

ENTERED
11/16/16
SDS

CM-2880

COVER SHEET - NEW and REVISED COURSES

Commission on Undergraduate Studies and Policies/ Commission on Graduate Studies and Policies/ University Curriculum Committee For Liberal Education
Effective September 2010

•SEE I - VIII for Basic Course Proposal Guidelines•
•SEE APPENDIX FOR NOTES, EXPLANATIONS AND ADDITIONAL GUIDELINES•
•PRINT CLEARLY, TYPE or COMPLETE ELECTRONICALLY•

APPROVED
GCC 10/27/16
CGSP 11/2/16

PROPOSAL DATE: March 7, 2016

15-DAY REVIEW END DATE:

DEPARTMENT: Department of Computer Science

COURSE DESIGNATOR AND NUMBER: CS 5834

3 Credit Hours

TITLE OF COURSE: Introduction to Urban Computing

TRANSCRIPT (ADP) TITLE (MAX-30 Characters): Intro to Urban Computing

INSTRUCTOR and/or DEPARTMENTAL CONTACT: Naren Ramakrishnan

CONTACT MAILCODE: 0379

CONTACT PHONE: 571-858-3331

CONTACT E-MAIL: naren@cs.vt.edu

Please count this course toward the following scorecard metrics area:

Study Abroad Service Learning Experiential Undergraduate Research

CHECK ONLY ONE OF THE FOLLOWING BOXES

NEW COURSE REVISED COURSE [Revision > 20% _____ Revision < 20% _____]

NEW COURSE & INCLUSION IN THE CLE [Area _____] OTHER: _____
Include Attachment, if Needed

REVISED COURSE FOR INCLUSION IN THE CLE OR CLE AREA CHANGE

•Courses routed directly to the University Curriculum Committee For Liberal Education MUST be endorsed by the appropriate Department Head or Dean.
•The Chair of the University Curriculum Committee For Liberal Education shall inform the appropriate college curriculum committee of all courses under review by the University Curriculum Committee For Liberal Education.

- A **Attach Statement from Dean or Departmental Representative as to whether Teaching this Course will Require or Generate the Need for Additional Departmental Resources.**
- B **Attach Appropriate Letters of Support from Affected Departments and/or Colleges.**

•C **Effective Semester:** Spring 2017

•D **Change in Title From:** _____

To: _____

•E **Change in Lecture and/or Lab Hours** From: _____ To: _____

•F **Change in Credit Hours** From: _____ To: _____

•G **Percentage of Revision from Current Syllabus:** _____ **Revision Summary:** _____

•H **Course Number(s) and Title(s) to be Deleted from the Catalogue with APPROVAL of course:** _____

APPROVAL SIGNATURES

Department Representative _____
College Curriculum Committee Representative _____

Naren Ramakrishnan

Date: 10/12/16

Date: _____

College Dean

Date:

COVER SHEET - NEW and REVISED COURSES

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•C **Effective Semester:** Fall, 2016

•D **Change in Title From:**

To:

•E **Change in Lecture and/or Lab Hours** **From:** _____ **To:** _____

•F **Change in Credit Hours** **From:** _____ **To:** _____

•G **Percentage of Revision from Current Syllabus:** _____ **Revision Summary:** _____

•H **Course Number(s) and Title(s) to be Deleted from the Catalogue with APPROVAL of course:**

APPROVAL SIGNATURES

Department Representative

Date:

College Curriculum Committee
Representative

Barbara Crawford

Date: 3/15/16

College Dean

Date: 3/25/16

Introduction to Urban Computing

CS 5834

I. Catalog Description

Computational approaches to address urban challenges; sensor network testbeds; algorithms for storing, processing, and mining data from urban settings; communicating patterns to decision makers; special focus on epidemiology, sustainability, transportation, social science, urban economics; case studies with applications. Pre: Graduate Standing (3H, 3C).

Course Number: 5834

ADP TITLE: Intro Urban Computing

II. Learning Objectives

Having successfully completed this course, students will be able to:

- Define computational approaches to urban problems using the methods of data science.
- Implement algorithms to analyze data from urban sensor networks.
- Develop network science models to pose and study optimization problems in epidemiology, sustainability, transportation.
- Develop statistical data mining approaches to pose and study design problems in social science and urban economics.
- Communicate patterns inferred from data analysis to urban practitioners.

III. Justification

Urban computing is defined as the process of acquisition, integration, and analysis of large heterogeneous data generated by a diversity of sources in urban settings, such as sensors, devices, vehicles, buildings, and humans, to tackle the major issues that cities face, e.g. air pollution, increased energy consumption, rapid disease spread among dense populations, and traffic congestion. CS 5834 will introduce students to this cutting edge area and the entire lifecycle of formulating urban computing problems, gathering data from urban settings, analyzing data using the methods of network science and data mining, visualizing the results, and most importantly communicating inferences to the end-users, i.e., urban practitioners.

Graduate credit is required for this course. Students will apply advanced, extensive, and in-depth knowledge that builds on undergraduate learning with analysis of urban data for graduate research. Students will develop the ability to analyze and investigate urban computing problems independently using the methods of data science, and to deepen their scholarly development in analyzing city-scale datasets and in communicating results.

IV. Prerequisites and Corequisites

Graduate Standing.

V. Texts and Special Teaching Aids

Required:

Zheng, Yu, Capra, Licia, Wolfson, Ouri and Yang, Hai, Urban Computing: Concepts, Methodologies, and Applications, ACM Transactions on Intelligent Systems and Technology, Vol. 5, No. 3, Sep 2014.

Reference papers from the ACM SIGKDD Workshops on Urban Computing.

Recommended Textbooks:

Batty, Michael, THE NEW SCIENCE OF CITIES. MIT Press, 2013, 520.

Batty, Michael. CITIES AND COMPLEXITY: UNDERSTANDING CITIES WITH CELLULAR AUTOMATA, AGENT-BASED MODELS, AND FRACTALS. MIT Press, 2007, 592.

VI. Syllabus

	Percent of Course
1. Introduction to Urban Computing	10
a. Urban sensor networks	
b. Urban data characteristics	
c. Design and optimization problems in urban settings	
2. Network science topics	10
a. Node, edge, and path properties	
b. Degree distributions	
c. Connectivity and centrality	
d. Random graph models	
e. Community detection	
f. Dynamical processes on networks	
3. Data mining topics	10
a. Graph mining techniques	
b. Spatial and spatio-temporal data mining algorithms	
c. Communicating patterns to decision makers	
4. How urbanization affects disease spread	20
a. Compartmental models	
b. Cascades	
c. Complex contagion models	
d. Surveillance and forecasting	
5. How urbanization affects energy usage	20
a. Energy analytics	
b. Energy disaggregation	
c. Demand response modeling	
6. Urban congestion and pollution	20
a. Modeling human mobility	
b. Modeling air and climate patterns	
7. Other topics	10
a. Societal sentiment analysis	
b. Crime	
c. Urban economic analysis for planning	
d. Ethical issues	
TOTAL	100



VirginiaTech

College of Engineering

Department of Computer Science
Knowledgeworks II, 2202 Kraft Drive
Blacksburg, Virginia 24060
540/231-9195 Fax: 540/231-4240
www.cs.wvu.edu

February 25, 2016

Dear Graduate Curriculum Committee,

The Department of Computer Science is in support of the establishment of a new course, CS 5834: Introduction to Urban Computing, which will be offered by faculty within the Department of Computer Science. This new course will serve as a core course for the proposed graduate certificate in Urban Computing. Students can enroll in this new course that is offered by our department, and no new resources are needed to support the course.

Sincerely,

Calvin J. Ribbens
Professor and Department Head
Department of Computer Science

Invent the Future

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