CpE 5430 /EE 5430 /Sys Eng 5323 Wireless Networks (tentative)

| PROFESSOR: | Dr. M. Zawodniok | SEMESTER: | Fall 2019 |
| OFFICE: | 133 EECH | OFFICE HOURS: | MTuW 1pm-2pm |
| OFFICE PHONE: | (573)-308-2319 | EMAIL: | mjzx9c@mst.edu |
| CLASS TIME: | MWF 8am-8:50am | LOCATION: | CS 209 (tentative) |


**REFERENCE:** Several IEEE Transactions and other international journals.

**PREREQUISITES:** EE 3420 (old 243) or CpE 3150 (old 213); basic programming competency, or consent of the instructor.

**OBJECTIVES:** The subject will provide students with fundamentals and theoretical foundations of wireless communication systems. Specific topics will include: transmission fundamentals and wireless channel challenges, signal coding techniques and error control, satellite communications, cellular networks, cordless systems, mobile IP and mobility management, multiple access techniques and wireless access protocols, wireless LAN, IEEE 802.11, and introduction to wireless ad-hoc and sensor networks. Additionally, students will become familiar with Network Simulator 3 and GNU Radio software packages; and be able to design, run, and analyze results of wireless networks simulations.

**GRADING:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Term Examination</td>
<td>40%</td>
</tr>
<tr>
<td>(3 exams, but the best two will be used toward final grade)</td>
<td></td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>15%</td>
</tr>
<tr>
<td>Lab Assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Mid-Semester Report on Semester Project (survey)</td>
<td>5%</td>
</tr>
<tr>
<td>Final Project</td>
<td>20%</td>
</tr>
</tbody>
</table>

Grades will be based on the following percentage guidelines (standards will not be raised!):

- >90% = A, 80 - 89% = B, 70 - 79% = C, 60 - 69% = D, < 60% = F

**POLICIES**

1. No late homework will be accepted.
2. No make ups will be given for missed exams without a verified medical excuse. A grade of 0 will be assigned to missed exams.
3. Unless otherwise stated, homework and computer assignments must be done individually
4. University policies regarding academic dishonesty will be implemented.
5. Lecture notes for each class will be posted on Blackboard prior to presentation in class. It is advised that you download these notes and bring them to class.
6. You are expected to read appropriate sections of the textbook before presentation in class. The textbook sections corresponding to each lecture can be found on the class schedule.
7. Assignments are due at the beginning of the class.

**ASSIGNMENTS**

You may work together to solve the homework problems, but the write-up should be done individually. Copying from anyone else's solution, as well as being dishonest, will deprive you of the opportunity to learn and to find out how much you know about the subject. If homework from two students is found to be effectively identical, both students will receive zero as the grade. If you cannot explain your answer
for solutions at a later date, no credit will be given, even if the solution was correct. If you cite from other works, for example textbook, internet sources, professional articles, you have to reference it properly (see standard IEEE reference guidelines – e.g. in conference or transaction papers).

COURSE OUTLINE: (TENTATIVE--CAN CHANGE!!!)
The following subjects will be covered in the course; the phrase in [brackets] indicates reading assignment. NOTE: each reading assignment is for discussion on the following week. Reading is not expected prior to the class for which it is listed.

1. Overview of wireless communications and networking [Chapters 1, 2, 3, and 4]
   a. Transmission fundamentals
   b. Communication networks
   c. TCP/IP protocol stack overview
2. Introduction to GNU Radio lab setup
3. Basic wireless communication technology, channel uncertainties and countermeasures [Chapters 5, 6, 7, 8, 9, and 10]
   a. Wireless Communication and Wireless Channel (Antennas and propagation theory and models)
   b. Signal encoding techniques
   c. Modulation techniques for wireless systems
   d. Coding and error control
4. Introduction to network simulator tool (Network Simulator 3 - Ns3)
5. Wireless LAN and PAN systems
   a. Wi-Fi (IEEE 802.11) wireless LAN standard
   b. Bluetooth and Zigbee standards
6. Mobile Wireless Systems
   b. 4G and LTE Systems [Chapter 14]
   c. Long range communication: Satellite communication, WiMAX/IEEE802.16
7. Wrap-up and Discussion

COURSE UPDATES AND CHANGES ON CANVAS
The CANVAS (http://mst.instructure.com or from the CANVAS link on the Missouri S&T homepage at www.mst.edu) will be used to post course materials including syllabus, class slides, assignments, and grades. Additionally, announcements and alerts will be sent by email (done through CANVAS) when applicable including class schedule changes, new assignment being posted on CANVAS.

All students are being assigned to following course on the CANVAS:

mst.instructure.com → 5430 Wireless Nets

Please check that you are able to access the materials for the course.

REPORTS REQUIREMENTS
1. Submission of reports is expected in electronic format (PDF, Word files) via email or Digital DropBox at Blackboard. In special cases hardcopies will be accepted – please contact instructor.
2. The assignment reports should be submitted using provided template (see Blackboard). It is not necessary to use all sections from the template.
3. The assignment reports should not exceed 6 pages. Penalty of 10% will be given for each page over 8 pages. For example, 9 page report will result in reduction of grade by 10%, the 13 page report will result in reduction of grade by 50%, for 18 page and longer report - 0 points! The appendixes (e.g. Matlab or Ns2 code/scripts) will not be counted toward the limit!
4. The students are required to discuss the results and explain the observed phenomena and changes in the results – simple description of the plots is not sufficient. The report with only
results shown will receive maximum 50%. Please talk to the instructor in advance if you have questions or doubts.

5. The detailed requirements for project report will be given in separate document. The project will have mandatory sections and separate page limits.

ATTENDANCE POLICY
The students are required to attend the lectures. If you must miss a class, you are responsible for procuring any material, information, handouts, or announcements that you missed. The attendance will be verified through in-class quizzes and exercises.

EXAMINATIONS
Tests will cover material from the lectures, text, homework and labs, with a slight emphasis on homework. Tests will primarily cover material presented since the last exam, though the nature of the course dictates knowledge of some material from earlier tests.

Unless there is a valid excuse, failure to show up at an exam will result in a grade zero. If there is a scheduling conflict wherein an examination from another course overlaps in time with any of these times, you should notify the instructor in writing (preferably by email) at least two weeks ahead of time. Students are expected to provide evidence of scheduling conflicts or other excuses before permission for a makeup exam can be granted. According to the Student Academic Regulations, all requests to change the final schedule because of conflicts or having three or more examinations schedule on one day are to be made in the Registrar's Office at least one week before the beginning of the final examination week.

Students needing special accommodations for exams should notify the instructor at least one week prior to the exam.

TITLE IX
Missouri University of Science and Technology is committed to the safety and well-being of all members of its community. US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Furthermore, in accordance with Title IX guidelines from the US Office of Civil Rights, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Title IX Coordinator, any notice of sexual harassment, abuse, and/or violence (including personal relational abuse, relational/domestic violence, and stalking) disclosed through communication including but not limited to direct conversation, email, social media, classroom papers and homework exercises.

Missouri S&T’s Title IX Coordinator is interim chief diversity officer Neil Outar. Contact him (naoutar@mst.edu; (573) 341-6038; Temporary Facility A-1200 N. Pine Street) to report Title IX violations. To learn more about Title IX resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit http://titleix.mst.edu.

STUDENT HONOR CODE AND ACADEMIC INTEGRITY:
Please take a few minutes to stress the importance of academic integrity in class. Discuss why it should matter to the student, why it matters to you and your discipline, why it matters to Missouri S&T, and why it matters to future employers. Include a statement on your syllabus about the Honor Code developed and endorsed by the Missouri S&T Student Council: the Honor Code can be found at this link: http://stuco.mst.edu/honor-code/. Encourage students to read and reflect upon the Honor code and its emphasis on HONESTY and RESPECT.

Page 30 of the Student Academic Regulations handbook describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism or sabotage (http://registrar.mst.edu/academicregs/index.html). Additional guidance for faculty, including the University’s Academic Dishonesty Procedures, is available on-line at http://academicsupport.mst.edu. Other informational resources for students regarding ethics and integrity can be found online at http://academicsupport.mst.edu/academicintegrity/studentresources-ai .
We expected every member of the Missouri S&T community to practice honorable and ethical behavior inside and outside of the classroom. Any action that might unfairly improve a student’s score on homework, quizzes, or examinations will be considered cheating, and will not be tolerated.

A few examples of cheating are:

- Submitting homework that is not your own work. While we encourage you to work together, your work should not be a copy of any other student’s work.
- Sharing results or notes during quizzes or exams.
- Bringing notes, in hard copy or electronic form, to an exam where they are not allowed. This includes improper use of a programmable calculator.
- Counting work on your exam after we have called for papers.
- Requesting a re-grad on an exam or homework problem that has been altered after grading.
- Copying entire paragraphs/sentences from past publications without proper citation (“” and reference)

If you are unsure whether a certain act is considered cheating, please ask the instructor. **Cheating on assignments or exams can result in a zero score for the assignment or exam, and lead to a reduced or failing grade for the course. Instances of cheating will be reported to university administrative officials for further action and possible suspension or expulsion from the university.**

**S&TCONNECT:** https://canvas.mst.edu/ (S&Tconnect icon on left toolbar)

S&Tconnect provides an enhanced system that allows students to request appointments with their instructors and advisors via the S&Tconnect calendar, which syncs with the faculty or staff member’s Outlook Exchange calendar. S&Tconnect will also facilitate better communication overall to help build student academic success and increase student retention. S&Tconnect Early Alert has replaced the Academic Alert system used by Missouri S&T. If training is needed, please contact Rachel Morris at rachelm@mst.edu or 341-7600.

**CLASSROOM EGRESS MAPS:**

Faculty should explain where the classroom emergency exits are located. Please include a statement in your course syllabus asking the students to familiarize themselves with the classroom egress maps posted on-line at: http://designconstruction.mst.edu/floorplan/.

**ACCESSIBILITY AND ACCOMMODATIONS:**

It is the university’s goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please contact Student Disability Services at (573) 341-6655, sdsmsst@mst.edu, visit http://dss.mst.edu/ for information, or go to mineraccess.mst.edu to initiate the accommodation process.

*Please be aware that any accessible tables and chairs in this room should remain available for students who find that standard classroom seating is not usable.*

**THE STUDENT SUCCESS CENTER**

The Student Success Center is a centralized location designed for students to visit and feel comfortable about utilizing the campus resources available. The Student Success Center was developed as a campus wide initiative to foster a sense of responsibility and self-directedness to all S&T students by providing peer mentors, caring staff, and approachable faculty and administrators who are student centered and supportive of student success. Visit the SSC at 198 Toomey Hall; 573-341-7596; success@mst.edu; web: http://studentsuccess.mst.edu/

If you have any questions about the information listed above, please contact the Office of Academic Support at 573-341-7276.

**CLASSROOM EGRESS MAPS:**

In case of emergency, everyone should leave the building in orderly fashion by following exit routes. Students should familiarize themselves with the classroom egress maps posted on-line at: http://designconstruction.mst.edu/floorplan/