

ITT Technical Institute
MC2560
Mobile Wireless Communications I
Onsite Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisites: MC1260 Introduction to Mobile Communications Technology or equivalent, NT2640 IP Networking or equivalent

Course Description:

This course covers fundamental technologies of mobile information systems and wireless communications. Topics of study include, but are not limited to, characteristics of the mobile radio environment – propagation phenomena, cellular concept and channel allocation, dynamic channel allocation and power control, multiple access techniques: FDMA, TDMA, CDMA – system capacity comparisons.

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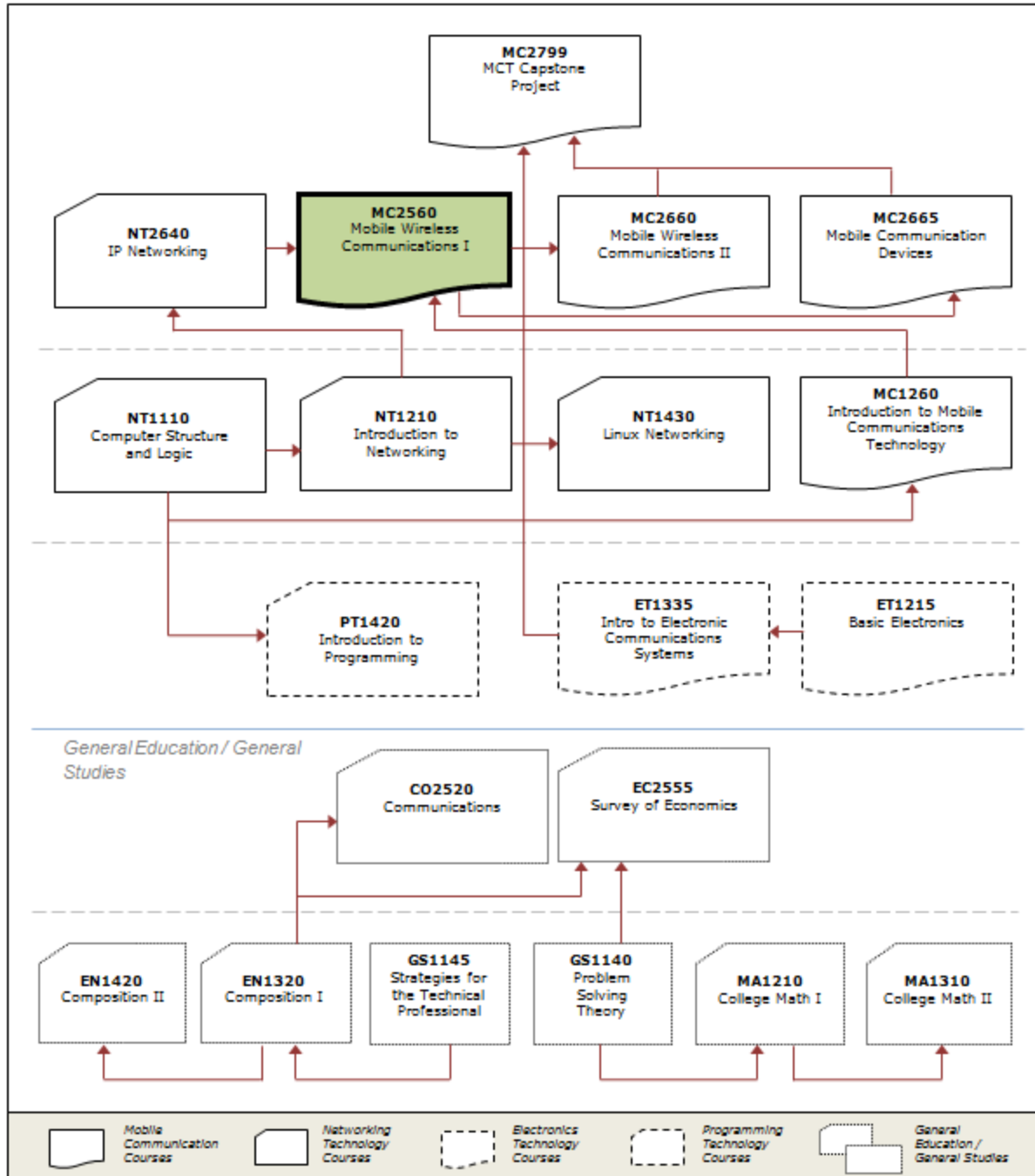
Prerequisites: MC1260 Introduction to Mobile Communications Technology or equivalent
NT2640 IP Networking or equivalent

Where Does This Course Belong?

This course is required for the Mobile Communications Technology program. This program covers the following core areas:

- Basic electronics
- Electronic communications systems
- Computers
- Networking
- Programming
- Mobile wireless communications
- Mobile communications devices

The following diagram demonstrates how this course fits in the program:



Course Summary

Course Description

This course covers fundamental technologies of mobile information systems and wireless communications. Topics of study include, but are not limited to, characteristics of the mobile radio environment – propagation phenomena, cellular concept and channel allocation, dynamic channel allocation and power control, multiple access techniques: FDMA, TDMA, CDMA – system capacity comparisons.

Major Instructional Areas

1. The history and evolution of mobile communications
2. Characteristics of the mobile radio environment – propagation phenomena
3. Cellular concept and channel allocation
4. Dynamic channel allocation and power control
5. Multiple access techniques: FDMA, TDMA, CDMA – system capacity comparisons

Course Objectives

1. Describe the history and evolution of mobile communications.
2. Explain the characteristics of the mobile radio environment with respect to propagation phenomena.
3. Describe cellular concept and channel allocation.
4. Describe dynamic channel allocation and power control.
5. Discuss multiple access techniques including FDMA, TDMA, and CDMA and compare their systems capacities.
6. Discuss the uses of mobile wireless communication with respect to the general model of data communications.
7. Describe the role of protocol architecture in the OSI reference model.
8. Distinguish among the different methods of data transmission.
9. Describe the various techniques involved with Data Link control protocols.
10. Explore the various types of LAN applications.
11. Contrast circuit and packet-switching types of networks.
12. Explore the different components and types of switching networks.
13. Distinguish between the methods used to control congestion in data networks.

14. Describe the operation of internetwork protocols.
15. Evaluate the methods used to secure a network.
16. Explore various Internet applications.

Learning Materials and References

Required Resources

Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Schiller, J., Grayson, M., et al. (2012). <i>Mobile wireless communications</i> (Custom Ed.). Boston, MA: Pearson Education.	■		■
Other Items	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
From the ITT Tech Virtual Library> Books> Books24x7> Zhang, Y., Zheng, J., & Miao M. (2008). <i>Handbook of research on wireless security</i> . Hershey, PA: Information Science Reference. Webb, W. (2007). <i>Wireless communications: The future</i> . Hoboken, NJ: John Wiley & Sons.	■		

Recommended Resources

[ITT Tech Virtual Library](#) (accessed via Student Portal)

Log on to the ITT Tech Virtual Library at <http://library.itt-tech.edu/> to access online books, journals, and other reference resources selected to support ITT Tech curricula.

Books

You may click “Books” or use the “Search” function on the home page to find the following books:

Books24x7:

- Zhang, Y., Zheng, J., & Miao, M. (2008). *Handbook of research on wireless security*. Hershey, PA: Information Science Reference.
- Webb, W. (2007). *Wireless communications: The future*. Hoboken, NJ: John Wiley & Sons.

Professional Associations

- American National Standards Institute (ANSI): www.ansi.org
- CDMA Development Group (CDG): www.cdg.org
- Cellular Telecommunications Internet Association (CTIA): <http://www.ctia.org/>
- Computer and Communications Industry Association (CCIA): www.ccianet.org/
- Defense Advanced Research Projects Agency (DARPA): www.darpa.mil
- European Telecommunications Standards Institute (ETSI): www.etsi.org
- Federal Communications Commission (FCC): www.fcc.gov
- Institute of Electrical and Electronics Engineers, Inc. (IEEE): www.ieee.org
- Internet Assigned Numbers Authority (IANA): www.iana.org
- Internet Society (ISOC): www.isoc.org/isoc/
- Mobile Satellite Users Associations (MSUA): www.msua.org
- National Institute of Standards and Technology (NIST): www.nist.gov
- National Technical Information Service (NTIS): www.ntis.gov
- National Telecommunications and Information Administration (NTIA): www.ntia.doc.gov
- Open Mobile Alliance (OMA) & WAP Forum: www.openmobilealliance.org
- Personal Communications Industry Association (PCIA): www.pcia.com
- Portable Computer and Communications Association (PCCA): www.pcca.org
- Satellite Broadcasting & Communications Association (SBCA): www.sbca.com
- Satellite Industry Association (SIA): www.sia.org
- Telecommunications Industry Association (TIA): www.tiaonline.org
- The Computing Technology Industry Association (CompTIA): www.comptia.org
- The Consumer Electronics Association (CEA): www.ce.org
- United States Internet Service Provider Association (USIPSA): www.cix.org
- United States Telecom Association: www.usta.org
- United States Telecommunications Training Institute (USTTI): www.ustti.org
- Wi-Fi Alliance: <http://www.wi-fi.org/index.php>
- Wireless Communications Association International (WCA): www.wcai.com

Information Search

Use the following keywords to search for additional online resources that may be used for supporting your work on the course assignments:

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- Access methods (wireless)
- ALOHA scheme
- AMPS (Advanced Mobile Phone Services)
- Antenna technology
- Authentication
- CDMA
- Cellular systems
- Frequency-division multiple access
- GSM
- HARQ
- Location-based services
- MIMO
- Mobile Internet Protocol
- UMTS
- WiMAX/Mobile
- Wireless system

NOTE: All links are subject to change without prior notice.

Course Plan

Suggested Learning Approach

In this course, you will be studying individually and within a group of your peers. As you work on the course deliverables, you are encouraged to share ideas with your peers and instructor, work collaboratively on projects and team assignments, raise critical questions, and provide constructive feedback.

Use the following advice to receive maximum learning benefits from your participation in this course:

DO	DON'T
<ul style="list-style-type: none"> ▪ Do take a proactive learning approach. 	<ul style="list-style-type: none"> ▪ Don't assume there is only one correct

- Do share your thoughts on critical issues and potential problem solutions.
- Do plan your course work in advance.
- Do explore a variety of learning resources in addition to the textbook.
- Do offer relevant examples from your experience.
- Do make an effort to understand different points of view.
- Do connect concepts explored in this course to real-life professional situations and your own experiences.

answer to a question.

- Don't be afraid to share your perspective on the issues analyzed in the course.
- Don't be negative about the points of view that are different from yours.
- Don't underestimate the impact of collaboration on your learning.
- Don't limit your course experience to reading the textbook.
- Don't postpone your work on the course deliverables – work on small assignment components every day.

Course Outline

Unit 1: THE HISTORY AND EVOLUTION OF WIRELESS COMMUNICATION			Out-of-class work: 8 hrs.
Upon completion of this unit, students are expected to:			
<ul style="list-style-type: none"> • Demonstrate an understanding of the term “wireless.” • Describe the characteristics of wireless devices. • Identify applications of wireless technology in today’s society. • Describe the key milestones in wireless history to date. • Identify the differences between wired, fixed, and wireless networks. • Describe the effects of wireless communications on our environment. • Describe all the layers of the OSI model in involved in wireless technology. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> • Schiller and Grayson, Part I: Chapter 1 • Schiller and Grayson, Part II: Chapter 1 	Assignment	Unit 1 Assignment 1: TCP/IP and OSI Model	1.5%
	Lab	Unit 1 Lab 1: Presentation on Major Events in the History of Wireless	3%

Unit 2: WIRELESS TRANSMISSION			Out-of-class work: 8 hrs.
Upon completion of this unit, students are expected to:			
<ul style="list-style-type: none"> • Explain the characteristics of communication propagation in a mobile environment. • Identify the characteristics of radio signal propagation. • Explain frequency regulations worldwide. • Identify causes of transmission errors. • Describe multiplexing and discuss its implementation. • Demonstrate an understanding of the cause and remediation of interference in wireless transmissions. • Identify standard modulation schemes. • Describe the use of spread spectrum techniques. • Describe basic cellular systems. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> • Schiller and Grayson, Part I: Chapter 2 	Lab	Unit 2 Lab 1: VisSim/Comm: Exploring and Building a Typical Communication System	3%

Out-of-class work:

Unit 3: MEDIUM ACCESS CONTROL			<i>8 hrs.</i>
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> • Describe cellular and channel allocation. • Explain channel allocation and power control. • Define, describe, and compare medium access control mechanisms. • Describe the implementation of access control mechanisms. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> • Schiller and Grayson, Part I: Chapter 3 	Assignment	Unit 3 Assignment 1: Comparison of SDMA, TDMA, FDMA, and CDMA Mechanisms	1.5%
	Lab	Unit 3 Lab 1: MAC Scheme Simulations	3%
	Quiz	Unit 3 Quiz 1	5%

Unit 4: TELECOMMUNICATION SYSTEMS AND DIGITAL CELLULAR NETWORKS			<i>Out-of-class work: 8 hrs.</i>
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> • Define multiple access techniques, including FDMA, TDMA, and CDMA. • Describe the use of mobile communication models of data communications channels and protocols. • Define and describe digital cellular networks. • Explain the use of digital cellular networks. • Describe the system architecture of digital cellular networks. • Describe subsystems in digital cellular networks. • Specify sources and remediation of signal inference. • Summarize the process of localization and calling for users on a cellular network. • Predict the growth and future use of digital cellular networks. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> • Schiller and Grayson, Part I: Chapter 4 	Assignment	Unit 4 Assignment 1: Generations of Mobile Telecommunication Technologies	1.5%
	Lab	Unit 4 Lab 1: GSM Systems	3%
	Project	Unit 4 Project Part 1: Community Project	5%
		Unit 4 Project Part 2: Technical Solutions Manual (ePortfolio)	5%

Unit 5: TELECOMMUNICATION SYSTEMS, HANDOVER PROCESS, SECURITY,	<i>Out-of-class work:</i>
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AND NEW DATA SERVICES			<i>8 hrs.</i>
<p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> Identify applications of wireless technology in today's society. Describe and discuss the use of handover procedures in cellular systems. Identify major security issues in wireless communication. Describe and discuss security techniques in cellular systems. Identify, describe, and discuss new data services in wireless systems. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> Schiller and Grayson, Part I: Chapter 4, review pp. 117-158 	Lab	Unit 5 Lab 1: Building a Wireless Network, Part 1	3%
	Quiz	Unit 5 Quiz 2	5%

Unit 6: INTERNET SESSION			<i>Out-of-class work: 8 hrs.</i>
<p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> Identify and discuss strategies for enabling mobile Internet. Compare the difference between packet switching and circuit switching. Describe TCP/IP-based communications and give examples. Define IPv4 addressing. Define IPv6 addressing. Describe the implementation of network address translation. Describe the TCP/IP Five-Layer Model. Distinguish the protocol and functionality of each layer of the TCP/IP Five-Layer Model. Summarize session persistence and the locator-identifier problem. Identify major implementation issues in building the mobile Internet. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> Schiller and Grayson, Part II: Chapter 2 	Assignment	Unit 6 Assignment 1: TCP/IP Five-Layer Model	1.5%
	Lab	Unit 6 Lab 1: Building a Wireless Network, Part 2: Configuring a Wireless Router	3%

Unit 7: NOMADICITY			<i>Out-of-class work: 8 hrs.</i>
<p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> Describe the issues involved in keeping Internet sessions alive, regardless of location and time. Explain the need for security in wireless communication systems. 			

<ul style="list-style-type: none"> Describe authentication and authorization standards in wireless communication. Describe authentication and authorization standards in Internet applications. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> Schiller and Grayson, Part II: Chapter 3 	Assignment	Unit 7 Assignment 1: Eduroam.org	1.5%
		Unit 7 Assignment 2: OpenID	1.5%
	Lab	Unit 7 Lab 1: Nomadcity of Laptops, Tablets, and Other Mobile Devices	3%
	Quiz	Unit 7 Quiz 3	5%

<p>Unit 8: SECURITY IN MOBILE COMMUNICATIONS</p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> Describe the characteristics of wireless devices. Identify applications of wireless technology in today's society. Describe security risks inherent in wireless communications. Specify malicious software threats in mobile devices. Describe and discuss deterrents to malicious software in mobile devices. Summarize privacy and anonymity in mobile networks. Describe security services that should be provided in wireless communication. Identify security goals in service discovery, invocation, and composition. 			<p>Out-of-class work: 8 hrs.</p>
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> ITT Tech Virtual Library> Books> Books24x7> Zhang, et al., Chapters 1-17, 27-39 <p>(See Required Resources above for full citation.)</p>	Assignment	Unit 8 Assignment 1: Malicious Software	1.5%
		Unit 8 Assignment 2: Synchronization Applications	1.5%
	Lab	Unit 8 Lab 1: RF Reader, Vista/Windows 7 RFID Login	3%
	Project	Unit 8 Project Part 3: RFID Logger	5%

<p>Unit 9: SATELLITE SYSTEMS</p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> Describe security risks inherent in wireless communications. Describe malicious software threats in mobile devices. Describe and discuss deterrents to malicious software in mobile devices. Discuss privacy and anonymity in mobile networks. Describe security services that should be provided in wireless communication. 			<p>Out-of-class work: 8 hrs.</p>
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<ul style="list-style-type: none"> Identify security goals in service discovery, invocation, and composition. Identify applications for communication systems. Describe and discuss the architecture and implementation of satellite communication systems. 			
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> Schiller and Grayson, Part I: Chapter 5 	Lab	Unit 9 Lab 1: Satellite Communication Systems	3%
	Quiz	Unit 9 Quiz 4	5%

<p>Unit 10: WIRELESS COMMUNICATION: THE FUTURE</p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> Describe the accuracy of past predictions for wireless communication. Explain why the accurate ability to predict the future of wireless communication is a necessary part of business. Describe the future roadmap for wireless communication. Describe and discuss the role of ad hoc technology in the broadband wireless networks of the future. 			<p>Out-of-class work: 8 hrs.</p>
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
<ul style="list-style-type: none"> ITT Tech Virtual Library> Books> Books24x7> Webb, Chapters 1, 3, 8-15 (See Required Resources above for full citation.) 	Assignment	Unit 10 Assignment 1: Present and Future Biomedical Applications for Wireless Communication	1.5%
		Unit 10 Assignment 2: Present and Future Military Applications for Wireless Communication	1.5%
	Lab	Unit 10 Lab 1: Setup, Configuration, Synchronization, and Backup of Wireless Tablets	3%
	Project	Unit 10 Project Part 4: Wardriving (ePortfolio)	5%

<p>Unit 11: FINAL EXAM</p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> Demonstrate knowledge of wireless systems. Demonstrate application of knowledge of wireless system. 			<p>Out-of-class work: 8 hrs.</p>
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
None	Exam	Final Exam	15%

Evaluation and Grading

Evaluation Criteria

The graded assignments will be evaluated using the following weighted categories:

Category	Weight
Assignment	15%
Lab	30%
Project	20%
Quiz	20%
Exam	15%
TOTAL	100%

Grade Conversion

The final grades will be calculated from the percentages earned in the course, as follows:

Grade	Percentage	Credit
A	90–100%	4.0
B+	85–89%	3.5
B	80–84%	3.0
C+	75–79%	2.5
C	70–74%	2.0
D+	65–69%	1.5
D	60–64%	1.0
F	<60%	0.0

Academic Integrity

All students must comply with the policies that regulate all forms of academic dishonesty, or academic misconduct, including plagiarism, self-plagiarism, fabrication, deception, cheating, and sabotage. For more information on the academic honesty policies, refer to the Student Handbook and the Course Catalog.

(End of Syllabus)