Undergraduate Education Of Mechanical and Manufacturing Engineering In China

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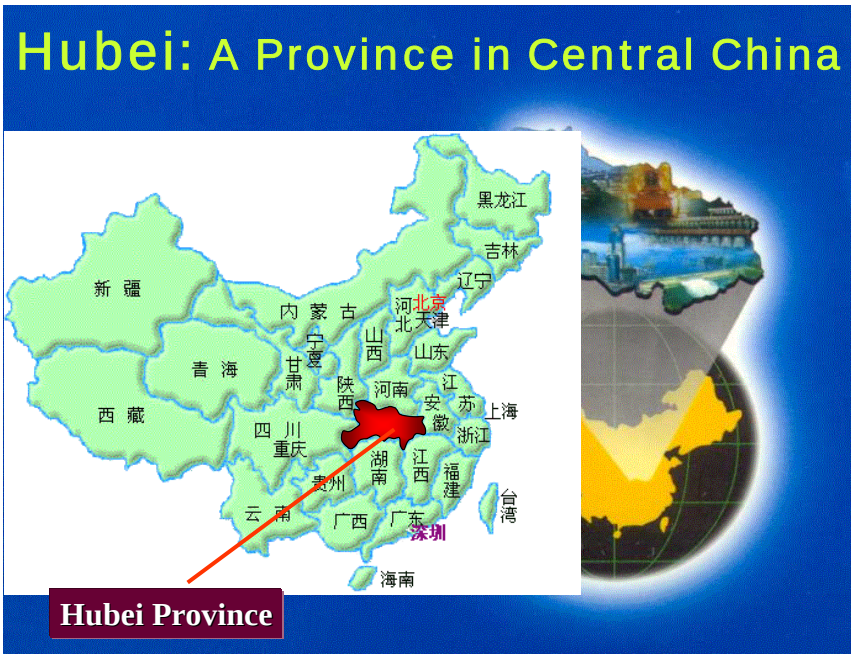
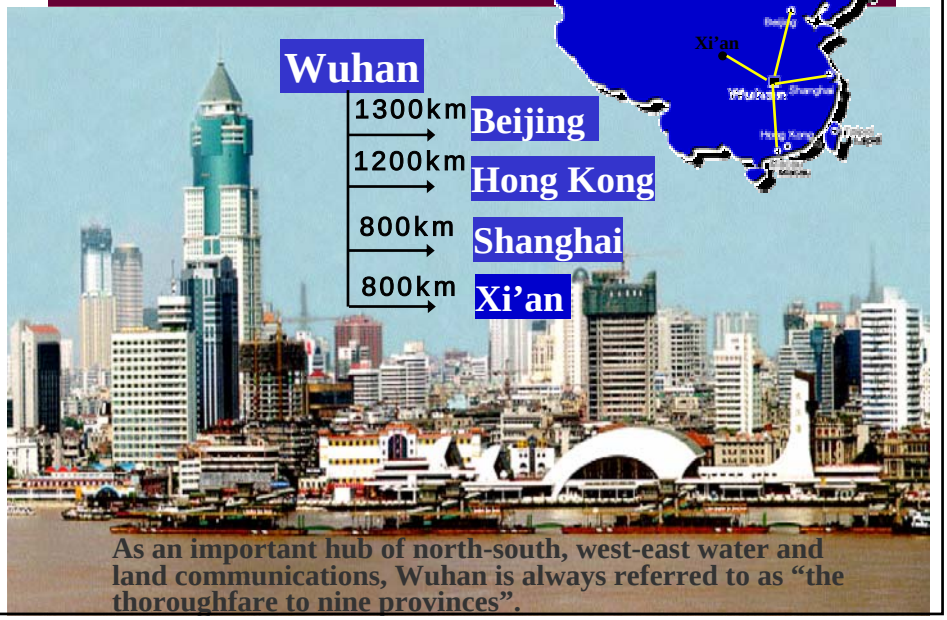


Wuhan City

Wuhan: "the city on rivers"(Yangtze River & Han River), Capital of Hubei Province, one of the largest cities in China

Wuhan: Transportation Junction



As an important hub of north-south, west-east water and land communications, Wuhan is always referred to as "the thoroughfare to nine provinces".

華中科技大學

Huazhong University of Science and Technology (HUST)

-One of the largest universities in China

Introduction of HUST

- **36 academic schools and departments**
- **74 undergraduate programs**
- **200 master's programs**
- **139 doctoral programs & 17 post-doctoral centers**
- **More than 10,000 faculty & staff members**
- **15 academicians of CAS & CAE**
- **Over 45,000 undergraduate students and 15,000 graduate students**
- **1300 acres of campus area**

Campus Overview

Campus Scenery

Spring
Summer

Autumn
Winter

Introduction of SMSE

After 5 decades of development, the School of Mechanical Science and Engineering (SMSE) has become the largest school in the university.

Introduction of SMSE

Department

Mechanical Science & Electronic Information Engineering
Engineering Equipment & Automation
Instruments Science & Technology
Mechanical Design & Automobile Engineering
Industrial & Manufacturing Systems Engineering
Industry Design

Center

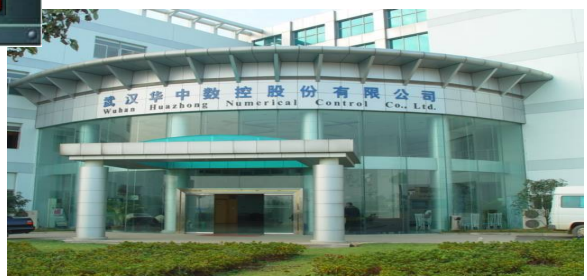
National Education Base of Fundamental Mechanical Courses
State Key Laboratory of Digital Manufacturing
National CAD Support Software Research Center
National NC Engineering Research Center

National Education Base of Fundamental Mechanical Courses

State Key Lab of Digital Manufacturing

National Engineering Research Center for CAD

National Engineering Research Center for NC



Outline

- Overview of China's undergraduate education in mechanical and manufacturing engineering (UEMME)
- Key issues facing UEMME
- Alternative solutions
- Summary

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Overview of China UEMME

China Manufacturing Trends:
- Rapid modernization progress
- Shift of the World's manufacturing center to China

Growing Demand For:
- Well trained engineers with strong learning ability
- Good industry knowledge
- Good understanding of world class technology
- Creative thinking and problem solving abilities
- International communication ability and teamwork skills

Overview of China UEMME

Mechanical engineering (ME) undergraduates :
190,385 in 2005
The Biggest Group

- Technical secondary schools
- Junior colleges
- Colleges
- Graduate schools

Recruit Principle:
Solely based on
the score of major exams

- No significant update for curriculum system
- No sufficient investment in facilities and equipment for education

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- Overview of China's undergraduate education in mechanical and manufacturing engineering (UEMME)
- **Key issues facing UEMME**
- Alternative solutions
- Summary

Key Issues Facing UEMME

- **Generalist vs. specialist**
- **Theory vs. practice**
- **Activeness vs. passiveness**
- **Quality vs. Skills**

Generalist vs. specialist

- Traditional ways is to divide disciplines into specialties, following the Soviet style
- Nowadays the fast changing manufacturing market requires more generalists than before

Issue I: Generalist vs. specialist

Technology innovation requires strong engineering capability

Students solely focusing on specialties might lack of skills:

- **Overall engineering view**
- **Creative thinking**
- **Problem solving skills**

Issue II: Theory vs. Practice

Inadequate efforts in exploring how to combine theory with practice

- How could theory and practice be well combined?
- Active practice vs. passive practice
- Practice can not only be limited to curriculums of technology but also fundamental theory(e.g. Theory of Optimization)
- Non-technical practice is also useful (e.g., customer demand survey or interview)

Issue III: Activeness vs. passiveness

Active learning + active thinking → Innovation

How to develop a mechanism to encourage students to learn actively

Issue IV: Quality vs. Skills

Collaboration and communication become increasingly important in working environment.

- **Besides of technical skills, how we could create a learning environment that helps students develop teamship, leadership and communication skills?**

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Alternative Solutions

Issue I: Generalists vs. Specialists

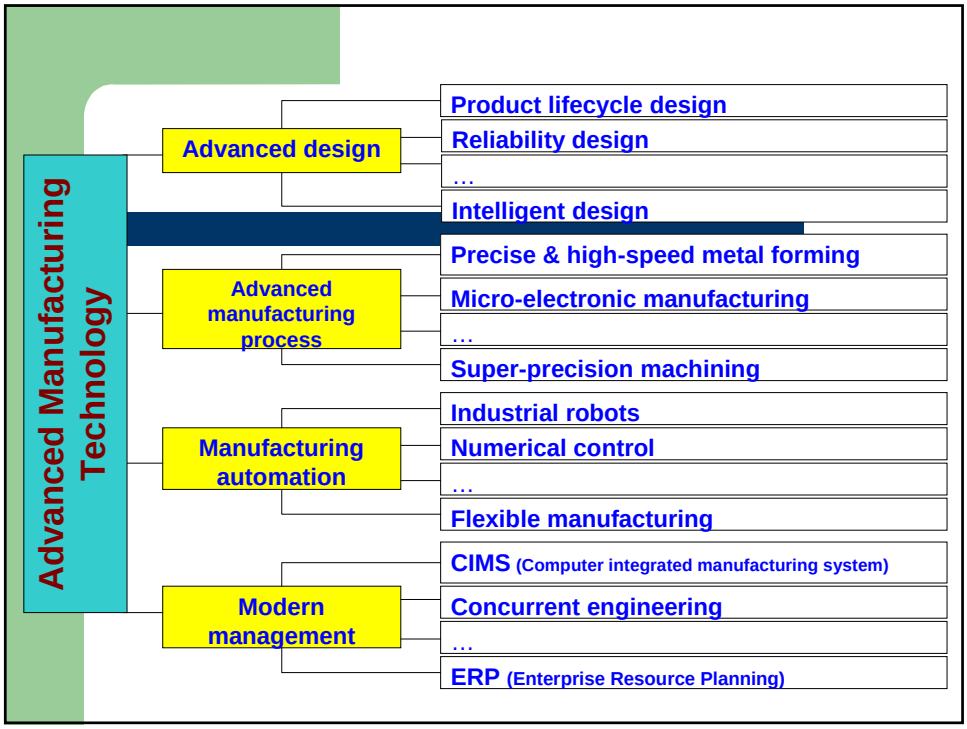
My observation and proposals:

- **Eliminate the boundary of some majors, e.g. mechanical engineering**

Generalist vs. specialist

- **Where should be the boundary**
  - **between Distinctness & Fuzziness**
- **The margin of the traditional mechanical engineering discipline has been greatly expanded**
  - **Technologies from other disciplines:**

    micro-electronics; computer; and inspection, testing, and control, as well as management engineering
  - **Knowledge fusion and cross discipline intersection is not only a development trend, but also an endlessly undergoing process.**



Alternative Solutions

Issue I: Generalists vs. Specialists

My observation and proposals:

- Eliminate the boundary of some majors, e.g. mechanical engineering
- Increase more new selective courses
  - Electronic manufacturing,
  - Special process technology
    (For examples, advanced molding technology, surface engineering…)
  - Simulation technology
- Increase interdisciplinary selective courses
  - MEMS (Micro-Electro-Mechanical Systems)
  - Production planning and management
  - Supply chain management
  - Logistics technology

Generalist vs. specialist

- University should make the decision:

  Generalist-oriented or specialist-oriented?

  So can they do with the coverage of specialty, whether being broader or narrower

- Therefore, students can make choices
  - According to one's own preference
  - According to one's strengths
  - According to the trend of the market

Alternative Solutions

Issue II: Theory vs. Practice

My observation and proposals:

- More Case Studies
- More project based programs
- Tighten the linkage between industries and universities
- Provide students with more world class technology platform

Theory vs. Practice

Comparison between teaching materials at home and abroad

- Foreign teaching materials normally have a broader coverage, a shorter length per topic, and focus more on application
- Domestic teaching materials normally put more effort on the integrity of the theoretical knowledge system

Theory vs. Practice

Suggestions are:

- Teachers should try best to find typical cases that can help students to extend to many cases
- Students should be able to learn by analogy , and try to resolve many other cases with only a few instances learnt

Alternative Solutions

Issue 3:How to develop a mechanism to encourage students to learn actively

My proposals:

- **Provide interactive learning environment**
- **Allow students to make course selection based on their personal interests and strengths**
- **Provide students with opinions about industry trends**

Interactive learning

If students can replace some of the current "seat-time" with "screen-time," we may have opportunities to use faculty time for more individual one-on-one time, (Oxbridge-like) and could provide us with means to offer specialized courses to a few students

Alternative Solutions

Issue 4: to develop students' teamship, leadership, communication skills

My proposals:

- **Help students develop teamship in project based studies**
- **Case studies encourage students to develop their analytical skills and research skills**
- **Add personal development courses such as effective communication, powerful public speaking, business report writing**
- **Encourage leadership development, rotate of team leader role, create such courses as organization behavior, workflow, art of leadership**
- **Help students to adapt diverse environment, such as design some projects to require students to form interdisciplinary groups**

Summary

Fast changing world	Adaptive Strong learning abilities
Globalization	Innovative Strong communication abilities to work in diversified environment
World Manufacturing Center	Grasp World Class Technology Industry knowledge


Thanks !
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