

# Audiology and Communication Sciences

The Program in Audiology and Communication Sciences (PACS) offers exceptional graduate education programs in clinical audiology (AuD), deaf education (MSDE), and speech and hearing sciences (PhD) as well as an undergraduate minor in speech and hearing.

PACS provides students with a uniquely supportive and approachable atmosphere where they are encouraged and respected by one another and by faculty as they develop their passion, knowledge, and experience. With hearing research programs, a school for children who are deaf or hard of hearing, and audiology clinics located on campus, our students gain a breadth and depth of firsthand experience with opportunities to further their educations and careers. As one of the oldest and most respected centers for education, clinical care, and research in hearing disorders, balance, and language, our history is rich in groundbreaking discoveries, and our highly ranked graduate programs are taught by some of the leading minds in these fields.

By preparing passionate and experienced graduates, we strive to improve outcomes for people with hearing disorders.

## Additional Information

Additional information — including application and admission information, program descriptions, and tuition and fees — can be found on the PACS website or through direct correspondence with PACS.

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Program in Audiology and Communication Sciences  
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## Degrees & Offerings

- Doctor of Audiology
- Master of Science in Deaf Education
- PhD in Speech and Hearing Sciences
- Minor in Speech and Hearing Sciences

## Research

The integration of research into the curriculum is a distinctive feature of the PACS graduate programs. All students receive research training through course work and the completion of an independent research project. Additional opportunities to pursue individual research interests

are also available, including via Grand Rounds, colloquia, brown bag seminars, journal clubs and similar opportunities. In addition, elective summer research opportunities, which include a stipend, are also available for interested and qualified AuD students.

The affiliated Department of Otolaryngology's Harold W. Siebens Hearing Research Center provides focused research in two primary areas. The Fay & Carl Simons Center for the Biology of Hearing and Deafness is made up of a group of investigators within the department who study the cellular and molecular mechanisms of auditory signal transduction, sensory cell death, and regeneration and development. Ongoing and new studies within this group are adding to our understanding of the molecular and cellular processes of the development of neural connections, hearing loss and the potential for future treatments. In the Center for Childhood Deafness and Adult Aural Rehabilitation, researchers are achieving a better understanding of how communication disorders can be measured, treated and overcome.

Additional areas of research focus within the department include the study of normal vestibular function and vestibular disorders, hearing aids, cochlear implants, auditory brain stem implants, age-related and noise-induced hearing loss, and the education of children who are deaf or hard of hearing.

## Faculty

### Program Directors

#### Kate McClannahan

Director of Undergraduate Studies  
Assistant Professor of Otolaryngology

#### Amanda Ortmann

Director of Audiology Studies  
Assistant Professor of Otolaryngology

#### Casey Reimer

Director of Deaf Education Studies  
Assistant Professor of Otolaryngology

## Faculty and Staff List

For a full list of faculty and staff, please visit the PACS website.

## Courses

Visit online course listings to view offerings for M89 PACS.

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### M89 PACS 324 Acoustics and Speech Perception

Topics include principles of acoustics, with applications to speech and hearing. Basic physics of sound -- including simple harmonic motion, wave propagation in air, resonance, sound measurement and spectral analyses, filtering, and digital sound processing -- are discussed. Principles will be applied to the production and physical properties of speech. An overview of the acoustic characteristics of individual speech sounds and of suprasegmental speech patterns will be provided. Perceptions of speech and non-speech sounds are discussed.

Credit 3 units.

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**M89 PACS 343 Observation in Audiology**

Provides students with an introduction to clinical methods and observation experiences in audiology. Prerequisite: Permission of department required. Important note: Students must complete screening requirements to be eligible to observe in clinical spaces. Visit <https://hr.wustl.edu/non-appointee-visitor-observer/> for information. Credit 3 units.

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**M89 PACS 344 Observation and Methods in Speech-Language Pathology**

This course surveys a broad range of speech and language disorders in terms of associated characteristics, assessment techniques, and treatment considerations. Prerequisite: Permission of department required. Important note: Students must complete screening requirements to be eligible to observe in clinical spaces. Visit <https://hr.wustl.edu/non-appointee-visitor-observer/> for information. Credit 3 units.

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**M89 PACS 360 Introduction to Audiology**

This course covers the role of the audiologist in the diagnosis and treatment of hearing loss; the administration and interpretation of audiologic test results; and amplification systems and assistive devices. It explores practical experience with the clinical issues professionals will face when working with individuals who are deaf or hard of hearing. This course is recommended for future practitioners in speech-language pathology/audiology/deaf education who will be serving individuals with hearing loss across the lifespan. Credit 3 units.

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**M89 PACS 401 Anatomy and Physiology of Speech and Hearing**

Comprehensive introduction to anatomy (structure) and physiology (function) of the auditory, vestibular, and speech production systems, including organ systems of audition, articulation, and phonation (nervous, respiratory, and musculoskeletal systems). Covers normal and disordered structure and function. Prerequisite: Educ 234 or PACS 234. All undergraduate students should register for Section 01. Credit variable, maximum 3 units.

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**M89 PACS 4011 Behavior Management**

Introduction to various behavior management systems effective in both individual and group environments. Behavior interventions, classroom management strategies, environmental controls, psychodynamic techniques, and biophysical interventions are discussed, observed, and practiced. Focus is on working with children who are deaf or hard of hearing. Prerequisite: Permission of department required. Credit 2 units.

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**M89 PACS 416 Evaluation Techniques for Children Who Are Deaf or Hard of Hearing**

A basic introduction to psychometrics with emphasis on the selection, interpretation, and evaluation of assessments. Specific techniques for evaluating intellectual, educational, and linguistic abilities and achievement in children who are deaf or hard of hearing, from infancy through adolescence, are discussed and demonstrated. Prerequisite: Permission of department required. Credit 3 units.

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**M89 PACS 421 Introduction to Electroacoustics**

Introduction to the physics of sound. Topics include production, transmission, and reception of sound and factors affecting human communication. Includes discussion, lectures, problems, and lab. Credit 3 units.

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**M89 PACS 424 Speech and Hearing Sciences**

Surveys a broad array of speech and hearing science topics. Focus is on how speech and hearing science research findings can be applied to the practice of deaf education. Credit 1 unit.

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**M89 PACS 4301 Sign Language I**

Basics of American Sign Language are introduced, including vocabulary, grammatical structure, fingerspelling, and cultural information about the Deaf community. This is a highly interactive and participatory course. Credit 2 units. EN: H

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**M89 PACS 4302 Sign Language II**

Continues development of American Sign Language with additional vocabulary, emphasis on expressive and receptive abilities, conversational skills, and knowledge of Deaf culture. This is a highly interactive and participatory course. Prerequisite: PACS 4301-Sign Language I. Credit 2 units. EN: H

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**M89 PACS 4303 Sign Language III**

Continues development of American Sign Language with additional vocabulary, emphasis on expressive and receptive abilities, conversational skills. Expands knowledge of deaf culture/history specific to D/deaf Education and American Sign Language. This is a highly interactive and participatory course. Prerequisite: PACS 4302 or instructor permission. Credit 2 units.

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**M89 PACS 434 Typical Language Development**

Study of typical language development, including the phonologic, morphologic, semantic, syntactic and metalinguistic aspects. Interactions between linguistic and other areas of child development will be discussed. Contrasts will be explored between typical and atypical child development to shed light on language learning processes. Credit 3 units.

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**M89 PACS 438 Early Literacy Development of Children who are Deaf or Hard of Hearing**

Development of early print-recognition, reading, and writing of children who are typically hearing and children who are deaf or hard of hearing. Focus is on the years leading up to kindergarten. An overarching theme is the interaction between early language and early literacy development. Evidence-based strategies for differentiated instruction will also be discussed. Permission of department required. Credit 3 units.

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**M89 PACS 443 Speech and Language Disorders**

This course surveys a broad range of speech and language disorders in terms of associated characteristics, assessment techniques and treatment considerations. Prerequisite: Permission of department required. Credit 3 units.

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**M89 PACS 444 Amplification Systems and Aural Rehabilitation for Children**

This course will provide students with a broad understanding of amplification systems and principles and methods of aural rehabilitation as they apply to children who are deaf or hard of hearing. Amplification systems to be covered will include digital hearing aids, cochlear implants and a full range of assistive devices. Aural

rehabilitation topics will emphasize patient management and will include communication strategies, conversation styles and speech recognition assessment. Students will be provided with videos, live demonstrations and in-class activities. Direct contact with children and technological devices will also be used to support lectures and discussions. Prerequisites: Permission of department required. Credit 2 units.

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**M89 PACS 4511 Practicum in Deaf Education**

Supervised practicum in education of children who are deaf or hard of hearing. Students will be placed in field experiences (early, mid-level, and culminating levels) in a variety of educational settings with a variety of age ranges, using interventions in areas such as language, speech, auditory training, reading, math, and other content areas. Prerequisite: Permission of department required. Credit 6 units.

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**M89 PACS 4512 Practicum in Deaf Education**

Supervised practicum in education of children who are deaf or hard of hearing. Students will be placed in field experiences (early, mid-level, and culminating levels) in a variety of educational settings with a variety of age ranges, using interventions in areas such as language, speech, auditory training, reading, math, and other content areas. Prerequisite: Permission of department required. Credit 8 units.

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**M89 PACS 4515 Language Instruction for Children Who Are Deaf or Hard of Hearing**

Principles and methods of developing competence in spoken English in children who are deaf or hard of hearing, birth to grade 12. Includes presentation of differentiated instructional techniques for teaching a diverse population of children who are deaf or hard of hearing. English vocabulary, syntax, and pragmatics, as well as techniques for auditory training. Evaluations and data-driven lesson planning/IEP/IFSP development will be discussed, as well as the role of families as engaged, educational partners in spoken language development. Prerequisite: Permission of department required. Credit 3 units.

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**M89 PACS 4525 Foundations of Literacy Theory and Instruction**

Principles and methods of developing reading and writing competence in children who are typically hearing, with an emphasis on the stages of development and appropriate teaching sequences. Based on this foundation, strategies and methods will be presented for making appropriate differentiated learning adaptations and interventions for reading instruction with students who are deaf or hard of hearing who have language and reading deficits. Additional topics include the use of children's literature in instruction, the intersection of language and reading development, content literacy, and general language arts instruction. Prerequisite: Permission of department required. Credit 4 units.

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**M89 PACS 4526 Literacy Lab: A Focus on Typical and Atypical Learners**

Emphasizes observation and some practice planning and teaching reading and writing with students who are typical and atypical learners, including children who are deaf or hard of hearing and who struggle to develop appropriate literacy skills. Observations will focus on areas such as how teachers use differentiated learning strategies for diverse learners, the use of children's literature in instruction, the intersection of language and reading development, instruction in content literacy, and general language arts instruction. Prerequisite: Permission of department required. Credit 2 units.

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**M89 PACS 454 Mathematics and Content-Area Instruction for Children who are Deaf or Hard of Hearing I**

Principles and methods of teaching mathematics to students who are typically hearing and those who are deaf or hard of hearing. Strategies for other content-area instruction (science, social studies), use of instructional technology, and strategies for improving content literacy will also be discussed, with an emphasis on techniques for working with children who are deaf or hard of hearing. Students will practice developing and implementing lesson plans that are aligned to state and national standards. Prerequisite: Permission of department required. Credit 3 units.

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**M89 PACS 455 Mathematics and Content-Area Instruction for Children who are Deaf or Hard of Hearing II**

Principles and methods of teaching mathematics to students who are typically hearing and those who are deaf or hard of hearing. Strategies for other content-area instruction (science, social studies), use of instructional technology, and strategies for improving content literacy will also be discussed, with an emphasis on techniques for working with children who are deaf or hard of hearing. Students will practice developing and implementing lesson plans that are aligned to state and national standards. Prerequisites: PACS 454 and permission of department required. Credit 3 units.

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**M89 PACS 457 Counseling Parents of Children Who Are Deaf or Hard of Hearing**

Examines the psychological needs of families who have children who are deaf or hard of hearing. The aim of the course is to help teachers of children who are deaf or hard of hearing interact more effectively with parents and caregivers, using a collaborative model that views families as engaged partners in the educational process. Students will develop a repertoire of interviewing and counseling skills, as well as learn about a wealth of resources to share with families. Prerequisite: Permission of department required. Credit 3 units.

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**M89 PACS 458 Speech for Children Who Are Deaf or Hard of Hearing**

Development, improvement and maintenance of speech skills for children who are deaf or hard of hearing through multisensory approaches. Articulation, voice and rhythm patterns are considered. Lectures, demonstrations and practice. Prerequisite: Permission of department required. Credit 3 units.

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**M89 PACS 460 Audiology Staffing**

Discussion and presentations of clinical cases and issues related to practice in clinical audiology. Prerequisite: Permission of department required. Credit 0.5 units.

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**M89 PACS 4601 Clinical Skills**

Credit 0.5 units.

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**M89 PACS 4611 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: Permission of department required. Credit 1 unit.

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**M89 PACS 4612 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 1 unit.

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**M89 PACS 4613 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 4 units.

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**M89 PACS 4621 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 2 units.

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**M89 PACS 4622 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 2 units.

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**M89 PACS 4623 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 4 units.

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**M89 PACS 4631 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 2 units.

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**M89 PACS 4632 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 2 units.

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**M89 PACS 4633 Practicum in Audiology**

Supervised practicum in audiology. Prerequisite: permission of department required.  
Credit 6 units.

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**M89 PACS 463A Pre-Clinical Externship**

Clinical externship in audiology application process.  
Credit 1 unit.

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**M89 PACS 4641 Clinical Externship in Audiology**

Clinical externship in audiology. Prerequisite: permission of department required.  
Credit 9 units.

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**M89 PACS 4642 Clinical Externship in Audiology**

Clinical externship in audiology. Prerequisite: permission of department required.  
Credit 9 units.

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**M89 PACS 466 Rehabilitative Audiology**

Principles and methods of aural rehabilitation with an emphasis on patient management. Topics include communication strategies and conversation styles, speech recognition assessment and hearing aid service provisions for adults, older persons, children, and family members. Prerequisite: permission of department required.

Credit 3 units.

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**M89 PACS 468 Pediatric Audiology**

Fundamentals of audiologic assessment for infants and children. Behavioral and electrophysiologic procedures, and assessment of auditory processing abilities, are presented. Prerequisite: permission of department required.  
Credit 3 units.

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**M89 PACS 470 Business Practices**

Issues relating to establishing a private practice including clinical management, small business and accounting practices, models of private practice, referrals and reimbursement, and managed care. Prerequisite: permission of department required.  
Credit 2 units.

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**M89 PACS 474 Leadership Skills and Precepting**

Credit 1 unit.

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**M89 PACS 5001 Electrophysiologic Techniques I**

Introduces basic concepts in administration and interpretation of physiologic and electrophysiologic measures, with focus on auditory evoked potentials (AEP). Content covers basic instrumentation, parameters and variables affecting the AEP, auditory brainstem response (ABR), middle (MLR) and late (LLR) evoked potentials, auditory steady state response (ASSR) and otoacoustic emissions (OAE). Prerequisite: permission of department required.  
Credit 3 units.

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**M89 PACS 5002 Electrophysiology II**

Advanced concepts related to the administration and interpretation of physiologic and electrophysiologic measures. Content includes in-depth study of ABR and other auditory evoked potentials, and the clinical application of these for the audiologist. Additional topics include study of electrocochleography (ECoChG), P300 auditory responses, and mismatched negativity (MMN). This course will include a thorough study of intraoperative monitoring including neurophysiology and anatomy review, cranial nerve monitoring, spinal cord monitoring, and facial nerve monitoring. Prerequisites: permission of department required.  
Credit 1 unit.

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**M89 PACS 502 Pharmacology**

Includes basic information related to medications utilized for treating common hearing/balance disorders. Hearing and balance side effects of medications are discussed, as are ototoxic and preventative mechanisms related to pharmacology. Prerequisites: permission of department required.  
Credit 1 unit.

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**M89 PACS 505 Auditory Neuroscience**

Development of an in-depth understanding of issues related to auditory neurophysiology from the auditory nerve to the cortex. Prerequisites: permission of department required.  
Credit 2 units.

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**M89 PACS 506 Genetics in Hearing Loss**

Study of the genetic causes of hearing loss and balance disorders, and syndromes affecting the auditory and vestibular systems. Prerequisites: Permission of department required.  
Credit 1 unit.

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**M89 PACS 507 Vestibular Disorders**

Comprehensive course covering the assessment, diagnosis, and treatment of vestibular disorders. Prerequisites: Permission of department required.

Credit variable, maximum 3 units.

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**M89 PACS 510 Auditory Perception**

Study of how the listener perceives parameters of and differences in acoustical stimuli. Perception of the speech stimulus is also studied in detail, both for listeners who are typically-developing and those who are deaf or hard of hearing. Prerequisites: Permission of department required.

Credit 3 units.

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**M89 PACS 511 Hearing Conservation**

This course will cover topics related to hearing conservation, including effects of noise on hearing, environmental noise, classroom acoustics, federal regulations, interactions of noise and other agents, and ototoxicity. Additional topics may vary year-to-year. Prerequisites: Permission of department required.

Credit 2 units.

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**M89 PACS 517 Counseling for Audiology**

Examines the relationship between clinician and patient in audiology. Topics include counseling theory and practices, and principles and methods of effective interviewing and counseling across the lifespan. Prerequisites: Permission of department required.

Credit 2 units.

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**M89 PACS 519 Psychosocial and Educational Foundations of Deafness**

Examines psychological, social, educational, legal, historical, and cultural influences related to individuals who are deaf or hard of hearing. Additional topics include IEPs and interprofessional collaboration related to post-high school transitions. Prerequisite: Permission of department required.

Credit 2 units.

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**M89 PACS 535 Geriatric Audiology**

Study of general aging and age-related hearing loss. Will provide foundational knowledge in the fundamental concepts of aging common to most species, normal and pathological processes in auditory physiology across the lifespan, assessment and treatment of hearing loss in older adults, and non-auditory factors that affect clinical intervention and treatment strategies for older patients (e.g., cognition, mental health, physical limitations). Prerequisite: Permission of department required.

Credit 2 units.

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**M89 PACS 551 Research Seminar**

A seminar of variable topics related to research in speech and hearing sciences. Each semester/section has its own specific area of focus, which may include an investigation of active areas of research, an overview of outcomes-based research and evidence-based practice for students' research projects, or thorough analysis and discussion of a specific area of active research. See section description for information on specific topics by section. Prerequisite: Permission of department required.

Credit variable, maximum 1 units.

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**M89 PACS 552 Hearing and Communication Seminar**

Provides an overview of hearing, auditory neuroscience, language, and deaf education.

Credit 3 units.

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**M89 PACS 554 Fundamentals of Early Intervention and Child Development**

Course provides information about general and exceptional child development, focusing on ages birth through five years. Course also discusses historical and philosophical tenets of early intervention practice, focusing on a collaborative coaching model, which views families as engaged partners in the child's education. Other topics include addressing needs of families from a variety of cultural and economic backgrounds, linking families to resources, and Federal laws that govern special education services for children with disabilities including transitions in service provisions for children at the age of 3 years. Prerequisites: Permission of department required.

Credit 1 unit.

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**M89 PACS 555 Early Intervention: Serving Children Who Are Deaf or Hard of Hearing, Birth to Age 5**

This course provides an overview of early childhood development of children who are deaf or hard of hearing, birth to age 5, with particular focus on early speech and language development, intervention strategies, assessment techniques, instructional strategies, and aural rehabilitation. Course discusses the philosophical tenets of early intervention practice, which views families as engaged partners in the child's education, and respects cultural and linguistic diversity. Students will learn about IFSP and IEP development, as well as a variety of resources that can be provided to families. Prerequisite: Permission of department required.

Credit 3 units.

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**M89 PACS 558 Pre-Service Teacher Preparation**

This course is designed to help students in the deaf education teacher training program create a teaching portfolio that reflects their own teaching development. Students will demonstrate their ability to reflect on and critique their own teaching practice especially in relation to course planning, instructional strategies, differentiated learning, data-based decision-making, tiered systems for supporting instruction, and classroom management. Professional issues, including developing a résumé and conducting interviews, will also be discussed. Prerequisites: Permission of department required.

Credit 1 unit.

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**M89 PACS 5601 Clinical Audiology I**

An introduction to the field of clinical audiology. Covers the role of the audiologist in the diagnosis and treatment of hearing disorders; the administration and interpretation of audiologic test results; and amplification systems and assistive devices, such as DM/FM technology. Additional topics may include relevant calibration and instrumentation requirements, audiology as a career, aural rehabilitation, and legal and ethical issues in the field. Prerequisites: Permission of department required.

Credit 3 units.

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**M89 PACS 5602 Clinical Audiology II**

Covers hearing evaluation and diagnosis in clinical audiology from infancy through adulthood. Topics include auditory processing disorders, functional hearing loss, and other advanced measures. Prerequisites: Permission of department required.

Credit 3 units.

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**M89 PACS 5651 Hearing Devices in Audiology I**

Philosophical issues related to the selection and evaluation of hearing devices, including hearing aids and alternative devices. Means of adjusting hearing devices and measuring their function and benefit are covered.

Credit 4 units.

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**M89 PACS 5652 Hearing Devices in Audiology II**

Advanced issues related to the selection and evaluation of hearing aids. Means of adjusting hearing aids and measuring their function and benefit. Prerequisites: Permission of department required.

Credit 3 units.

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**M89 PACS 5653 Hearing Devices in Audiology III**

Course covers a variety of topics related to selection, fitting and rehabilitation of cochlear implant patients. Lectures and practical experience in psychophysical testing, programming of the cochlear implant, and auditory training. Prerequisites: Permission of department required.

Credit 2 units.

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**M89 PACS 569 Hearing Disorders**

This course covers the nature and causes of hearing disorders, including outer and middle ear, cochlear, retrocochlear and central nervous system. Prerequisites: Permission of department required.

Credit 2 units.

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**M89 PACS 570 Independent Study**

Students engage in independent work on the Independent Study, which demonstrates advanced critical thinking and writing skills. Prerequisites: Permission of department required.

Credit variable, maximum 6 units.

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**M89 PACS 5700 Capstone Project**

Independent work on the Capstone Project. Prerequisites: Permission of department required.

Credit variable, maximum 6 units.

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**M89 PACS 5701 Capstone Project Seminar**

This weekly, joint meeting is intended to provide extra and preliminary support for initiation of the Capstone Project. Areas will include but are not limited to: journal article critique, scientific writing, overview of research design and methodologies, statistical review, support for graph and table construction, and others. Prerequisites: Permission of department required.

Credit 1 unit.

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**M89 PACS 573 Research Design and Methods**

A review of statistical concepts learned and discussion of their application in research projects. Will include selection of statistical tests in different projects with different types of data and data distributions, as well as the interpretation of the results of the statistical analysis in lieu of clinical importance and generalizability of results. Course will also include a critical review of statistical methods used in published articles chosen for discussion. Prerequisite: Permission of department required.

Credit variable, maximum 2 units.

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**M89 PACS 574 Statistics and Research Methods**

Examines experimental and field research methods as they apply to audiology and communication sciences. Covers such methods as surveys, survey interviews, content analysis, and experimental design. Prerequisites: Permission of department required.

Credit 3 units.

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**M89 PACS 575 Special Topics**

Special topics in speech and hearing sciences, audiology and/or education of the deaf or hard of hearing. Contact the department for more information. Prerequisites: Permission of department required.

Credit variable, maximum 4 units.

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**M89 PACS 576 Introduction to Scientific Literature**

Credit 0.5 units.

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**M89 PACS 577 Research in Speech and Hearing**

Independent research (pre-dissertation). Prerequisites: Permission of department required.

Credit variable, maximum 12 units.

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**M89 PACS 587 Dissertation Research**

Dissertation research. Prerequisites: Permission of department required.

Credit variable, maximum 12 units.

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