Northeastern
College of Engineering

TELE 6530 – Connected Devices

FALL 2024

Course Information
Course Title: Connected Devices
Course Number: TELE 6530
Term and Year: Fall 2024
Credit Hour: 4
CRN: 14618
Course Format: Lecture and Lab, meeting 2x weekly (see Registrar's site for details)
Course LMS (Canvas): https://northeastern.instructure.com/courses/195153

Instructor Information
Full Name: Andy King
Email Address: an.king@northeastern.edu
Office Hours: See the course LMS for details

Instructor Biography
See LinkedIn Profile: https://www.linkedin.com/in/aking/

Teaching Assistant Information
Full Name: See the course LMS for details

Course Prerequisites
Please review the academic catalog to identify any course prerequisites

Course Description

The Connected Devices course is all about making the IoT 'work', and as such, involves substantial software development using Python, Java, Git source code management, and Linux shell scripting.

Connected Devices assignments are different than what you might normally see in a course. Each assignment serves as the basis for the next one, so it's **VERY IMPORTANT** that you start working on each as soon as possible, as they get progressively more difficult and can take many days to implement.

Although specialized device hardware (e.g., an SBC with attached sensors and actuators) is NOT required for the course, you will need a modern computing workstation or laptop for software development and application execution. While not required, we have used the Raspberry Pi 3 or 4 as the hardware platform for testing in the past, so it's an option for you as well.

All required lab modules can technically be developed and run on a single system running Windows 11 (WSL 2), macOS, or Linux; I'll mostly be teaching and demonstrating code using either Windows 11 / WSL 2 or macOS. That said, one of the **optional** lab module exercises is specific to Raspberry Pi SBC's, although it is not required for the course. Lastly, the emulator in Lab Module 04 is generally easier to run in a native Linux environment, as are the exercises in Lab Modules 08 and 09, although all **required** lab modules should technically run in Windows 11 using WSL 2, macOS, or Linux.

We'll meet for lectures, discussions, and labs 2x weekly (see Registrar's site for details). After the Semester begins, we will focus our sessions on context (lecture) and lab module design and implementation details. As we progress through the semester, and lab modules become increasingly more challenging, labs will often occupy each session.

We'll use Teams and / or Zoom to collaborate – we'll make this determination during the first full week of class. It's very important that you join the Teams site to stay up-to-date and connect into our meetings. For more information and the link to join, please see the course LMS for details.

Course LMS site (Canvas): https://northeastern.instructure.com/courses/195153

Course Learning Outcomes

Upon successful completion of this course, students are expected to understand, and build the software necessary to support, the following core IoT concepts and technologies:

- IoT architectures (edge to cloud)
- Edge-specific sensing and actuation concepts
- Data simulation, emulation, and management / translation
- MQTT as an IoT messaging protocol
- CoAP as an IoT messaging protocol
- Connected device integration basic analytics concepts
- IoT-specific cloud integration concepts

Required Tools and Course Textbooks

Reading:

- Programming the Internet of Things, by Andy King. ISBN-13: 978-1-492-08141-8
    - URL: Northeastern Scholar OneSearch - Programming the Internet of Things
    - Direct URL (O'Reilly): Programming the Internet of Things (oreilly.com)
- Other required and recommended reading can be found on the Course's Teams site, and in the bibliography listed in the course textbook above.

Labs:

- A software development workstation capable of running Windows 11 (with WSL v2), macOS, and / or Linux (e.g., Ubuntu – latest LTS) and Python 3.8+, Java 11+, git, and other open source tools (see the course textbook listed above for details).
    - URL: Programming the Internet of Things - Connected Devices Course Overview and Lab Links

Course Schedule/Topics Covered

The following represents the typical Connected Devices schedule, although some modifications should be expected depending upon the classes progression through both content and lab modules. All assignment due dates are listed in the course LMS (see above for link).

Week	Date*	In Class Topic*	Assignment Due*
1	**09/04**	Foundational Concepts and DevOps	See LMS for details
2	**09/11**	IoT Architectures and Edge Computing Overview	See LMS for details
3	**09/18**	Quiz No. 1 (Part 01)	See LMS for details

4	**09/25**	Data Simulation and Emulation	See LMS for details
5	**10/2**	Data Management and Integration	See LMS for details
6	**10/9**	Quiz No. 2 (Part 02)	See LMS for details
7	**10/16**	MQTT Client – part 01 of 02	See LMS for details
8	**10/23**	MQTT Client – part 02 of 02	See LMS for details
9	**10/30**	CoAP Server	See LMS for details
10	**11/6**	CoAP Client	See LMS for details
11	**11/13**	Edge Integration	See LMS for details
12	**11/20**	Quiz No. 3 (Part 03)	See LMS for details
13	**11/27**	Cloud Integration	See LMS for details
14	**12/4**	Quiz No. 4 (Part 04)	See LMS for details
15	**12/11**	Final Project and Presentations	See LMS for details

*** Dates and topics SUBJECT TO CHANGE! See course LMS for details.**

Assignment Grading

Please insert all assignment grades and weights for the course. Example below:

- Attendance – See MGEN policy on 'Attendance/Late Work Policy' below
- Assignments (Lab Modules 1 – 11) – 25%
- Semester Project (Lab Module 12) – 20%
- Semester Project Presentation – 5%
- Quizzes (4 total) – 50%

Grading Scale

	87-89.9% B+	77-79.9% C+	
95-100% A	84-86.9% B	74-76.9% C	
90-94.9% A-	80-83.9%B-	70-73.9% C-	69.9% or below F

Attendance/Late Work Policy

Attendance Policy

Students registered in MGEN courses (INFO, CSYE, and DAMG) are allowed **a maximum of 2 absences per course, with 3 or more absences resulting in an automatic 'F' for that course.** Students are expected to inform their instructors of any absences in advance of the class; if a student is sick long-term or experiences a medical issue that prevents class attendance, it is strongly encouraged that they speak with their Academic Advisor (coe-mgen-gradadvising@northeastern.edu) to learn more about the Medical Leave of Absence. Should a student anticipate being unable to attend 3 or more classes, they should discuss their situation with their Academic Advisor to explore other types of leave in accordance with the University's academic and global entry expectations. International students should review the Office of Global Services webpage to understand their visa compliance requirements.

Teaching Assistants (TAs) or Instructional Assistants (IAs) will be present at each class to collect student attendance.

Late Work Policy

Students must submit assignments by the deadline in the time zone noted in the syllabus. Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late. Work submitted late without prior communication with faculty will not be graded.

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is particularly important to the College of Engineering. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at **https://neu.evaluationkit.com**. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your Northeastern University Mail account notifying you when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind

according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to http://www.northeastern.edu/osccr/academic-integrity-policy/ to access the full academic integrity policy.

MGEN Student Feedback
Students who would like to provide the MGEN unit with anonymous feedback on this particular course, Teaching Assistants, Instructional Assistants, professors, or to provide general feedback regarding their program, may do so using this survey: https://neu.co1.qualtrics.com/jfe/form/SV_cTIAbH7ZRaaw0Ki

University Health and Counseling Services
As a student enrolled in this course, you are fully responsible for assignments, work, and course materials as outlined in this syllabus and in the classroom. Over the course of the semester if you experience any health issues, please contact UHCS.

For more information, visit https://www.northeastern.edu/uhcs.

Student Accommodations
Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit https://drc.sites.northeastern.edu.

Library Services
The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for education specific resources, visit https://library.northeastern.edu
Network Campus Library Services: Northeastern University Library Global Campus Portals

24/7 Canvas Technical Help
For immediate technical support for Canvas, call 617-373-4357 or email help@northeastern.edu

Canvas Student Resources: https://canvas.northeastern.edu/student-resources/

For assistance with my Northeastern e-mail, and basic technical support:
Visit ITS at https://its.northeastern.edu
Email: help@northeastern.edu
ITS Customer Service Desk: 617-373-4357

Diversity and Inclusion
Northeastern University is committed to equal opportunity, affirmative action, diversity, and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration, and an awareness of global perspectives on social justice.

Please visit http://www.northeastern.edu/oidi/ for complete information on Diversity and Inclusion

Title IX
Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty, and staff.

In case of an emergency, please call 911.

*Please visit **https://www.northeastern.edu/ouec** for a complete list of reporting options and resources both on- and off-campus*.