I. How and When to Reach me

   Email:  Subhash.bhatnagar@marquette.edu
   Telephone  288-3390
   Office:  Cramer Hall – 230H
   Office Hrs:  Tuesday 10:00-11:00
                Wednesday 4:00-5:00 or by Appointment

II. Course Objectives:

After completing this course, students should be able to:

   • Explain normal functional anatomy of the brain;
   • Define the clinical concepts of neuroanatomy, neuroembryology, neuroradiology,
     neurophysiology, neurohistology, and clinical neurology;
   • Explain the physiology and anatomy of the motor and sensory (somatic, visual,
     auditory, and proprioception) systems;
   • Describe brain circulatory mechanisms;
   • Relate neuroanatomy to systems and diseases;
   • Apply neuroscience to human behavior with special reference to communicative
     skills and other pertinent behaviors important to Speech-Language Pathologists.

III. Required Texts:

   1. BS:  Bhatnagar, Subhash.  *Neuroscience for the Study of Communicative
          Disorders*. Baltimore, Lippincott Williams and Wilkins.

Reference Texts:

   2.  Digital Anatomist. Health Science Center for Education. Post. Box 357161
       University of Washington. Seattle 98195-7161
digital.anatomist.com

**IV. ASHA Certification Standards and DPI Requirements**

Satisfactory completion of this graduate class is intended to assist students in meeting the following clinical skills and academic knowledge required for the American Speech-Hearing-Language Association (ASHA) Standards for the Certificate of Clinical Competence in Speech-Language Pathology.

Standard IIIA. Knowledge of the principles of biological sciences related to human behaviors—speech/language/cognition.

Standard IIIB. Knowledge of basic human communication processes including their biological, neurological, acoustic, physiological, developmental, and linguistic and cultural bases/issues.

Standard IIIC. Knowledge of the nature of speech/language and communicative disorders including etiologies, anatomical, physiological, linguistic and cultural attributes in the areas of expressive and receptive language.

Standard IIID. Knowledge principles and methods of prevention, assessment, and intervention for people with communication disorders including consideration of anatomical/physiological, psychological, developmental, and linguistic correlates of the disorders in the area of expressive and receptive language.

**WI-DPI Standards**

Satisfactory completion of this course assists you in meeting the following requirements for WI-DPI Licensure.

Standard 1 a, e.
Standard 2. Learning a-e
Standard 2. Applications a and d.
Standard 3. e
Standard 5. a-d.
Standard 6. a-e
Standard 8.
Standard 9. a-g

**V. Requirements and Grading:**

- **Four objective sectional examinations.** Each test will cover lectures, lab material, textbook readings, and assignments discussed before the exam date.
  - 84 points
- **10 completed quizzes.**
  - 10 points
- Studying **laminated labeled brains** for 5 hours in the neuro lab. Time spent needs to be documented and cannot be completed in less than four lab visits.
  - 2 points
- **Navigating Digital Anatomist Software** for 4 hours. Documented log needs to be submitted
  - 1 point
- Viewing 4 **video tapes** in the Rayner Library. To be documented; see the attached form.
  - 2 point
Writing and presenting 2 multiple choice case study questions
  • 1 point

Requirement Summary
• Examinations  84 Points
• Quizzes  10Points
• Laminated Brains  2 Points
• Digital Anatomist  1 Point
• Videotapes  2 Points
• MC Questions  1 Point

Each Exam is given only at the scheduled time. Failure to take an exam will result in 0 point. There are no make-up exams, unless you present me with an official excuse (see the absence policy).

Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>AB</td>
<td>90-94</td>
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<tr>
<td>BC</td>
<td>80-84</td>
</tr>
<tr>
<td>C</td>
<td>75-79</td>
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</tbody>
</table>

VI. Attendance Policy

Since each lecture in this graduate class deals with important clinical/functional information, you are expected to attend every class and lab. On time attendance in class and lab is an important part of professional behavior. Any absence prevents you from getting the proper benefit of the course. The instructor does not differentiate between "excused" and "unexcused" absences. Tests missed because of an absence cannot be made-up unless an official excuse is presented. Make up tests can only be given during final exam week. Regardless of reason(s) for the absence, the student will be responsible for the material covered in the class.

Acceptable anticipated absences (departmental norm):

• The student is away from campus representing an official university function, e.g., participating in a professional meeting, as part of a judging team, or athletic team.
• Required court attendance as certified by the Clerk of Court.
• Religious observances when certified by a letter from the student's parent(s) or religious leader.
• Required military duty as certified by the student's commanding officer.

Acceptable emergency absences:
• Illness or injury when certified by an attending physician, dentist, or nurse. The certification should show the date service was provided to the student but should not describe the nature of that service.
• Death or serious illness in the immediate family (parents, step-parents, siblings, spouse, children, step-children, foster children, in-laws, sibling in-laws, grandparents, great-grandparents, step-great-grandparents, grandchildren, aunts, uncles, nieces, and nephews) when certified by a letter from the student's parent(s) or spouse.

VII. Marquette University Policy on Multiple Exams
If a student has four exams in one day, the student has the option to ask all four instructors about the possibility of changing the exam to another time. If none of the four instructors agrees, or if they changed exam time does not fit the student's schedule, the student may contact the College or Registrar staff about the possibility that they might proctor a special exam time with the student, if the instructor agrees.

VIII. Policy on Academic Dishonesty
Please refer to the following website regarding guidelines and disciplinary procedures relating to academic misconduct:
http://www.marquette.edu/academics/regulations/acaddishonesty.html

IX. Disability related Issues
Please see me as soon as possible if you require any accommodations because of a disability.

X. Dates to Remember:
September  25  Examination One
October  25  Examination Two
October  30  No Class
November   15  Examination Three
             Question presentation
December  12  Examination Four

XI. Changes in Lab Schedule: Late start time is 1:30
August   28  No Lab scheduled
*September  27  Late start
*October  2    Late start
**October  4   Late start
**October  9   Late start
***October  30  No Class and No Lab
Neuroscience

*November 6    Late lab start
**November  27    Late lab start
**November  29    Late lab start

Class Activities

August 28 (No Lab)
Course orientation
Reading: Syllabus

August 30
OVERVIEW
- Scope and Applications of Neuroscience
- Relationship between Neuroscience and Speech Language Pathology
- Nature of Training in Neuroscience
- Basic Philosophies Regulating Brain Functioning

READING: BS: Chapter 1, pp. 1-32

TECHNICAL TERMS AND BASIC CONCEPTS
- Axial organization
- Brain sections
- Directions
- Medical lexicon
- Visual orientation
- Functional components of the CNS
- Architectural maps
- Anatomical and Clinical Orientation
- Lesion Localization Rules

READING: BS: Chapter 1, pp. 1-32

September 4, 6, 11, 13, 18, 20
REGIONAL ANATOMY OF THE BRAIN
- Divisions of the brain
  - Prosencephalon
  - Mesencephalon
  - Rhombencephalon (Cerebellum, pons, and medulla)
- FOREBRAIN
  - Telencephalon
    - Neocortex: structures and locations
    - Diencephalon:
      - Thalamus: location & structures
      - Hypothalamus: location and structures
    - Mesencephalon
Neuroscience

- Rhombencephalon
  - Cerebellum, pons, and medulla
  **READING:** BS: Chapter 2, pp. 35-65

- ANATOMY OF THE SPINAL CORD
  **READING:** BS: Chapter 2, pp. 65-71

- VENTRICLES:
  **READING:** BS: Chapter 2, pp. 71-73

- AXONAL CONNECTIONS
  **READING:** BS: Chapter 2, pp. 73-77

- MENINGES
  **READING:** BS: Chapter 2, pp. 73-84

- CRANIAL NERVES
  **READING:** BS: Chapter 2, pp. 84-87

- Autonomic Nervous System
  **READING:** BS: Chapter 2, pp. 87-89

- THE CEREBRAL CORTEX: FUNCTIONAL ORGANIZATION
  **READING:** BS: Chapter 19, pp. 441-443.

September 25
EXAMINATION ONE
(Class meets after the examination)

September 27
INTERNAL MORPHOLOGY OF THE NEURAXIAL SYSTEM

- Transverse Sections of the Spinal Cord
  **READING:** BS: Chapter 3, pp. 95-100

- Cross Section of the Brain stem (Medulla/Pons/Midbrain)
  - Medulla oblongata
    **READING:** BS: Chapter 3, pp. 100-106
  - Pons
    **READING:** BS: Chapter 3, pp. 106-109
  - Midbrain
    **READING:** BS: Chapter 3, pp. 109-115

- Coronal Sections of the Forebrain (Basal Ganglia and Diencephalon)
  **READING** BS: Chapter 3, pp. 115-123
  # Horizontal Sections of the Brain
**Neuroscience**

**READING:** BA: Chapter 3, pp. 123-131

**October 2-4**
- CELLULAR ORGANIZATION AND FUNCTIONING
  **READING:** BS: Chapter 5, pp. 152-1168

**October 9**
- DIENCEPHALON
  **READING:** BS: Chapter 6, pp. 175-185

**October 11-16**
- NEUROEMBRYOLOGICAL DEVELOPMENT OF THE CNS.
  **READING:** BS: Chapter 4, pp. 133-150

**October 16**
- CIRCULATORY SYSTEM
  - Blood Circulation. (Also See the coverage in SPPA 249)
    - Functions
    - Vascular Anatomy
    - Clinical Considerations
      **READING:** BS: Chapter 7, pp. 186-211
  - Cerebral Spinal Fluid System
    - Functions
    - Neuroanatomy
    - Clinical Considerations
      **READING:** BS: Chapter 8, pp. 212-218

**October 23**
- VISUAL SYSTEM (Examination Three Material)
  **READING:** BS: Chapter 12, pp. 273-293

**October 25** Examination Two

**October 30** No Class

**November 1**
- AUDITORY SYSTEM
  **READING:** BS: Chapter 9, pp. 225-238

**November 6**
- VESTIBULAR SYSTEM
  **READING:** BS: Chapter 10, pp. 240-250
November 8-13
- SOMATOSENSORY SYSTEM
  READING: BS: Chapter 11, pp. 251-272

November 15  Examination Three,
        (Class meets after examination)

November 20
  Axial Brain
  READING: BS: Chapter 17, pp. 360-412

November 22  Thanksgiving Break

November 27 and 29
  MOTOR SYSTEM
  - Spinal Cord System
    READING: BS: Chapter 13, pp. 295-315
  - Cerebellar System
    READING: BS: Chapter 14, pp. 316-326
  - Basal Ganglia
    READING: BS: Chapter 15, pp. 328-345
  - Motor Cortex
    READING: BS: Chapter 16, pp. 346-358

December 4 and 6
  - Rules for Localizing Lesions Chapter 1, pp. 30-31
  - Solving Clinical Problems

Wednesday, December 12:
Examination Four/Final
8:00–10:00 AM
SPPA 6160-101  
Neurological Bases of Speech and Language Disorders

**Laboratory Assignments**

**Lab Locations:** 1. Cramer Hall 004.  
CHS Anatomy Laboratory

Contact info: mari.bliss@marquette.edu  
847-754-0535

The laboratory component supplements the learning of clinical neuroscience by incorporating visual approach to simplify neuroanatomical complexities and promote analytical skills. The activities listed under each lab day are intended to coincide or relate with the topics that are discussed either the same or next day in the class.

Most of the instructional videotapes (**) viewed during the lab sessions are **on reserve** and are available to you in the University Library (basement). Repeated reviewing of the tapes will enhance your understanding of complex neurological concepts. All viewing of the videotape will be followed by a question/discussion session.

**Late start time is 1:30**

**Assigned Laboratory Activities:**

**August 28**  
No lab scheduled

**August 30**  
o Orientation to Digital Anatomist Software  
o Orientation to Labeled and Plastic-framed Brain Sections

**September 4**  
o "Secrets of the Mind" followed by a discussion  
  • RC351 .S43 2001

**September 6**  
o "Cerebral Hemispheres, Lobes, Sulci and Gyri." S-V Series (22).  
  • QM 455 .H42, 1986. Tape 5  
o Identification of major cortical structures  
  • Textbook Figures: 2.1 to 2.11.

**September 11**  
o "Midsagittal Section", (24). S-VMS,  
  • QM 455. H42, Tape 4
Identification of major cortical structures using the Figures from the textbook: 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.13, 2.14, 2.15, 2.16, 2.20, 2.21, & 2.39
Discussion

September 13
Discussion

September 18
The brainstem External Features-Self-Evaluation (25).
- AGC, QM 455 .N48 V. 23
- Dissuasion

September 20
"Cerebral Localization of Functions." Part V. A. AGC (36)
- QM 455 .N48 V. 14
Discussion

September 25 Examination One (Lab Time).
The class meets after the examination.

*September 27
Late start
- Internal Structure Of The Brain
  - QM455 .I58 1987

*October 2
Late Start
- Internal Structures of the Brain: Examination (31). AGC
  - QM 455.I582 1987
- Discussion

**October 4
Late Start
  - QM 455 .H42, 86. Tape 6
- Discussion

**October 9
Late Start
- "Introduction, Nerve Cell and Brain Membrane" (27) :S-V Series
October 11
- Blunt Dissection of major pathways II, (23)
- S-V Ser., QM 455. H42, 86. tape 7
- Discussion

October 16
- Human Embryology Series
  - Highlights of reproduction and prenatal development (16)
    - QM 601. H852 V.1
  - Formation of Sex Cells and Chromosomal Abnormality I (14) AGC.
    - QM 601. H852 V.2
  - Formation of Sex Cells and Chromosomal Abnormality II (14)
    - AGC. QM 601. H852 V.3
- Discussion

October 18

October 23 (this material will be covered on examination three)
- Ophthalmic Optics: Refraction by the eye. AGC. (10).
- Ophthalmic Optics: Refractive Errors and Optical Aberrations. AGC (10).
  - QP 476, 067, 1975. V.4. minutes

October 25--Examination Two

**October 30 No Lab and No Class

November 1
- (Gross Anatomy Lab, Dental School)
  - Meet at the student lounge in Cramer Hall at 12:45
  - Examination of the important anatomical structures on the dorsal/ventral/lateral/midsagittal surfaces of the brain.
  - Examination of the brainstem structure

*November 6
- Late Start
  - Examination of structures using a coronal/ sections of the brain.
  - Dissection and examination of the Brainstem.
  - Examination of the brain into horizontal sections. Review

November 8
- Compensation for Head Movements: Vestibular System S-V Series (17).
  - QM 455. A52 V.5

**November 13**
- Pathway for Pain Temperature and Touch Sensation (18).  
  QP 431 . P37.1986
- Trigeminal System: (Personal Tape)
- Bodily Sensation I. Conducting Systems of Cord and Stem. (20).
  - AGC  QM 455 .A52 V.8.

====================================================================
**November 15**  Examination Three
(Thomas meets after the examination)
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**November 20**
  - AGS QP 368.5 A98 1994
- **The Autonomic Nervous System: Part II: The Parasympathetic System. (21)**
  AGS
  - QP368 .A98 1994

**November 24**  Thanksgiving

**November 27**
- Late Start
  - Cerebrovascular system (29)
    - QM455 .H42, 1986
  - Examination of Vascular Pathologies (Slides)

**November 29**
- Late Start
  - Examination of Vascular Pathologies (Slides)
  - "Basal Ganglia (16)", Tape S-V Series.
    - QM 455. H42, 1986. Tape 10
  - "Performance of Skills. the Pyramidal System.
    - Qm 455 A 52, Vol 10

- December 4-6
  - Question presentation
  - Case Studies: Neurological Problem Solving
  - Case Studies: Neurological Problem Solving

**December 12**  Fourth examination
8:00-10:00
====================================================================
Student Digital Anatomist Guidelines

1.) Google ‘Digital Anatomist’.
   a. Click on the link labeled Digital Anatomist Interactive Atlases
      It should be the first link listed.
      Or, go to http://www9.biostr.washington.edu/da.html

2.) Click ‘Brain’ under Atlases
   a. It should be the first selection listed in the Atlases.

3.) You should see this picture. Click the far right yellow button labeled ‘Click for Atlas’

4.) You are then able to view various anatomical illustrations. Click on any view, and
    the program will take you there.

5.) The navigation bar on the bottom of the screen will guide you as you use the site.
    You can go to the main page (shown above) by clicking on the house.
The Question mark will take you to a detailed outline of the site that also includes more detailed directions. The arrows allow you to move forward and backward through the slides. The blue and white paper provides the table of contents.

6). In order to identify the structure, put the arrow on the structure and right click.

7.) There are also quizzes available on the bottom of each page of illustrations (scroll down). You do need to have Java installed in order to use them.

7.) Document the time and the date each time you log into the site.

**Additional Online Resource: Anatomy.tv**

**Instructions**

1. Go to Marquette.edu
2. Click “libraries” under quick links
3. Click “Raynor Memorial Libraries”
4. Click “databases” (blue tab under “find resources”)
5. Under “choose discipline or topic”, scroll down and click on “dentistry”
6. Click on link for “anatomy.tv from Primal Pictures”.
7. Under “regional anatomy” (purple box), click “head and neck”.
8. Exit out of help box
9. Click “MRI” tab at top of page and rotate through slides
Quiz One: Chapter 1: Essential Neurological Concepts and Principles (Due Date: September 13)

Quiz Two: Chapter 2: Gross Anatomy of the Central Nervous System (Due Date: September 20)

Quiz Three: Chapter 3: Internal Anatomy of the Central Nervous System (Due Date: October 2)

Quiz Four: Chapter 5: Nerve Cell Physiology (Due Date: October 9)

Quiz Five: Chapter 6: Diencephalon: Thalamus and Associated Structures (Due Date: October 11)

Quiz Six: Chapter 4: Development of the Nervous System (Due Date: October 16)

Quiz Seven: Chapter 7: Cerebrovascular System (Due Date: October 25)

Quiz Eight: Chapter 12: Visual System (Due Date: October 30)

Quiz Nine: Chapter 11: Somatosensory System (Due Date: November 13)

Quiz Ten: Chapters 16: Motor System 4: Motor Cortex (Due Date: December 4)

Name each quarter and side of the visual fields for each eye.

4. Name each of the following visual field defects:

   A.  
   B.  
   C.  
   D.  
   E.  
   F.
<table>
<thead>
<tr>
<th>Tape</th>
<th>Date/Time-Checked Out</th>
<th>Signature</th>
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<tr>
<td>Introduction, the nerve cell and brain membrane (27).</td>
<td></td>
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<tr>
<td>Cerebrovascular system (29)</td>
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<tr>
<td>Basal Surface Cranial Nerves (15)</td>
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<tr>
<td>Midsagittal section (24)</td>
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<tr>
<td>Cerebral hemisphere, lobes, sulci and gyri (22)</td>
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<tr>
<td>Blunt dissection of major pathways, I (24)</td>
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<tr>
<td>Blunt dissection of Major Pathways, II (23)</td>
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<tr>
<td>Ventricular system I, choroid plexus (18)</td>
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<tr>
<td>Ventricular system II, fornix, hippocampus &amp; amygdala (27)</td>
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<tr>
<td>Basal ganglia (15)</td>
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<tr>
<td>Brainstem and Cerebellum (16)</td>
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Tapes

Dissection of the Human Brain (Video recordings)/ Lennart Heimer. New York, Springer-Verlag, 1986. (This series is based on Heimer’s textbook: “The Human Brain and Spinal Cord”)

1. Introduction, the nerve cell and brain membrane (27)
2. Cerebrovascular system (29)
3. Basal Surface Cranial Nerves (15)
4. Midsagittal section (24)
5. Cerebral hemisphere, lobes, sulci, and gyrri (22)
7. Blunt dissection of Major Pathways, II (23)
8. Ventricular system I, choroid plexus (18)
9. Ventricular system II, fornix, hippocampus, and amygdala (27)
10. Basal ganglia (15)
11. Brainstem and Cerebellum (16)

Additional Tapes:

2. “Pathway for Pain Temperature and Touch Sensation” (18) QP431 .37, 1986
3. The Mind and the Brain Series (Video recordings), Public Broadcasting Corporation, 1988, QP 376 .M56 [each tape is 30 minutes]

1. Madness 2. The Two Brains
3. Learning and Memory 4. Addictions
5. Aging 6. Development
7. Pain and Healing 8. Depression
9. Language 10. Thinking

ALTSHUL GROUP CORPORATION TEACHING FILMS

   Neuroanatomy, 19 (m)
   Neuroanatomy, 20 (M)
   Thalamus and Cortex
   Frontal Lobe

2. Immunology
   A. Immunology QR181.142 5 (1981)
   B. The New Immunology: An Overview, 36(m) QR181.145 (1979)
3. **Human Embryology Series**  AVM QM601 .H852  
   Highlights of Reproduction and Prenatal Development, 16(vol. 1)  
   Formation of Sex Cells and Chromosomal Abnormalities I, 14 (vol.2)  
   Formation of Sex Cells and Chromosomal Abnormalities II, 14(vol.3)  

4. **The Neuroanatomy Series: The Human Brain in Dissection**  
   AVM QM455 .N48  
   (vol. 8) Practical Examination in Neuroanatomy, 3rd Ed.: Part I  
   (vol. 9) Practical Examination in Neuroanatomy, 3rd Ed.: Part II  
   (vol. 14) Cerebral Localization of Function: Part V (A)  
   (vol. 19) Brain Dissection: The Rhinencephalon: Part VII(A)  
   (vol. 22) Brainstem: External Features: Part X  
   (vol. 24) The Cranial Nerve Nuclei: Part X(A)  

5. **The Anatomical Basis of Brain Function Series**  
   AVM QM455 .A52  
   (vol. 5) Compensation for Head Movements: Vestibular System  
   (vol. 8) Bodily Sensation I: Conducting Systems of Cord and Stem  
   (vol. 9) Bodily Sensation II: Thalamus and Cortex  
   (vol. 10) Performance of Skills: The Pyramidal System  
   (vol. 16) Intellect and Organization of Reaction: Frontal Lobe  

6. **Optics of the Human Eye Series**  
   AVM QP476 .O67 (1975)  
   (vol. 3) Opthalmic Optics: Refraction By the Eye  
   (vol. 4) Opthalmic Optics: Refractive Errors and Optical Aberrations  

7. **The Autonomic Nervous System Series**  
   AVM QP368.5 .A98 (1994)  
   Autonomic Nervous System Part 1: The Sympathetic Division  
   Autonomic Nervous System Part 2: The parasympathetic & Enteric  
   Divisions  
   (vol. 3) Opthalmic Optics: Refraction By the Eye  
   (vol. 4) Opthalmic Optics: Refractive Errors and Optical Aberrations  

8. **Muscles of Facial Expression**  
   AVM QP327 .M87 (1983)