock” Practical Examination
12 pm – 1 pm	“Mock” Practical Examination
1 pm – 2 pm	“Mock” Practical Examination

**Module 10 Examinations** (Drs. Petryk/Humphreys)

Saturday:

8 am – 9 am	Review and Q&A
9 am – 10 am	Open Lab (practice for final)
10 am – 11 am	Open Lab / Final Review
11 am – 12 pm	Open Lab / Final Review
12 pm – 1 pm	Lunch Break
1 pm – 2 pm	Final Examination (written)
2 pm – 3 pm	Final Examination (written)
3 pm – 4 pm	Short Break and divide into 2 testing groups for practical
4 pm – 5 pm	Open Lab: last chance to practice
5 pm – 6 pm	Open Lab: last chance to practice

Sunday:

8 am – 9 am	Lab Set Up... Explain how the exam will be delivered
9 am – 10 am	Practical Exam (Group 1)
10 am – 11 am	Practical Exam (Group 1)
11 am – 12 pm	Lunch Break
12 pm – 1 pm	Practical Exam (Group 2)
1 pm – 2 pm	Practical Exam (Group 2)