

## **DEPARTMENT OF PHYSICS**

### **1. General Information**

The Department of Physics teaches General Physics to students of all faculties of the University and Advanced Physics for some special courses. The Department provides the students with the basic understanding of physics, training them in applying the principles of physics to various engineering problems as well as giving the students a review of modern physics.

The department is divided into three sections according to their research and educational specialisation and an additional one, which has special tasks to support the research activities of the Department. The staff consists of 1 professor, 9 associate professors, 15 senior lecturers, 2 lecturers, 3 research fellows, 10 technicians and administrative support.

Traditionally, the research carried out at the department is mostly concerned with the utilization of ultrasonic methods for the investigation of condensed matter. Currently a wide range of ultrasonic techniques is used to investigate semiconductors, metals and ferroelectric materials as well as new ultrasonic techniques are developed. The Department also contains one group working on optical fibres, which are used in communication links, and some research work has been done on the x-ray diffraction analysis of thin layers. In last years the research programme was extended to theoretical high-energy physics phenomenology of strong electroweak symmetry breaking.

The research groups of the Department are also well known abroad. The scientific activities of the Department are regularly presented at the international conferences and are published in significant physical journals.

In accordance with their qualifications the members of the staff participate in different educational, scientific and management activities beyond the framework of the department and the University, especially on various scientific boards of both domestic and international institutions. There are also many activities directed to advancing the education of physics teachers working in secondary schools and to the organisation of Physics Olympiads in order to prepare young people for national and international competitions.

### **2. Staff of the Department**

Head of the Department	:	Igor Jamnický, Assoc. Prof. PhD.
Subhead of the Department	:	Peter Bury, Prof., PhD.
Secretary for Education	:	Čtibor Musil, PhD.
Administrative support	:	Anna Chasníková, Naďa Remencová, Juraj Remenec, Viliam Tavač,

#### **2.1. Sections of the Department:**

##### **2.1.1 Section of General Physics**

Head of the section	:	Juraj Bracíník
Associate professors	:	Juraj Bracíník,
Research fellows	:	Mikuláš Gintner, Ivan Melo
Senior lecturers	:	Anna Bracíníková, Ján Demko, Milan Krkoška, Ivan Pavlus, Terézia Štrbová, Igor Varga
Lecturers	:	Vladimír Žucha, Gabriela Gaňová

##### **2.1.2. Section of Acoustics**

Head of the section	:	Drahoslav Vajda
Professor	:	Peter Bury
Associate professors	:	Igor Jamnický, Sofia Slabeyciusová Jozef Kejst
Senior lecturers	:	Ivan Bellan. Peter Hockicko, Július Štelina, Ladislav Vikisály

Lecturers : Andrea Hanuliaková

**2.1.3. Section of Applied Physics**

Head of the section : Ivan Turek  
 Associate professors : Ivan Turek, Quido Jackuliak, Július Štelina  
 Senior lecturers : Ctibor Musil, Ivan Bellan, Karol Grondžák, Ivan Martinček,  
 Beáta Trpišová  
 Postgraduate students : Norbert Tarjanyi :

**2.1.4. Section for Research Activities Support**

Head of the section : Jaroslav Kovár  
 Research fellows : Ján Vančo (1/2)  
 Technical staff : František Černobila, Elena Pechancová, Ján Gažo (1/2),  
 Milan Obrcian, Ľudovít Trháč

**2.1.5. Postgraduate Students**

: Karol Grondžák, Peter Hockicko, Ivan Martinček,  
 Jozef Štelina, Norbert Tarjanyi

**3. Teaching**

**3.1. Courses in Bachelor and Master Degree Programmes**

Lessons-Seminars-Lab.exercises

Code	Title	Semester	hours/week	Teachers
<b>Courses for the Faculty of Electrical Engineering</b>				
31070	Physics I	2	3 - 2 - 1	Bracíník, Bury
31047	Physics II	3	4 - 1 - 1	Bracíník, Bury
31059	Semiconductor Physics	4	4 - 0 - 0	Bracíník
31101	Introduction to Physics	1	2 - 0 - 0	Krkoška
31023	Computer Modelling of the Real Processes	3	1 - 0 - 2	Grondžák
31080	Introduction to Physics II	2	0 - 2 - 0	Kejst, Bracíník
31081	Seminar on Semiconductors	4	0 - 2 - 0	Bracíník
31602	Physical Principles of Optoelectronics	6	2 - 1 - 0	Turek, Štelina
32236	Optoelectronics	5	2 - 0 - 2	Štelina, Turek
31688	Principles of Modern Acoustics	7	3 - 1 - 0	Baják,
32201	Physics	1	3 - 2 - 1	Musil
31007	Analysis of Quantities and Processes	2	0 - 2 - 0	Pavlus
31099	Wave processes	4	2 - 0 - 2	Čáp
32008	Seminar on Physics	1	0 - 2 - 0	Musil
32002	Electrophysics	1	3 - 2 - 1	Musil
<b>Courses of the Faculty of Mechanical Engineering</b>				
21950	Introduction to Physics	1	1 - 1 - 0	Jackuliak
21008	Physics I	2	3 - 2 - 0	Vajda, Slabeyciusová
21013	Physics II	3	3 - 0 - 2	Vajda, Jackuliak
22002	Technical Physics	1	2 - 2 - 0	Vikisály
21685	Technical Optics	8	2 - 1 - 1	Turek
<b>External Study</b>			hours/sem	
26007	Physics I	2	20 - 6 - 0	Slabeyciusová

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26011	Physics II	3	24 - 6 - 0	Jackuliak
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***Courses of the Faculty of Civil Engineering***

41030	Introduction to Physics I	1	0 - 2 - 0	Slabeyciusová
41031	Introduction to Physics II	2	0 - 2 - 0	Varga
41011	Physics II	2	2 - 0 - 2	Jackuliak, Kejst
41093	Physics I	1	2 - 2 - 0	Štelina
42351	Introduction to physics	1	0 - 2 - 0	Slabeyciusová
42303	Physics	1	2 - 1 - 1	Slabeyciusová

**EXTERNAL STUDY**

46095	Physics I.	1	10 - 6 - 0	Krkoška
46008	Physics II.	2	10 - 6 - 0	Krkoška

***Courses of the Faculty of Operation and Economics of Transport and Communication***

11031	Introduction to Physics	1	1 - 1 - 0	Martinček
11010	Physics	2	3 - 1 - 2	Jamnický, Štelina, Martinček
	Physics	1	2 - 2 - 0	Vikisály

***External Study***

			hours/sem.	
16032	Physics I	2	24 - 4 - 0	Bury
16022	Physics II	3	24 - 2 - 0	Bury

***Courses of the Faculty of Management Science and Informatics***

P403	Fundamentals of physics	3	3 - 1 - 1	Jamnický, Pavlus, Vikisály
P311	Physics I	1	4 - 1 - 1	Kejst
P412	Physics II	3	4 - 1 - 1	Kest
A512	Fundamentals of Analytic and Quantum Physics	5	3 - 1 - 0	Bracíník

***Courses of the Faculty of Special Engineering***

			hours/sem	
61507	Physics	2	24 - 0 - 42	Kovár
61507	Physics	2	24 - 0 - 0	Kovár
66323	Physics	1	2 - 1 - 14	Kovár
61306	Physics	1	18 - 0 - 0	Kovár

***Courses of the Faculty of Natural Sciences***

61005	General Physics I	1	4 - 2 - 0	Bracíník, Melo
61058	General Physics IV	4	3 - 2 - 0	Gintner, Melo
61061	Physics Processes Modeling	4	0 - 2 - 0	Jamnický, Grondžák
61059	Computer Physics Methods	6	2 - 0 - 2	Grondžák

**4. Research Projects**

**4.1. Internal Projects**

***Title: Investigation of Nonlinear Optical and Acoustooptical Phenomena in selected Materials (Ef-A-023/00)***

Coordinator: Július Štelina

Cooperators: Juraj Braciník, Ivo Čáp, (DAS – FS), Klára Čápková (DTAE), Dagmar Faktorová (DTAE), Karol Grondžák, Jozef Kejst, Quido Jackuliak, Ctibor Musil, Norbert Tarjanyi, Ivan Turek

***Title: Ultrasonic Investigation of Phase Transitions and Non-linear Phenomena in Dielectrics***

Coordinator: Drahoslav Vajda

Cooperators: Jaroslav Kovár, Ladislav Vikisály,

***Title: To find new methods of measurement of optical fiber parameters***

Coordinator: Ivan Turek

Cooperator: Ivan Martinček, Karol Grondžák

***Title: Study of Physical Properties of Materials Perspective for Electrotechnics Using Acoustic Methods***

Coordinator: Peter Bury

Cooperators: Ivan Baják, Igor Jamnický, Peter Hockicko

***Title: Study of dynamic electroweak symmetry breaking (Grant VEGA 1/6045/99)***

Coordinator: Mikuláš Gintner

Cooperator: Ivan Melo

***Title: Study of Physical Properties of Materials Using of Acoustic Microscopy Methods***

Coordinator: Sofia Slabeyciusová

Cooperators: Ivan Turek, Igor Jamnický, Karol Grondžák, Milan Krkoška

## **4.2. Research Projects funded by the Science & Education Grant Agency of the Slovak Republic**

***Title: Utilization of Acoustic Microscopy for Nondestructive Testing of Materials (Grant VEGA 1/6072/99)***

Coordinator: Sofia Slabeyciusová

Cooperators: Ivan Turek, Igor Jamnický, Peter Palček, Karol Grondžák, Milan Krkoška

***Title: Phenomenological Studies of the Role of the Top Quark in the Strong Electroweak Symmetry Breaking (Grant VEGA 1/8307/01)***

Coordinator: Mikuláš Gintner

Cooperator: Ivan Melo

***Title: Study of Physical Properties of Prospective Materials Using Acoustic Methods (Grant VEGA 1/8308/01)***

Coordinator: Peter Bury  
Cooperators: Igor Jamnický, Peter Hockicko

***Title: Examination of Self – Diffraction in Magnetic Fluids. (Project is a part of the programme: Study of Physical Parameters of Complex Systems with Fine Magnetic Particles)***

Coordinator: Ivan Turek  
Cooperators: Július Štelina, Ctibor Musil

## 4.3 International Projects

***Title: Measurement Technique for Active and Passive Fibres to Support Future Telecommunication Standardisation (COST-265)***

Coordinator: Milan Dado (DT)  
Cooperators: Ivan Turek, Karol Grondžák, Ivan Martinček

## 5. Cooperation

### 5.1. Cooperation in Slovakia:

- Department of Physics, Faculty of Electrical Engineering and Information Technology , Slovak University of Technology in Bratislava
- Departments of Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava
- Department of Physical Engineering, Faculty of Industrial Technology, Trenčín University, Púchov
- Department of Physics, Military Academy, Liptovský Mikuláš
- ATLAS group, Institute of Experimental Physics, Slovak Academy of Science, Košice,
- Virtual Collaboration, University of P.J. Šafarik, Košice
- Institute of Experimental Physics , Slovak Academy of Science, Košice,

### 5.2. International cooperation

- Institute of Biochemical Physics, RAS, Moscow
- Škoda – Research, Prague
- Department of Physics, Nottingham University
- ÚRE Prague
- Institute of Experimental Physics Science, Czech Academy, Prague
- Columbia University , New York

#### 5.2.1. Visits to Foreign Institutions:

Sofia Slabeyciusová	- Institute of Thermomechanics, Czech Academy of Science, Prague, 2 days, - IFW Dresden, Section Surface Dynamics Group, 1 day - University of Roma, 7 days
Ivan Melo	- Vienna University, Austria, 2 days, Cern, Geneva - 9 days, - University of Dubrovnik, Croatia, 12 days
Mikuláš Gintner	- Vienna University, Austria, 2 days, Cern, Geneva - 9 days,

Norbert Tarjanyi	- University of Linkoping, 6 months
Peter Bury	- University of Roma, 7 days
Igor Jamnický	- Department of Physics, Faculty of Electrical Engineering and Information Technology, Brno, 2 days

## 6. Other activities

### 6.1 Conferences and Workshops Organized by the Department

- 8<sup>th</sup> Optical Workshop, July 2001, Žilina
- Virtual Workshop, July 2001, Žilina

### 6.2 Special Lectures, Courses provided by the Department

Dr. Ivan Melo.: Lecture "Latest Development in Cosmology" at "Vanovičove dni" pedagogical conference, July 2, 2001, Žilina

Dr. Ivan Melo: Seminar at „Nitra Physics Days“, Oct 29, 2001, Nitra

Dr. Ivan Melo: Seminar at P.J. Šafarik University, Nov 21, 2001, Košice

Dr. Mikuláš Gintner.: „Mass without Mass“, Seminar at Matej Bel University, Banská Bystrica

Dr. Miroslav Kocifaj, SAS Bratislava: „Scattering of Light“, Jan 12, 2001

Dr. Dušan Bruncko, SAS Košice: „ep Physics at Hera“, Jan 17, 2001

Dr. Quido Jackuliak.: Collection of Problems for Tutorials“, Feb 22, 2001

Dr. Ivan Turek: „What Optical Group is Working on“, Apr 12, 2001

Dr. Sofia Slabeyciusová: „Investigation of Fullerite Composites by Acoustic Microscope“, Apr 25, 2001

Dr. Mikuláš Gintner.: „Mass without Mass“, Jun 7, 2001

Prof. Peter Zvolenský: „Technical Acoustics“, Dec., 2001

Small seminars are organized also within the Acoustics (Dr. Vajda) and the Optical (Dr. Turek) groups at the Physics Department.

Dr. Mikuláš Gintner: Creation of WWW Pages, Dec. 2001

## 7. Publications

### Textbooks:

- [1] Vajda, D., Štelina, J., Kovár, J., Musil, C., Bellan, I., Jamnický, I.: *Physics Laboratory Manual*, EDIS Žilina, 2001

### Journals:

- [2] P. C. Fanin, S. W. Charles, P. Kopčanský, M. Timko, V. Ocelík, M. Konarecká, L. Tomčo, I. Turek, J. Štelina, C. Musil: *A comparative study of determination of ferrofluid particle size by means of rotation Brownian motion and translation Brownian motion*, Czechoslovak Journal of Physics, 51 (2001), 599-608 [in English]
- [3] Turek, D. Káčik, S. Černický: *Bending dependence of cut-off wavelength of optical fibres and their transfer functions*. Fine Mechanics and Optics, 7-8/2001, p. 227 [in English]
- [4] M. Gintner, I. Melo: *Resonances from strongly-interacting electroweak symmetry breaking sector at future  $e^+e^-$  colliders*, Acta Physica Slovaca, 51 (2001) pp. 139-149 [in English]
- [5] I. Melo: *Advances in Math., Physics and Astronomy* 46, No. 2, (2001) p. 89 [in Slovak]
- [6] J. Bracíník, J. Kejst: *Investigation of the Direct Ultrasound Generation on the (100) GaAs Surface*, Works and Studies of the University of Žilina, Electrotechnical Series, Vol.27 (2001), p. 15 [in English]
- [7] V. M. Prokhorov, V.D. Blank, G. A. Dubitsky, V.M. Levin, S. Berezina: *Synthesis  $C_{60}^-$  and  $C_{70}^-$  based polymerized fullerites at high pressures 12 - 15 GPa and elevated temperatures and the comparison studies of their elastic and mechanical properties*. Proc. AIRAPAT HPCC, 2001, Beijing, China [in English]

- [8] J. Bracinič, J. Kejst: *Acoustic Technique for Investigation of The Surface Relaxation Processes in Piezoelectric Semiconductors*, Acta Acoustica (submitted for publication) [in English]
- [9] Q. Jackuliak, P. Šutta: *Influence of Diffuse Scattering from Stark Distorted Thin Intermediate Layer on Profile Analysis of Si Thin Films SiA/ON*. (will be published) [in English]
- [10] D. Vajda, A.B. Sherman: *Attenuation of ultrasonic waves in Z-direction connected with the Fluctuations in  $KH_2PO_4$  crystals above and below Curie temperature*. Works and Studies of the University of Žilina, Electrotechnical Series, Vol.28 (2001), (will be published) [in English]

### Proceedings:

- [11] Martinček, I. Turek, K. Grondžák, K. Černický, D. Káčik, *Relation between intermodal interference and cut-off wavelength of optical fibres*. Proc. 4<sup>th</sup> International Scientific Conference ELEKTRO 2001, p. 63 [in English]
- [12] K. Grondžák, M. Dado: *Determination of propagation characteristics of optical fibres with arbitrary refractive index profile using finite element method*. Proc. 4<sup>th</sup> International Scientific Conference ELEKTRO 2001, p.35 [in English]
- [13] J. Štelina, C. Musil, M. Timko, P. Kopčanský, M. Konarecká, I. Turek: *Determination of diffusion constant of colloidal particles in magnetic fluids*. Proc. 4<sup>th</sup> International Scientific Conference ELEKTRO 2001, p. 51
- [14] Turek, J. Štelina, C. Musil, P. Kopčanský, M. Timko, M. Konarecká, I. Potočová, A. Juríková, L. Tomčo, *Self diffraction of the light in magnetic fluids*. Poster na 11<sup>th</sup> Czech and Slovak Conference on Magnetism Košice, August 2001 (to be published in Czech. J. Phys. 52 (2002) [in English].
- [15] M. Gintner, I. Melo: *Study of resonances from strongly-interacting electroweak symmetry breaking sector at future  $e^+e^-$  colliders*. [in Slovak]
- [16] M. Gintner, I. Melo: *Study of resonances from strongly-interacting electroweak symmetry breaking sector at future  $e^+e^-$  colliders*. In Proc. Eight Adriatic Conference, Dubrovnik, Croatia, 2001. [in English]
- [17] P. Murín et al (M. Gintner, I. Melo): *Virtual Collaboration*, Proc. International Conference „Physics at the end of Millennium“, České Budejovice, The Czech Republik, 2001. [in English]
- [18] P. Murin et al (M. Gintner, I. Melo): *Virtual Collaboration*, Proc. Conference INFOVEK 2001, Bratislava 2001. [in Slovak]
- [19] J. Kejst, J. Bracinič: *New Acoustic Technique for study of the Surface Nonequilibrium Processes in GaAs*. Proc. 4<sup>th</sup> International Scientific Conference ELEKTRO 2001, p.47 [in English]
- [20] J. Štelina, C. Musil, M. Timko, P. Kopčanský, M. Konarecká, L. Tomčo, I. Turek: *Determination of Diffusion Constant of Colloidal Particles in Magnetic Fluids*. Proc. 4<sup>th</sup> International Scientific Conference ELEKTRO 2001, pp. 51-53 [in English]
- [21] P. Bury, P. Hockicko: *Utilisation of Acoustoelectric Effect on Light Beam Generated Interface in High Resistivity Semiconductor for Deep Centres Investigation*, Proc. 12<sup>th</sup> Conference of Slovak Physicists, Smolenice 2001, (will be published) [in Slovak]
- [22] Jamnický, P. Bury, M. Jamnický: *Electrical Properties of Ion Conducting Glasses*, Proc. 4<sup>th</sup> International Scientific Conference ELEKTRO 2001, p. 68 [in English]
- [23] Jamnický, P. Bury, M. Jamnický, P. Hockicko, *Correlation between Electrical and Acoustical Properties of Ion Conductive Glasses*. Proc. 7<sup>th</sup> Int. Workshop on Appl. Phys. of Condensed Matter, Liptovský Mikuláš 2001, p. 89 [in English]
- [24] P. Hockicko, P. Bury, I. Jamnický, M. Jamnický: *Acoustic Behaviour Properties of Ion Conducting Glasses*, Proc. 6<sup>th</sup> International Colloquium „ACOUSTICS'01“, Banská Štiavnica 2001 p. 17 [in Slovak]
- [25] J. Moravec, P. Bury : *Heat Transfer through Sample Wall During Abrasion*, Proc. Scientific Conference „MALLEABILITY – ENVIRONMENT – ECONOMICS“ Žilina 2001, pp. 49-55 [in Slovak]
- [26] P. Bury, P. Hockicko, I. Jamnický: *Photo-Induced Acoustoelectric Effect in High Resistivity Semiconductors – Methods of Deep Centers Investigation*, Proc. 17<sup>th</sup> International Congress on Acoustics, Roma 2001, (will be published) [in English]
- [27] P. Bury, I. Jamnický, M. Jamnický, P. Hockicko: *Acoustic Investigation of Ion Conductive Centers* Proc. 17<sup>th</sup> International Congress on Acoustics, Roma 2001, (will be published) [in English]
- [28] P. Bury, I. Jamnický, J. Bracinič, J. Kejst: *New Acoustic Techniques for Deep Centers Investigation in Bulk and Multilayered Semiconductors*, Proc. Conference NOVÉ TRENDY VE FYZICE Vol. 1., Brno 2001, p. 55 [in English]
- [29] P. Bury, Š. Barta, V. Magula, V. Slugen, T. Šmida: *Ultrasonic Investigation of Plastically Deformed Steel*, Proc. 31<sup>th</sup> International Conference DEFEKTOSKOPIA 2001, Praha 2001, p. 85 [in Slovak]

- [30] S. Berezina, V. Levin V. Prokhorov, V. Blank: *Investigation of Fullerite composites by Acoustic Microscope*, *Zborník z konferencie ELEKTRO 2001*, Žilina 2001 [in English]
- [31] S. Berezina, J. Slabeycius: *Sound Velocity Measurement by Acoustic Microscope with Additional Refraction Surface*, Proc.17 th International Congress on Acoustic, September 2.-7, Roma 2001, CD-II, 4-05, p. 42-43 [in English]
- [32] S. Berezina, V. Levin, V. Prokhorov, V. Blank: *Visualisation of Elastic Heterogeneity of Diamond-Fullerite Composites*, Proc.17 th Int. Congress on Acoustics, September 2.-7, Roma 2001, CD-I, 2-07, p. 4-5 [in English]
- [33] D. Vajda: *Ultrasonic study of the relaxation time of ordering parameter in KDP type Crystals*, Proc. 4<sup>th</sup> International Scientific Conference ELEKTRO 2001, pp. 54-56 [in English]

## 8. Contact Address:

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