

Cover Sheet: Request 15914

CNT4530 Intro to Mobile Networking

Info

| | |
|------------------------|---|
| Process | Course New Ugrad/Pro |
| Status | Pending at PV - University Curriculum Committee (UCC) |
| Submitter | Ahmed Helmy helmy@ufl.edu |
| Created | 3/2/2021 8:16:19 AM |
| Updated | 9/11/2021 6:22:43 PM |
| Description of request | Request for a new undergraduate course CNT 4530 Introduction to Mobile Networking |

Actions

| Step | Status | Group | User | Comment | Updated |
|-------------------------------------|----------|---|--------------------------|--|-----------|
| Department | Approved | ENG - Computer and Information Science and Engineering 19140000 | Christina Gardner-McCune | | 4/23/2021 |
| No document changes | | | | | |
| College | Approved | ENG - College of Engineering | Heidi Dublin | Approved by HWCOE Curriculum Committee and Faculty Council | 5/13/2021 |
| consult-ece-Janice-McNair-1.pdf | | | | | 5/4/2021 |
| consult-ece-Yuguang-Mike-Fang-2.pdf | | | | | 5/4/2021 |
| consult-ece-Dapeng-Oliver-Wu-3.pdf | | | | | 5/4/2021 |
| University Curriculum Committee | Pending | PV - University Curriculum Committee (UCC) | | | 5/13/2021 |
| No document changes | | | | | |
| Statewide Course Numbering System | | | | | |
| No document changes | | | | | |
| Office of the Registrar | | | | | |
| No document changes | | | | | |
| Catalog | | | | | |
| No document changes | | | | | |
| Student Academic Support System | | | | | |
| No document changes | | | | | |
| College Notified | | | | | |
| No document changes | | | | | |

Course|New for request 15914

Info

Request: CNT4530 Intro to Mobile Networking

Description of request: Request for a new undergraduate course CNT 4530 Introduction to Mobile Networking

Submitter: Ahmed Helmy helmy@ufl.edu

Created: 9/11/2021 4:09:25 PM

Form version: 4

Responses

Recommended Prefix

Enter the three letter code indicating placement of course within the discipline (e.g., POS, ATR, ENC). Note that for new course proposals, the State Common Numbering System (SCNS) may assign a different prefix.

Response:
CNT

Course Level

Select the one digit code preceding the course number that indicates the course level at which the course is taught (e.g., 1=freshman, 2=sophomore, etc.).

Response:
4

Course Number

Enter the three digit code indicating the specific content of the course based on the SCNS taxonomy and course equivalency profiles. For new course requests, this may be XXX until SCNS assigns an appropriate number.

Response:
530

Category of Instruction

Indicate whether the course is introductory, intermediate or advanced. Introductory courses are those that require no prerequisites and are general in nature. Intermediate courses require some prior preparation in a related area. Advanced courses require specific competencies or knowledge relevant to the topic prior to enrollment.

Response:
Joint (Ugrad/Grad)

- 1000 level = Introductory undergraduate
- 2000 level = Introductory undergraduate
- 3000 level = Intermediate undergraduate
- 4000 level = Advanced undergraduate
- 5000 level = Introductory graduate
- 6000 level = Intermediate graduate
- 7000 level = Advanced graduate
- 4000/5000= Joint undergraduate/graduate
- 4000/6000= Joint undergraduate/graduate

**Joint undergraduate/graduate courses must be approved by the UCC and the Graduate Council)*

Lab Code

Enter the lab code to indicate whether the course is lecture only (None), lab only (L), or a combined lecture and lab (C).

Response:

None

Course Title

Enter the title of the course as it should appear in the Academic Catalog. There is a 100 character limit for course titles.

Response:

Introduction to Mobile Networking

Transcript Title

Enter the title that will appear in the transcript and the schedule of courses. Note that this must be limited to 30 characters (including spaces and punctuation).

Response:

Intro to Mobile Networking

Degree Type

Select the type of degree program for which this course is intended.

Response:

Baccalaureate

Delivery Method(s)

Indicate all platforms through which the course is currently planned to be delivered.

Response:

On-Campus, Online

Co-Listing

Will this course be jointly taught to undergraduate, graduate, and/or professional students?

Response:

Yes

Co-Listing Explanation

Please detail how coursework differs for undergraduate, graduate, and/or professional students. Additionally, please upload a copy of both the undergraduate and graduate syllabus to the request in .pdf format. For more information please see the [Co-Listed Graduate Undergraduate Courses Policy](#).

Response:

Graduate students have 33% more assigned discussions and readings (8 for graduate students vs 6 for undergraduates). Graduate students are required to submit 20% additional parts in the

assignments, that are more challenging (requiring deeper analysis of the networking protocols and data) than the undergraduate level.

Graduate students have greater project requirements including larger test case, simulations, and data requirements, and requirement of higher component of novelty in their projects than undergraduate projects (35% for graduate students versus 10% for the undergraduates).

Effective Term

Select the requested term that the course will first be offered. Selecting "Earliest" will allow the course to be active in the earliest term after SCNS approval. If a specific term and year are selected, this should reflect the department's best projection. Courses cannot be implemented retroactively, and therefore the actual effective term cannot be prior to SCNS approval, which must be obtained prior to the first day of classes for the effective term. SCNS approval typically requires 2 to 6 weeks after approval of the course at UF.

Response:

Fall

Effective Year

Select the requested year that the course will first be offered. See preceding item for further information.

Response:

2021

Rotating Topic?

Select "Yes" if the course can have rotating (varying) topics. These course titles can vary by topic in the Schedule of Courses.

Response:

No

Repeatable Credit?

Select "Yes" if the course may be repeated for credit. If the course will also have rotating topics, be sure to indicate this in the question above.

Response:

No

Amount of Credit

Select the number of credits awarded to the student upon successful completion, or select "Variable" if the course will be offered with variable credit and then indicate the minimum and maximum credits per section. Note that credit hours are regulated by Rule 6A-10.033, FAC. If you select "Variable" for the amount of credit, additional fields will appear in which to indicate the minimum and maximum number of total credits.

Response:

3

S/U Only?

Select "Yes" if all students should be graded as S/U in the course. Note that each course must be entered into the

UF curriculum inventory as either letter-graded or S/U. A course may not have both options. However, letter-graded courses allow students to take the course S/U with instructor permission.

Response:

No

Contact Type

Select the best option to describe course contact type. This selection determines whether base hours or headcount hours will be used to determine the total contact hours per credit hour. Note that the headcount hour options are for courses that involve contact between the student and the professor on an individual basis.

Response:

Regularly Scheduled

- *Regularly Scheduled [base hr]*
- *Thesis/Dissertation Supervision [1.0 headcount hr]*
- *Directed Individual Studies [0.5 headcount hr]*
- *Supervision of Student Interns [0.8 headcount hr]*
- *Supervision of Teaching/Research [0.5 headcount hr]*
- *Supervision of Cooperative Education [0.8 headcount hr]*

Contact the Office of Institutional Planning and Research (352-392-0456) with questions regarding contact type.

Weekly Contact Hours

Indicate the number of hours instructors will have contact with students each week on average throughout the duration of the course.

Response:

3

Course Description

Provide a brief narrative description of the course content. This description will be published in the Academic Catalog and is limited to 500 characters or less. See course description guidelines.

Response:

(3 credits) Fundamental concepts of emerging mobile networks architecture, systematic analysis of effects of mobility on network performance, synthetic and data-driven mobility modeling and simulation, behavior analysis in mobile networks, mobile service and application structure, development, implementation, and evaluation. Topics include architecture, geographic routing and query resolution in ad hoc networks, sensor networks, Internet of Things, and vehicular networks.

Prerequisites

Indicate all requirements that must be satisfied prior to enrollment in the course. Prerequisites will be automatically checked for each student attempting to register for the course. The prerequisite will be published in the Academic Catalog and must be formulated so that it can be enforced in the registration system. Please note that upper division courses (i.e., intermediate or advanced level of instruction) must have proper prerequisites to target the appropriate audience for the course.

Courses level 3000 and above must have a prerequisite.

Please verify that any prerequisite courses listed are active courses.

Response:

COP 3502c or COP 3503c or above

Completing Prerequisites on UCC forms:

- Use “&” and “or” to conjoin multiple requirements; do not use commas, semicolons, etc.
- Use parentheses to specify groupings in multiple requirements.
- Specifying a course prerequisite (without specifying a grade) assumes the required passing grade is D-. In order to specify a different grade, include the grade in parentheses immediately after the course number. For example, “MAC 2311(B)” indicates that students are required to obtain a grade of B in Calculus I. MAC2311 by itself would only require a grade of D-.
- Specify all majors or minors included (if all majors in a college are acceptable the college code is sufficient).
- “Permission of department” is always an option so it should not be included in any prerequisite or co-requisite.
- If the course prerequisite should list a specific major and/or minor, please provide the plan code for that major/minor (e.g., undergraduate Chemistry major = CHY_BS, undergraduate Disabilities in Society minor = DIS_UMN)

Example: A grade of C in HSC 3502, passing grades in HSC 3057 or HSC 4558, and undergraduate PBH student should be written as follows: HSC 3502(C) & (HSC 3057 or HSC 4558) & UGPBH

Co-requisites

Indicate all requirements that must be taken concurrently with the course. Co-requisites are not checked by the registration system. If there are none please enter N/A.

Response:

N/A

Rationale and Placement in Curriculum

Explain the rationale for offering the course and its place in the curriculum.

Response:

As emerging mobile networking technologies (portable/smart mobile devices, Internet of Things or IoT) proliferate, students need to learn 1. how to analyze and develop systems that use mobile networking technologies, 2. what types of problems are associated with mobility and its modeling, 3. evaluation techniques for simulation and testing of mobile services and applications.

This course introduces students to concepts of the design and evaluation of mobile networking systems and services, including IoT, sensor and vehicular networks. Students also learn modeling and simulation of mobility to understand its effects on system and network performance and be able to evaluate existing and future mobile services and applications. Finally, students apply the network architecture, and mobile service design concepts through developing solutions to address real-world problems, and improve users experience (e.g., campus safety, shared transportation).

Course Objectives

Describe the core knowledge and skills that student should derive from the course. The objectives should be both observable and measurable.

Response:

The purpose of the mobile networking course is to introduce students to emerging networking protocols and technologies in the field of mobile networks, where students learn fundamental and basic concepts of network architecture, design, analysis, and implementation of mobile services and applications. One main objective is for the students to acquire practical skills and hands-on experience of implementation of mobile networking technologies and systems. Students will design, analyze, implement and test new mobile services and applications to improve user experience, particularly in the areas of mobile networking for safety on campus, emergency

communication, public health and shared transportation.

Undergraduate students are expected to refine their system and analysis by routinely adding measurements and test cases and re-evaluating the system, through simulation or test bed implementation.

Course Textbook(s) and/or Other Assigned Reading

*Enter the title, author(s) and publication date of textbooks and/or readings that will be assigned. Please provide specific examples to evaluate the course and identify required textbooks. *

Response:

There are no required textbooks. Lecture notes will be provided by the instructor(s). The software packages that we will use in this class are open-source platforms that are free to use, including the network simulator (NS), ONE simulator, and SUMO simulator for vehicular mobility. Packages for statistical analysis include Android studio, Pandas, NumPy, and Scikit-learn, all of which are open and freely available.

Weekly Schedule of Topics

Provide a projected weekly schedule of topics. This should have sufficient detail to evaluate how the course would meet current curricular needs and the extent to which it overlaps with existing courses at UF.

Response:

Week 1: Introduction to Course, Mobile Networking, and Internet of Things (IoT)

Week 2: Evaluation of mobile networks and systems, and intro to mobility modeling

Week 3: Synthetic Mobility Modeling and Introduction to routing evaluation in ad hoc and sensor networks

Week 4: Encounter-based Protocols and Delay-tolerant Networks

Week 5: Network measurements and data-driven modeling of mobility and networked systems

Week 6: Analysis of mobile networked systems for pedestrians

Week 7: Analysis of mobile networked systems for vehicular networks and connected transportation

Week 8: Discuss class project proposals

Week 9: Simulation and modeling tools for mobility and networks

Week 10: Geographic routing, Geocast, and Geo-hash tables

Week 11: Topic presentations and project progress review

Week 12: Experimental network measurements, and data analysis

Week 13: Implementation, Development and Analysis tools

Week 14: Project presentations and final progress review

Week 15: Demo Day!

Grading Scheme

List the types of assessments, assignments and other activities that will be used to determine the course grade, and the percentage contribution from each. This list should have sufficient detail to evaluate the course rigor and grade integrity. Include details about the grading rubric and percentage breakdowns for determining grades. If participation and/or attendance are part of the students grade, please provide a rubric or details regarding how those items will be assessed.

Response:

= Class attendance and paper discussions (in class and online on canvas) – 10% of final grade

Students will critique and discuss study/research on mobile networked systems and mobility modeling

= Three Assignments – 30% of final grade (10% each)

- Assignment #1 – Mobile network measurements and distance/localization estimates using Bluetooth and WiFi signals. Students learn how to conduct measurements using mobile devices, and use the data to estimate distances between devices that can be helpful for exchanging messages, social distancing or contact tracing

- Assignment #2 – Analyzing datasets for mobile network measurements on campus, and

correlating it to campus crime data to inform safety campus services

- Assignment #3 – Simulate vehicular mobility using SUMO simulation tool. Students learn to run various scenarios from various cities and output delay and congestion data for transportation networks

= Topic presentation – 15% of the final grade. Students learn to review and present technical material about studies/research conducted in their project area, highlighting the strengths and weaknesses of every study covered

= Project presentation & demo – 20% of the final grade. Students learn to present their own ideas, and compare and contrast it to the prior work (presented in the topic presentation). They share their results and findings in a systematic way using visual aids and statistical visualizations

= Written project proposal and report – 25% of the final grade. Students learn to motivate, and present their ideas to solve the project problem, in written format, similar to technical writings in related conferences. The project proposal is reviewed half-way through the semester (8th week), and the final report is reviewed on the 15th week. Writing is evaluated for sound technical discussion, clarity of presentation, novelty of ideas, details of design and depth of analysis.

Instructor(s)

Enter the name of the planned instructor or instructors, or "to be determined" if instructors are not yet identified.

Response:

Ahmed Helmy

Attendance & Make-up

Please confirm that you have read and understand the University of Florida Attendance policy.

A required statement related to class attendance, make-up exams and other work will be included in the syllabus and adhered to in the course. Courses may not have any policies which conflict with the University of Florida policy. The following statement may be used directly in the syllabus.

• *Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:*

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Response:

Yes

Accommodations

Please confirm that you have read and understand the University of Florida Accommodations policy.

A statement related to accommodations for students with disabilities will be included in the syllabus and adhered to in the course. The following statement may be used directly in the syllabus:

• *Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.*

Response:

Yes

UF Grading Policies for assigning Grade Points

Please confirm that you have read and understand the University of Florida Grading policies.

Information on current UF grading policies for assigning grade points is require to be included in the course syllabus. The following link may be used directly in the syllabus:

- <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Response:
Yes

Course Evaluation Policy

Course Evaluation Policy

Please confirm that you have read and understand the University of Florida Course Evaluation Policy.

A statement related to course evaluations will be included in the syllabus. The following statement may be used directly in the syllabus:

• *Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/public-results/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.*

Response:
Yes

characterize encounters, clusters of users, and prediction of mobility, 2- distance estimation using bluetooth measurement data (collected by my group), 3- vehicular mobility simulation using SUMO, sometimes coupled with ONMET++ and VEINS for vehicular networks, and other times extensions of SUMO for platooning, and imagery-based city simulations using EnRoute (developed by my group).

Potential student projects will focus on campus safety, shared transportation/ride sharing, localization, health/fitness, sleep, geographic routing dissemination, disease spread modeling and social distancing apps, emergency preparedness and response.

Please let me know if you need further information about these course offerings, and whether you think there are any issues in putting a regular number to these (otherwise regular) special topics course 😊

And by the way, this should not affect in any way CISE credit for ECE courses. CISE students should still be able to take ECE courses on adhoc and sensor networks (or similar) and get credit for them as electives (just as they do now).

Thanks in advance for your time and opinion,

Best Regards and stay well!

-Ahmed

[PS, I am Cc'ing Robert Fox and Suzzanne Zorilo from the college curriculum committee. Thank you all!]

Subject: Re: Consult on Mobile Networking course
From: Janise McNair <mcnair@ece.ufl.edu>
Date: 5/4/2021, 12:41 AM
To: "Wu, Dapeng" <dpwu@ufl.edu>, "Helmy,Ahmed" <helmy@cise.ufl.edu>
CC: "Zorilo, Suzanne" <sazorilo@eng.ufl.edu>, "Fox,Robert M" <fox@ece.ufl.edu>

Hi Ahmed,

I looked at your description and syllabus. The ECE wireless courses do not conflict with the proposed course.

My graduate wireless course focuses on 4G/5G cellular infrastructure (not ad hoc).
My undergrad wireless course covers 4G/5G and WiFi evolution and some energy management for ad hoc.
Michael Fang's wireless ad hoc course focuses on communications, medium access control, error control, modulation, channel conditions and architecture.

None of our wireless classes address design of software systems.

Thanks!

Janise

Janise McNair

Associate Professor, Dept of Electrical & Computer Engineering
Office: (352)392-2629 | Mobile: (352) 575-9375
Email: mcnair@ece.ufl.edu | URL: wam.ece.ufl.edu

Herbert Wertheim College of Engineering
UF | UNIVERSITY of FLORIDA

From: Wu, Dapeng <dpwu@ufl.edu>
Sent: Monday, May 3, 2021 6:01 PM
To: Helmy,Ahmed <helmy@cise.ufl.edu>; Janise McNair <mcnair@ece.ufl.edu>
Cc: Zorilo, Suzanne <sazorilo@eng.ufl.edu>; Fox,Robert M <fox@ece.ufl.edu>
Subject: RE: Consult on Mobile Networking course

Dear Ahmed,

Your course looks very good to me. I have no problem at all.
Since Dr. Yuguang Fang also teaches a wireless network course, you may want to seek his opinion, too.

Best wishes,

Oliver

%%%%%%%%%%%%%%
Dr. Dapeng Oliver Wu
Professor, IEEE Fellow
Deputy Director, NSF Center for Big Learning

University of Florida
Dept. of Electrical & Computer Engineering
P. O. Box 116130
Gainesville, FL 32611
USA

Phone: (352) 392-4954
Fax: (352) 392-0044
Email: dpwu@ufl.edu
URL: <http://www.wu.ece.ufl.edu>
%%%%%%%%%

-----Original Message-----

From: Helmy,Ahmed
Sent: Monday, May 3, 2021 5:36 PM
To: Wu, Dapeng <dpwu@ufl.edu>; Janice McNair <mcnair@ece.ufl.edu>
Cc: Zorilo, Suzzanne <sazorilo@eng.ufl.edu>; Fox,Robert M <fox@ece.ufl.edu>
Subject: Consult on Mobile Networking course

Dear Oliver, Janice,

I hope you are doing well, and I hope to see you soon after we return back to normal.

I am sending you this email to consult you on a new course (co-listed as ugrad/grad) I'm proposing. It's new in the sense that I'm asking for a regular number for them, but I've taught various versions of this course for 20 years now at USC and UF :-).

I know you have offered (and are offering) classes that address issues of ad hoc and sensor networks, but I believe that this co-listed course is complementary/orthogonal to the seemingly similar ECE courses, even with some minor (yet healthy) overlap.

I am attaching the syllabi for the course (they're very similar, with one for ugrad and the other for grad). Let me try to summarize the main focus. The current submitted version for regular number focuses on software system development (through mobile (e.g., Android) apps, and mobile web design). There are no hardware aspects and no communications aspects per se (at the physical layer). Also, they focus on simulations, and measurements/data analysis to inform protocol and software system design aspects. There is as much focus on 'mobility' itself, its analysis, metrics, modeling, simulation, as there is on the networking aspects, and their interactions.

The experiments include: 1- analysis of WLAN campus data (from my MobiLib traces) to characterize encounters, clusters of users, and prediction of mobility, 2- distance estimation using bluetooth measurement data (collected by my group), 3- vehicular mobility simulation using SUMO, sometimes coupled with ONMET++ and VEINS for vehicular networks, and other times extensions of SUMO for platooning, and imagery-based city simulations using EnRoute (developed by my group).

Potential student projects will focus on campus safety, shared transportation/ride sharing, localization, health/fitness, sleep, geographic routing dissemination, disease spread modeling and social distancing apps, emergency preparedness and response.

Please let me know if you need further information about these course offerings, and whether you think there are any issues in putting a regular number to these (otherwise regular) special topics course :-)

And by the way, this should not affect in any way CISE credit for ECE courses. CISE students should still be able to take ECE courses on adhoc and sensor networks (or similar) and get credit for them as electives (just as they do now).

Thanks in advance for your time and opinion,

Best Regards and stay well!

-Ahmed

[PS, I am Cc'ing Robert Fox and Suzzanne Zorilo from the college curriculum committee. Thank you all!]

Subject: Re: Consult on Mobile Networking course
From: "Fang,Yuguang" <fang@ece.ufl.edu>
Date: 5/3/2021, 8:37 PM
To: "Helmy,Ahmed" <helmy@cise.ufl.edu>
CC: "Zorilo, Suzanne" < sazorilo@eng.ufl.edu>, "Gardner-McCune,Christina" <gmccune@ufl.edu>, "Fox,Robert M" <fox@ece.ufl.edu>, "Fang,Yuguang" <fang@ece.ufl.edu>

Dear Ahmed,

I quite agree with your argument here and this course would complement well the networking courses from ECE. I fully support your proposal. If there is anything I could help speed up the process, please do not hesitate to let me know.

By the way, your email for Rob (Fox) is not correct and you may want to forward the material to him.

All the best,

Mike

Yuguang "Michael" Fang, PhD, FAAAS and FIEEE
Distinguished Professor
Department of Electrical and Computer Engineering
University of Florida
435 New Engineering Building, 1064 Center Drive
Gainesville, FL 32611-6130
Tel: (352) 846-3043, Fax: (352) 392-0044
Email: fang@ece.ufl.edu, [Http://www.fang.ece.ufl.edu](http://www.fang.ece.ufl.edu)
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Important Privacy Notice: According to its stated policy, the University of Florida "monitors computer and networking activities without user authorization, and the university may provide information about computer or network usage to university officials, including law enforcement when warranted. Therefore the user should have limited expectations of privacy."

From: Helmy,Ahmed <helmy@cise.ufl.edu>
Sent: Monday, May 3, 2021 6:12 PM
To: Fang,Yuguang
Cc: Fox,Joshua E; Zorilo, Suzanne; Gardner-McCune,Christina
Subject: Consult on Mobile Networking course

Dear Mike,

I hope you are doing well, and I hope to see you soon after we return back to normal.

I am sending you this email to consult you on a new course (co-listed as ugrad/grad) I'm proposing. It's new in the sense that I'm asking for a regular number for them, but I've taught various versions of this course for 20 years now at USC and UF 😊 .

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The experiments include: 1- analysis of WLAN campus data (from my Mobilib traces) to characterize encounters, clusters of users, and prediction of mobility, 2- distance estimation using bluetooth measurement data (collected by my group), 3- vehicular mobility simulation using SUMO, sometimes coupled with ONMET++ and VEINS for vehicular networks, and other times extensions of SUMO for platooning, and imagery-based city simulations using EnRoute (developed by my group).

Potential student projects will focus on campus safety, shared transportation/ride sharing, localization, health/fitness, sleep, geographic routing dissemination, disease spread modeling and social distancing apps, emergency preparedness and response.

Please let me know if you need further information about these course offerings, and whether you think there are any issues in putting a regular number to these (otherwise regular) special topics course 😊

And by the way, this should not affect in any way CISE credit for ECE courses. CISE students should still be able to take ECE courses on adhoc and sensor networks (or similar) and get credit for them as electives (just as they do now).

Thanks in advance for your time and opinion,

Best Regards and stay well!
-Ahmed

[PS, I am Cc'ing Robert Fox, Chrsitina-Mccune and Suzzanne Zorilo from the college curriculum committee. Thank you all!]

Introduction to Mobile Networking

CNT4530

Class Periods: T 10:40-11:30 (Period 4), R 10:40-12:35 (Periods 4-5)

Location: CSE E119

Academic Term: Fall 2021

Instructor:

Name: Ahmed Helmy

Email Address: helmy@ufl.edu

Office Phone Number: (352) 294-6652

Office Hours: Days of week: TBA, hours available: TBA, office location: CSE426

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Name, email address, office location, office hours: TBA

Course Description

(3 credits) Fundamental concepts of emerging mobile networks architecture, systematic analysis of effects of mobility on network performance, synthetic and data-driven mobility modeling and simulation, behavior analysis in mobile networks, mobile service and application structure, development, implementation, and evaluation. Topics include architecture, geographic routing and query resolution in ad hoc networks, sensor networks, Internet of Things, and vehicular networks.

Course Pre-Requisites

COP 3502c or COP 3503c or above

Course Objectives

The purpose of the mobile networking course is to introduce students to emerging networking protocols and technologies in the field of mobile networks, where students learn fundamental and basic concepts of network architecture, design, analysis, and implementation of mobile services and applications. One main objective is for the students to acquire practical skills and hands-on experience of implementation of mobile networking technologies and systems. Students will design, analyze, implement and test new mobile services and applications to improve user experience, particularly in the areas of mobile networking for safety on campus, emergency communication, public health and shared transportation.

Undergraduate students are expected to refine their system and analysis by routinely adding measurements and test cases and re-evaluating the system, through simulation or test bed implementation.

Materials and Supply Fees

N/A

Required Textbooks and Software

There are no required textbooks. Lecture notes will be provided by the instructor(s). The software packages that we will use in this class are open-source platforms that are free to use, including the network simulator (NS), ONE simulator, and SUMO simulator for vehicular mobility. Packages for statistical analysis include Android studio, Pandas, NumPy, and Scikit-learn, all of which are open and freely available.

Recommended Materials

none

Course Schedule

(lecturer is Ahmed Helmy in all sessions)

Week 1: Introduction to Course, Mobile Networking, and Internet of Things (IoT)

Week 2: Evaluation of mobile networks and systems, and introduction to mobility modeling

Week 3: Synthetic mobility modeling and Introduction to routing evaluation in ad hoc and sensor networks [paper discussion 1 due]

Week 4: Encounter-based Protocols and Delay-tolerant Networks [assignment 1 due]

Week 5: Network measurements and data-driven modeling of mobility and networked systems [paper discussion 2 due]

Week 6: Analysis of mobile networked systems for pedestrians

Week 7: Analysis of mobile networked systems for vehicular networks and connected transportation [assignment 2 due]

Week 8: Discuss class project proposals [written project proposals due]

Week 9: Simulation and modeling tools for mobility and networks [paper discussion 3 due]

Week 10: Geographic routing, Geocast, and Geo-hash tables

Week 11: Topic presentations and project progress review

Week 12: Experimental network measurements, and data analysis [assignment 3 due]

Week 13: Implementation, Development and Analysis tools [paper discussion 4 due]

Week 14: Project presentations and final progress review

Week 15: Demo Day! [written project reports due]

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Evaluation of Grades

| Assignment | Total Points | Percentage of Final Grade |
|--------------------------------|---------------------|----------------------------------|
| Paper Discussions & Attendance | 100 | 10% |
| Assignments (3) | 100 each | 30% |
| Topic Presentation | 100 | 15% |
| Project Presentation | 100 | 20% |
| Project Report | 100 | 25% |
| | | 100% |

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Cross listing: Graduate students have 33% more assigned discussions and readings (8 for graduate students vs 6 for undergraduates). Graduate students are required to submit 20% additional parts in the assignments, that are more challenging (requiring deeper analysis of the networking protocols and data) than the undergraduate level. Graduate students have greater project requirements including larger test cases, simulations, and data requirements, and requirement of higher component of novelty in their projects than undergraduate projects (35% for graduate students versus 10% for the undergraduates).

Grading Policy

| Percent | Grade | Grade Points |
|----------------|--------------|---------------------|
| 90 - 100.0 | A | 4.00 |
| 87.0 - 89.9 | A- | 3.67 |
| 85.0 - 86.9 | B+ | 3.33 |
| 80.0 – 84.9 | B | 3.00 |
| 78.0 - 79.9 | B- | 2.67 |
| 76.0 - 77.9 | C+ | 2.33 |
| 70.0 – 75.9 | C | 2.00 |
| 68.0 - 69.9 | C- | 1.67 |
| 66.0 - 67.9 | D+ | 1.33 |

Course Title, Prefix, and Number
Course Instructor and Academic Term

Page 3

| | | |
|-------------|----|------|
| 60.0 - 65.9 | D | 1.00 |
| 58.0 - 59.9 | D- | 0.67 |
| 0 - 57.9 | E | 0.00 |

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Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

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There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

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U Matter, We Care:

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Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.

Mobile Networking

CNT6530

Class Periods: T 10:40-11:30 (Period 4), R 10:40-12:35 (Periods 4-5)

Location: CSE E119

Academic Term: Fall 2021

Instructor:

Name: Ahmed Helmy

Email Address: helmy@ufl.edu

Office Phone Number: (352) 294-6652

Office Hours: Days of week: TBA, hours available: TBA, office location: CSE426

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Name, email address, office location, office hours: TBA

Course Description

(3 credits) Concepts of emerging mobile networks architecture, systematic analysis of effects of mobility on network performance, synthetic and data-driven mobility modeling and simulation, behavior analysis in mobile networks, mobile service and application structure, development, implementation, and evaluation. Topics include architecture, geographic routing and query resolution in ad hoc networks, sensor networks, Internet of Things, and vehicular networks.

Course Pre-Requisites

COP 3502c or COP 3503c or above

Course Objectives

The purpose of the mobile networking course is to expose students to emerging networking protocols and technologies in the field of mobile networks, where students learn concepts of network architecture, design analysis, and implementation of mobile services and applications. One main objective is for the students to acquire practical skills and hands-on experience of implementation of mobile networking technologies and systems. Students will design, analyze, implement, and test new mobile services and applications to improve user experience, particularly in the areas of mobile networking for safety on campus, emergency communication, public health, and shared transportation.

Graduate students are expected to refine their system and analysis by routinely adding measurements and test cases and re-evaluating the system, through simulation or test bed implementation.

Materials and Supply Fees

N/A

Required Textbooks and Software

There are no required textbooks. Lecture notes will be provided by the instructor(s). The software packages that we will use in this class are open-source platforms that are free to use, including the network simulator (NS), ONE simulator, and SUMO simulator for vehicular mobility. Packages for statistical analysis include Android studio, Pandas, NumPy, and Scikit-learn, all of which are open and freely available.

Recommended Materials

none

Course Schedule

(lecturer is Ahmed Helmy in all sessions)

Week 1: Introduction to Course, Mobile Networking, and Internet of Things (IoT)

Week 2: Evaluation of mobile networks and systems, and introduction to mobility modeling

Week 3: Synthetic mobility modeling and Introduction to routing evaluation in ad hoc and sensor networks [paper discussion 1 due]

Week 4: Encounter-based Protocols and Delay-tolerant Networks [assignment 1 due]

Week 5: Network measurements and data-driven modeling of mobility and networked systems [paper discussion 2 due]

Week 6: Analysis of mobile networked systems for pedestrians

Week 7: Analysis of mobile networked systems for vehicular networks and connected transportation [assignment 2 due]

Week 8: Discuss class project proposals [written project proposals due]

Week 9: Simulation and modeling tools for mobility and networks [paper discussion 3 due]

Week 10: Geographic routing, Geocast, and Geo-hash tables

Week 11: Topic presentations and project progress review

Week 12: Experimental network measurements, and data analysis [assignment 3 due]

Week 13: Implementation, Development and Analysis tools [paper discussion 4 due]

Week 14: Project presentations and final progress review

Week 15: Demo Day! [written project reports due]

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| 81.5 – 87.4 | B | 3.00 |
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| 71.5 – 77.4 | C | 2.00 |
| 69.5 - 71.4 | C- | 1.67 |
| 67.5 - 69.4 | D+ | 1.33 |

| | | |
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