LUBLIN UNIVERSITY
OF TECHNOLOGY
FACULTY OF ELECTRICAL ENGINEERING
AND COMPUTER SCIENCE

INSTITUTE OF ELECTRICAL ENGINEERING
AND ELECTROTECHNOLOGIES

ASPPECT

Centre of Excellence for the Application of Superconducting and Plasma Technologies in Power Engineering

Lublin 2003

CONTENTS

HISTORICAL BACKGROUND

Lublin University of Technology was established in 1953 as a successor of the long tradition of technical education in Lublin. It was founded thanks to the inspiration of outstanding Lublin engineers and scientists. The main task of Lublin University of Technology was to prepare technical staff for rapidly developing industry in the Lublin region. In 1964 – the Faculty of Electrical Engineering was established. During the following years the university developed and expanded the range of scientific and didactic interests. It is a thriving academic community with a highly qualified and experienced staff and excellent teaching resources. The staff and the students of Lublin University of Technology have helped to establish its reputation as one of the best and the most popular in the university sector. It has an excellent academic reputation, which is reflected in the successful employment record of its graduates.

Lublin University of Technology comprises 4 faculties:

1. Faculty of Mechanical Engineering
2. Faculty of Electrical Engineering and Computer Science
3. Faculty of Civil and Sanitary Engineering
4. Faculty of Management Science and Engineering

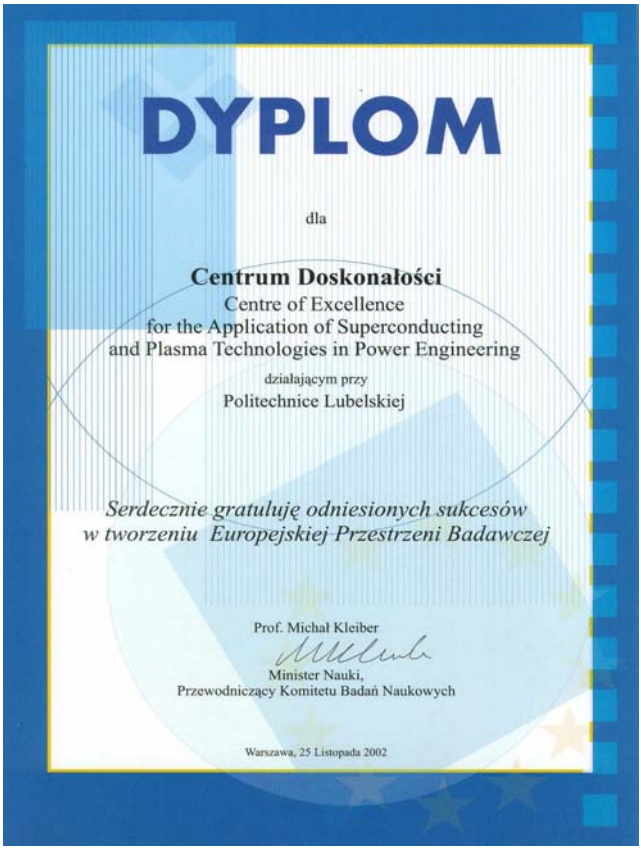
The Faculty of Electrical Engineering and Computer Science was consists of 1 Institute and 11 Departments.

The Institute of Electrical Engineering and Electrotechnologies was established in 1999 to replace the previous Department of Fundamental Electrical Engineering. The staff of the Institute comprises 28 persons, and it

provides teaching for the students of the Faculty of Electrical Engineering and Computer Science as well as other faculties.

In 2002, the Institute of Electrical Engineering and Electrotechnologies was recognized as the exemplary unit and received its present status as **the Centre of Excellence for the Application of Superconducting and Plasma Technologies in Power Engineering (ASPPECT).** The Centre is aimed at developing activity in the multi-disciplinary area of advanced superconducting and plasma technologies in power engineering in the following directions: fundamental and technology-oriented research, education and training, networking and cooperation with leading European research centres. This will stimulate international cooperation; initiate joint research aimed at specific engineering problems and enhance participation of Polish researchers into European Union Projects. An important objective is not only to strengthen the established international scientific position of the Centre, but also to build capacity of the unit as a potent research partner for Polish industry.

The main aim of the Centre is to provide and develop world-class scientific, technical and research resources in superconducting and plasma technologies in power engineering. Research areas cover a wide range of disciplines and the Centre intends to broaden and strengthen its service to industry.



Certificate for the Centre of Excellence ASPPECT awarded at Warsaw Conference Launching the 6th Framework Programme of the European Union on 25-26 November 2002.

The letter of the Rector of Lublin University of Technology to Professor Tadeusz Janowski.

POLITECHNIKA LUBELSKA
REKTOR

TECHNICAL UNIVERSITY OF LUBLIN
RECTOR

20-618 Lublin, ul. Nadbystrzycka 38 D, tel. (48-81) 538-11-00, fax: (48-81) 532-26-12, e-mail: tul@rekt.pol.lublin.pl

Professor Tadeusz JANOWSKI
Director of the Institute
of Electrical Engineering and Electrotechnologies
Faculty of Electrical Enginerring

Dear Professor Janowski,

It is my great pleasure to express in my personal name as well as on behalf of the whole academic community of Lublin Univesity of Technology our utmost congratulations on the establishment of the Centre of Excellence for the Application of Superconducting and Plasma Technologies in Power Engineering (ASPPECT).

Your vast knowledge, experience, your exceptional position in science as well wide-ranging activities has led to such a magnificent initiative. It required a great commitment and assiduity. I would like to thank you and the staff of the Institute for the engagement that resulted in the establishment of such innovative unit at our university. The operation of the Centre of Excellence creates vast array of opportunities for the cooperation with the European research area in the field of the development of new technologies not only for the research staff of the Institute and the university, but also for Polish researchers in general.

Your authority and creative initiative contribute to the development of our academic center that gains international recognition. We are proud that you belong the academic community of Lublin University of Technology and offer your intellectual potential and vital pragmatism.

Please accept my very best wishes for health and delight as well as further creative achievements that are great contributions to both our university, region and our country.

Faithfully Yours

Professor Józef Kuczmaszewski, Ph.D., Dsc.

Lublin, 6 September 2002.

POLITECHNIKA LUBELSKA
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Szanowny Pan
Prof. dr hab. inż. Tadeusz JANOWSKI
Dyrektor Instytutu
Podstaw Elektrotechniki i Elektrotechnologii
Wydzial Elektryczny

Szanowny Panie Profesorze,

W imieniu społeczności akademickiej oraz własnym, składam Panu oraz pracownikom Instytutu serdeczne gratulacje z okazji utworzenia Centrum Doskonałości Zastosowań Technologii Nadprzewodnikowych i Plazmowych w Energetyce (ASPPECT).

Rozległa wiedza, doświadczenie, wyjątkowa pozycja w świecie nauki oraz wszechstronna działalność Pana Profesora, urzeczywistniły się w postaci wspaniałej inicjatywy. Wymagała ona wielkiego zaangażowania i wytrwałości. Dziękuję Panu oraz całemu zespołowi za niestrudzoną pracę na rzecz powołania tak innowacyjnej jednostki w naszej uczelni. Funkcjonowanie Centrum stwarza dla pracowników nauki z Instytutu i Politechniki, ale i ogólnie dla polskich badaczy, szansę współpracy z pozostałą częścią europejskiego kontynentu w zakresie rozwoju nowych technologii.

Dzięki autorytetowi i niesłabnącej energii inicjuje i wspiera Pan Profesor rozwój naszego ośrodka akademickiego oraz rozsławia go na forum międzynarodowym. Jesteśmy dumni, że należy Pan do społeczności Politechniki Lubelskiej, służąc jej swoją mądrością i życiowym pragmatyzmem.

Proszę przyjąć życzenia zdrowia, ciepła i radości oraz dalszych twórczych dokonań, które przynoszą splendor zarówno naszej uczelni i województwu, jak również naszemu krajowi.

Z wyrazami szacunku

Dr hab. inż. Józef Kuczmaszewski, prof. PL

Lublin, dnia 6 września 2002 r.

ORGANISATION, SCOPE AND PROFILE

1968	Electrical Engineering Group	(5 persons)
1974	Department of Fundamental Electrical Engineering	(15 persons)
1976	Laboratory of Cryomagnets	(4 persons)
1991	Chair of Fundamental Electrical Engineering	(19 persons)
1999	Institute of Electrical Engineering and Electrotechnologies	(21 persons)
2000	PhD Studies	(12 PhD students)
2000	Laboratory of Superconductivity Applications - LSA (Electrical Institute of Warsaw, Polish Academy of Science)	(6 persons)

HUMAN RESOURCES

The Centre comprises staff members with the title of professor, scientists with PhD degree, MSc degree and technicians. Such staff is able to solve targeted problems. 55 research papers are published every year in journals of international circulation. Expert teams composed of dynamic research groups have been delegated to specific activities in order to react to power engineering demands. The efficiency of the actions is enhanced through a mobility scheme of the staff.

STRUCTURE AND STAFF OF THE CENTRE

Director: Professor Tadeusz Janowski, PhD (Eng), DSc
Director-Manager: Henryka Danuta Stryczewska, PhD (Eng), DSc (Assoc. Prof.)

Laboratory assistant: Włodzimierz Janowski, MSc (Eng)
Office of the Institute: Renata Gałat, MA
Anna Machulska-Bartoszek, MSc (Eng)

Division of Electrical Engineering:

Head: Andrzej Wac-Włodarczyk, PhD (Eng), DSc (Assoc. Prof)
Ryszard Goleman, PhD (Eng)
Bolesław Horyński, PhD (Eng)
Paweł Mazurek, MSc (Eng)
Tomasz Giżewski, MSc (Eng)
Czesław Malik, technician

Division of Electrotechnology:

Head: Zbigniew Złonkiewicz, PhD (Eng)
Prof. Tadeusz Janowski, PhD (Eng), DSc
Kazimierz Bodziak, PhD (Eng)
Krzysztof Nalewaj, PhD (Eng)
Michał Łanczont, MSc (Eng)
Gustaw Świerczyński, MSc (Eng)

Division of Computer Techniques in Electrical Engineering:

Head: Henryka Danuta Stryczewska, PhD (Eng), DSc (Assoc. Prof.)
Elżbieta Ratajewicz-Mikołajczak, PhD (Eng)
Paweł Surdacki, PhD (Eng)
Leszek Jaroszyński, PhD (Eng)
Dariusz Czerwiński, PhD (Eng)
Grzegorz Komarzyniec, MSc (Eng)
Jarosław Diatczyk, MSc (Eng)
Jacek Dominiak, technician

Laboratory of Applied Superconductivity

Head: Prof. Tadeusz Janowski, PhD (Eng), DSc
Sławomir Kozak, PhD (Eng)
Henryk Malinowski, PhD
Beata Kondratowicz-Kucewicz, MSc (Eng)
Grzegorz Wojtasiewicz, MSc (Eng)
Janusz Kozak, MSc (Eng)

Staff of Centre of Excellence (ASPPECT)

QUALITY

The Centre of Excellence ASPPECT is the leading research unit in the field of the application of superconductivity in power engineering devices and the application of non-thermal plasma technologies for air cleaning from gaseous pollutants. The Centre's scope of operations is focused on

fundamental and basic research and transfer of the accumulated knowledge to the education process. Comprehensive and interdisciplinary system of basic studies is addressed to important problems of electrical engineering. The modes of investigation contain both experimental and theoretical approach, including substantial effort on elaborating new methods of investigation in particular in the field of superconducting and plasma technologies. The result activities of the staff are scientific publications and over 20 patents and copyrights. Modern technologies are presented to the engineers and managers from power engineering sector and disseminated to the society. In the last several years, these activities have resulted in the creation of a modern research unit, equipped in line with world standards and able to serve as a focal point of expertise in up-to date techniques of the application of superconducting and plasma technologies in power engineering.

RESEARCH FOCUS OF THE CENTRE

Interdisciplinary system of basic and advanced research addressed to important problems of electrical engineering is one of the main scopes of the Centre. The modes of investigation contain both the experimental and theoretical approach, including a substantial effort to elaborating theoretical bases of the design and exploitation of superconducting and plasma devices applied to the production, transmission and distribution of energy.

The Centre plays an increasingly important role in the development of new technologies, and modern methods applied in power engineering. Superconducting and plasma technologies belong to the recent achievements in the applied research, known as 21 century technologies, and the Centre has taken part in developing this research and is well prepared for their implementation in industry and in particular in power engineering.

The research activities of ASPPECT also aim at supporting modernisation of Polish industry and engineering sector by promoting new more economical and safe technologies for application in power engineering.

The staff of the Centre is very active and successful in applying for and getting research funds granted in open national competitions by the State Committee for Scientific Research in Warsaw as well as funds of EU research programmes.

The major research and development areas carried out at the Institute of Electrical Engineering and Electrotechnologies are as follows:

- **Superconductivity Application**:
  - superconducting magnets, their design, construction and application in magnetic separation,
  - filtering,
  - superconducting fault current limiters,
  - magnetic OGMS separators,
  - superconducting magnetic energy storage systems (SMES).
- **Plasma Technologies in Environment Protection**:
  - supply systems of ozone generators,
  - plasma reactors to remove gaseous pollutants from the air,
  - electrical supply systems for ozonizer and plasma reactors.
- **Non-linear Circuits with Magnetic Elements:**
  - magnetic multipliers,
  - hybrid systems of frequency conversion,
  - inductive motors with the synchronous speed of 9000 rpm/min.

- **Electromagnetic Field:**
  - inductive heating,
  - conventional separators,
  - coupled field calculations.
- **Electromagnetic Compatibility:**
  - electromagnetic field influence on living organisms,
  - shielded chambers for electromagnetic measurements,
  - monitoring of electromagnetic interferences.
- **Soft Magnetic Materials, Their Applications in Power Devices and Electronics**
- **Energy-saving Electromagnetic Technologies for Environment and Health Protection**
- **Renewable Energy Sources.**

LABORATORIES AND TEST STANDS

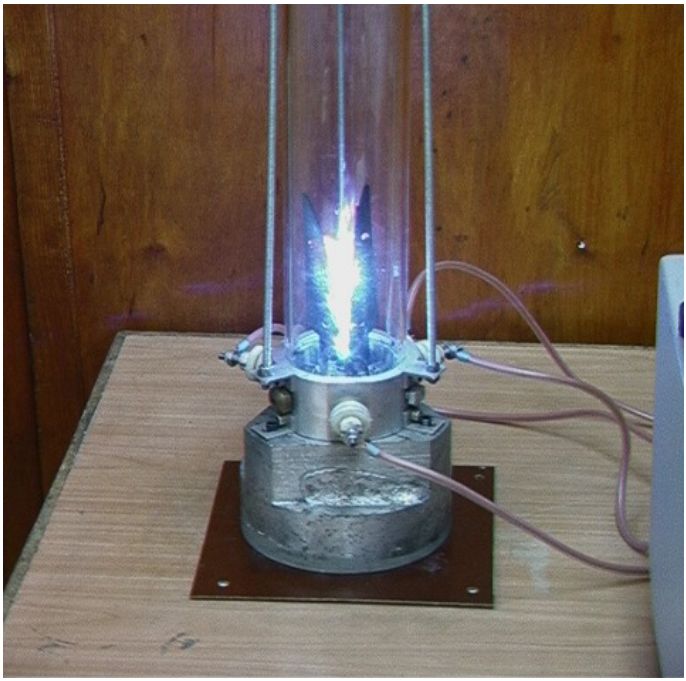
The Centre of Excellence for the Application of Superconducting and Plasma Technologies (ASPPECT) has a wide range of facilities within its laboratories:

1. **Plasma Laboratory**
2. **Laboratory of Cryoelectromagnets**
3. **Laboratory of Circuits and Field Theory**
4. **Laboratory of Electrothermy and Electrotechnologies**

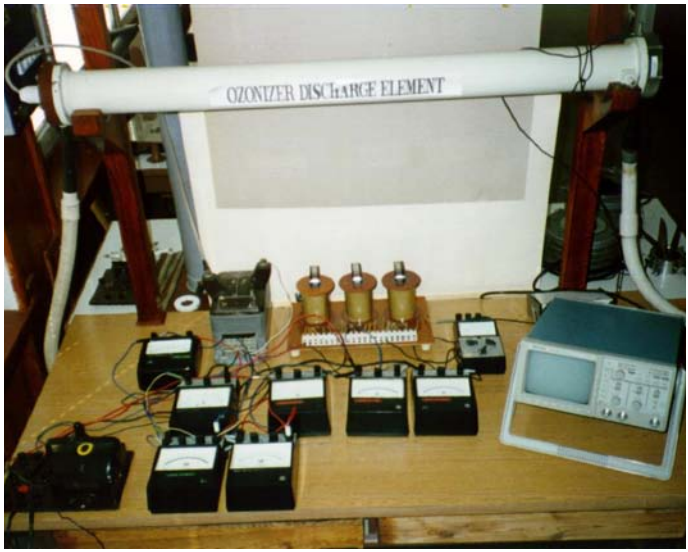
5. Computer Laboratories

TEST STANDS

- ***Stand for the investigation of the discharge in non-thermal plasma generators and ozone processes as well as the plasma methods applied for air cleaning***



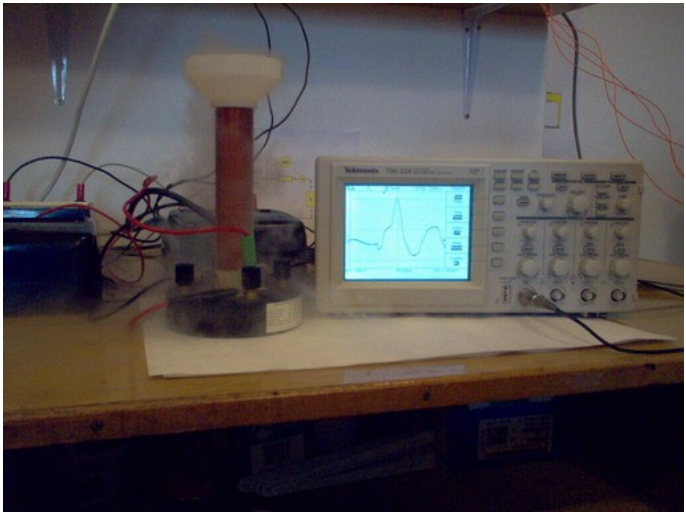
Plasma reactor



Ozonizer

- ***Stand for superconductors' testing:***

Superconducting Levitation Disc



Test stand for investigation of inductive Superconducting Fault Current Limiter

Test stand for investigation of resistive Superconducting Fault Current Limiter

Superconducting electromagnets cooled by cryocooler

Laboratory of circuits and field theory

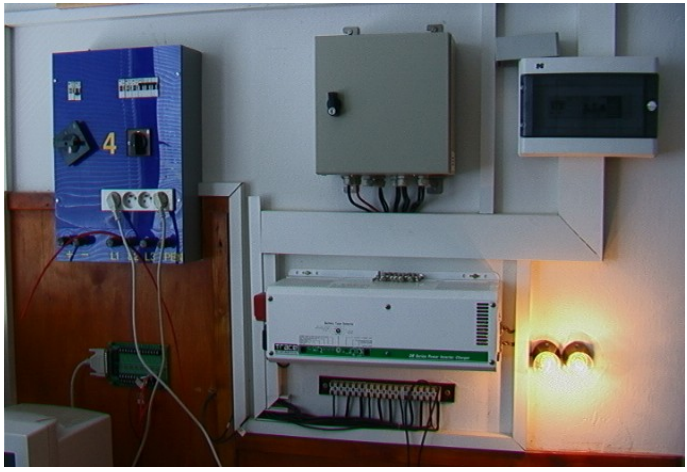
- ***Electromagnetic and acoustic shielded chamber to investigate the disturbances and electromagnetic compatibility:***

Electromagnetic and acoustic shielded chamber (size: 2,5 m x 2,6 m x 2,0 m)
Analyser Bruel & Kjaer 2144, sound measuring meter FALCON 2669,
disturbance measuring meter EM

- ***Stand for inductive heating*:**

Generators of 8 kHz 56 kW (750 – 380) V (106 – 212) A

- ***Stand for solar energy:***



Accumulator station and control-measuring system in the laboratory

Solar battery of 6m^2 located on the roof of the building

Computer Laboratory

ACHIEVEMENTS

Major achievements are as follows:

- Elaboration of theoretical bases for the designing of magnetic frequency multipliers.
  Construction of the feeder with the increased frequency of electrovortexes for the companies in Chodaków and in Grodzisk Wielkopolski.
  Patents no: PRL 98763, PRL 136124, PRL 98711

- Elaboration and implementation of triple-phase inductors for heating matrixes for drop forging dies and steel foundry moulds applied in many metallurgic factories. (Nisko, PZL Świdnik, Kuźnia Jawor)
  Patents no: PRL 103915, PRL 120077

- Construction of the integrated supply systems for plasma reactors for the neutralization of gaseous pollutants emitted to the atmosphere. Portable supply system and the reactors investigating the efficiency of plasma methods applied to the destruction of toxic pollution.
  Patents no: 172170, PL 172152, PL 180063

- Construction of the models of superconducting OGMS deflecting separators for magnetic separation of ferromagnetic and paramagnetic water pollution.

- Construction of the stand to investigate the properties of superconducting materials and devices operating at temperature from 3.5 to 300 K.

- Construction and investigation of the models of inductive and resistive superconducting fault current limiters.

ACTIVITIES OF THE CENTRE OF EXCELLENCE

Centre of Excellence for the Application of Superconducting and Plasma Technologies in Power Engineering offers a wide range of activities run throughout the year. They combine basic and applied activities related to the application of superconducting and plasma technologies in power engineering.

Thematic Conferences

The Institute of Electrical Engineering and Electrotechnologies organises the International Conference "**Electromagnetic Devices and Processes in Environement Protection" – ELMECO**. This conference aims at knowledge exchange in the field of superconducting and plasma technologies. The first conference ELMECO was organized in 1994 and since that time it is held every three years. The purpose of the Conference is to gather some recently developed and new aspects of electromagnetic applications in environment protection. The Conference is focused on knowledge exchange in the field of electromagnetic devices and processes in environment protection and it promotes industrial applications related to the subject.

ELMECO-4 Conference participants

Conference oral session

Conference oral session

Conference poster session

The conference gathers remarkable scientists from many countries dealing with the following issues:

- low-temperature plasma to neutralise toxic gases,
- ozone generators and water conditioning,
- production of energy by the application of environment-friendly technologies,
- electrofilters,
- environment-friendly superconducting devices,
- magnetic separation,
- the influence of electromagnetic fields on living organisms,
- electromagnetic compatibility,
- monitoring in the environment protection,
- magnetic water treatment,
- computer aided designing of devices in environment protection,
- the influence of acoustic noise and vibration on human beings,
- other related subjects.

Seminars

The Institute runs seminars **"The application of superconductors"** in response to rapid development in this area. The researchers from Poland and several specialists from the leading EU centres have attended these seminars. The seminars enable to establish new contacts between scientists involved in superconducting technology.

Workshops

The Centre offers the following workshops run throughout the year: **"Superconducting and Plasma Technologies"** and **"The Application of Superconductors"**. Their scope comprises magnetic separation of para-magnetic and ferro-magnetic contaminants of water, plasma methods applied for the reduction of gaseous pollutants emitted during industrial processes, the application of the ozone for water purification technologies, superconducting technologies applied in water purification.




ELMECO 2003 Workshop


Workshop “The Application of Superconductors”

PhD Studies

The Centre offers PhD studies in the field of electrical engineering. The curricula of PhD studies have been modified by the implementation of the latest research in the field of the application of superconducting and plasma technologies in power engineering. This goal has been achieved through inviting experts from the leading Centres of the European Union.


Seminar of PhD students

Postgraduate Studies

Postgraduate studies have been designed for various purposes, such as training for students wishing to change discipline, upgrading knowledge

within a discipline and preparing for future employment in industry in the field related to the technologies applied in power engineering.

Final examination – Examination Board and Graduates

Summer Courses

The Centre offers a variety of courses for different audiences - ranging from students, graduates, PhD students, through to the industrial sector. The aim is to provide the participants with the skills necessary for dealing with superconducting and plasma technologies, with the emphasis on the practical application.

SCIENTIFIC COOPERATION

The Centre of Excellence ASPPECT cooperates in the field of superconducting and plasma technologies with the following institutions:

- Electrotechnical Institute in Warsaw,
- Electrotechnical Institute in Wrocław,
- Warsaw University of Technology,
- Technical University of Łódź,
- Poznań University of Technology,
- Industrial Chemistry Research Institute, Warsaw,
- The Szewalski Institute of Fluid-Flow Machinery, Polish Academy of Sciences, Gdańsk.

The cooperation with foreign partners has a longstanding tradition. The Centre has active connections to institutions in United Kingdom, France, Germany, Japan, Finland, the Netherlands, Russia, Slovakia, Czech Republic, Ukraine. The researchers of the Centre participated in scientific networks supported by the European Community – coordination of 3 Tempus Projects in the period of 1990-1999.

The Centre currently deeply cooperated with the following foreign institutions:

- Cardiff University, Wolfson Centre of Magnetic Technology, UK – cooperation since 1985, cooperation agreement since 1986 (Prof. A. J. Moses).
- South Bank University, London, UK – since 1994 (Prof. B. Bridge, Dr G. Shirokoohi).
- University of Southampton; UK – (Prof. J. Sykulski).
- University of Orlean; France – (Prof. A. Czernichowski, J.M. Cormier).
- Ernst-Moritz-Arndt University, Greifswald, Germany (Dr H. Wagner).
- Kanazawa University, Japan (Prof. S. Yamada).
- Saga University, Japan (Prof. Ch. Yamabe).
- Tampere University of Technology, Finland (Dr R. Mikkonen).
- University of Twente, the Netherlands (Dr B. ten Haken).
- CERN, Switzerland,

- United Institute of Nuclear Research, Russia (Prof. W. Datskov).
- Technical University of Bratislava, Slovakia (Prof. J. Slama).
- University of Brno, Czech Republic (Prof. J. Janca).
- Ukrainian Academy of Science, Ukraine (Prof. W. Wołkow).
- Technical University of Lviv, Ukraine (Prof. P. Stakhiv).

COOPERATION WITH INDUSTRIAL PARTNERS

The staff engaged in the Centre's activity has a longstanding experience in mutual cooperation and collaboration with industrial partners. Such cooperation led to the realization of a great number of mutual research and implementation projects, expertise, studies, training of considerable economic profits. The Centre has been established to facilitate innovation and technology transfer towards industry. It plays an increasingly important role in the development of new technologies, as well as the development of modern methods applied in power engineering. The Centre is renowned for its research and development service for industry. The staff has extensive technical expertise and experience of working with industry. It provides research, development, education and training related to the application of superconducting and plasma technologies in power engineering and has an established record of local and national industrial collaboration. The Centre of

Excellence ASPPECT responses to various demands from power engineering industry.

EDUCATION, COURSES, DEGREES AND TITLES

1. Full-time graduate studies (5 years)

- Electrical Engineering Course – theoretical electrical engineering
- Applied Computer Engineering – Theory of Circuits and Signals:
- Electrical engineering, course: electrical power engineering

- Electromagnetic devices and technologies in environment protection since 1992 (TEMPUS)
- Electrical energy conversion and utilisation

2. Full-time undergraduate studies (3,5 years)

2 courses:

- Electromagnetic devices and technologies (introduced in 1997 with the support of TEMPUS Programme, great majority of subjects and diploma courses conducted by ASPPECT staff)
- Information Technology in Electrical Engineering (selected subjects carried out by Department of Computer Science)

3. Extramural undergraduate studies (1,5 years)

Courses:

- Theoretical Electrical Engineering
- Electric Heating Engineering
- Electrotechnologies

3. PhD studies (4 years)

- Theory of Electrical Engineering

4. Post-graduate studies

- Information Technology (1 year)

DETAILED SCHEDULE OF THE LABORATORY MODULES CARRIED OUT BY THE STAFF OF THE CENTRE

Theoretical Electrical Engineering I

No	*Subject*
1	Electric circuit elements
2	Electric signals
3	Linear circuits of direct current
4	Non-linear circuits of direct current
5	Magnetic circuits
6	Circuits with RLC elements
7	Power in sine current circuits
8	Basic issues of three-phase circuits
9	Three-phase circuits operation
10	Power of three-phase circuits

11	Resonance in electric circuits
12	Coupled magnetic circuits
13	Parameters of the equivalent circuit diagram for the single-phase transformer

Theoretical Electrical Engineering II

No	*Subject*
1	Four-terminal networks
2	Frequency filters
3	Alternating current circuits with ferromagnetic elements
4	Magnetic amplifier
5	Magnetic frequency multipliers
6	Non-linear circuits with rectifiers
7	Harmonics analysers
8	Non-stationary states in circuits with RC elements
9	Relaxation oscillations
10	RLC circuit in non-stationary state
11	Long line model
12	Power in the conditions of distorted current and voltages
13	The analysis of passive two-terminals

Theoretical Electrical Engineering III

No	*Subject*
1	Investigation of electromagnetic field of cylindrical coil
2	Investigation of electromagnetic field of cylindrical coil with the conductive core
3	Planar field modelling on electro-conductive paper
4	Planar field modelling on electro-conductive paper – computer simulation
5	Measurement of basic quantities in electromagnetic field
6	Investigation of cylindrical systems
7	Magnetic field and power loss in steel wall

Techniques and Plasma Reactors

No	*Subject*
1	Investigation of ozonizers
2	Electrofilters
3	Magnetic separation
4	Magnetic water treatment
5	Investigation of GlidArc Plasma Reactor

Computer Modelling in Electrical Engineering

No	*Subject*
1	The analysis of electrostatic field distribution in the systems of the axial symmetry. Determination of the field distribution in laminar system (design of the bushing insulator, condenser bushing insulator).
2	The analysis of flow field distribution in dielectric of the planar and cylindrical condenser. Examination of current density distribution and power losses in variable section conductor. Determination of the earth electrode field (design of the earth electrode).
3	Magnetostatic field. Determination of the magnetic field of the air-core coil (design of the cylindrical coil). Determination of the magnetic field of the coil with non-linear core. Examination of the distribution of the magnetic field in coaxial cable. Magnetostatic shielding (shield design).
4	Variable magnetic field. Examination of the phenomena of the skin and closing effect. Determination of the magnetic field distribution of current density in the rotor's slot of the asynchronous motor.
5	The analysis of non-stationary state in RLC circuits.
6	Determination of the input and output characteristics for the transistors and integrated circuits.
7	Designing of the amplifiers and electronic generators systems.

Electromagnetic Processes and Devices in Environment Protection

No	*Subject*
1	Investigation of the supply system of GlidArc plasma reactor

2	Investigation of electrofilter
3	Investigation of ozone generator characteristics
4	Investigation of the supply systems of ozone generators
5	Magnetic water treatment systems

Electromagnetic Compatibility

No	*Subject*
1	Investigation of shielding effectiveness of electric and magnetic shields
2	The analysis of electric field distribution and magnetic field generated by microwave devices
3	Investigation of EM field around resistance chamber furnace and inductive heater
4	Investigation of electromagnetic susceptibility on electromagnetic interferences
5	The analysis of electromagnetic coupling in aspect of EMC of electronic and electric devices
6	The analysis of conducted interferences in supply circuits of electric devices
7	Investigation of the influence of the material and the geometry of common mode and differential mode chokes on insertion loss

Renewable Energy

No	*Subject*
1	Investigation of heat pump model
2	The analysis of OW 120 PC heat pump operation
3	Determination of characteristics of outer photovoltaic system 450 W at different solar conditions
4	Measurement of electric and thermal values of PV system connected to the computer
5	Simulation of PV system operation with the application of PSpice
6	Simulation of solar system operating with the network

Visual Programming

No	*Subject*
1	Object-oriented programming
2	Properties of variables in visual programming
3	Communication between visual components
4	Implementation of algorithms in visual components
5	Definition of basic functions for visual components
6	Visual application project

Electromagnetic and Acoustic Interferences

No	*Subject*
1	Apparatus and methods of interference measurements
2	Measurements of audibility threshold
3	Determination of equal level of loudness
4	Determination of sound height
5	Investigation of vibration
6	Investigation of interferences induced by electric field
7	Digitally controlled acoustic filter
8	Determination of materials acoustic insulating power
9	Investigation of interferences induced by magnetic field
10	Investigation of interferences induced by electromagnetic field

Electrothermal Processes

No	*Subject*
1	Modelling of thermal losses on RC model
2	Determination of thermal losses in resistance-chamber furnace
3	Thermal issues in inductive heating systems
4	Investigation of the resistance heater
5	Investigation of channel-type induction furnace model
6	Investigation of inductive heating systems with transverse magnetic field
7	Determination of arc furnace characteristics
8	Investigation of inductive system of 8000 Hz

9	Modelling of inductive heating systems
10	Investigation of reactive power compensation in inductive systems

Postgraduate Studies

No	*Subject*
1	Unix Operating System
2	Windows/Novell Operating System
3	Programming of Numerical Methods
4	Modelling of Dynamic Systems
5	World Wide Web Site Designing
6	Engineering Graphics
7	Computer Aided Calculation
8	Computer Processing of Signals
9	Data Bases
10	Data Bases Designing
11	Structured Query Language

SCIENTIFIC PAPERS OF ASPPECT STAFF RELEASED IN 2003

1. Kozak S., Janowski T.: ***„Physical and Numerical Models of Superconducting Fault Current Limiters"*** IEEE Transactions on Applied Superconductivity, June 2003 vol. 13, no. 2, pp. 2068-2071

2. Janowski T., Kozak S., Malinowski H., Wojtasiewicz G., Kondratowicz-Kucewicz B., Kozak J.: ***„Properties Comparison of Superconducting Fault Current Limiters with Closed and Open***

Core" IEEE Transactions on Applied Superconductivity, June 2003 vol. 13, no. 2, pp. 2072-2075

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