

**The University of Texas at El Paso
Department of Computer Science
CS 4318/5323 – Wireless Networks
Spring 2024 Syllabus**

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General Information

Instructor:

Name:	Bhanukiran Gurijala
Email:	bgurijala@utep.edu
Office:	CCSB 3.0604
Office Phone:	(915) 747-5827
Office Hours:	MW 3:00 – 4:00 PM Or By appointment
Dates:	January 17, 2023 – May 12, 2023

Class Information

CRN:	23323/25670	
Time:	R 6:00 PM – 8:50 PM	CCSB G.0208

Important Dates:

January 17, 2023 – First Day of Classes

February 1, 2023 – Census Day

March 30, 2023 – Drop/Withdraw Deadline (Automatic W)

May 4, 2023 – Last day of Classes

May 5, 2023 – Dead Day

May 9, 2023 – Final Exam (7:00 PM – 9:45 PM)

Please communicate with the instructor or TA anytime you have questions, concerns, or wish to discuss anything. Reach out as often and frequently as necessary so that you may succeed.

NOTE: When emailing the instructor please use [CS 4318/5323 SP24] in the subject.

Course Description:

This introductory course in mobile and wireless networks provides a mixture of theoretical, engineering, and practical topics in contemporary wireless systems. The course covers fundamental techniques in design and operation of the second, third, and fourth generations of wireless LANs, and it places a significant emphasis on the design of security-related features within wireless networks.

Prerequisites:

MATH 2300 with a grade of C or better (OR)

CS 2202 with a grade of C or better (AND) CS 2302 with a grade of C or better

Textbook Book (Required):

Cory Beard, William Stallings, *Wireless Communication Networks and Systems*, 2014

Supplemental Materials:

- Supplementary and online technical articles to be provided during the semester.

Course Hardware:

- <https://www.rtl-sdr.com/buy-rtl-sdr-dvb-t-dongles/>
- https://www.amazon.com/dp/B0BMKB3L47?th=1&linkCode=sll1&tag=rsv0f-20&linkId=3bf60e27220eae8a0f3089db51359aae&language=en_US&ref=as_li_ss_tl
- (Optional) https://www.amazon.com/JahyShow%C2%AE-DVB-T-RTL2832U-Receiver-Compatible/dp/B01H830YQ6/ref=sr_1_20?crid=25XV3SZ1CNEQZ&keywords=rtl+sdr&qid=1639508466&s=electronics&sprefix=rtl,electronics,213&sr=1-20
- (Optional) <https://hakshop.myshopify.com/collections/wireless-gear/products/yard-stick-one?variant=6651566213>

Objectives

Course Objectives:

Introductory course in mobile, cellular, and wireless networks providing fundamental techniques in architecture, operation, and security of second, third, and fourth generation wireless networks. The evolution of wireless networks will be discussed covering infrastructure components, protocols, logical channels, security, and registration procedures. Starting with the technical background, we will cover transmission fundamentals, communication networks, protocol and TCP/IP Suite. The technologies used will be covered next resulting in the ability to describe the wireless channel, signal encoding, orthogonal frequency division multiplexing, spread spectrum, and coding and error control. The evolution into wireless local and personal area networks covering IEEE 802.11 and 802.15 standards will be covered to discuss some of the biggest technology trends and threat areas, the smart home. Wireless network and applications will be covered near the end of the course allowing discovery and discussion of fourth generation systems and long-term evolution. Smart phone technologies, embedded operating systems, location-based services, and security throughout all components of mobile technologies will be covered. Pros and cons of security will be discussed and alternate solutions will be theorized.

Course materials:

All the course materials will be available through **Blackboard**. Please check Blackboard regularly to stay updated with the class.

Policies & General Information

Grading:

Attendance and Participation	5%
Quizzes	8%
Homework/In-class Assignments	12%
Exam 1	10% (Undergrads) 10% (Grads)
Exam 2	20% (Undergrads) 15% (Grads)
Final Exam	25% (Undergrads) 20% (Grads)
Team Project and Presentations	20%
Research Work Deliverable and Presentations	10% (Grad only)

The nominal percentage-score-to-letter-grade conversion is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- below 60% is an F

The instructor reserves the right to adjust these criteria downward, e.g., so that 88% or higher represents an A, based on overall class performance. The criteria will not be adjusted upward, however.

Anyone found cheating on an exam will receive an automatic F in the course.

Attendance and Participation:

Attendance and participation in all lecture sessions are critical factors of your success in this course. Students should be **on time** for all scheduled sessions and **attend the entire session**. Attendance will be taken at every session and will count towards your grade. Attendance may be taken through iClicker, Blackboard, sign-in sheets, rollcall, visual attendance by instructional team, or other means. It is required that you attend each session. Failure to attend the class will result in poor performance in the course. Please come prepared for all sessions. Please inform the instructor if you will be late or absent from class.

Students should notify the instructor prior to missing a session if possible, and certainly right after if earlier was not possible. It is the student's responsibility to obtain the content covered during missed class(es). Participation points also include participating in class discussions, completing post-lecture online quizzes (when applicable) that are administered as surveys to monitor students' overall progress and potential struggles. Any assignments due on the date of the absence will be considered late if not turned in as specified by the assignment guidelines unless an exception is granted by the instructor. Points lost due to an unexcused absence may not be made up. Any points lost due to an excused absence will need to be made up by arrangement with the instructor.

Homework/In-Class Assignments:

Reading, non-programming homework, in-class exercises, special reports, and programming assignments will be posted on Blackboard. It is your responsibility to check Blackboard for all assignments. The work can be individual, or group based as specified in the instructions of the assignment. If you need help, consult the instructor. All assignment submissions must be newly attempted, never used original work. Late penalty of 10% will be assessed for every 24 hours. The work will be accepted up to seven (7) days from the submission deadline with late penalty, beyond which it will not be accepted. There is no make-up for in-class exercises.

Quizzes:

The purpose of each quiz is to ensure that you are staying current with the class content weekly reading and to verify that you have acquired the skills developed in class. Quizzes will usually be paper-based, or online quizzes on Blackboard, or other platform(s) as mentioned in the class. There will be **no make-up** for missed quizzes.

Exams:

There will be two exams and one final exam. Exams may be posted and submitted through Blackboard with appropriate due dates listed. The purpose of the exams is to allow you to demonstrate mastery of course concepts. Make-up exams will be given only in extremely unusual circumstances, and at the discretion of the instructor.

The purpose of the midterm exams is to allow you to demonstrate mastery of course concepts covered thus far during the semester. Mid-term exams will take place during the regular lecture session. You will receive an announcement (i.e., in-class, email, Blackboard, etc.) at least one week prior to an exam. The two exams (Exam 1 and Exam 2) are worth 10% and 20% of the course grade for undergraduate students and 10% and 15% for graduate students.

The final exam will be comprehensive. You must take the final exam during the time shown in the schedule for the lecture section that you normally attend. If you have a scheduling conflict (e.g., if you are taking a final at EPCC) or if you are scheduled for three final exams in one day, see your instructor in advance for accommodations. The final exam is worth 25% of the course grade for undergraduate students and 20% of the course grade for graduate students.

Make-up exams will be given only in extremely unusual circumstances. If you must miss an exam, please meet with the instructor BEFORE the exam. Unless in extreme circumstances and at the discretion of the instructor, students who miss an exam will not be able to make-up the exam.

Exams may make use of test proctoring software such as, Respondus Lockdown Browser and Respondus Monitor inside of Blackboard to promote academic integrity. You are encouraged to learn more about how to use these programs prior to the first exam. You may be required to provide a photo ID (i.e., Miner Gold card, Drivers License, etc.) to your exam. You may also be required to have an assigned seat during the exam. Students should avoid leaving the classroom during exams – you may be requested to submit your exam prior to leaving.

Team Project and Presentations:

Students will work in teams for the team project to gain hands-on experience and apply concepts learnt during the semester. The individual student grade on the project will be a combination of an evaluation of the overall completeness and quality of the project deliverables, project presentations, and the contribution of the individual to the team effort (that may be measured by self and peer evaluations and other means as will be discussed). A late penalty of 10% will be assessed for every 24 hours. The team will demo their final project deliverable and present it to the entire class.

Research Work Deliverables and Presentations:

The research work deliverable and presentations component are only applicable to graduate students. All graduate students will be surveying some topics related to wireless networks as assigned by the instructor or approved by the instructor. They may need to create a report of their findings and present it to the entire class. This component is worth 10% of the course grade for graduate students only.

Technology Requirements:

Some course content is delivered via the Internet through the Blackboard learning management system (LMS), supplemented by Microsoft Teams, Zoom, or the like. Ensure your UTEP MINERS account is working and that you have access to the Internet. You may use any of the primary Web browsers—Edge, Google Chrome, Firefox, Safari, etc. When having technical difficulties, try switching to another browser.

You will need to have access to a computer/laptop. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about [Microsoft Office 365](#) and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP [Help Desk](#) as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

You are not authorized to use any online services that are not licensed by UTEP, including, but not limited to Discord, Twitch, WhatsApp, or GroupMe. You should not use these services for communication, collaboration, or the like in any way with respect to this course. You are only permitted to use Microsoft Teams, Microsoft Office (Licensed through your Miners account), and Blackboard.

Students are permitted to use iPad/Tablets to handwrite notes. Students are not permitted to use their iPad/Tablet to browse the internet or use any other applications that are not related to the course. Students who use unauthorized applications during class time will be no longer be permitted to use the iPad/Tablet for note taking. Students should take notes by hand and not by typing. Students should avoid the use of laptops or cell phones during class unless indicated by the instructor.

Course Communication:

Here are the ways we can keep the communication channels open:

- Office Hours: I will have office hours for your questions and comments about the course. My office hours are in-person; however, you can request a virtual meeting and I will send you a Teams/Zoom link. Please see the days and times at the top of this syllabus. You can reach out to anyone on the instructional team for questions and comments.
- Email: UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24 hours of receipt. Please note that response may be delayed for e-mail sent during the weekend and holidays. When e-mailing me, be sure to e-mail from your UTEP e-mail account and please put the course number in the subject line. In the body of your e-mail, clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.

- **Announcements:** Announcements will be made in class and most of them will be posted on Blackboard as well. In case a student misses a class, the student is responsible to obtain any missed announcements. Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

Incomplete Grade Policy:

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

Excused Absences and/or Drop Policy:

You will not be dropped by the instructor in this course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar's Office to initiate the drop process. If you do not, you are at risk of receiving an "F" for the course.

Accommodations Policy:

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, email them at cass@utep.edu, or apply for accommodations online via the CASS portal. Students are required to discuss their accommodations with the instructor for a proper plan to be made.

Course Resources

Technology Resources:

- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources:

- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.
- [History Tutoring Center \(HTC\)](#): Receive assistance with writing history papers, get help from a tutor and explore other history resources.

- [RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.
- [The Miner Learning Center](#): Join peer-led study sessions in person or online to review content and discover study strategies in core curriculum courses.
- [UTEP Edge](#): UTEP's cross-campus framework for student success and empowerment – develops students' assets through high-impact experiences made possible by the expertise and dedication of faculty, staff, alumni, and community partners.

Individual Resources:

- [Student Success Help Desk \(SSHD\)](#): Students experiencing challenges or obstacles to academic success including registration, financial, food, housing, and transposition resources may submit a ticket request assistance to studentsuccess@utep.edu
- [Military Student Success Center](#): Assists personnel in any branch of service to reach their educational goals.
- [Center for Accommodations and Support Services](#): Assists students with ADA-related accommodations for coursework, housing, and internships.
- [Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

[UTEP Food Pantry](#): Non-perishable food items are available to students who are currently enrolled in classes. Bring a Miner Gold Card to Memorial Gym, Room 105, Monday through Friday, 10 a.m. to 2 p.m.

Standards of Conduct, Academic Dishonesty, and Other Information

Scholastic Integrity:

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as one's own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the [Office of Student Conduct and Conflict Resolution \(OSCCR\)](#) for possible disciplinary action. To learn more, please visit [HOOP: Student Conduct and Discipline](#).

Copyright Statement for Course Materials:

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. It is not permitted to share, reproduce, or alter any assignment for any purpose. Students are not permitted from sharing code, uploading assignments online in any form, or viewing/receiving/modifying code written from anyone else. Assignments are part of an academic course at The University of Texas at El Paso and a grade will be assigned for the work produced individually by the student.

Class Recordings:

Course lectures may be recorded by the instructor/department. Students are not permitted to record the course (i.e., video, audio, etc.) without expressed permission from the instructor.

The use of recordings will enable you to have access to class lectures, group discussions, and so on in the event you miss a synchronous or in-person class meeting due to illness or other extenuating circumstance. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. **You may not share recordings outside of this course.** Doing so may result in disciplinary action.

Illness Precautions:

Please stay at home if you have symptoms of a communicable illness. If you are feeling unwell, please let me and the instructional team as soon as possible, so that we can work on appropriate accommodation.

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let the instructor know as soon as possible, so that appropriate accommodations can be made. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID 19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

Netiquette:

Always consider audience. Remember that members of the class and the instructor will be reading any postings. Respect and courtesy must be always provided to classmates and to instructor. No harassment or inappropriate postings will be tolerated. When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a F2F situation. Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

Plagiarism Detection:

All coursework and assignments are subject to be submitted to plagiarism detection software including, but not limited to SafeAssign.

Guidance on Artificial Intelligence:

AI prohibited

Use of AI technologies or automated tools, particularly generative AI such as [ChatGPT](#) or [DALL-E](#), is **not allowed** for assignments in this class. Each student is expected to use critical and creative thinking skills to complete tasks and not rely on computer-generated ideas. Any direct use of AI-generated materials submitted as your own work will be treated as plagiarism and reported to the Office of Student Conduct and Conflict Resolution (OSCCR).

AI allowed only with prior permission from instructor

Use of AI technologies or automated tools, particularly generative AI such as [ChatGPT](#) or [DALL-E](#), is **only allowed with approval from the instructor BEFORE being used**. Without permission, you will be expected to think creatively and critically to complete assignments without assistance from these tools.

If given permission to use any of these tools, students must properly cite and give full credit to the program used upon submission of every relevant assignment. For example, text generated using ChatGPT must be cited:

Chat-GPT(version). Date of query (year/month/day). "Text of your query."
Generated using OpenAI. <https://chat.openai.com/>

A short paragraph describing how the tool(s) was/were used for the assignment must be included.

AI allowed with proper acknowledgement

Use of AI technologies or automated tools, particularly generative AI such as [ChatGPT](#) or [DALL-E](#), is **only allowed with proper attribution given for its use**.

Students must properly cite and give full credit to the program used upon submission of every relevant assignment. For example, text generated using ChatGPT must be cited:

Chat-GPT(version). Date of query (year/month/day). "Text of your query."
Generated using OpenAI. <https://chat.openai.com/>

A short paragraph describing how the tool(s) was/were used for the assignment must be included.

Using AI for brainstorming

Some AI technologies or automated tools, particularly generative AI such as [ChatGPT](#) or [DALL-E](#), can be beneficial during the early brainstorming stages of an activity, and you are welcome to explore them for that purpose. However, keep in mind that AI-generated ideas are not your own and may hinder your ability to think critically and creatively about a problem. It is also important

to remember that these technologies often “hallucinate” or produce materials and information that are inaccurate or incomplete—even providing false citations for use.

That said, you are not allowed to submit any AI-generated work in this course as your own. If you use any information or materials created by AI technology, you are required to cite it like you would any other source. Consider how this will affect your credibility as a writer and scholar before doing so. Any direct use of AI-generated materials submitted as your own work will be treated as plagiarism and reported to the Office of Student Conduct and Conflict Resolution (OSCCR).

Free use of AI without acknowledgement

Use of AI technologies or automated tools, including generative AI such as [ChatGPT](#) or [DALL-E](#), is permitted in this class. Students must include a short paragraph, with each relevant assignment, explaining how the tool was used.

The use of generative AI tools such as Chat GPT is permitted in this course for the following activities, which must be noted or cited:

- Reinforce understanding of concepts discussed in the course.

However, you may not use AI tools to complete any of the assessment items used to compute the grade for the course.

Students must cite any borrowed content sources to comply with all applicable citation guidelines, copyright law, and avoid plagiarism. Instances that violate these guidelines will be referred to the Office of Student Conduct and Conflict Resolution.

Standards of Conduct:

You are expected to conduct yourself in a professional and courteous manner, as prescribed by the [UTEP Standards of Conduct](#).

A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at El Paso. More specifically, students are expected to maintain absolute integrity and a high standard of individual honor in scholastic work undertaken at the University. At a minimum, you should complete any assignments, exams, and other scholastic endeavors with the utmost honesty, which requires you to:

- Acknowledge the contributions of other sources to your scholastic efforts.
- Complete your assignments independently unless expressly authorized to seek or obtain assistance in preparing them.
- Follow instructions for assignments and exams, and observe the standards of your academic discipline; and
- Avoid engaging in any form of academic dishonesty on behalf of yourself or another student.

Graded work, e.g., homework and tests, is to be completed independently and should be unmistakably your own work (or, in the case of group work, your team's work), although you may discuss your project with other students in a general way. You may not represent as your

own work material that is transcribed or copied from another person, book, or any other source, e.g., a web page.

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable to another person.

- **Cheating**
 - Copying from the test paper of another student
 - Communicating with another student during a test
 - Giving or seeking aid from another student during a test
 - Possession and/or use of unauthorized materials during tests without authorization (i.e., Crib notes, class notes, books, etc.)
 - Substituting for another person to take a test.
 - Falsifying research data, reports, academic work offered for credit.
- **Plagiarism**
 - Using someone's work in your assignments without the proper citations.
 - Submitting the same paper or assignment from a different course, without direct permission of instructors
- **Collusion**
 - Unauthorized collaboration with another person in preparing academic assignments.

Collaboration:

Collaboration among students is strongly encouraged.

It is acceptable to:

- Talk with other students about approaches and ideas.
- Get ideas and extra information from the internet, books, etc.

However, it is not acceptable to:

- Share code with another student (if a piece of code is submitted by two or more students, both students are guilty of cheating, regardless of who wrote the original code).
- Use code acquired from an outside source (the internet, a friend, etc.)
- Look at another student's code
- Debug another student's code

Software to detect plagiarized programs are used; appropriate disciplinary actions will be taken as necessary. A full description of the University Standards of Conduct and Academic Dishonesty can be found in the [Handbook of Operating Procedures](#). Professors are required to -- and will -- report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students and OSCCR.

Tentative Schedule

Please note that this schedule is subject to change at any time without advance notice. You should not assume that the exams scheduled below are finalized.

<u>Week</u>	<u>Topic</u>
1	Introduction to Wireless Networks, Networking Review/Intro
2	Transmission Fundamentals, Communication Networks
3	Protocols and the TCP/IP Suite
4	Overview of the Wireless Communications, The Wireless Channel
5	Exam 1
6	Orthogonal Frequency Division Multiplexing
7	Spread Spectrum
8	Coding and Error Control
9	Cellular Wireless Networks
10	Fourth Generation Systems
11	Exam 2
12	Mobile IP and Applications
13	802.11 and 802.15
14	Team Project Presentations
15	Team Project Presentations
16	Final Exam