University of Szeged

Doctoral School of Physics

training plan

Doctoral training is conducted in Hungarian and English according to the same rules.

Astrophysics and Gravitational Theory (Dr. László Árpád Gergely full professor, DSc)

- *Black holes and gravitational lenses* (Dr. László Árpád Gergely full professor, DSc)
- *Gravitational waves* (Dr. László Árpád Gergely full professor, DSc; Dr. Zoltán Keresztes associate professor, PhD)
- *Eclipsing binary and multiple stellar systems* (Dr. Tamás Borkovits research fellow, DSc; Dr. Barna Imre Bíró research fellow, PhD; Dr. Tibor Hegedüs senior research fellow, PhD)
- *Machine learning methods in astrophysics* (Dr. Gábor Márton senior research fellow, PhD, HUN-REN CSFK)
- *Minor bodies in the Solar System* (Dr. Csaba Kiss scientific advisor, DSc, HUN-REN CSFK)
- *Neutron capture processes in low-mass stars* (Dr. Maria Lugaro scientific advisor, PhD, HUN-REN CSFK)
- *Interactions and dust formation in the vicinity of supernova explosions* (Dr. Tamás Szalai Tamás associate professor, PhD)
- *Application of optical spectroscopy in astrophysics* (Dr. József Vinkó senior research fellow, DSc)
- *Astrophysics of supernovae and explosive transients* (Dr. József Vinkó József senior research fellow, DSc; Dr. Andrea Nagy assistant professor, PhD; Dr. Barnabás Barna assistant professor, PhD)

Knowledge	**Abilities**	**Attitudes**	**Autonomy and responsibility**
Possesses comprehensive knowledge of the overall physical description of Nature and is familiar with the fundamental physical concepts. Has confident know-ledge concerning the most important concepts in related scientific disciplines. Has in-depth, research-level understanding of a specific area within astrophysics or	Capable of independently conducting international-level research within their specific scientific field. Able to present research findings to the professional community both in writing (e.g., scientific articles) and orally (e.g., conference presentations). Can summarize the essence of their research in a way that is comprehensible to non-professionals.	Continuously strives to identify and address open questions within their field of specialization. Demonstrates genuine curiosity and an open-minded attitude, free from prejudice, while evaluating new scientific findings with sound critical thinking based on expertise. Open to exploring new methods and research areas and integrates newly acquired	Demonstrates creative and innovative independence in their professional activities and assumes leadership responsibilities when required. Makes autonomous decisions during their research work, not only regarding the selection of appropriate methods for answering specific questions, but also in defining the questions themselves. Takes full

gravitational theory, including not only established canonical results but also awareness of currently debated issues. Holds methodological knowledge essential for independently conducting research within their specialized field.	Collaborates effectively with colleagues within their own discipline, as well as with professionals from other scientific fields. Competent in designing and executing new research projects.	knowledge into their own research activities. Assesses the professional value of both their own and others' results realistically and empathetically. Seeks and considers the professional arguments of others when forming opinions and decisions.	responsibility for these decisions. Acts as an equal and competent discussion partner when debating professional issues with any representative of their scientific field.

Biophysics (Dr. András Dér scientific advisor, DSc)

- *Light-induced electron- and proton transfer in the reaction centres of photosynthetic bacteria* (Dr. Péter Maróti professor emeritus, DSc; Dr. László Nagy associate professor, PhD)
- *Protein bio-nanotechnology* (Dr. László Nagy associate professor, PhD; Dr. András Dér scientific advisor, DSc; Dr. László Zimányi research professor emeritus, DSc)
- *The biophysics of membrane proteins* (Dr. Tibor Páli scientific advisor, DSc; Dr. László Zimányi research professor emeritus, DSc)
- *Differential polarization laser-scanning microscopy* (Dr. Győző Garab research professor emeritus, DSc; Dr. Gábor Steinbach, research fellow, PhD)
- *Microfluidics* (Dr. Pál Ormos research professor emeritus, member of HAS; Dr. Péter Galajda senior research fellow, PhD; Dr. András Dér scientific advisor, DSc)
- *Optical micromanipulation* (Dr. Pál Ormos research professor emeritus, member of HAS; Dr. Lóránd Kelemen senior research fellow, PhD; Dr. Péter Galajda senior research fellow, PhD)
- *Femtosecond spectroscopy of biological samples* (Dr. Áron Sipos research fellow, PhD; Dr. László Zimányi research professor emeritus, DSc)
- *Macro-organisation and structural stability of photosynthetic membranes* (Dr. Győző Garab research professor emeritus, DSc; Dr. Péter Maróti professor emeritus, DSc)
- *Structure and function of natural and artificial light-harvesting antenna complexes* (Dr. Győző Garab research professor emeritus, DSc; Dr. Péter Maróti professor emeritus, DSc)

Knowledge	**Abilities**	**Attitudes**	**Autonomy and responsibility**
At the 8th level, the deepening and enrichment of knowledge in the subject area of the field is realized by investigating a sub-topic, with the aim of completeness, and by exploring new knowledge and connections.	Ability to make interventions in the field based on facts and evidence, to solve problems systematically and creatively, and to develop new approaches. A degree in the field of training can be awarded to	A solid professional commitment, a constant dedication to finding new paths, and an acceptance of the need for persistent work. A degree in the field of training can be awarded to such a researcher, who	Creative independence, taking the initiative and leadership role (and, if necessary, the role of a discussion partner) during the task. A degree in the field of training can be awarded to such a researcher, who

A degree in the field of training can be awarded to such a researcher, who has the scientific and methodological skills necessary for carrying out independent research in the field. He/she should know and understand the connections and theories of the field, and the conceptual systems and professional nomenclature that build them, at a level necessary for creative application.	such a researcher, who is able to apply and further develop the specific knowledge acquisition and problem-solving methods of the field. Able to independently write professional articles, books, and studies, as well as to plan and implement new projects and work phases.	strives to identify and formulate unexplored, unresolved scientific questions. He/she has a solid professional commitment, accepts the need for persistent work.	takes responsibility for answering ethical questions arising in connection with the theoretical and practical issues of his/her profession. He/she takes on an equal role as a discussion partner with experts in his field of science.

Theoretical and mathematical physics (Dr. Péter Földi full professor, DSc)

- *Interaction of electromagnetic radiation with atomic systems, attosecond physics* (Dr. Mihály Benedict professor emeritus, DSc; Dr. Péter Földi full professor, DSc; Dr. Attila Czirják associate professor, PhD; Dr. Szabolcs Hack research fellow, PhD; Dr. István Magashegyi, senior lecturer, PhD)
- *Quantum theory, quantum optics and quantum information theory* (Dr. Mihály Benedict professor emeritus, DSc; Dr. Péter Földi full professor, DSc; Dr. Attila Czirják associate professor, PhD; Dr. Róbert Trényi senior lecturer, PhD)
- *Physics of atoms, molecules and solids* (Dr. Péter Földi full professor, DSc; Dr. István Magashegyi, senior lecturer, PhD; Dr. Gábor Paragi senior lecturer, PhD)
- *Integrable Hamiltonian systems, classical many-particle models and their symmetry structures* (Dr. László Fehér professor emeritus, DSc)
- *Statistical physics of random- and nonequilibrium systems, critical behaviour in classical and quantum systems* (Dr. Ferenc Iglói professor emeritus, DSc)
- *Numerical investigation of biomolecular systems* (Dr. Ferenc Bogár senior research fellow, PhD; Dr. Gábor Paragi senior lecturer, PhD)
- *Cosmology and dark energy models* (Dr. László Á. Gergely full professor, DSc; Dr. Zoltán Keresztes associate professor, PhD)
- *Research in general relativity* (Dr. László Á. Gergely full professor, DSc; Dr. Zoltán Keresztes associate professor, PhD)
- *Scalar-tensor gravitational theories* (Dr. László Á. Gergely full professor, DSc; Dr. Zoltán Keresztes associate professor, PhD)
- *Theory of gravitational waves* (Dr. László Á. Gergely full professor, DSc; Dr. Zoltán Keresztes associate professor, PhD)

Knowledge	**Abilities**	**Attitudes**	**Autonomy and responsibility**
Possesses comprehensive knowledge of the overall physical description of	Capable of independently conducting international-	Continuously strives to identify and address open	Demonstrates creative and innovative independence in their professional activities

Nature and is familiar with the fundamental physical concepts. Has confident know-ledge concerning the most important concepts in related scientific disciplines. Has in-depth, research-level understanding of a specific area within theoretical or mathematical physics, including not only established canonical results but also awareness of currently debated issues. Holds methodological knowledge essential for independently conducting research within their specialized field.	level research within their specific scientific field. Able to present research findings to the professional community both in writing (e.g., scientific articles) and orally (e.g., conference presentations). Can summarize the essence of their research in a way that is comprehensible to non-professionals. Collaborates effectively with colleagues within their own discipline, as well as with professionals from other scientific fields. Competent in designing and executing new research projects.	questions within their field of specialization. Demonstrates genuine curiosity and an open-minded attitude, free from prejudice, while evaluating new scientific findings with sound critical thinking based on expertise. Open to exploring new methods and research areas and integrates newly acquired knowledge into their own research activities. Assesses the professional value of both their own and others' results realistically and empathetically. Seeks and considers the professional arguments of others when forming opinions and decisions.	and assumes leadership responsibilities when required. Makes autonomous decisions during their research work, not only regarding the selection of appropriate methods for answering specific questions, but also in defining the questions themselves. Takes full responsibility for these decisions. Acts as an equal and competent discussion partner when debating professional issues with any representative of their scientific field.

Medical imaging, radiology (Dr. László Pávics full professor, DSc)

- *MR-spectroscopy and its clinical applications* (Dr. András Palkó professor emeritus, PhD)
- *3D reconstruction imaging methods in clinical diagnostics of tumors* (Dr. Palkó András professor emeritus, PhD)
- *Clinical applications of PET/CT diagnostics* (Dr. László Pávics full professor, DSc)
- *Radiation protection in nuclear medicine* (Dr. László Pávics full professor, DSc)
- *Hybrid imaging in theranostics* (Dr. Zsuzsanna Besenyi assistant professor, PhD)
- *Theranostics in neuro-oncology* (Dr. Zsuzsanna Besenyi assistant professor, PhD)
- *Clinical application of novel PET radiopharmaceuticals* (Dr. Zsuzsanna Besenyi assistant professor, PhD)

Knowledge	**Abilities**	**Attitudes**	**Autonomy and responsibility**
Has a research-level knowledge of the subject of their field of science, its general and specific characteristics, its most important directions and boundaries, and its agreed and disputed connections. • Has a reliable knowledge of the most important connections,	• Able to independently plan and conduct research in their field of study. • Able to perform creative analysis within their field of study, formulate comprehensive and specific connections in a synthetic and innovative manner, create models, and	• Strong professional commitment, a constant dedication to finding new paths, and an acceptance of the need for persistent work. • Strives to identify and formulate unexplored, unresolved scientific questions.	• Creative independence, taking the initiative and leadership role in completing tasks (and acting as a discussion partner when necessary) is a hallmark of this role. • Acts as an equal discussion partner with experts in their field of science.

theories, and conceptual systems that make up the natural sciences related to their field of science, as well as nomenclature. • He continuously expands his knowledge of international literature defining his field of science in an understanding and analytical manner. • He possesses the level of IT and mathematical knowledge necessary for the creative application of the data and results obtained during his research, as well as for their evaluation and communication. • Possesses the research methodology knowledge necessary for independent research in their field of expertise. • Possesses the knowledge and understanding necessary for creative work, including the interrelationships and theories of their field of expertise, as well as the conceptual systems and professional terminology that constitute them.	perform evaluative and critical activities • Able to analyze, evaluate, and treat their own and others' research results professionally, realistically, and critically	• Open to learning about new technologies and emerging research areas. • Characterized by decisive behavior.	

Optics, laser physics (Dr. Béla Hopp full professor, DSc)

- *UV photoablation and applications* (Dr. Béla Hopp full professor, DSc; Dr. Tamás Kolumbán Smausz senior lecturer, PhD)
- *Laser processing of biological samples* (Dr. Béla Hopp full professor, DSc; Dr. Tamás Kolumbán Smausz senior lecturer, PhD)
- *Photoacoustic spectroscopy* (Dr. Gábor Szabó professor emeritus, DSc; Dr. Zoltán Bozóki full professor, DSc; Dr. Tibor Ajtai research fellow, PhD)
- *Femtosecond optics, ultrafast laser impulses* (Dr. Károly Osvay associate professor, PhD; Dr. Attila Kovács senior lecturer, PhD; Dr. Katalin Varjú associate professor, PhD; Dr. Balázs Major research fellow, PhD)

- *Material processing of thin solid films and sensors, plasmonics, micro-fabrication with lasers* (Dr. Zsolt Geretovszky associate professor, PhD; Dr. Maria Csete research fellow, PhD; Dr. Zsolt Tóth associate professor, PhD)
- *Microscopy, plasmonics and ellipsometry* (Dr. Miklós Erdélyi full professor, DSc; Dr. Zsolt Tóth associate professor, PhD; Dr. Mária Csete research fellow, PhD; Dr. Judit Budai research fellow, PhD; Dr. Miklós Füle associate professor, PhD)
- *Laser surface treatment and nanoparticle generation* (Dr. Béla Hopp full professor, DSc; Dr. Tamás Kolumbán Smausz senior lecturer, PhD; Dr. Attila Kohut senior lecturer, PhD; Dr. Zsolt Geretovszky associate professor, PhD)

Knowledge	**Abilities**	**Attitudes**	**Autonomy and responsibility**
At a researcher level, he/she knows the subject of his/her field of study, its general and specific characteristics, its most important directions and boundaries, and its agreed and disputed relationships. He/She continuously expands his/her knowledge of the international literature that determines his/her field of study in an insightful and analytical manner. He/She has the level of IT and mathematical knowledge necessary for the creative application of data and results obtained during his/her research, which is necessary for the management, evaluation and communication of such data and results. Possesses the research methodology knowledge necessary for independent research in his/her field.	He/She is able to independently plan and conduct research in his/her field of study. He/She is capable of creative analysis within his/her field of expertise, synthetic formulation of comprehensive and special relationships with a new perspective, model creation, and evaluative and critical activity. He/She recognizes professional problems in his/her field of study and is able to explore and solve the theoretical and practical background necessary for their solution in detail, at a research level. Capable of professional communication, both verbally and in writing, as well as professional cooperation, both domestically and internationally.	He/She strives to identify and formulate unexplored and unresolved scientific questions. He/She is open to learning about new technologies and newly developing research areas, disseminating the knowledge he/she has acquired, and incorporating and further developing the defining elements into his/her own research and development work. Committed and open to participating in and initiating professional collaborations, both domestically and internationally. His/Her characteristic is independent, in-depth professional work, but he/she is also open to teamwork and supporting the work of others.	He/She is characterized by creative independence and the responsibility of taking the initiative and leading role (and, if necessary, the role of a discussion partner) during the performance of tasks. All of his/her activities are permeated by responsible thinking based on his/her expertise for the protection and improvement of living and non-living nature. With creative independence, he/she develops new areas of knowledge and initiates new practical solutions.

Credit system

Requirement for completion of studies is the achievement of 240 credits

During the regular 2+2-year training, a complex exam should be taken by the end of the fourth semester. The complex exam can be taken by those students who have obtained at least 90 cumulative credits and completed at least 5 professionally relevant courses finished with a colloquium.

In the case of students pursuing individual studies, there are no credit and course requirements, they should take the complex exam in the first semester of their training.

The complex exam subjects and exam requirements are selected individually for the examiner, taking into account the topic of the student's research work.

In the regular 2+2 training, the PhD students are required to take a complex exam on one major and one minor subject, while during the individual preparation they have to take this exam on one major and two minor subjects.

At least 20 and at most 45 credit points shall be collected during each semester.

How to achieve credits

Courses (obligatory only in the first four semester)

- minimum 5 courses finished with colloquium
- minimum 3 courses related to the chosen doctoral program
- doctoral programs:
  - Astrophysics and gravitational theory
  - Biophysics
  - Theoretical and mathematical physics
  - Optics, laser physics
  - Medical imaging, radiology
- In well-founded case with the recommendation of the council of doctoral school, courses taken in an external institution or held by guest lecturers are also acceptable as special or optional courses depending on the chosen educational program.

Teaching

- Not obligatory!
- maximum 48 credits during the training
- 2 credits / hour / semester
- maximum 8 credits in each semester

Research

- research work - specialized laboratory:
  - in the first 4 semesters: 15 credits / semester; in the second 4 semesters: 20 credits / semesters
  - maximum 60 credits under the first 4 semesters; maximum 80 credits under the second 4 semesters
- yearly work report: 3 credits
- publications, conference talks, poster presentations, spring/summer/autumn/winter schools:
  - maximum 3 credits for a course/school without an exam, the number of credits is determined in each case by the council of the doctoral school
  - special courses (in the second 4 semesters): study of literature supported by consultations: 5 credits

Credit table related to research and teaching

Type	Semester	Subject code, subject name	Credits
Research		FDITE60 Work report	3
Research		FDITE61a International conference poster presentation	3
Research		FDITE61b International conference poster co-author	1
Research		FDITE61c Hungarian conference poster presentation	1
Research		FDITE62b Major international conference talk	8
Research		FDITE62a International conference talk co-author	5
Research		FDITE62c Hungarian conference talk	2

Research		FDITE62d Hungarian conference talk co-author	1
Research		FDITE62e International conference talk	7
Research		FDITE62f Minor international conference talk	6
Research		FDITE64 Article in periodical	20
Research		FDITE76uj Article in periodical IF=0	10
Research		FDITE64m Hungarian article	5
Research		FDITE64c International conference paper	2
Research		FDITE65a Special courses I	5
Research		FDITE65b Special courses II (e.g. summer school etc.)	3
Specialized laboratory	1-4	FDITE59a Specialized laboratory I	15
Specialized laboratory	5-8	FDITE59b Specialized laboratory II	20
Teaching		FDITE70 Education	2

Student must be registered for the specialized laboratory courses in Neptun as courses advertised under the supervisor's name. The supervisor enters the grade.

Student must be registered for research and education-related courses in Neptun. The completions are checked by the head of the doctoral program. The evaluation is entered in Neptun by the program director or his/her delegate.

Comprehensive examination subjects

During the regular 2+2-year training, a complex exam should be taken by the end of the fourth semester. The complex exam can be taken by those students who have obtained at least 90 cumulative credits and completed at least 5 professionally relevant courses finished with a colloquium.
In the case of students pursuing individual studies, there are no credit and course requirements, they should take the complex exam in the first semester of their training.
The complex exam subjects and exam requirements are selected individually for the examiner, taking into account the topic of the student's research work.
In the regular 2+2 training, the PhD students are required to take a complex exam on one major and one minor subject, while during the individual preparation they have to take this exam on one major and two minor subjects.

Major and minor subjects of comprehensive examination per training program:

Training program	Major subject	Minor subject
Astrophysics and gravitation theory	- Astrophysics - General relativity	- Galactic and Extragalactic Astronomy - Stellar evolution - Variable stars - Scalar-tensor gravitation theory
Biophysics	- Biophysics	- Physics of photosynthesis - Spectroscopy of biomolecules and membranes
Theoretical and mathematical physics	- General relativity - Atomic and molecular physics -Integrable Hamiltonian systems - Quantum mechanics - Statistical physics	- Differential geometric and group theoretical methods - Elements of quantum mechanics - Fundamentals of light-matter interaction theory - Quantum optics - Scalar-tensor gravitation theory - Solid state physics - Computational physics - Phase transitions and critical phenomena
Medical imaging - radiology	- Hybrid imaging	- Nuclear medicine - Radiological diagnostics
Optics, laser physics	- Fundamentals of lasers - Fundamentals of light-matter interaction - Optics	- Fundamentals of femto- and nonlinear optics - Physical optics - Laser material processing - Laser-tissue interactions - Microscopy - Photoacoustic spectroscopy

Angol nyelven történő doktori képzés kontakt órai kurzus listája

Astrophysics and gravitation theory:

Neptun code, subject name	Credits	Lecturer
FDITE08 Gravitational waves: theory and detection	6	L. Á. Gergely, Z. Keresztes
FDITE09 Astrophysics of supernova explosions	6	J. Vinkó
FDITE16 Constrained dynamical systems	6	L. Á. Gergely
FDITE50 Scalar-tensor gravity	6	L. Á. Gergely, Z. Keresztes
FDITE89 Binary and multiple systems of stars 1	6	I. B. Bíró
FDITE104 Astronomical instrumentation in space	6	J. Vinkó
FDITE142 Binary and multiple systems of stars 2	6	T. Borkovits
FDITE182 Radiation processes in astrophysics	6	J. Vinkó
FDITE173 Problem solving in astrophysics	6	A. Nagy
FDITE176 Nuclear Astrophysics	6	T. Szalai
FDITE196 Numerical modeling	6	J. Vinkó
FDITE214 Selected topics in gravitational theories 1	6	L. Á. Gergely, Z. Keresztes
FDITE215 Selected topics in gravitational theories 2	6	L. Á. Gergely, Z. Keresztes

Biophysics:

Neptun code, subject name	Credits	Lecturer
FDITE01 Molecular biophysics	6	P. Maróti
FDITE02 Fluorescence spectroscopy in biophysics and biochemistry	6	A. Sipos, P. Galajda, G. Laczkó, P. Maróti
FDITE04 Biophysical methods in photosynthesis	6	P. Lambrev
FDITE68 Primary processes in photosynthesis	6	P. Lambrev

FDITE69 Optical spectroscopy for photosynthesis research	6	P. Lambrev
FDITE72 Bioenergetics	6	L. Zimányi
FDITE112 Bioelectronics	6	A. Dér
FDITE113 Methods in modern biophysics	6	P. Maróti

Theoretical and mathematical physics:

Neptun code, subject name	Credits	Lecturer
FDITE08 Gravitational waves: theory and detection	6	L. Á. Gergely, Z. Keresztes
FDITE11 Differential geometric methods in physics	6	L. Fehér
FDITE12 Lie algebras in physics 2	6	L. Fehér
FDITE13 Integrable systems 1	6	L. Fehér
FDITE16 Constrained dynamical systems	6	L. Á. Gergely
FDITE21 Lie algebras in physics 1	6	L. Fehér
FDITE22 Integrable systems 2	6	L. Fehér
FDITE50 Scalar-tensor gravity	6	L. Á. Gergely, Z. Keresztes
FDITE210 Density functional theory	6	G. Paragi
FDITE214 Selected topics in gravitational theories 1	6	L. Á. Gergely, Z. Keresztes
FDITE215 Selected topics in gravitational theories 2	6	L. Á. Gergely, Z. Keresztes
FDITE218 Theoretical methods in strong-field and attosecond physics	6	A. Czirják, Sz. Hack
FDITE219 Numerical methods for time-dependent quantum systems	6	P. Földi, A. Czirják
FDITE220 Quantum Information Theory	6	P. Földi, R. Trényi

Medical imaging - radiology:

Neptun code, subject name	Credits	Lecturer
FDITE26 Fundamentals of radiological imaging	6	K. Gion, L. Pávics
FDITE27 Fundamentals of isotope diagnostics	6	L. Pávics
FDITE28 Fundamentals of nuclear physics and metrology in nuclear medicine	6	T. Polanek, L. Pávics
FDITE31 Radiation protection	6	T. Polanek, L. Pávics
FDITE32 CT and its clinical applications	6	A. Palkó
FDITE33 MR and its clinical applications	6	A. Palkó
FDITE34 Clinical isotope diagnostics	6	L. Pávics
FDITE35 Nuclear medicine in oncology	6	L. Pávics
FDITE36 Nuclear medicine investigations of CNS	6	L. Pávics
FDITE37 Radiological investigations of CNS	6	L. Pávics, A. Csomor
FDITE38 Radiology in oncology	6	A. Palkó

Optics, laser physics:

Neptun code, subject name	Credits	Lecturer
FDITE106 Selected topics in femto- and attosecond pulse phenomena	6	K. V. Geretovszkyné
FDITE107 Generation and applications of attosecond pulses	6	K. V. Geretovszkyné
FDITE133 Laser-tissue interactions	6	B. Hopp
FDITE109 Optics and laser physics special course	6	A. Kovács
FDITE139 Photoacoustic spectroscopy	6	Z. Bozóki
FDITE164 Surface Physics	6	M. Füle
FDITE177 Fundamentals of light-matter interaction	6	P. Földi
FDITE190 Photoacoustic spectroscopy 2	6	Z. Bozóki
FDITE194 Optics 1	6	A. Kovács

FDITE195 Optics 2	6	A. Kovács
FDITE203 Advanced Plasma Physics	6	N. A. M. Hazif
FDITE206 Atmospheric aerosol physics	6	T. Ajtai
FDITE207 Fundamentals of light-matter interaction 2	6	P. Földi
FDITE208 Optical Wave Propagation and Metamaterials		M. Qasim
FDITE209 Recent trends in laser developments	6	K. Osvay
FDITE213 Wave equation and propagation of laser pulses in plasma	6	Zs. Lécz

Elective courses independent of programs:

Neptun code, subject name	Credits	Lecturer
FDITE160 Advanced experimental laser-plasma physics	6	Sargis Ter-Avetisyan
FDITE161 Investigation of ultra-short laser driven plasma dynamics and ion acceleration	6	Sargis Ter-Avetisyan
FDITE172 Microphysics and chemistry of clouds	6	M. Szakáll
FDITE212 Advanced classical electrodynamics	6	N. A. M. Hazif