

EL 7048
Green Information and
Communication Technologies

For Fall Term 2017
March – July 2017

Table of Contents

1	TIME	3
2	INSTRUCTOR.....	3
3	CLASS SCHEDULE	3
4	INTRODUCTION.....	3
5	ELIGIBILITY FOR THE COURSE.....	3
5.1	GRADUATE STUDENTS	3
5.2	UNDERGRADUATE STUDENTS	3
5.2.1	<i>DIE</i>	4
5.2.2	<i>Other departments</i>	4
6	SUMMARY OF CONTENTS	4
6.1	UNIT 1 - INTRODUCTION AND CONCEPTS OF GREEN ICT (2 WEEKS)	4
6.2	UNIT 2 - GREEN ICT ISSUES, TECHNOLOGIES, AND APPROACHES (5 WEEKS)	4
6.3	UNIT 3 - ENVIRONMENTAL ASSESSMENT AND SUSTAINABILITY (3 WEEKS)	5
7	TEACHING METHODOLOGIES	5
8	OVERALL ASSESSMENTS OF THE COURSE TO STUDENTS.....	5
9	REFERENCES	5
9.1	GENERAL	6
9.2	OTHER BIBLIOGRAPHY	6

1 Time

Fall Term 2017
March -July 2017

2 Instructor

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3 Class Schedule

Every Wednesday 14:30 – 17:45 (tentative, could be discussed)

4 Introduction

The concept of green Information and Communications Technologies (ICT) relevant to environmental sustainability and ICT could be explained in numerous ways. Although this field with the term of ICT in the title, many general topics relevant to sustainability which are not even related to ICT could be addressed. Green ICT is an interdisciplinary field relevant to a number of fields and topics, such as information systems, computer science and technologies, communications and networking, power and energy systems, environmental and civil engineering, industrial engineering, economics and finance, business and administration, social sciences, and so on. Basically, two directions may be addressed: greening ICT and ICT for green objectives. The concepts, principles, mechanisms, designs, algorithms, analyses, and relevant research challenges could be addressed in this course. The students taking this course may understand and use relevant topics, categories, issues, technologies and solutions on the environmental sustainability relevant to information and communication technologies (ICT) systems, aAnalyze and evaluate the sustainability and green issues in ICT as well as approaches relevant to ICT systems, develop and compare some new green principles, strategies and approaches, and evaluate the roles of relevant advanced green ICT technologies and approaches.

5 Eligibility for the course

5.1 Graduate students

This course opens to graduate students

5.2 Undergraduate students

This course opens to undergraduate students

5.2.1 DIE

EE (Electrical Engineering) students who have taken EL4005 Principles of Communications may take this course.

EE Students who have taken EL4001 Energy Conversion and Power Systems, EL4002 Digital Systems, EL4102 Computer Architecture, EL4103 Energy Systems and Electrical Equipment or EL4107 Information and Communication Technologies may also take this course. Please consult the instructor for authorizations.

5.2.2 Other departments

This course welcomes (graduate and undergraduate) students from computer science, industrial engineering, civil engineering, mathematics, physics, and so on.

Students from other Departments are also allowed to take the course if with relevant backgrounds, such as: Computer Science (CC4301 Computer Architecture, CC4303 Networks), Industrial Engineering (IN4402 Probability and Statistics Applications Management, IN4703 Operation Management I, IN4704 Operation Management II) Environmental Civil engineering (CL4102 Environmental Engineering, CI5106 Water Treatment Processes).

6 Summary of contents

6.1 UNIT 1 - Introduction and Concepts of Green ICT (2 weeks)

Green ICT definitions and Global ICT footprint

Major categories of green ICT and relevant techniques

Relevant social science aspects and frameworks

Case study

6.2 UNIT 2 - Green ICT issues, technologies, and approaches (5 weeks)

- Key sustainability issues across the organization in business processes
- Key green issues, approaches, and applications of ICT systems, such as green data centers, green computing systems, smart buildings, smart energy management, sustainable cities
- Key green issues and approaches across communications and networking, such as green physical layer techniques, green wireless networks, green wireline networks, energy harvesting, green smart grid communications
- Case studies, such as advanced cooling technologies, optimizing physical placement of the resources, integration techniques, power management, virtualization techniques

6.3 UNIT 3 - Environmental assessment and sustainability (3 weeks)

- Introduction of the Life cycle assessment (LCA) concept, and the life cycle stages.
- LCA model
- Principles of life cycle design and variants of life cycle assessment.
- Recyclability strategy and methodologies
- Sustainable methods of end of life management
- Waste management approaches
- Applications, economics, social issues, and interdisciplinary topics

7 Teaching methodologies

The course will use the following teaching methods:

- Lectures
- Invited talks by expert speakers in relevant topics
- Activities in the classroom
- Assignments, in which the students present papers and articles in the relevant areas of green research.
- Projects
- Discussion of papers.

In terms of organization, the course has three thematic units that will be covered in the first 10 weeks of the course. The last 4 weeks will be exclusively devoted to work on a research topic integrating and consolidating what has been learned in the previous 3 units of the course. The projects should have been prepared since the third week of the course.

8 Overall assessments of the course to students

The students will be evaluated based on the following criteria:

- Exercises
- Assignments of research papers and articles in which they will present their interpretation
- Research Project

9 References

9.1 General

- [1] IEEE Digital Library, available at <http://ieeexplore.ieee.org/Xplore/home.jsp>
- [2] ACM Digital Library, available at <http://dl.acm.org/>

9.2 Other Bibliography

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