

# **Doctoral Education at Warsaw University of Technology**

*Andrzej Krasniewski*

*Bologna Seminar, Warsaw, 17 June 2010*

- ❑ **Background: Doctoral education in Poland after 1989**
- ❑ **Developments in doctoral education at Warsaw University of Technology**
  - **PhD programme at Faculty of Electronics & Information Technology**
  - **developments at the University level**
- ❑ **Conclusion**

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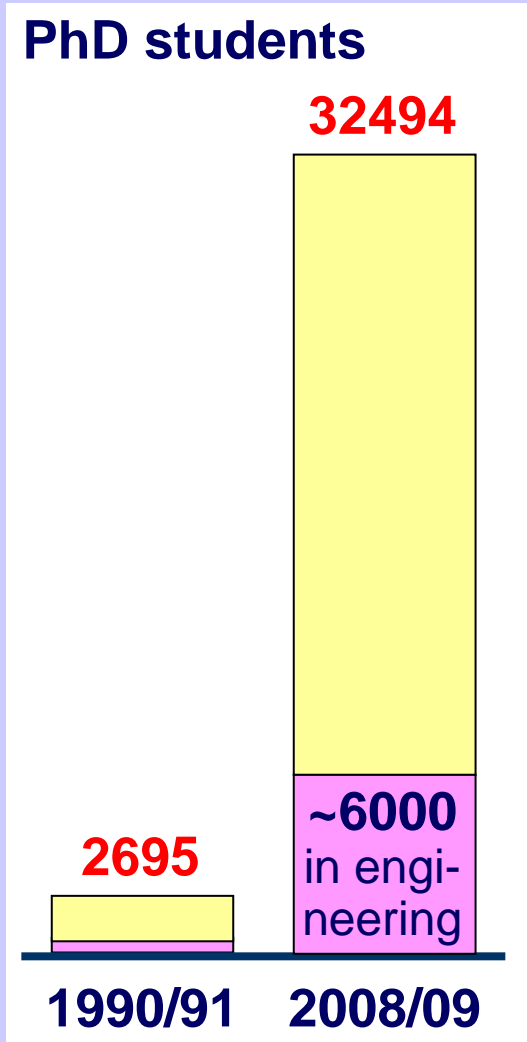
# Two paths to a doctoral degree

- ❑ „unstructured” (individual) education ← dominating until early 1990's
- ❑ „structured” education (doctoral study programmes)

Organisation of doctoral education	Number of countries	Countries
Individual education only (1)	5	Bosnia-Herzegovina, Cyprus, Georgia, Malta, Montenegro
Structured programmes only (2)	4	Croatia, Estonia, Lithuania, Spain
Doctoral/graduate research schools only (3)	3	France, Liechtenstein, Turkey
Mixed (1) and (2)	12	Andorra, Austria, Belgium-Flanders, Czech Republic, Greece, Iceland, Ireland, Latvia, Poland, Romania, Russia, Slovak Republic
Mixed (2) and (3)	2	Italy, Norway
Mixed (1) and (3)	2	Belgium-Wallonia, Netherlands
Mixed (1), (2) and (3)	9	Albania, Armenia, Germany, Denmark, Finland, Sweden, Switzerland, UK and Scotland

source: *Doctoral Programmes in Europe's Universities: Achievements and Challenges*, EUA 2007

# Growing number of PhD candidates



source:  
Central Statistical Office, 2009

- ❑ **social and economic changes**  
*recognition of the impact of PhD on well-being and position in the society*
- ❑ **new rules for financing HEIs**  
*no. PhD students strongly affects the allocation of public funds to HEIs*

# Problems and challenges (1)

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## Traditional separation of MSc and PhD programmes

- low number of courses intended for PhD candidates
  - low flexibility and attractiveness of the curriculum
- PhD research frequently unrelated to work done at the Master's level
  - long time to degree

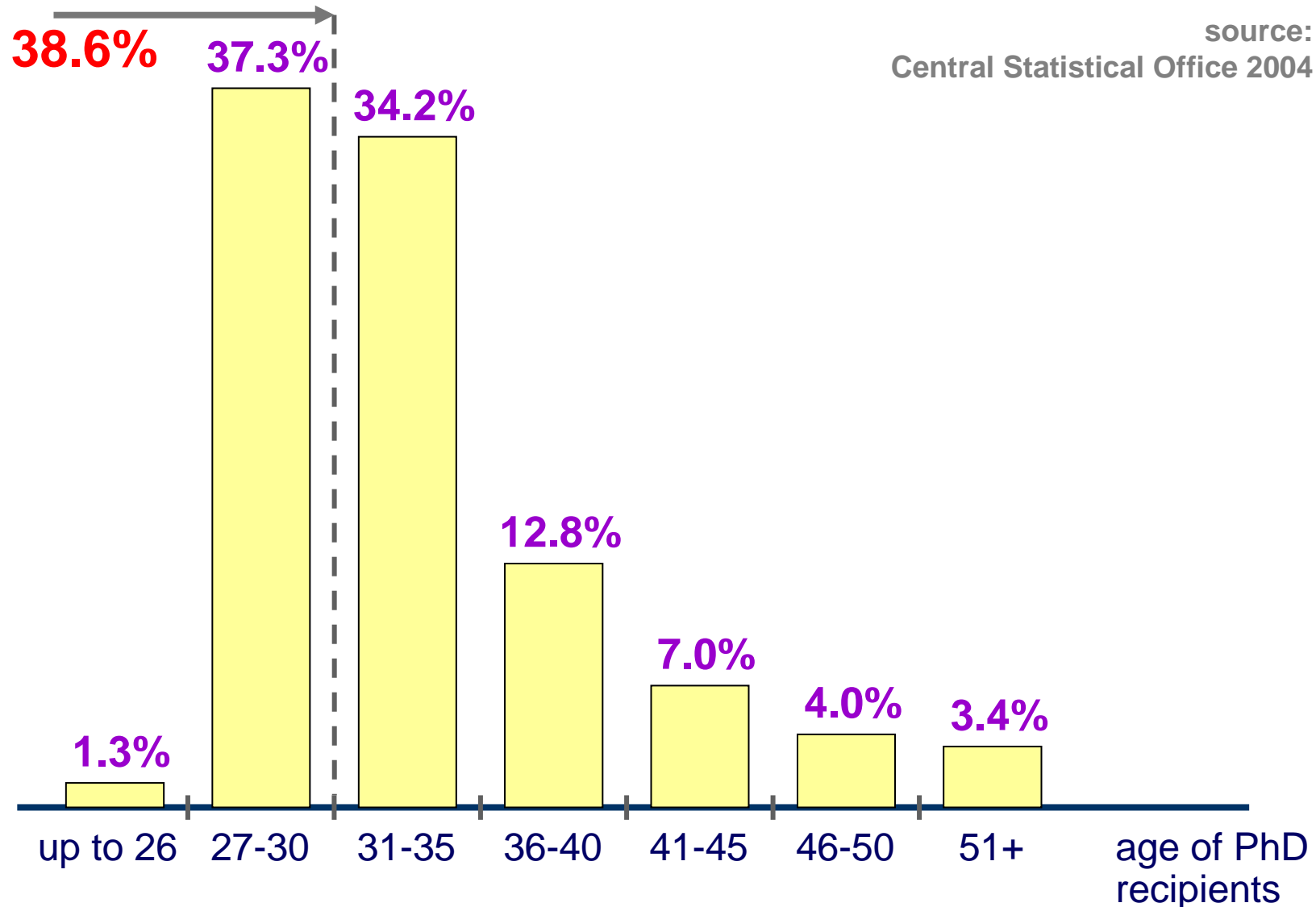
# Problems and challenges (2)

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## Unattractive financial status of students

- *only 40% of doctoral students receive scholarships (from university or faculty budget)*
  - *scholarships are low (300-450 euro/months)*
  - *new forms of financial aid (from university or faculty budget) available since 2006 – insufficient*
  - *limited opportunities for extra support from research projects*
- 
- little attractiveness of PhD study programmes for potentially best candidates
  - part-time or full-time employment outside university
    - large number of dismissals
    - slow progress in research (long time to degree)

# age of PhD recipients





# Problems and challenges (3)

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## Mismatch of training goals with needs of labour market

- *ca. 5500 PhD degrees awarded each year*
- *limited opportunities for hiring at HEIs (saturation or decrease in the number of students predicted)*
  - ➔ *professional careers outside of academia*

## At most HEIs, no serious attempts to adapt

- ➔ **doctoral education still, in principle, oriented towards future university employees**

# A look from outside

## key issue - financing



OECD Reviews of Tertiary Education

Poland

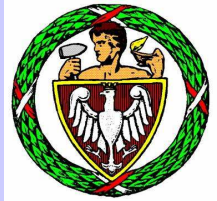
Oliver Fulton, Paulo Santiago, Charles Edquist,  
Elaine El-Khawaz and Elsa Hackl



p. 107

**Funding for PhD studies is very limited in Poland and should be expanded.** ... In any event, if the human resource base in the Polish research system is to be secured and enhanced, both policy making and policy implementation need to pay more attention to the funding of younger researchers, both pre- and post-PhD. **In addition to specific support grants for PhD students, consideration should be given to creating special funding streams to support the research projects of younger researchers.**

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## ***Warsaw University of Technology (WUT)***

- 32000 students, incl. 900 PhD students
- 2400 academic staff (550 professors)
- 19 faculties
- decentralised model of PhD education
  - programmes offered by faculties
  - basic regulations by WUT Senate and Rector
- large differences in the number of PhD candidates at individual faculties

# PhD programmes – selected regulations

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- 4-year programmes (can be extended by one year)
- admission requirement - MSc degree
- supervised research work + coursework
- curriculum requirements determined by the Faculty Council
- no tuition fee for full-time students
- full-time students can apply for scholarships (teaching duties)
- Director of PhD programme (at faculty level) - in charge of administration

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# PhD programme at Faculty of E&IT

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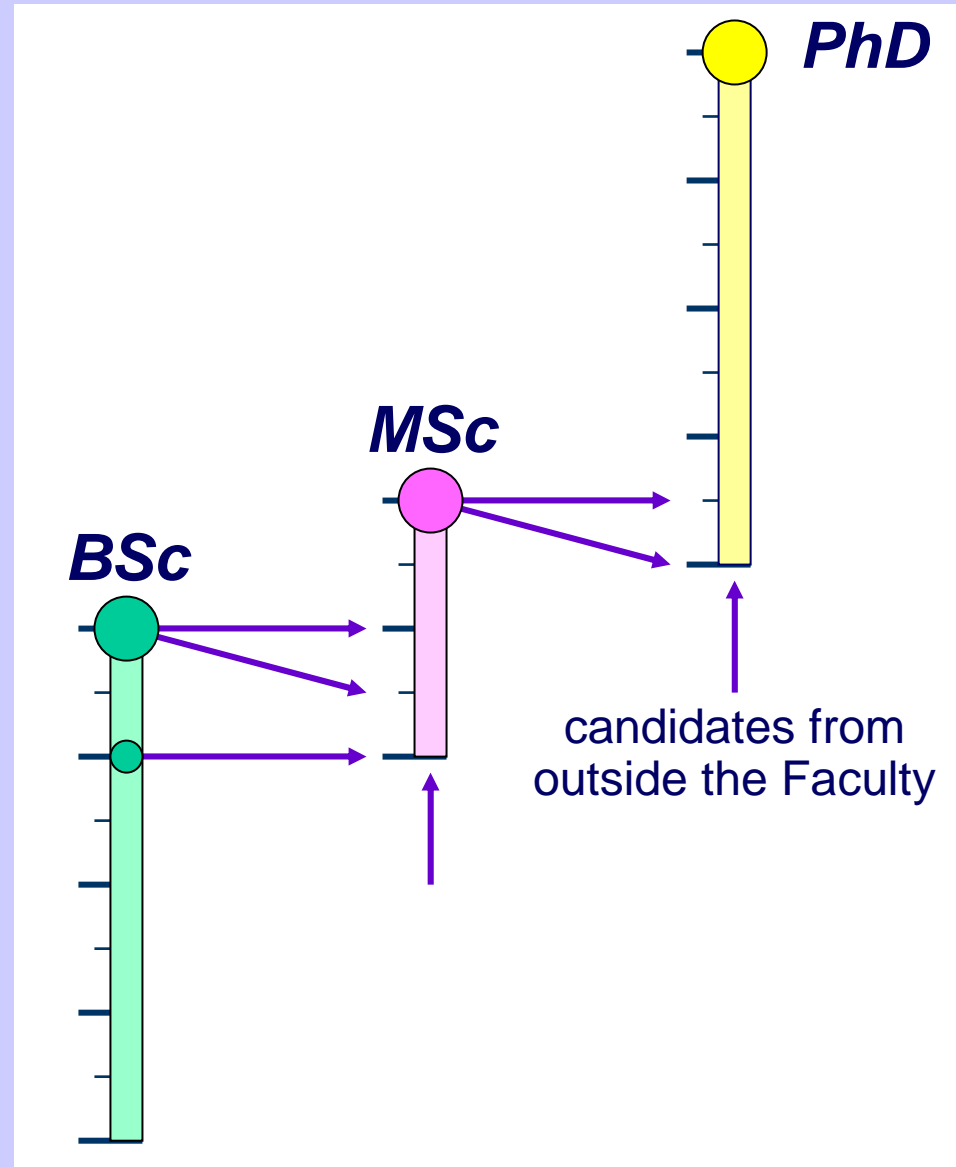
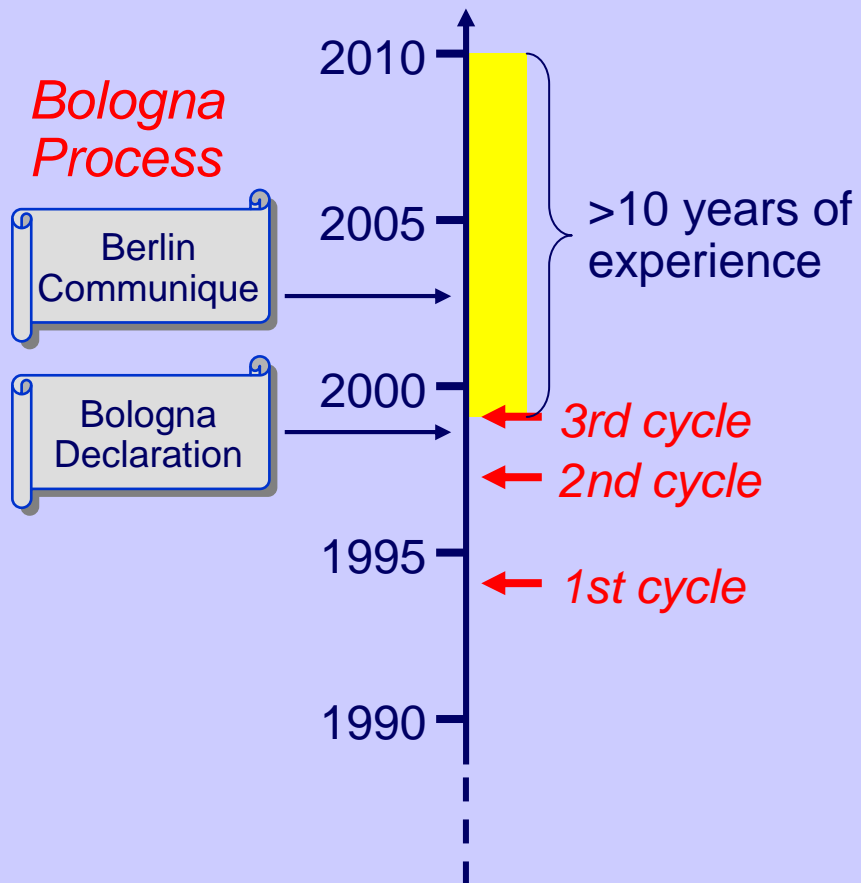
## ***Faculty of Electronics and Information Technology***

- 4000 students, incl. 200 PhD students
- 310 academic staff (70 professors)
- entitled to award PhD degrees in
  - electronics
  - control & robotics
  - informatics (computer science)
  - telecommunications

# Study system at Faculty of E&IT

## PhD programme

*part of three-cycle study system*





# Curriculum requirements

- ❑ core component - original research (starts at 1st semester)
- ❑ flexibility (in selecting taught components)

	ECTS points	
non-engineering courses	6	} < 25%
non-advanced courses in engineering	8	
advanced math and science courses	12	
advanced specialization-oriented courses	12	
advanced courses	18	
PhD seminar (7 semesters)	14	
PhD research (7 semesters)	140	
editing PhD thesis	30	
<b>total</b>	<b>240</b>	

# Integration with MSc programme

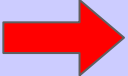
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*uncommon in Poland !!!*

- ❑ common course offer for both MSc students and PhD candidates

> 100 advanced courses  
(in math & science and electronics & IT)

*solution to 'unsolvable' problem of providing PhD candidates with a large number of elective courses*

-  ❑ partial credit transfer MSc → PhD
- ❑ administrative procedures (registration for courses, ...)
  - same as for the second-cycle studies

## credit transfer MSc → PhD

	ECTS points	max transfer
non-engineering courses	6	4
non-advanced courses in engineering	8	8
advanced math and science courses	12	6
advanced specialization-oriented courses	12	6
advanced courses	18	6
PhD seminar (7 semesters)	14	
PhD research (7 semesters)	140	
editing PhD thesis	30	
<b>total</b>	<b>240</b>	<b>30</b>

↑  
*equivalent to one semester*

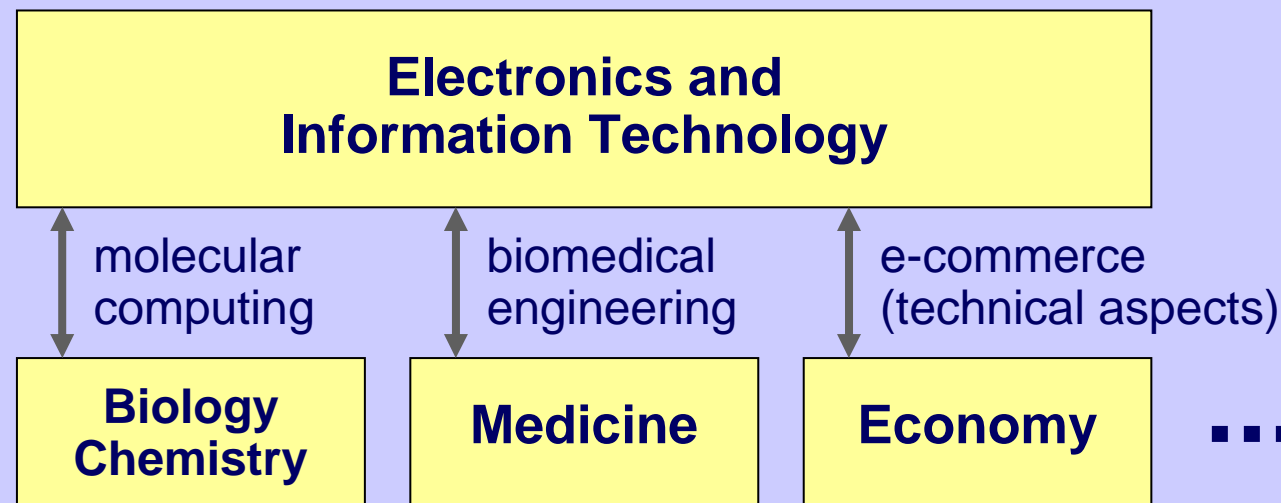
for most candidates the course load reduced to < 30 ECTS

# Support for interdisciplinary training

*uncommon  
in Poland !!!*

- ❑ PhD programme open to candidates with non-engineering background
- ❑ flexibility of curriculum requirements (courses can be taken at other engineering and non-engineering HEIs)

*Research (PhD theses) outside traditional disciplines represented at the Faculty*



# Clearly defined and transparent organisation

The screenshot shows the website of the Faculty of Electronics and Informatics (EITI) at Warsaw University of Technology. The main page displays information about a PhD program in Polish, including a list of attachments (Załączniki) for the application process. The attachments are listed in a table with columns for 'Załącznik nr', 'Tytuł', 'DOC', and 'PDF'. Yellow arrows point from the attachment titles to the text boxes on the right.

Załącznik nr	Tytuł	DOC	PDF
załącznik 1	<a href="#">Ustalenia kompetencyjne</a>		
załącznik 2	<a href="#">Przedmioty zaawansowane dla studiów II i III stopnia</a>		
załącznik 3	<a href="#">Zadania opiekuna naukowego doktoranta</a>		
załącznik 4	<a href="#">Obowiązki kandydata przyjętego na studia III stopnia oraz studenta studiów III stopnia</a>		
załącznik 5	<a href="#">Podanie o przyjęcie na studia III stopnia</a>	<a href="#">Pobierz</a>	<a href="#">Pobierz</a>
załącznik 6	<a href="#">Karta informacyjna kandydata</a>	<a href="#">Pobierz</a>	<a href="#">Pobierz</a>
załącznik 7	<a href="#">Kwestionariusz osobowy</a>	<a href="#">Pobierz</a>	<a href="#">Pobierz</a>
załącznik 8	<a href="#">Wniosek o przyznanie stypendium doktoranckiego</a>	<a href="#">Pobierz</a>	<a href="#">Pobierz</a>
załącznik 9	<a href="#">Karta transferu osiągnięć absolwenta studiów magisterskich</a>	<a href="#">Pobierz</a>	<a href="#">Pobierz</a>
załącznik 10	<a href="#">Pracownia Naukowa: karta informacyjna</a>	<a href="#">Pobierz</a>	<a href="#">Pobierz</a>
załącznik 11	<a href="#">Pracownia Naukowa: karta oceny</a>	<a href="#">Pobierz</a>	<a href="#">Pobierz</a>
załącznik 12	<a href="#">Kryteria opiniowania wniosków o przyznanie stypendiów doktoranckich</a>		

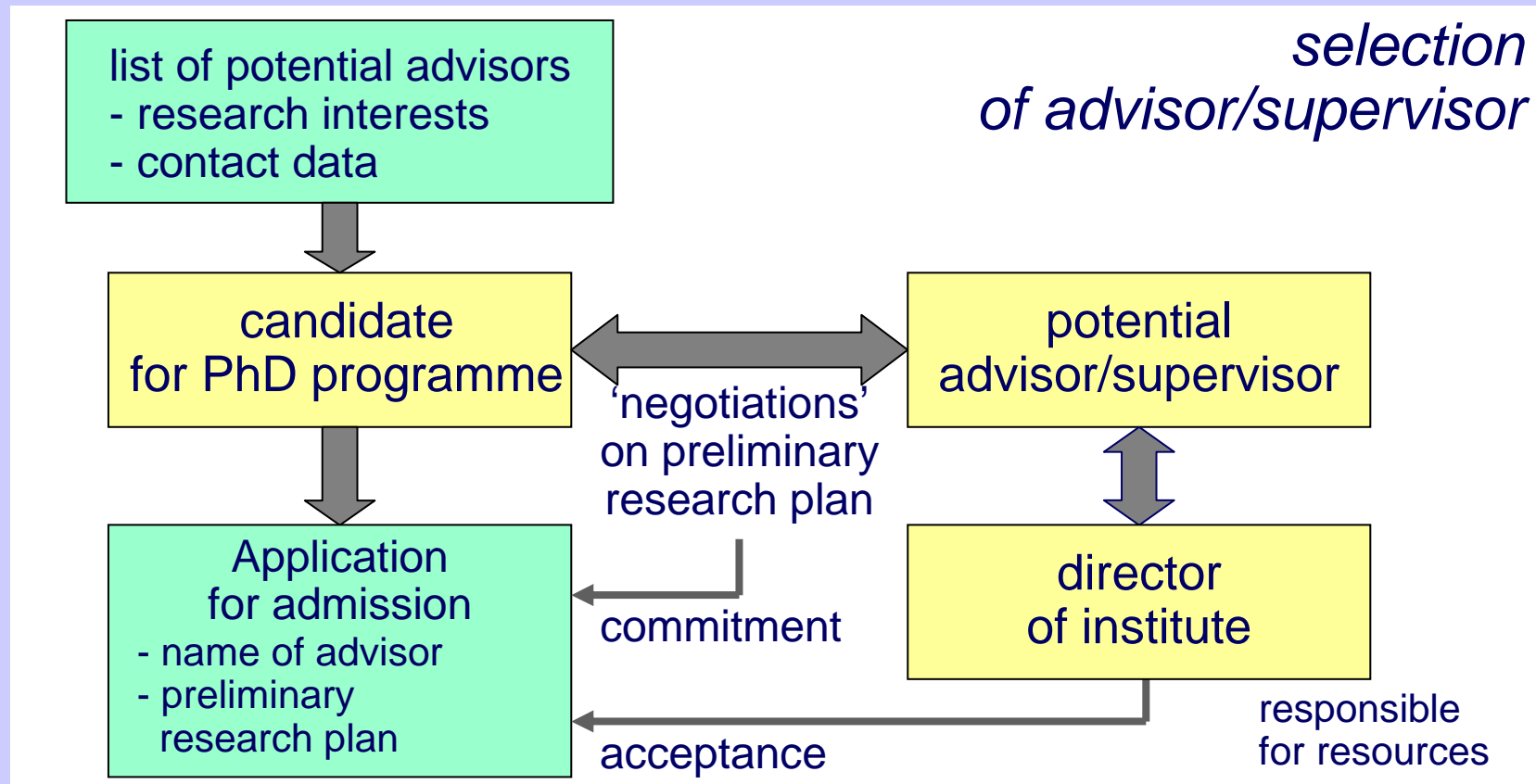
## Areas of decision making and duties

- Rector
- Faculty Council
- Dean
- Director of PhD Program
- Director of Institute
- Head of Research Lab
- Supervisor

## Tasks and duties of supervisor

## Duties of PhD candidate

# Admissions



- ❑ admission of almost all candidates approved by their future advisors  
(background and past performance – less critical)

# Supervision, monitoring and QA

## ***advisor/supervisor***

- assistance in development of individual study programme (selection of courses)
- assistance in development of research plan
- monitoring of student's progress in research and providing student with feedback
- assessment of student's research report (submitted at the end of each semester), including comments
- assessment of student's seminar presentations

## ***Director of PhD Programme***

- final assessment of student's research report and **advisor's comments**
- monitoring of student's progress in coursework
- monitoring of student's performance in teaching

***supervision  
of advisors***

- ❑ thorough examination of progress (each semester)
- ❑ dismissing those who do not show adequate progress

- ❑ Faculty scholarships for all PhD candidates who apply for a scholarship (ca. 50%)
- ❑ special scholarships offered by University
-  ❑ support from research projects (national and European)
- ❑ special Dean's fund to encourage and support participation in international conferences, workshops, ...



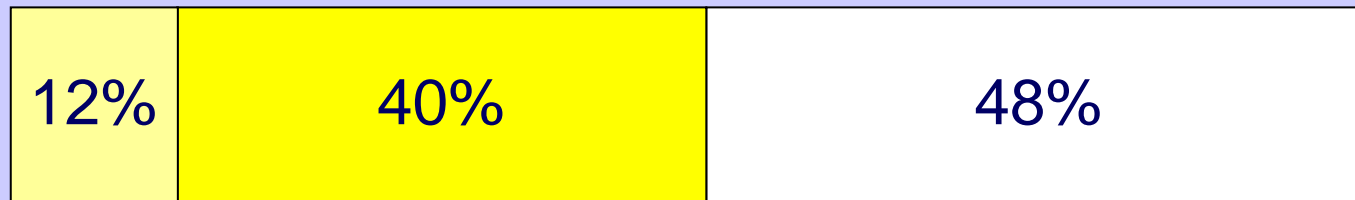
# Funding research & research infrastructure

Faculty budget (2009): €25M

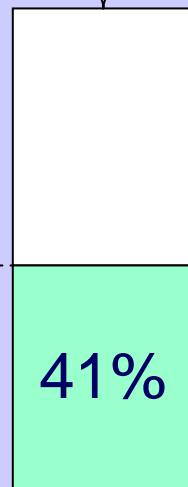
investments

research

education



source:  
FEIT Dean's Report, 2010



European funds (>€5M)

- Framework Programmes
- Structural Funds

*PhD candidates*  
*- among major beneficiaries*

# Successful participation in FPs

awarded to Fac. of Electronics & IT  
and 5 other Polish research centres

**Crystal Brussels Sprout** (Kryształowa Brukselka)  
for outstanding achievements  
in UE Framework Programmes in 1999-2009

LAUREACI NAGRODY  
KRYSTAŁOWEJ BRUKSELKI W KATEGORII:  
INSTYTUCJA BADAWCZA

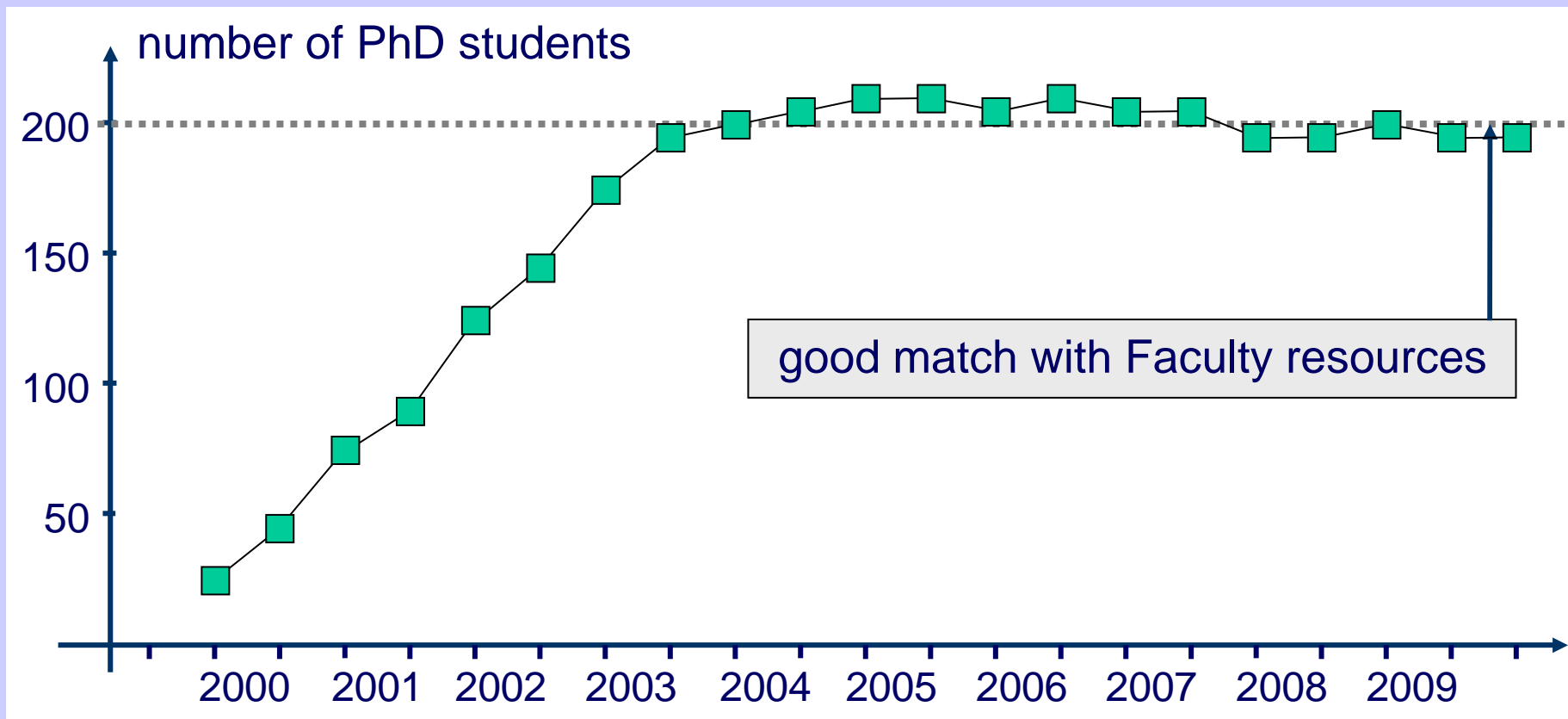
- Poznańskie Centrum Superkomputerowo-Sieciowe; Instytut Chemii Bioorganicznej PAN
- Wydział Elektroniki i Techniki Informatycznych; Politechnika Warszawska
- Wydział Lekarski; Uniwersytet Jagielloński
- Instytut Podstawowych Problemów Techniki PAN
- Wydział Elektrotechniki, Automatyki, Informatyki i Elektroniki; Akademia Górniczo-Hutnicza
- Wydział Fizyki; Uniwersytet Warszawski



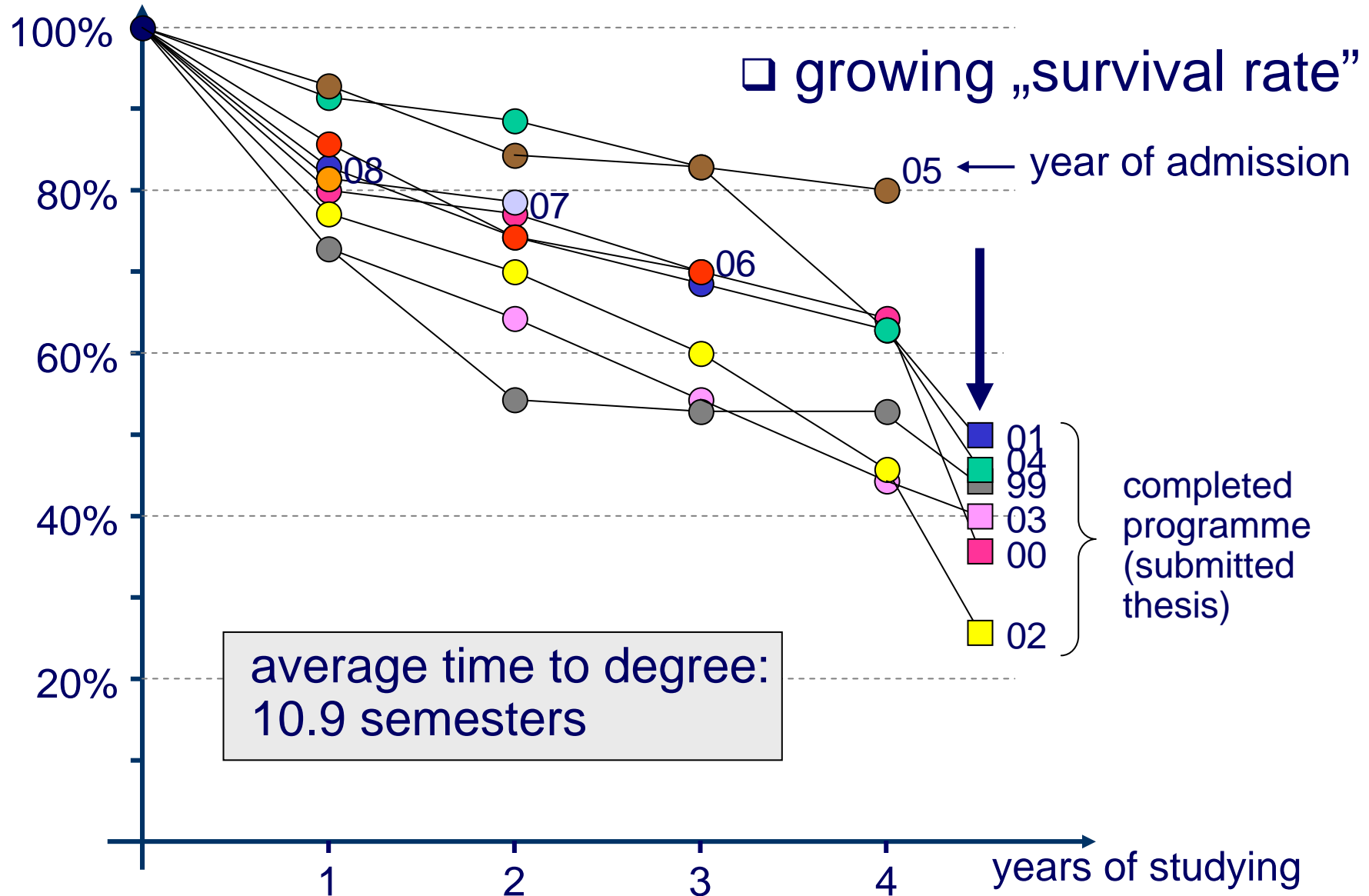
31 May 2010

# After 10 years – no. of students

□ critical mass achieved



# After 10 years – completion rate



# After 10 years – other indicators

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- growing number of publications
  - ca. 10 publications on average (incl. papers in conference proceedings) at the time of thesis defence
  
- growing mobility based on formal and informal international cooperation
  
- growing number of theses written in English
  - < 20% in 2005-2008
  - 50% in 2009/2010

# Stimulating research environment

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- ❑ resources
  - academic staff (>70 professors)
  - research infrastructure
  - funding (scholarships + extra income from national and European research projects)
- ❑ critical mass: 200 PhD candidates
- ❑ wide spectrum of research areas (incl. multidisciplinary)
- ❑ large number of courses to support individual research work

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# Evolution of University regulations

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- *inspired by developments at Faculty of E&IT*  
- *adopted by WUT Senate*

## 2005

- ❑ provision for double-degree PhD programmes
- ❑ flexible curriculum requirements
- ❑ obligatory training in transferable skills
- ❑ special provisions to support mobility

## 2007

- ❑ new forms of financial support for PhD candidates
- ❑ *The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers* - a reference in resolving problems

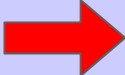


# Extension of educational offer



coordinated by  
**Centre for Advanced Studies**

***new unit***  
*established in 2008*

- advanced courses in math and science
-   special courses to develop transferable skills and social sensitivity
- special-topic one-semester seminars
- special events
  - lectures by renowned visiting researchers
  - thematic workshops

support for annual conference of young researchers  
„Young researchers facing challenges of  
today’s technology” (organised by the  
University Council of Doctoral Candidates)



# development of transferable skills

course offer for PhD students  
- special courses (2008/2009)

Uczelniana Oferta Dydaktyczna Politechniki Warszawskiej - Wykłady specjalne - Window

http://www.konwersatorium.pw.edu.pl/oferta/w\_specjalne\_arch.html

Uczelniana Oferta Studiów Zaawansowanych Politechniki Warszawskiej | Konwersatorium Politechniki Warszawskiej | CENTRUM STUDIÓW ZAAWANSOWANYCH POLITECHNIKI WARSZAWSKIEJ

Cele | Wykłady podstawowe | Wykłady specjalne | Masterclass | Seminaria doktoranckie | Visiting Lectures

### WYKŁADY SPECJALNE - ARCHIWUM

#### Semestr zimowy 2008/2009

**SZ1: Etyczne aspekty prawnej ochrony własności intelektualnej (15 godzin)**  
prof. Roman Morawski (PW)  
środy, godz. 16-18, s. 43 Gmach Elektroniki (pierwszy wykład 29 października, kolejne co środę aż do 17 grudnia)

**SZ2: Metody komputerowe w dynamice konstrukcji (30 godzin)**  
prof. Czesław Bajer  
wtorki, godz. 15-17, sala 2.19 na Wydziale SIMR, ul. Narbutta 84

**SZ3: Nauka i biznes, czyli jak to robią w Cambridge (30 godzin)**  
dr Kamil Kulesza (CambridgePYTHON)  
środy, godz. 14-16, s. 208 Gmach Główny

#### Semestr letni 2008/2009

**SL1: Problemy społeczeństwa wiedzy (15 godzin)**  
prof. Jerzy Woźnicki (PW)  
poniedziałki, godz. 16:00-18:00, od 2 marca (spotkania: 2, 16, 30 marca, 16, 27 kwietnia, 11, 25 maja, 8 czerwca), s. 219 Gmach Główny

**SL2: Techniki komunikowania się w działalności naukowca (15 godzin)**  
prof. Andrzej Kraśniewski (Politechnika Warszawska), mgr inż. Wojciech Murzyn (Erdo - pracownia dobrej komunikacji)  
wtorki, godz. 18:15-20:00, od 10 marca, s. 161 Gmach Elektroniki

*Ethical aspects of intellectual property protection*

*Science and business: How do they do it in Cambridge?*

*Technical communication for researchers*



## development of transferable skills

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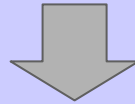
special one-week sessions  
run by professional trainers (2009/2010)

- *Project management*
- *Project human resources management*
- *Interpersonal communication, assertiveness and handling emotions*
- *Negotiations and exploiting social intelligence for development of interpersonal relations*

# Inter-university cooperation

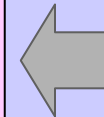
## Warsaw University of Technology

- Faculty of Electronics and Information Technology
- Faculty of Mechatronics
- Faculty of Physics



## Inter-University Programme in Optoelectronics, Photonics and Nanotechnology

Military  
University of  
Technology



## Warsaw University

- Faculty of Mathematics, Informatics and Mechanics
- Faculty of Physics

# PhD programmes **taught in English**

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offered for 2010/2011

- Faculty of Architecture
- Faculty of Automotive and Construction Machinery Eng.
- Faculty of Chemical and Process Eng.
- Faculty of Chemistry
- Faculty of Civil Eng.
- Faculty of Electrical Eng.
- Faculty of Electronics and Information Technology
- Faculty of Environmental Eng.
- Faculty of Geodesy and Cartography
- Faculty of Mechatronics
- Faculty of Mathematics and Information Science
- Faculty of Physics
- Faculty of Power and Aeronautical Eng.
- Faculty of Production Eng.
- Faculty of Transport
- Faculty of Materials Science and Technology
- Faculty of Civil Eng., Mechanics and Petrochemistry (Plock)
- Faculty of Management
- Faculty of Administration and Social Science

# Key issue – adequate funding

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**potential source of extra funding**

**EU structural funds (European Social Fund)  
- Operational Programme „Human Capital”**



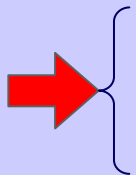
# Extra funding

**successful application to ESF for €25M for 2008-2015**  
*to support activities aimed at the enhancement  
of University human capital*

**essential component (€6M):**

**activities associated with training  
of early stage researchers**

- development of new advanced engineering and science courses
- training in transferable skills for PhD candidates
- scholarships for PhD candidates, incl. international candidates
- scholarships for post-docs
- visiting foreign institutions by young WUT scholars
- visiting WUT by renowned scientists and researchers



coordinated by Centre for Advanced Studies





# Extra funding



in 2009/2010

- 35 scholarships for PhD candidates (1-2 years)
- 16 scholarships for post-docs (2 years)
- 15 grants for PhD candidates to stay at research institutions abroad (1-6 months; 2000€/month)



# Medal for a Young Scientist

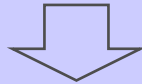
established by WUT Senate in 2007



*awarded each year  
to a leading Polish young researcher  
for outstanding achievements  
in research and technical innovation*

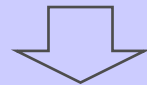
# Looking to the future

problems and challenges



discussion on the model  
of doctoral education

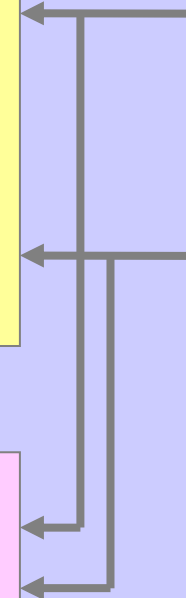
nationwide debate on the model  
of academic/research career



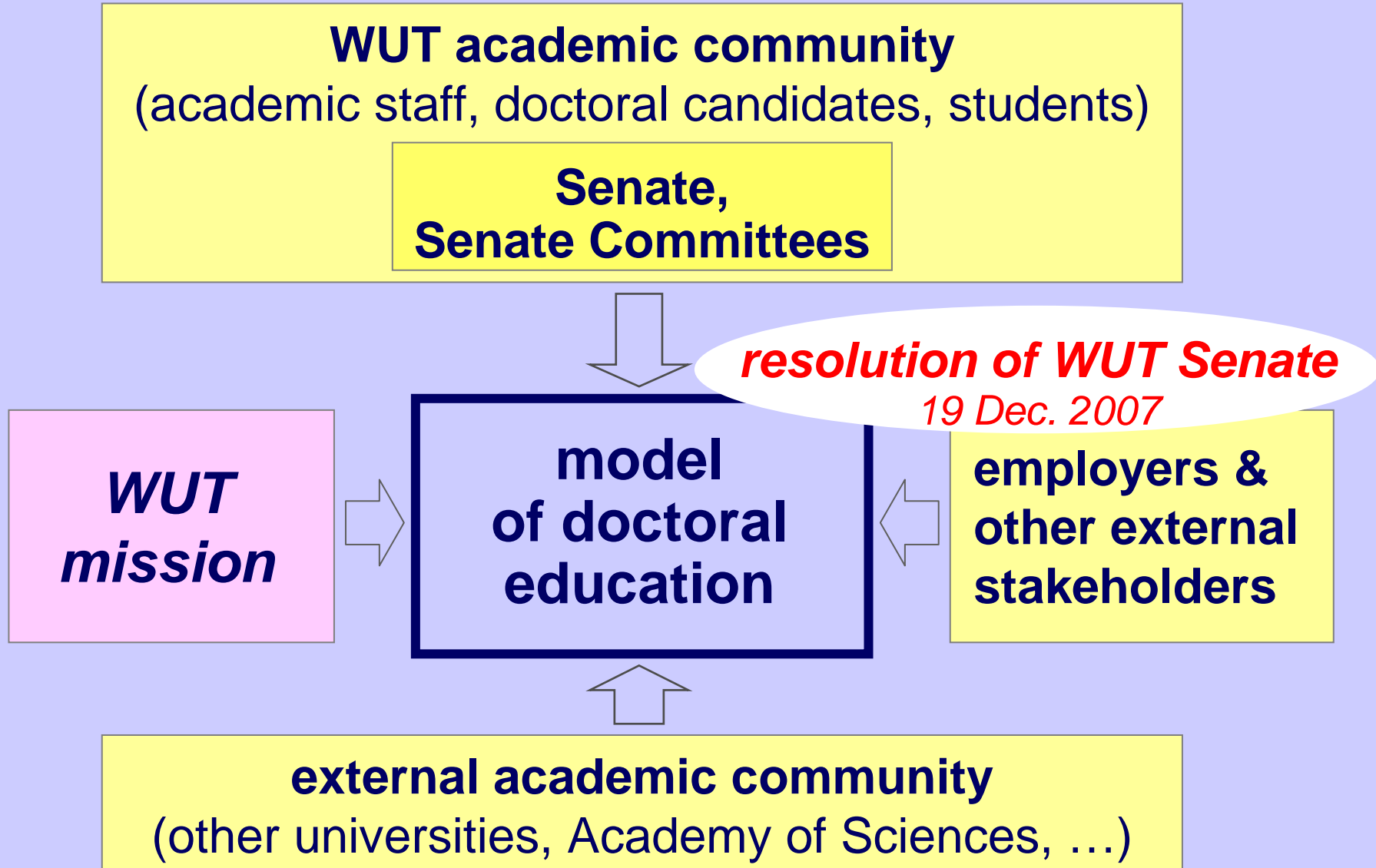
**institutional strategy:**  
**model of doctoral education**  
**at WUT**

trends observed  
in Europe and  
outside Europe

international  
debate on  
doctoral education



# Model of doctoral education



# Model of doctoral education

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- ❑ vision (ideas, rather than solutions)
- ❑ basis for future actions (evolutionary improvement)
- ❑ some controversial, questionable statements  
- formulated to stimulate future discussion



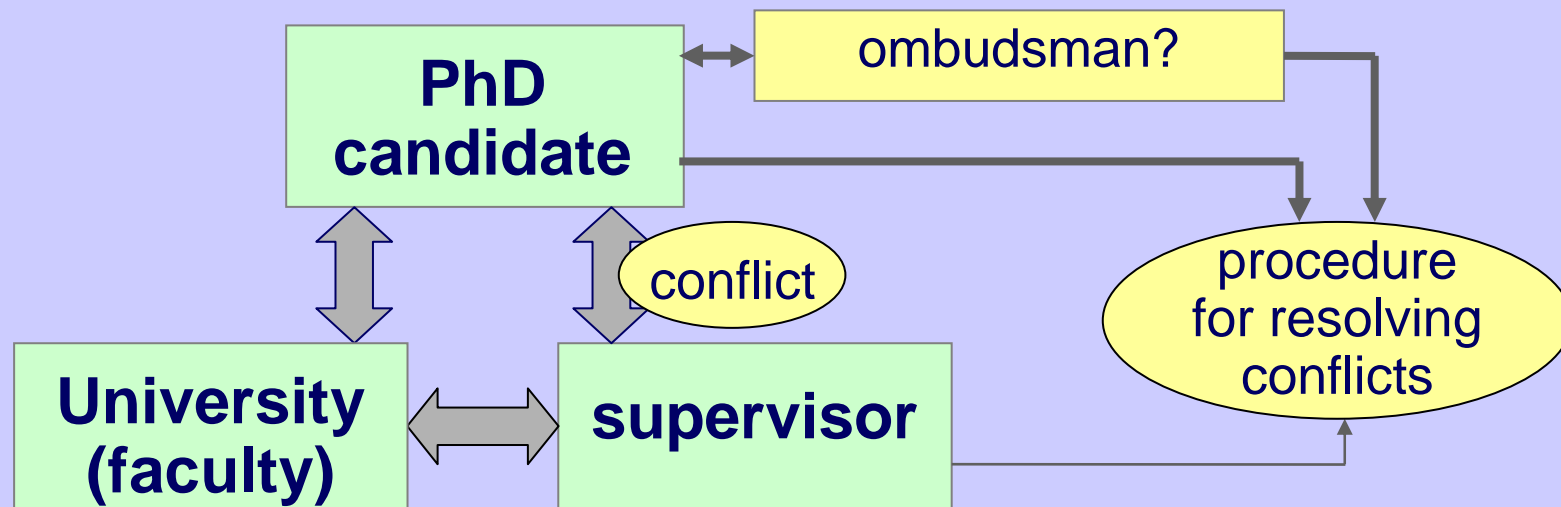
# Model of doctoral education

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## *Key features*

- ❑ diversification of educational offer: programmes addressed to different target groups
- ❑ openness to candidates with different background, including graduates from non-engineering HEIs
- ❑ more emphasis on development of transferable skills and social sensitivity
- ❑ intensive cooperation with other institutions in Poland and abroad
- ❑ high degree of internationalisation
-  ❑ special emphasis on supervision
-  ❑ adequate and sustainable funding

# Special emphasis on supervision



- well defined rights and duties of each party
- procedure for resolving conflicts (may involve an ombudsman)
- option of collective supervision (joint, double or team supervision)
- special training for supervisors
- evaluation of the quality of supervision (by PhD candidates, PhD graduates, director of PhD programme, ...)



# Adequate and sustainable funding

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- ❑ number of PhD candidates – highly weighted factor in formula-driven allocation of financial resources to individual faculties
- ❑ financial resources allocated to a faculty based on the number of its PhD candidates can only be used for financing PhD education
- ❑ combining different sources to increase income of good PhD candidates (scholarships, partial employment as TAs, work for research projects)
- ❑ commitment of the advisor on participation of the PhD candidate in externally funded research projects, incl. expected remuneration for the candidate – part of the admission procedure

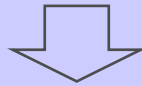


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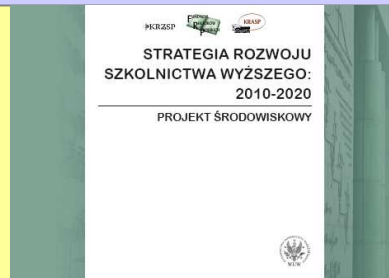


# A long way to go

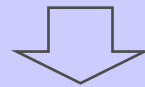
problems and challenges



discussion on the model of doctoral education



nationwide debate on the model of academic/research career



**institutional strategy:**  
model of doctoral education  
at WUT

**membership of EUA-CDE**  
(June 2008)

trends observed in Europe and outside Europe

international debate on doctoral education

**refinement & implementation**

## ... but good prospects

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- ❑ excellence in doctoral education
  - one of key strategic objectives of the Warsaw University of Technology
- ❑ better financing (EU funds)
- ❑ support of key stakeholders - PhD candidates
  - contribution to the work on the model of doctoral education at WUT
  - active promotion of the solutions adopted at WUT at the national level

## *more on doctoral education at WUT ...*

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### Publications (selected)

- A. Krasniewski, K. Malinowski, „Making Ph.D. Studies More Attractive”, *Proc. SEFI Annual Conf.*, pp. 141-146, Winterthur, Sept. 1999.
- A. Krasniewski, „Towards transparent, readable and comparable third degree: Making doctorate-level engineering education a part of the Bologna Process”, *Proc. Int. Conf. on Engineering Education and Research*, pp. 1363-1371, Olomouc, June 2004. (**Best Paper Award in category Bologna Declaration Processes**)
- A. Krasniewski, „Engineering education at the doctorate level: meeting the Bologna objectives”, *Proc. SEFI 2004 Annual Conference: The XXI Century - The Golden Opportunity for Engineering Education*, pp. 229-235, Valencia, Sept. 2004.
- A. Krasniewski, “Transformation of doctorate-level engineering education: meeting expectations of the society”, *Proc. Int. Conf. on Engineering Education*, Pecs-Budapest, July 2008
- A. Krasniewski, “Transformation of Doctoral Training in Poland”, *Higher Education in Europe*, vol. 33, no. 1, pp. 125-138, Routledge: Taylor & Francis Group, April 2008



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