

# Opportunities and challenges for teaching of smart wireless technologies



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# Wrocław /'vrɒtswəf/



- *also called „Venice of the North”: 25 rivers and channels, 12 islands, >200 bridges*
- *historical capital city of Silesia region (first recorded in 10th century)*
- *European Capital of Culture in 2016*
- *industry: Lenovo, Siemens, Toshiba, LG, Nokia...*
- *650 000 citizens (~800 000 during academic year)*
- *11 public and 17 private universities and academia*



# Wrocław University of Science and Technology (WUT)\*

## Politechnika Wrocławska

\*In mid 2016 name changed from Wrocław University of Technology



- one of the largest academic schools in Poland
- founded in 1945 by Polish academic teachers
- active international co-operation with academia, industry and R&D
- high position in rankings of higher education schools in Poland



### WUT in numbers:

- 28 500 students
- 2 100 research & teaching staff
- 16 faculties
- 212 buildings
- 5 370 registered inventions

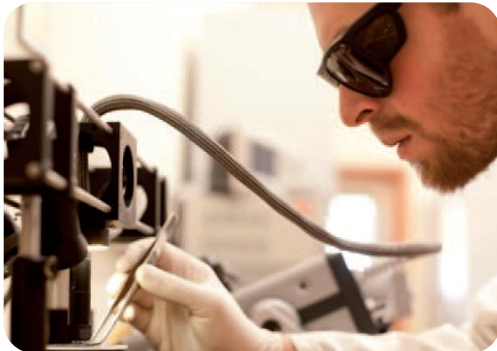
# Faculty of Microsystem Electronics and Photonics

## - founded in 2001

### Facts and numbers – students and staff

#### Students:

- ~700 students (1st and 2nd level of studies)
- 40 PhD students (3rd level of studies)
- 7 students' scientific associations



#### Academic Staff (63):

- 16 full professors
- 6 associated professors
- 2 assistant professors
- 34 adjuncts
- 7 assistants

**30** technicians, administration and support staff



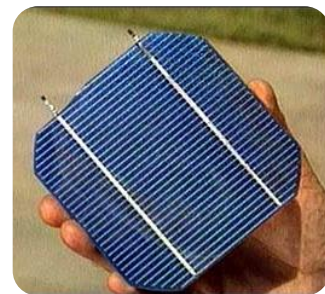
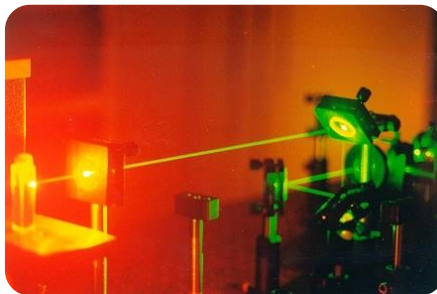
## Fields of education

- electronics,
- metrology (electronics),
- ICT,
- micro/nanoelectronics,
- microsystems,
- optoelectronics,
- optical fibers technology,
- electronic apparatus,
- analogue and digital electronics,

.....



**Knowledge, skills and competences  
in the fields of micro- and  
nanotechnology, microsystems and  
photonics.**



## Fields of study

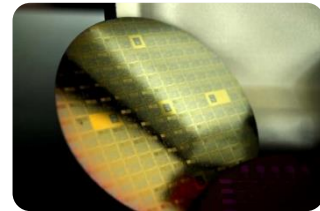
### First degree studies (Eng, 7 semesters):

- **ELECTRONICS AND TELECOMMUNICATION**
  - *Digital Electronics*
  - *Electronics and photonics engineering*

- **MECHATRONICS**

### Second degree studies (MSc, 3 semesters):

- **ELECTRONICS AND TELECOMMUNICATION**
  - *Optoelectronics and Optical Waveguide Technology*
  - *Electronics, Photonics, Microsystems (studies in English)*
- **MICROSYSTEMS**
- **MECHATRONIC MICROSYSTEMS ENGINEERING**



## Courses:

encompass knowledge in the field of:

- electronics,
- computer science,
- optoelectronics,
- microsystems,
- telecommunication,
- mechanical engineering,
- basics of automatics and control systems.



The curricula of courses is developed in such a way that they allow students to learn about new, dynamically developing fields of science and technology and, at the same time, give them versatile basic knowledge sufficient to be flexible in the demanding job market.

## Course - **Wireless systems**: Lectures and laboratories

### Course OBJECTIVES:

#### Gaining the knowledge about:

- fundamentals of data transmission in wireless systems,
- types of systems and standards used in wireless communication,
- data transmission methods in modern wireless systems.

#### Gaining the skills in the field of:

- designing and configuration of wireless data transmission with application of selected standards,
- designing and analysis of mobile communication systems,
- configuration of wireless data transmission in selected standards,
- designing and analysis of functioning of selected wireless systems,
- team work and preparation to conduct research in the field of wireless technologies.





Politechnika  
Wroclawska



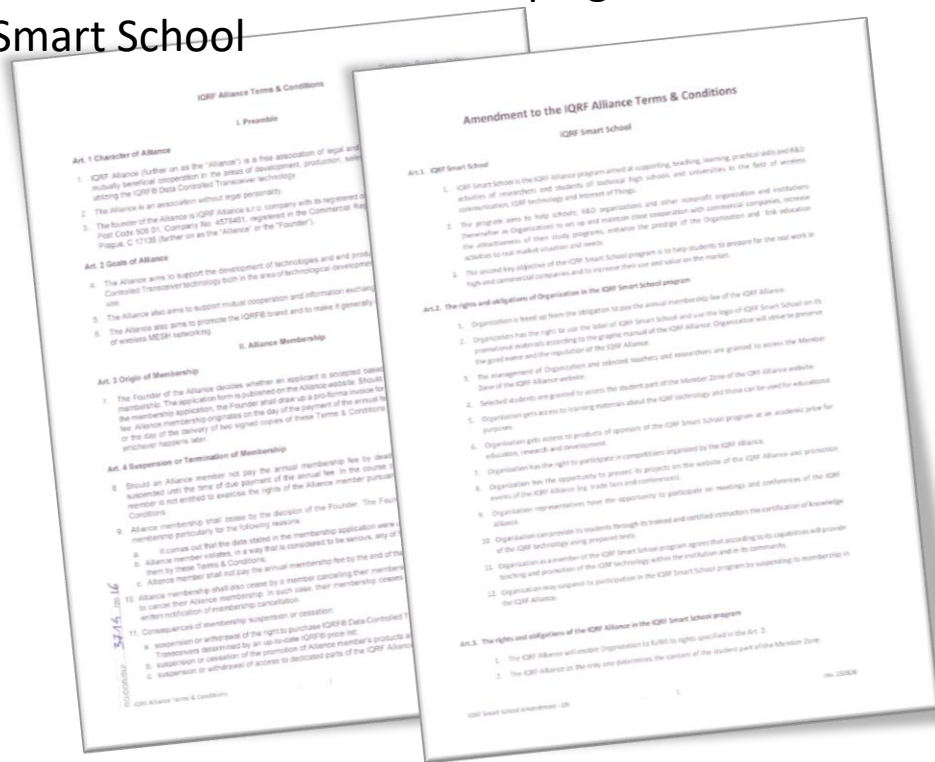
Alliance



Smart School

# IQRF Smart School Programme

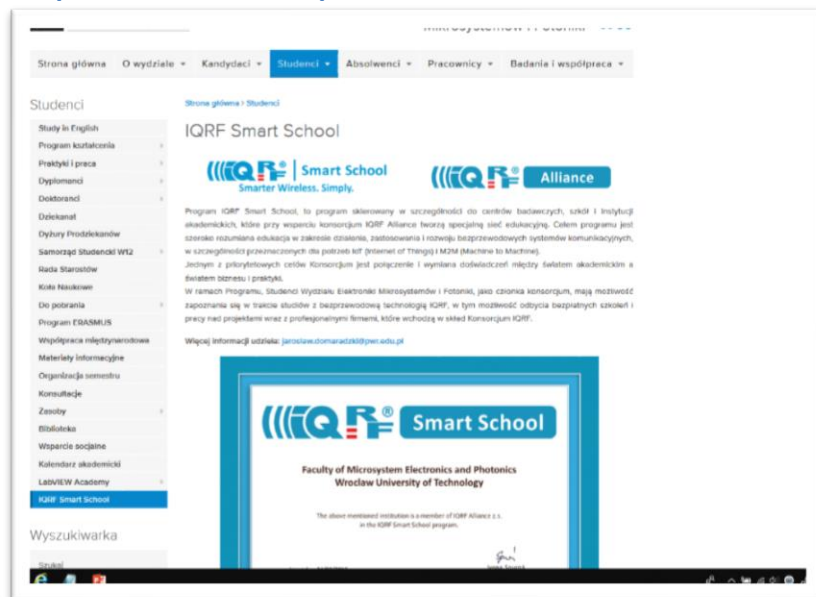
25.11.2016 signing the IQRF Alliance Membership agreement  
and joining the IQRF Smart School



Alliance  
Membership

## IQRF Smart School Programme

march 2017 launch the Faculty website dedicated to IQRF Smart School:  
<http://wemif.pwr.edu.pl/studenci/iqrf-smart-school>



Alliance  
Membership

launch the  
Faculty  
website

# IQRF Workshops – Wireless Technologies for IoT

1st Workshop 29.11.2017, IQRF Tech. - Politechnika Wroclawska



**Internet rzeczy** 

**IQRF Workshops: Technologia bezprzewodowa dla IoT**  
wstęp wolny

**IoT Starter Kit**

Relay kit  
switch connected device ON/OFF

Sensor kit  
temperature, light intensity  
and voltage

Repeater

UP board  
2GB memory + 32GB eMMC

Clouds  
Bleemix Azure




**Kiedy:** Środa, 29 listopada 2017 r  
9:30 - 12:30 Prezentacja tematu (interpretacja zagadnienia)  
14:00 - 18:00 Praktyczne warsztaty (konfiguracja urządzeń)

**Program:**  
W pierwszej części seminarium eksperci IoT zapoznają Cię ze wszystkimi elementami ekosystemu IoT, a następnie pod ich kierownictwem będzie można praktycznie przetestować wszystkie składniki.  
Dowiedz się więcej o technologii bezprzewodowej IQRF, skonfiguruj UP board w celu połączenia z chmurami i spróbuj utworzyć pulpit nawigacyjny za pomocą węzła Node-RED.  
W trakcie eventu będziesz mógł również zapoznać się z obecnie istniejącymi projektami

**Rejestracja:** nie później niż 17 listopada 2017 na [www.iqrfalliance.org](http://www.iqrfalliance.org)

Zarejestruj się!




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## **IQRF Workshops – Wireless Technologies for IoT**

1st Workshop 29.11.2017, IQRF Tech. - Politechnika Wroclawska

### **Participants:**

62 participants, including:

- 34 students from 6 technical universities in Poland
- IQRF Tech representatives,
- industry representaives: Teknosystem Sp. z o.o., Rabbit sp. z o.o., Perfand LED, Petrosoft.pl, COMAL Automatyka, POL-EKO-APARATURA Sp. j., Guenther Polska Sp. z o.o., GL Optic Polska, Sander Elektronik AG, Aaeon Europe, Sel Telecom S.A., FIMS, TME.



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# IQRF Workshops – Wireless Technologies for IoT

2st Workshop 29.11.2018, IQRF Tech. - Politechnika Wroclawska




lectures

42 students from  
WEMiF attended

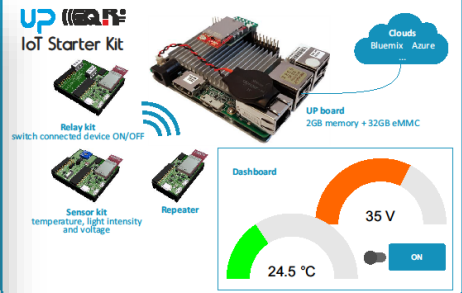


practical training

Internet of Things  Alliance

Technologia bezprzewodowa dla IoT

udział bezpłatny



**IoT Starter Kit**

- Relay kit: switch connected device ON/OFF
- Sensor kit: temperature, light intensity and voltage
- Repeater
- UP board: 2GB memory + 32GB eMMC
- Clouds: Bluemix, Azure
- Dashboard: 24.5 °C, 35 V, ON

Gdzie: Politechnika Wroclawska, Wydział Elektroniki Mikrosystemów i Fotoniki, Kampus przy ul. Długiej 61-65, budynek M11 s. 002

Kiedy: Czwartek 29. 11. 2018

9:30–11:00 Część wykładowo - prezentacja  
11:30–14:00 Część warsztatowa

Program:

W części wykładowo - prezentacyjnej będzie miała miejsce prezentacja stowarzyszenia IQRF Alliance oraz programu IQRF Smart School, prezentacje istniejących rozwiązań wykorzystujących technologię IQRF, jak również przedstawienie technologii IQRF oraz jej funkcjonalności. W trakcie części warsztatowej uczestnicy będą mieli możliwość poznania technologii IQRF poprzez praktyczną pracę z zestawami startowymi IQRF.

Rejestracja do 22. 11. 2018.

Chęć udziału należy zgłosić na adres mailowy: [piotr.antonzczyk@iqrf.com](mailto:piotr.antonzczyk@iqrf.com).  
Ilość miejsc jest ograniczona.

Seminarium organizowane dzięki współpracy Politechniki Wroclawskiej oraz IQRF Alliance

Dołącz!



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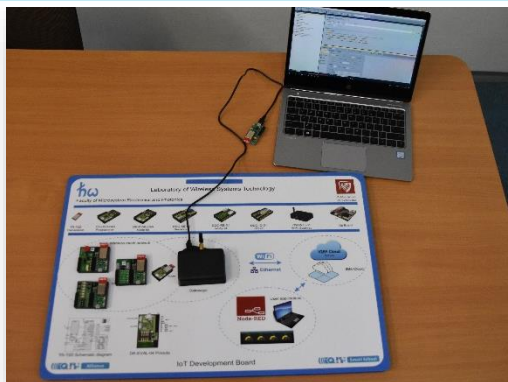




## Laboratory of Wireless Systems Technologies



TR-72D  
Transceiver



Developed boards for trainings



Developed IQRF kits for IoT solutions

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development  
of laboratory  
base



## Laboratory of Wireless Systems Technologies

### Laboratory programme for practical skills based on IQRF kits for IoT solutions:

1. Basis of IQRF mesh network,
2. Working with Sensors, Relays and I/O devices in IQRF mesh network
3. Connecting IQRF mesh to IoT using gates or up-boards



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development  
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## Realized diploma theses connected with IQRF technology

- *Application of wireless mesh type networks for the Internet of things, 2017;*
- *Analysis of wireless networks in IQRF standard, 2018;*
- *Wireless air quality monitoring system in the teaching rooms, 2019.*



## Opportunities for learning of smart wireless technologies

- Lectures and practical skills in electronics, telecommunications, informatics and wireless systems offered at the Faculty,
- Lectures and practical skills at the  Laboratory of Wireless Systems Technologies
- Workshops,
- Projects and Diploma theses,
- Projects within students' scientific associations...

## Challenges for teaching of smart wireless technologies

- Rapid progress in electronics requires continuous updating of knowledge and laboratory base;
- Support from the industries in teaching the students of new solutions and products – updating the knowledge database with the newest solution delivered to the market



## Acknowledgment

Special thanks to:

**Piotr Antończyk**

Country Sales and Application Engineer

IQRF Tech s.r.o.

for his great support in teaching of IQRF Technology at the  
Faculty of Microsystem Electronics and Photonics, Wroclaw, Poland



Politechnika Wrocławska Faculty of Microsystem Electronics and Photonics



Laboratory of Wireless Systems Technologies

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