



COGS2030

Hearing and Brain

Session 2, In person-scheduled-weekday, North Ryde 2022

School of Psychological Sciences

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Disclaimer

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General Information

Unit convenor and teaching staff

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Tutor

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Credit points

10

Prerequisites

COGS1000 or COGS100 or PSYU1101 or PSYU1104 or PSYC104 or PSYU1102 or PSYU1105 or PSYC105

Corequisites

Co-badged status

Unit description

Hearing is of fundamental importance for human cognition and communication and reflects the complex interplay of physical, biological, and psychological processes. This unit will provide a detailed introduction to the cognitive neuroscience of hearing. Topics will include the neuroanatomy and physiology of the auditory system; how the brain is organised to achieve identification and localisation of sound sources; how the auditory system interacts with motor, speech and language systems in the brain; the science of cochlear implants; the nature and cognitive consequences of hearing loss; and the science and technology of cochlear implants. Lecture topics will be reinforced and complemented with hands-on practicals covering the fundamentals of digital signal processing and analysis of acoustic and speech signals.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Explain the structure and function of the auditory system, with an emphasis on how the brain is organized to structure sound information into meaningful perceptual and

cognitive units.

ULO2: Demonstrate an understanding of the causes of hearing impairments and hearing loss, the effects of hearing loss on cognitive functioning, and the current capabilities and limitations of artificial sensory prosthetic devices.

ULO3: Critically evaluate contemporary theories and concepts of audition, including the interface of the auditory system with the motor and speech systems of the brain and with other aspects of human cognition.

ULO4: Display effective scientific communication in written form.

ULO5: Display a practical understanding of digital signal processing (DSP) techniques by applying them flexibly and appropriately to measure and analyse acoustic and speech signals.

General Assessment Information

Grade descriptors and other information concerning grading are contained in the [Macquarie University Assessment Policy](#).

All final grades are determined by a grading committee, in accordance with the Macquarie University Assessment Policy, and are not the sole responsibility of the Unit Convenor.

Students will be awarded a final grade and a mark which must correspond to the grade descriptors specified in the [Assessment Procedure](#) (clause 128).

To pass this unit, you must demonstrate sufficient evidence of achievement of the learning outcomes, meet any ungraded requirements, and achieve a final mark of 50 or better.

Further details for each assessment task will be available on iLearn.

Late Submissions

Unless a Special Consideration request has been submitted and approved, a 5% penalty (OF THE TOTAL POSSIBLE MARK) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11.55pm. A 1-hour grace period is provided to students who experience a technical concern.

For example:

| Number of days (hours) late | Total Possible Marks | Deduction | Raw mark | Final mark |
|-----------------------------|----------------------|-----------|----------|------------|
| 1 day (1-24 hours) | 100 | 5 | 75 | 70 |
| 2 days (24-48 hours) | 100 | 10 | 75 | 65 |
| 3 days (48-72 hours) | 100 | 15 | 75 | 60 |

| | | | | |
|------------------------|-----|----|----|----|
| 7 days (144-168 hours) | 100 | 35 | 75 | 40 |
| >7 days (>168 hours) | 100 | - | 75 | 0 |

Late submission of time sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

Special Consideration

If you are unable to complete an assessment task on or by the specified date due circumstances that are unexpected, unavoidable, significantly disruptive and beyond your control, you may apply for special consideration in accordance with the [special consideration policy](#). Applications for special consideration must be supported by appropriate evidence and submitted via ask.mq.edu.au.

Assessment Tasks

| Name | Weighting | Hurdle | Due |
|-----------------------------------|-----------|--------|------------------------|
| Commentary paper | 15% | No | 09/10/2022 |
| Online quizzes | 10% | No | Weekly |
| Mid-term exam | 20% | No | 07/09/2022 |
| Final exam | 40% | No | Semester 2 Exam Period |
| Code problem sets | 15% | No | 30/10/2022 |

Commentary paper

Assessment Type ¹: Report

Indicative Time on Task ²: 12.5 hours

Due: **09/10/2022**

Weighting: **15%**

Highly structured critical analysis of hearing research across the disciplines (max. 750 words)

On successful completion you will be able to:

- Critically evaluate contemporary theories and concepts of audition, including the

interface of the auditory system with the motor and speech systems of the brain and with other aspects of human cognition.

- Display effective scientific communication in written form.

Online quizzes

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 9 hours

Due: **Weekly**

Weighting: **10%**

Weekly online MC quizzes completed before each class lecture.

On successful completion you will be able to:

- Explain the structure and function of the auditory system, with an emphasis on how the brain is organized to structure sound information into meaningful perceptual and cognitive units.
- Demonstrate an understanding of the causes of hearing impairments and hearing loss, the effects of hearing loss on cognitive functioning, and the current capabilities and limitations of artificial sensory prosthetic devices.

Mid-term exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 17 hours

Due: **07/09/2022**

Weighting: **20%**

Multiple-choice exam

On successful completion you will be able to:

- Explain the structure and function of the auditory system, with an emphasis on how the brain is organized to structure sound information into meaningful perceptual and cognitive units.
- Demonstrate an understanding of the causes of hearing impairments and hearing loss, the effects of hearing loss on cognitive functioning, and the current capabilities and limitations of artificial sensory prosthetic devices.

- Critically evaluate contemporary theories and concepts of audition, including the interface of the auditory system with the motor and speech systems of the brain and with other aspects of human cognition.
- Display a practical understanding of digital signal processing (DSP) techniques by applying them flexibly and appropriately to measure and analyse acoustic and speech signals.

Final exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 34 hours

Due: **Semester 2 Exam Period**

Weighting: **40%**

Multiple-choice and short-answer exam

On successful completion you will be able to:

- Explain the structure and function of the auditory system, with an emphasis on how the brain is organized to structure sound information into meaningful perceptual and cognitive units.
- Demonstrate an understanding of the causes of hearing impairments and hearing loss, the effects of hearing loss on cognitive functioning, and the current capabilities and limitations of artificial sensory prosthetic devices.
- Critically evaluate contemporary theories and concepts of audition, including the interface of the auditory system with the motor and speech systems of the brain and with other aspects of human cognition.
- Display effective scientific communication in written form.
- Display a practical understanding of digital signal processing (DSP) techniques by applying them flexibly and appropriately to measure and analyse acoustic and speech signals.

Code problem sets

Assessment Type ¹: Problem set

Indicative Time on Task ²: 12.5 hours

Due: **30/10/2022**

Weighting: **15%**

Completion of problem sets based on code examples introduced in weekly practicals.

On successful completion you will be able to:

- Display a practical understanding of digital signal processing (DSP) techniques by applying them flexibly and appropriately to measure and analyse acoustic and speech signals.

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

As a student enrolled in this unit, you will engage in a range of online and face-to-face learning activities, including readings, practical laboratory activities and lectures. Details can be found on the iLearn site for this unit.

Recommended Readings

Auditory Neuroscience: Making Sense of Sound

By Jan Schnupp, Israel Nelken and Andrew J. King

Technology Used

Active participation in the learning activities throughout the unit will require students to have access to a tablet, laptop or similar device. Students who do not own their own laptop computer may borrow one from the university library.

Unit Schedule

| | Topic/Theme | Text | Learning Activities |
|--------|-------------------------|--------|---|
| Week 1 | Overview / Sound | Ch 1 | Tutorial 1.5 hrs Lab(1) Introduction to MATLAB |
| Week 2 | Sound / The Ear | Ch 1,2 | Tutorial 1.5 hrs Lab(2) Basic plotting in MATLAB |
| Week 3 | Central Auditory System | Ch 3 | Tutorial 1.5 hrs Lab(3) Signal types and generation |

| | | | |
|---------|--------------------------------------|------|---|
| Week 4 | Development, Learning and Plasticity | Ch 7 | Tutorial 1.5 hrs Lab(4) Signal transformation |
| Week 5 | Hearing Loss | Ch 8 | Tutorial 1.5 hrs Lab(5) Sampling and aliasing |
| Week 6 | Hearing Loss and Cognition 1 | Ch 8 | Tutorial 1.5 hrs Lab(6) Audio in MATLAB |
| Week 7 | Mid-Term Exam | | Tutorial 1.5 hrs MATLAB revision |
| Week 8 | Hearing Loss and Cognition 2 | Ch 8 | Tutorial 1.5 hrs Lab(7) Frequency domain analysis |
| Week 9 | Binaural Hearing | Ch 5 | Tutorial 1.5 hrs Lab(8) Filtering in MATLAB |
| Week 10 | Clinical Audiology | Ch 8 | Tutorial 1.5 hrs Lab(9) Sound-based examples |
| Week 11 | Music Perception | Ch 6 | Tutorial 1.5 hrs Lab(10) Fundamental frequency estimation and variation |
| Week 12 | Speech Production | Ch 4 | Tutorial 1.5 hrs Matlab review |
| Week 13 | Review | | Tutorial 1.5 hrs Final Review |

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault

- [Social support including information about finances, tenancy and legal issues](#)

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Inclusion and Diversity

Social inclusion at Macquarie University is about giving everyone who has the potential to benefit from higher education the opportunity to study at university, participate in campus life and flourish in their chosen field. The University has made significant moves to promote an equitable, diverse and exciting campus community for the benefit of staff and students. It is your responsibility to contribute towards the development of an inclusive culture and practice in the areas of learning and teaching, research, and service orientation and delivery. As a member of the Macquarie University community, you must not discriminate against or harass others based on their sex, gender, race, marital status, carers' responsibilities, disability, sexual orientation, age, political conviction or religious belief. All staff and students are expected to display appropriate behaviour that is conducive to a healthy learning environment for everyone.

Professionalism

In the Faculty of Medicine, Health and Human Sciences, professionalism is a key capability embedded in all our courses.

As part of developing professionalism, students are [expected to attend all small group interactive sessions](#) including clinical, practical, laboratory, work-integrated learning (e.g., PACE placements), and team-based learning activities. Some learning activities are recorded (e.g., face-to-face lectures), however you are encouraged to avoid relying upon such material as they do not recreate the whole learning experience and technical issues can and do occur. As an adult learner, we respect your decision to choose how you engage with your learning, but we would remind you that the learning opportunities we create for you have been done so to enable your success, and that by not engaging you may impact your ability to successfully complete this unit. We equally expect that you show respect for the academic staff who have worked hard to develop meaningful activities and prioritise your learning by communicating with them in advance if you are unable to attend a small group interactive session.

Another dimension of professionalism is having respect for your peers. It is the right of every student to learn in an environment that is free of disruption and distraction. Please arrive to all learning activities on time, and if you are unavoidably detained, please join activity as quietly as possible to minimise disruption. Phones and other electronic devices that produce noise and other distractions must be turned off prior to entering class. Where your own device (e.g., laptop)

is being used for class-related activities, you are asked to close down all other applications to avoid distraction to you and others. Please treat your fellow students with the utmost respect. If you are uncomfortable participating in any specific activity, please let the relevant academic know.