Steps toward implementing a CDIO approach at Telecom BCN

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Contents

• Introduction to UPC Telecom BCN
• Steps toward implementing a CDIO approach at Telecom BCN
• Specific Telecom BCN foreseen contributions to CDIO initiative
Telecom BCN

- Technical University of Catalonia (UPC)
- Telecom BCN, UPC EE school
  
  # Students………………………2000  
  # Incoming students/year……..400 (decreasing) 
  # Graduated students/year…..250  
  # Faculty…………………………..286  
  # Admin. staff……………………30  
  # Labs  ……………………………36  

- 5 year degree (Telecom engineer) with three specialties
  - Communication systems  
  - Networks  
  - Electronic Systems  

- 4 Master
  - Communication systems (MINT, MERIT)  
  - Networks  
  - Electronic Engineering

Telecom BCN

- New degrees in the Bologna context:
  
  - 4 year bachelor degrees (professional proficiency)  
    - Communication systems  
    - Networks  
    - Electronic Systems  
    - Audiovisual Systems  
  - Generic degree (more basic science and core fundamentals). Coupled with a specific master.  
  - Masters (comm systems, electronics, networks, photonics…)
Telecom BCN

Current focus

- Engineering science, research oriented
- Research groups very active in research projects and technology transfer
- “good quality” outcome, oversized for the local industry
- Cost: High drop-out, partially unadapted engineers
- Teaching approach:
  - Formulation, modeling ++++
  - Analysis +++
  - Design +
  - Implementation –
  - Operation – – –

Steps toward CDIO

Frame:

- EHEA. Bologna process
- Government and University rules
  - New bachelor curricula
  - Pushed to move toward outcome oriented learning
- New curricula design time schedule
  - Scheme approved November 2008
  - Subjects detail approved June 2009
Steps toward CDIO

Restrictions:
• Skills and abilities (competences) learning and assessment
  • 7 generic skills are mandatory (UPC)
    • Innovation and entrepreneurship
    • Societal and environmental context
    • Communication in English
    • Oral and written communication
    • Teamwork
    • Survey of information resources
    • Autonomous learning
  • Each center can choose 2-3 additional generic skills
  • Each center should define the skills learning outcomes, map, path and coordination procedure.
• EE Professional Association also has a skills list

Singapore, 7-10 June 2009

Steps toward CDIO

TELECOM BCN new curricula:
• Need to become student centered
• Need to include skills and abilities learning
• Need to include more active learning methods
• Need to motivate both students and faculty members
• Alternatives:
  • Adopting a minimum entropy approach (NO)
  • Just adopting new methodologies
  • Taking the change process as an opportunity to renew and improve the learning outcomes of our students
    • CDIO as a context

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Steps toward CDIO

Steps:
- International engineering education models comparison
- CDIO identification. Involvement of managing team
- New Curricula Advisory Committee
- Internal CDIO survey
- CDIO Syllabus – standards comparison
- Telecom BCN Competences (skills) list and definition (3 levels)
- Design of “CDIO compatible” Curricula
- Informative campaign
- Approval by committees, assembly, university and Ministry
- 2 of the new degrees will start at september 2009
Steps toward CDIO

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Singapore, 7-10 June 2009

It looks like we cannot continue doing the things the same way
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Singapore, 7-10 June 2009
Steps toward CDIO

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Steps toward CDIO

ETSETB. CDIO Skills and Attributes survey

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<td>3. To be able to understand and explain</td>
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<td>4. To be skilled in the practice or implementation of</td>
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<td>5. To be able to lead or innovate in</td>
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1 TECHNICAL KNOWLEDGE AND REASONING
1.1 KNOWLEDGE OF UNDERLYING SCIENCES
1.2 CORE ENGINEERING FUNDAMENTAL KNOWLEDGE
1.3 ADVANCED ENGINEERING FUNDAMENTAL KNOWLEDGE

2 PERSONAL AND PROFESSIONAL SKILLS AND ATTRIBUTES
2.1 ENGINEERING REASONING AND PROBLEM SOLVING
2.1.1 Problem identification and formulation
2.1.2 Modeling
2.1.3 Estimation and quantitative Analysis
Steps toward CDIO

ETSETB CDIO Survey

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Steps toward CDIO

Faculty

1. Technical knowledge and reasoning
2. Personal and professional skills and attributes
3. Interpersonal skills: teamwork and communication
4. Conceiving, designing, implementing and operating systems

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### Steps toward CDIO

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### CDIO vs Euro INI

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**UPC EE professional assoc.**

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Steps toward CDIO

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![Diagram of CDIO Syllabus](image)

**Figure 3.6. Professional Engineering Career Tracks Implicitly Identified in the CDIO Syllabus**
Steps toward CDIO

Steps:

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- CDIO identification. Involvement of managing team
- New Curricula Advisory Committee
- Internal CDIO survey
- CDIO Syllabus – standards comparison
- **Telecom BCN Competences (skills) list and definition (3 levels)**
- Design of “CDIO compatible” Curricula
- Informative campaign
- Approval by committees, assembly, university and Ministry
- 2 of the new degrees will start at September 2009
Steps toward CDIO

- Generic UPC skills
  1. Innovation and entrepreneurship
  2. Societal and environmental context
  3. Communication in a foreign language (English)
  4. Oral and written communication
  5. Teamwork
  6. Survey of information resources
  7. Autonomous learning

- Additional skills
  8. Ability to identify, formulate and solve engineering problems
  9. Ability to Conceive, Design, Implement and Operate complex systems in the ICT context
  10. Experimental behavior and ability to manage instruments

Steps:
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- Informative campaign
- 1st steps in workspaces redesign
- Approval by committees, assembly, university and Ministry
- 2 of the new degrees will start at September 2009

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Foreseen Contributions

- Preliminary Telecom BCN contribution proposals
  - Geographic (Spain, south of Europe) and thematic (EE) specificity
  - Influence in South American universities
  - Dealing with diversity. Different approach in the different bachelor grades, minors and even projects as a way to attend the student diverse interests and abilities
  - Low level design
  - Design Oriented Analysis

Conclusions

- Limited time for the design of new curricula
- Design of a “CDIO compatible” structure
  - Integrated curricula
    - introduction to engineering course
    - project courses
    - interwoven skills
- Need to step back and repeat several steps
  - external survey
  - staff training and involvement
Continental Europe CDIO meeting

Workshop on CDIO Initiative
23rd and 24th of June 2009
Campus Nord UPC, Barcelona, Spain