Evaluation Report
for the Accreditation of Study Programs

offered by

Samara State Aerospace University (SSAU)

Study Program	Level of Qualification	ECTS	Program Duration	Type of Program	Taught in
Aircraft and Aerospace Engineering: Heat, Electrojet Engines and Power Facilities of Aircraft	Candidate of Sciences	180	3 years	Full-time	Russian
Physics and Astronomy: Devices and Methods of Experimental Physics	Candidate of Sciences	180	3 years	Full-time	Russian
Applied Mathematics and Physics: Mathematical Modelling and Information Technologies in Photonics	Master	120	2 years	Full-time	Russian
Power Units and Energy Systems of Aircraft: Flight Type Engines Manufacturing	Master	120	2 years	Full-time	English/ Russian
Design, Construction and CALS Technology in Aviation Engineering	Master	120	2 years	Full-time	Russian

Date of site visit: December 2-4, 2014

Expert Panel:

- **Prof. Dr. Dr. h.c. Peter Deuflhard**, Professor of Numerical Analysis / Scientific Computing , founder and former president of Zuse Institute, Berlin
- **Prof. Dr. Uwe Apel**, Professor of Aircraft and Aerospace Engineering, esp. aircraft and rocket engines, Bremen University of Applied Sciences
- **Prof. Dr. Jürgen Oberst**, Institute of Planetary Research, German Aerospace Center (DLR) Berlin, Institute of Geodesy and Geoinformation Sciences (IGG), Technical University Berlin

Russian Experts:

- **Jury V. Maslov**, Ph.D., senior research associate, docent; Moscow Aviation Institute, docent, Head of the CAD (Computer-assisted Design) Lab of MAI Resource Centre for Aircraft manufacturing
- **Nikolay L. Kazansky**, Doctor of sciences, professor, deputy director for Science of Image Processing Systems Institute of the Russian Academy of Sciences
- **Alexander A. Markov**, Branch Director of Samara Design engineering department OJSC «Tupolev», deputy design manager of DED OJSC «Tupolev»
- **Yevgeny P. Kocherov Ph.D.**, deputy design manager of OJSC «Kusnetsov»
- **Alan K. Misonzhnik**, student, Moscow State Engineering University MAMI (Bachelor's degree "Transport and gas-turbine engines units")

Hanover, February 4, 2015

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1. Decision of the ZEvA Accreditation Commission

The KIA follows the experts' report and recommendations and takes note of the university's response. In accordance with the review panel, the KIA recommends further increasing the international scope and profile of the study programmes at all levels.

In due consideration of the requirements of the European Standards and Guidelines for Quality Assurance in Higher Education (ESG), the accreditation of the study programmes is awarded under the following condition:

- *The university must prove that it has developed formal policies and procedures for internal quality assurance which are publicly available.*

The condition must be fulfilled within the period of 18 months. Failure to comply with the condition in due time will result in withdrawal of the accreditation.

The KIA decides to accredit the Master's programme "Applied Mathematics and Physics: Mathematical Modelling and Information Technologies in Photonics" at Samara State Aerospace University for the duration of five years under the above mentioned condition.

The KIA decides to accredit the Master's programme "Design, Construction and CALS Technology in Aviation Engineering" at Samara State Aerospace University for the duration of three years under the above mentioned condition.

The KIA decides to accredit the Master's programme "Power Units and Energy Systems of Aircraft: Flight Type Engines Manufacturing" at Samara State Aerospace University for the duration of five years under the above mentioned condition.

The KIA decides to accredit the doctoral programme "Aircraft and Aerospace Engineering: Heat, Electrojet Engines and Power Facilities of Aircraft" at Samara State Aerospace University for the duration of five years under the above mentioned condition.

The KIA decides to accredit the doctoral programme "Physics and Astronomy: Devices and Methods of Experimental Physics" at Samara State Aerospace University for the duration of three years under the above mentioned condition.

2. Final Vote of the Expert Panel

2.1 General Aspects

2.1.1 Recommendations:

- The university should take increased efforts to put its internationalization strategy into practice. In particular, the academic mobility of students and faculty should be more strongly promoted and facilitated.
- The members of faculty should be given more opportunity to enhance their didactic capacity and their English language competence. Also, increased efforts should be taken to recruit more teaching faculty from abroad, both for short-term stays and on a permanent basis.
- It should be ensured that a large variety of teaching methods and forms of assessment is applied in all study programs.
- In the design of student surveys, special attention should be devoted to teaching methods and the quality of teaching materials.
- The English version of the website should contain more information on student support structures, contact persons and general practical issues.
- The student assessment system should be revised to bring it more closely in line with common practices in the European Higher Education Area.
- The university should have formal policies and procedures for internal quality assurance that are publicly available.
- The full implementation and acceptance of the ECTS instruments should be further promoted. The issuing of ECTS key documents (Diploma Supplement, Learning Agreement, Transcript of Records) to students and graduates should become standard practice.

2.2 Applied Mathematics and Physics: Mathematical Modelling and Information Technologies in Photonics (Master's level)

2.2.1 Recommendations:

- The program's degree of internationalization, though already quite high, should be further enhanced.

2.2.2 Recommendation to the ZEvA International Accreditation Commission:

*The expert group recommends towards the International Accreditation Commission the accreditation of the Master's program "Mathematical Modelling and Information Technologies in Photonics" for the duration of **five** years.*

2.3 Design, Construction and CALS Technology in Aviation Engineering (Master's level)

2.3.1 Recommendations:

- The experts strongly recommend expanding the international scope of the program by increasing the faculty's foreign language competence and the share of foreign-language teaching materials.
- Students should receive a more thorough introduction to the basic scientific methods of their discipline.

2.3.2 Recommendation to the ZEvA International Accreditation Commission:

*The expert group recommends towards the International Accreditation Commission the accreditation of the Master's program "Design, Construction and CALS Technology in Aviation Engineering" for the duration of **three** years.*

2.4 Power Units and Energy Systems of Aircrafts: Flight Type Engines Manufacturing (Master's level)

2.4.1 Recommendations:

- The international profile of the program should be further sharpened.
- The curriculum should contain more practical, application-oriented components.

2.4.2 Recommendation to the ZEvA International Accreditation Commission:

*The expert group recommends towards the International Accreditation Commission the accreditation of the Master's program "Flight Type Engines Manufacturing" for the duration of **five** years.*

2.5 Aircraft and Aerospace Engineering: Heat, Electrojet Engines and Power Facilities of Aircraft (Doctorate)

2.5.1 Recommendations:

- The international components of the program should be further strengthened, for example by introducing a larger number of classes in English or by organizing cooperative projects with international partners.

2.5.2 Recommendation to the ZEvA International Accreditation Commission:

*The expert group recommends towards the International Accreditation Commission the accreditation of the doctoral program "Heat, Electrojet Engines and Power Facilities of Aircrafts" for the duration of **five** years.*

2.6 Physics and Astronomy: Devices and Methods of Experimental Physics (Doctorate)

2.6.1 Recommendations:

- Aspirants should get more opportunities to gather international experience and should be more strongly encouraged to build up their foreign language competence. (Kriterium 2.x, Drs. AR 20/2013)
- The mission and profile of the study program should be clarified.

2.6.2 Recommendation to the ZEvA International Accreditation Commission:

*The expert group recommends towards the International Accreditation Commission the accreditation of the doctoral program "Devices and Methods of Experimental Physics" for the duration of **three** years.*

II. Evaluation Report of the Expert Panel

Introduction: Purpose, Design and Context of the Accreditation Procedure

By contract dated October 31, 2014, the two quality assurance agencies ZEvA and AKKORK (based in Moscow/Russia) agreed to cooperate in the international accreditation of five study programs at Samara State Aerospace University (SSAU) in Samara/Russia. To this end, a review panel of three German experts (university professors) was assembled, who were supported by a number of Russian experts both from inside and outside academia, including one student representative.

All members of the panel took part in the three-day site visit at SSAU in the first week of December, 2014. During the site visit, talks were held with members of the university leadership board, deans, students and graduates of all study programs, as well as employers and teaching faculty. Prior to the site visit, the university submitted a self-report to AKKORK, which was made available in English translation to ZEvA and the international members of the panel. The experts' evaluation of the study programs is based on this written material, additional documents provided on request and on the outcomes of the on-site talks.

The design of the review procedure and the standards and criteria underlying the evaluation of the study programs are described in detail in the *ZEvA Manual for the Evaluation and Certification of Study Programs* which is directed especially at higher education institutions outside Germany and at experts taking part in international quality assurance procedures. SSAU was provided with the manual well in advance to the site visit and used it as a general guideline and template during the generation of the self-report.

As pointed out in the manual, both the design of the accreditation procedure and the quality standards applied are fundamentally rooted in the in the common European Standards and Guidelines for Quality Assurance in Higher Education (ESG). As a full member of the European Association for Quality Assurance in Higher Education (ENQA) and the European Quality Assurance Register for Higher Education (EQAR), ZEvA is firmly bound to the principles set by the ESG. First and foremost, the awarding of the ZEvA quality seal confirms adherence to these fundamental standards shared by agencies and higher education institutions throughout the European higher education area and beyond.

In addition, the review procedure also served to clarify to which degree the ECTS key instruments have been implemented at SSAU.

The experts would like to thank the leadership board, faculty, staff and students of Samara State Aerospace University for the friendly and open atmosphere during the on-site talks. Also, the panel members are indebted to the colleagues of AKKORK for initiating this joint project and for the efficient organization of the site visit.

1. Outline of the Institutional Profile of Samara State Aerospace University

National Higher Education System of Russia – Preliminary Remarks

Russia signed the Bologna declaration in 2003 and since then has continuously implemented the declaration's basic objectives both at national and at institutional level. Part of this process has been the nation-wide introduction of a two-tier-study system as represented by the "Framework of Qualifications for the European Higher Education Area". First-cycle programs usually take four years to complete; graduates are awarded a Bakalavr's degree (equivalent of a Bachelor's degree). The second educational cycle comprises two years and is completed with the awarding of a Magistr degree (equivalent of a Master's). Graduates may then continue their studies at doctoral level. After successful completion of the third cycle, graduates are entitled to the degree "kandidat nauk" ("Candidate of Sciences"), which equals the level of qualification of Ph.D. holders in many Western European countries.

At the same time, many higher education institutions in Russia still award the so-called "specialist" degree, which was the only undergraduate degree awarded throughout the country before the introduction of the two-level study system. A "specialist" program usually takes five years to complete and is largely comparable to the former German Diploma programs. At SSAU, the "specialist" courses still exist side by side with the new study system, that is, there has been no radical abolition of the old program structure (as was the case in Germany, for example), but rather a gradual – and still ongoing – shift from the old to the new system. At present, the "specialist" programs still enjoy a higher reputation among Russian employers, although the two-tier system opens up better prospects for graduates on the international employment market. Regardless of that, both the Specialist and the Magistr degree allow graduates to enter the third cycle of studies.

State educational standards define the intended learning outcomes for each academic discipline and each qualification level. Also, the structure and contents of curricula depend to a large extent on ministerial directives. All Bachelor's and Master's programs consist of several "cikls" (educational "cycles"), i.e. of courses of lectures from different disciplinary fields. As Russian students leave school at a considerably younger age than in most EU countries, they receive a large part of their general education at third level. For this reason, the study programs do not exclusively focus on one specific academic field, but also provide a more general education, for example in the Humanities and Social Sciences. This goes especially for undergraduate programs, but also to some extent for postgraduate studies. The scope and the compulsory contents of each "cikl" are decided upon at ministerial level. However, higher education institutions have some autonomy in the design of their curricula, especially regarding elective disciplines.

The ECTS system has also been implemented at Russian higher education institutions. By national law, one credit point equals an average student workload of 27 hours (or 36 academic hours, respectively).

Institutional Profile and Mission of Samara State Aerospace University

Samara State Aerospace University (named after S.P. Korolev) has a clearly defined institutional mission, which is described in detail in the self-report of the university and is also laid out in the supplementary documentation, as, for example, in the strategic program of development for the years 2009-2018.

The roots of SSAU date back to the year 1942, when the Kuibyshev Aviation Institute was founded. From the beginning, the institution placed its main focus in teaching and research on the field of aerospace engineering, but also trained engineers for other industrial branches, as e.g. radioelectronics, metallurgy or the automotive industry. In 1992, the Institute was renamed into Samara State Aerospace University. Until today, SSAU has remained one of the leading Russian higher education institutions in the field of aerospace engineering, which still provides the core of its institutional profile and its priority area of development. About 25% of the university's undergraduate and Master students specialize on aviation and aerospace technology, followed by closely related disciplines like mechanical engineering or electronic engineering. Furthermore, a significant percentage of the students specialize on physics and mathematics, informatics or economics and management. The majority of graduates will find working positions as technicians or engineers in industry, either locally or in other parts of Russia. Master's graduates also have the option of further pursuing an academic career at SSAU or elsewhere.

At present, about 11.600 students are enrolled at SSAU (including doctoral students); 7.000 of whom are studying full-time. Most of SSAU's students are natives of Samara or the greater Samara region. Due to the good employment prospects offered by the local industry, graduates also tend to stay in the area. Through its production of highly qualified graduates, the university is of particular significance for the regional employment market.

About 70% of SSAU's budget is derived from state funding, 30% are generated through fees or contributions from industry. Along with several other Russian higher education institutions, SSAU was granted the status of "national research university" in 2009, which resulted in a significant increase in state funding to support the university's internal program of development over the following decade. As part of this program, SSAU aims at creating its own educational standards for the above mentioned core disciplines, and at extending its activities in research, development and the transfer of knowledge and technology.

The research activities of SSAU are described in detail in the self-report of the institution. The general focus is on basic and applied research, which is in accordance with the university's profile in teaching and education. The self-report names aerospace engineering (including engine construction) as the priority research area, followed by other disciplines in engineering and technology, as e.g. biotechnology and biomedicine, microelectronics, supercomputing and geoinformation sciences. Research grants are provided, for example, by the Russian Federation, the Russian Foundation for Basic Research or by external partners from industry in the context of contract research.

International Outlook

SSAU seeks to extend its primarily regional reputation to other parts of the world within the next years. Although internationalization is on top of SSAU's strategic agenda, the overall number of international students is still relatively low, and there is almost no long-term teaching faculty from outside Russia to be found in the entire university. For SSAU's own students and staff, outgoing mobility does not seem to play any significant role either, although SSAU has forged cooperative relationships with a number of higher education institutions abroad, especially in China and other East Asian countries, but also, to a limited extent, in the European higher education area (France, Spain, UK, Germany). First steps to change this situation have already been taken (regular invitation of guest lecturers, organization of summer schools etc.), yet a high potential for further improvement and development is clearly identifiable in this particular area. Further remarks on the topic of internationalization can be found in the chapters below.

2. Assessment of Key Quality Criteria

2.1 Teaching Faculty

In total, SSAU employs about 900 faculty members, 700 of whom work on a full-time basis. With 52 years, the average age of the professoriate is quite high, but is expected to decline significantly within the next few years.

For each of the five study programs that are subject of this review procedure, CVs of the teaching faculty involved have been submitted which also include publication lists. Based on the information provided and the extensive talks with various members of faculty, the experts come to the overall conclusion that there are a sufficient number of qualified lecturers at hand to maintain a high standard in effective teaching and learning. The experts are convinced that the members of faculty possess a sufficient level of knowledge, professional experience, skills and qualifications and that the requirements of the ESG concerning the quality assurance of teaching staff are largely satisfied. Also, students can provide feedback on the quality of teaching in the context of regular surveys (cf. Chapter 2.4).

However, with a view to their first impression of the applied methods of teaching (cf. chapter 2.3), the experts suggest giving the members of faculty more opportunity to enhance their didactic capacity, as e.g. by participating in professional training programs or other measures of staff development. Also, the English language competence of the teaching faculty should be gradually increased. According to the information provided during the site-visit, good knowledge of English is expected of the new, younger generation of university teachers.

As mentioned above, the number of teachers and researchers from outside Russia is very limited. Hence, the experts strongly support the university's intention of taking increased efforts to recruit more teaching faculty from abroad, both for short-term stays and on a permanent basis (cf. Chapter 3 of the strategic development program). Vice versa, SSAU lecturers should be given more frequent opportunities for leaves of absence and foreign travel, as e.g. in the context of (international) research projects or for conferences.

2.2 Infrastructure, Resources and Student Support

In the course of the three-day site visit, the experts gained a detailed picture of the general building infrastructure, the material resources and the technical equipment (machine labs, supercomputer etc.) provided on the SSAU campus. Based on their impressions, the experts have no doubt that the available resources are adequate and appropriate for the study programs offered. As far as the panel members can see, students and teachers have sufficient access to up-to-date machinery, infrastructure and technology to ensure effective learning processes.

There are a number of student dormitories located on or in close proximity to the campus which, according to the students interrogated, are of acceptable standard and provide a val-

uable alternative to private accommodation in the city, where rents are generally too high for students to afford. One of the dorms also hosts a medical center, where students can consult doctors, receive counseling and advice in health-related issues and get a free medical check-up once a year. Beyond their coursework, students are strongly encouraged to take part in the numerous extra-curricular activities offered, as e.g. different types of sport. The necessary infrastructure (gyms, swimming pool etc.) is provided on campus and other places within the city.

Counseling and advice on all academic matters is provided by the university teachers. With a view to the very good student-teacher ratio, the experts are convinced that lecturers are sufficiently accessible to their students. For first-year students, there are special introductory workshops during the first weeks. Students also support each other in various ways: for example, there is a 'job center' on campus run by students for students who are looking for summer jobs, internships etc.

The university also offers different forms of social support for students as, for example, scholarships and other financial aid.

In summary, the experts come to the conclusion that SSAU provides sufficient support and advice to students in both academic and non-academic matters. Only as far as academic mobility, student exchange and the recognition of credits are concerned, the support structures do not yet seem to be sufficient. To the experts' knowledge, an international office does not exist at SSAU, and it did not become clear during the site visit if there is any other person or organizational unit responsible for providing advice to students in these matters. The talks with the students and graduates revealed that their level of information in this realm was actually quite low. In general, curricula are tightly packed and allow for relatively little flexibility, which further aggravates the problem. Hence, it seems strongly advisable for SSAU to encourage and support students more actively in organizing study periods abroad as part of the general efforts to increase the university's overall level of internationalization.

2.3 Methods of Teaching, Learning and Student Assessment

In Samara, the experts got a chance to listen to parts of a lecture being given at the time of the site visit. In spite of the relatively small group of students participating, there seemed to be little or no interaction between the teacher and the learners – rather, traditional "ex cathedra" teaching seemed to be the method of choice, with students having the role of passive listeners and recipients of factual knowledge. The experts are, of course, aware that lectures for the purpose of knowledge transmission must necessarily be an integral part of each study program, yet this should not remain the only or dominant form of teaching and learning applied, as students need to develop a large variety of generic and communicative competences to be prepared for the requirements of working life. Therefore, it would be advisable to use other, more interactive forms of teaching as often as possible. (According to the written descriptions of the study programs, this is already happening: projects, for example, seem to be a regular part of the curricula). During the site visit, some lecturers also uttered the wish to

have more opportunity for interactive teamwork with students instead of lectures, which, however, is often prevented by the tightly knit curricula.

In addition, the experts recommend increasing the use of English as a language of communication in class. Didactic methods should also be paid more attention to in the internal quality assurance of the university (cf. chapter 2.4).

The basic examination regulations applying to all students of the university are documented and have been approved by the university leadership board and the academic council. The document also contains clear regulations covering student absence, illness and other mitigating circumstances.

According to the self-report of the university, written and oral examinations, supplemented by projects and occasional course papers, are the most frequently applied forms of assessment both at Master and at Ph.D. level, the biggest portion of the exams being “pass-fail” exams without grades being awarded.

There are two examination periods per academic year. Students who fail exams can sit repeats within a period of about two to four weeks; every exam may be repeated twice. However, in case of a failed exam, it is not possible for students to take the course once more in order to close their gaps before re-sitting the examination, which the experts regard as a critical aspect of the student assessment system. The same goes for the fact that there is usually only one examiner present during oral examinations, without a second member of faculty acting as a “counterbalance” to guarantee impartiality and fairness.

Based on these findings, the expert panel recommends to SSAU a revision of the student assessment system in order to bring it more closely in line with common practices in the European Higher Education Area. In particular, it would be desirable to introduce a larger variety of assessment forms that take into account the intended learning outcomes of the programs.

2.4 Internal Quality Assurance Procedures

The university has provided detailed information on its internal quality assurance procedures, both as part of the self-report and during the site visit. Furthermore, a member of the quality assurance department provided additional information regarding SSAU’s internal procedures of quality assurance in teaching and learning to the experts during the on-site talks.

SSAU collects and analyzes data based on a number of performance indicators in order to monitor and improve its overall performance in teaching and research and to gain useful insights for the further strategic development of the institution.

Beyond that, the university conducts course evaluations and graduate surveys on a regular basis. Concrete results were submitted for the Master’s program in Applied Mathematics and Physics only, which is regrettable but sufficient to give the experts a general idea of the design of the surveys. Based on the impressions gathered during the site-visit, the experts ad-

vocate devoting special attention to teaching methods and the quality of teaching materials in the questionnaires.

All members of the university, including the students, are involved in quality assurance procedures. Beyond that, the feedback given by employers and potential employers of graduates is taken into account for the further development of the study programs. Survey results are reported to the university leadership board on a regular basis.

Formal policies and procedures for internal quality assurance at SSAU were not presented to the experts. Even though SSAU has demonstrated that internal mechanisms for the approval, periodic review and monitoring of study programs have been developed, and in spite of the institution's general commitment to quality assurance, it seems crucial to the experts that the procedures and instruments applied are solidly based on approved and published regulations.

2.5 Implementation of ECTS Key Instruments

As mentioned above, SSAU has implemented an ECTS system as required by national law. The estimated average student workload of 27 hours per credit point (with a maximum of 60 credit points awarded per academic year) is in line with the recommendations of the ECTS Users' Guide.

In order to receive a Master's degree, Russian students usually spend a total of six years at university (4-year Bachelor cycle (240 ECTS) followed by a 2-year Master program (120 ECTS)). As already explained, this relatively long study duration is due to the fact that students enter university at a younger age than in many Western European countries and therefore receive part of their general education not a second, but at third level.

Based on the talks with students and faculty, the experts have gained the overall impression that so far, the implementation of the ECTS system has happened on a formal level, but is not yet fully ingrained into the academic culture and organizational structures of the university. Students seemed to have only rudimentary knowledge of the basic principles and the benefits of ECTS as, for example, the recognition of credits. It has remained unclear whether the university issues key ECTS documents that are critical for international student exchange, as e.g. Diploma Supplements, Transcripts of Records and Learning Agreements. In any case, this seems unlikely, as academic mobility still seems to be no real option for the majority of SSAU students.

The self-report and documentation provide a similar picture. The allocation of credits to individual teaching units seems somewhat random (especially at Ph.D. level) and is not always logically consistent: for example, the number of credits does not in all cases correspond to the estimated number of working hours, and for some units there is no self-study time included in the calculation of the overall workload.

In conclusion, the experts recommend to the university management to further accelerate the full implementation and acceptance of the ECTS instruments at a deeper structural level. The necessary formal framework is given, but has yet to be filled with life.

2.6 Transparency and Public Information

As demonstrated during the site visit, detailed course handbooks are made available to the students via the intranet, some of them in English language. The course descriptions presented to the peers contained all central information as recommended by the ECTS Users' Guide.

As mentioned above, the examination regulations are laid out and published in an official document.

The university website contains basic facts and figures about the university, its portfolio of study programs, admission procedures, international relations and research activities.

All in all, the experts arrive at the conclusion that SSAU provides the students and the general public with all necessary information and follows the principle of transparency in the sense of the European Standards and Guidelines.

Nevertheless, the experts still see potential for improvement in this realm. For example, the English version of the website provides little information regarding student support structures (for example, it does not include the names and contact data of faculty and staff to provide advice and guidance on examinations and other academic issues, mobility and recognition of credits, social and health issues etc.). Furthermore, some additional facts on practical issues like accommodation, general cost of living, meals, health and insurance etc. would be particularly helpful especially for international students and those interested in spending a longer study period at SSAU.

3. Applied Mathematics and Physics: Mathematical Modelling and Information Technologies in Photonics (Master's level)

3.1 Intended Learning Outcomes

The intended learning outcomes of the Master's program "Mathematical Modelling and Information Technologies in Photonics" are described in detail in the self-report of the university. The central objective of the program is to prepare students for a career in science and research, especially in the fields of diffractive optics, image processing, photonics and nanophotonics. To this end, students are to acquire a variety of professional and key competencies, as, for example, the ability to apply the methods and technological tools of their discipline, to develop their own research ideas, to work in teams and to engage actively in scientific and general debates, both in Russian and in English.

3.2 Concept and Structure of the Study Program

As outlined above, the curriculum of the Master's program contains both general educational elements (foreign language courses, history and philosophy of science, current problems of science and technology), as well as a number of compulsory courses on different topics in the field of optics and IT. Also, students may choose from a number of electives, as, for example, software development, numerical methods and special topics in computer sciences, as e.g. Cloud Computing. The general educational part (humanities "cikl") is designed according to ministerial standards, all other parts of the curriculum lie in the responsibility of the university itself.

In this particular branch of program, the transition from the traditional to the new, two-tier study system is almost completed: the last "specialist" students (enrolled in the traditional system) are expected to receive their degree this year.

The final semester is dedicated to the Master's thesis and final state examination, complemented by a brief research internship.

The study program depends to a large extent on a close cooperation and permanent knowledge transfer between SSAU and the external Institute of Image Processing Systems. This Institute contributes scientific expertise, lecturing personnel and technological equipment to the program, although the degree to which the Master's students are involved in the work of the institute has not become fully clear to the experts.

3.3 General Findings and Impressions of the Expert Panel

The experts were deeply impressed by the high qualification of students and lecturers participating in the on-site talks, many of whom have published their research results in internationally renowned peer-reviewed journals and conference proceedings. In the realm of re-

search, the program without doubt has a clear international profile. Also, according to the employers, graduates are in high demand due to their broad knowledge and competencies in physics, mathematics and information sciences alike.

At the level of the curriculum, however, the experts find that international elements are still strongly underrepresented. Foreign languages and intercultural competences, if at all, are imparted only to a very marginal extent. As a result, the students are not sufficiently prepared for working in international environments (which, as the on-site talks showed, both students and employers are quite aware of and would like to see changed). Within its sphere of influence, the faculty should therefore take suitable measures to enhance the program's degree of internationalization, for example by offering more lectures in English or courses on intercultural communication. In this context, the declared intention of creating more exchange options for the students of this program within the coming year seems like a step in the right direction.

4. Design, Construction and CALS Technology in Aviation Engineering (Master's level)

4.1 Intended Learning Outcomes

Graduates of the Master's program should be able to demonstrate a variety of professional and generic skills, which are listed in the self-report of the university. Primarily, graduates should be able to apply the technological tools and methods of aircraft construction and design, but should also be prepared to tackle related managerial tasks. Also, they should have acquired the necessary competences to engage in research and development activities and be able to act as team leaders.

4.2 Concept and Structure of the Study Program

The Master's program, in its current structure and design, is still relatively new: the first students enrolled in the year 2011. Currently, 20 students are enrolled, about half of them from outside Russia.

Apart from a number of compulsory subjects of a more general nature (as e.g. foreign language classes, mathematical modeling etc.) the elective courses focus primarily on tools and technologies of aircraft construction and design. At the end, students submit their Master's thesis and must pass the final state examination in order to receive the "Magistr" degree.

4.3 General Findings and Impressions of the Expert Panel

The poor documentation and description of the program made it hard for the experts to arrive at a qualified judgment. All in all, the written information given to the review panel is too scarce and too imprecise to provide a clear enough picture. Most importantly, detailed course descriptions were not submitted; hence the contents of the curriculum do not become fully transparent from the self-report alone. Therefore, the experts had to rely on the information and (Russian-language) material provided by students and faculty on site as the sole basis for their evaluation of the program.

During the talks with the group of experts, the members of faculty stressed that the program had a strong international profile and was explicitly directed at both Russian and non-national students (who, as mentioned above, constitute a considerable portion of the students enrolled). In the light of this claim, the experts were disappointed to learn that the textbooks and scripts used by faculty and students were almost exclusively in Russian, and that English was hardly ever used as a language of communication in class. The members of faculty involved in the program have hardly worked or published abroad. All in all, the program is not recognizably in line with the international standards of the discipline.

Furthermore, the experts gained the impression that the program is primarily application-oriented and leaves only limited room for dealing with the underlying scientific theories and methods. For example, students are encouraged to "think in terms of software" from an early stage, but on the other hand do not seem to receive a thorough understanding of numerical methods. Also, a certain tendency towards "overspecialization", i.e. placing the focus on isolated subtopics, seems to prevent students from gaining a comprehensive view of their discipline. As a result, students are not fully prepared to assume responsible tasks in research and development, even though this is one of the desired learning outcomes of the program.

Based on these findings, the experts recommend expanding the international scope of the program by increasing the faculty's foreign language competence and the share of foreign-language teaching materials. Also, basic scientific methods should gain more weight within the curriculum.

On the positive side, the experts noted the high motivation of the students as well as the faculty's notable efforts to facilitate international exchange.

5. Power Units and Energy Systems of Aircraft: Flight Type Engines Manufacturing (Master's level)

5.1 Intended Learning Outcomes

The self-report describes the intended learning outcomes of the program in great detail. Both generic and subject-specific competencies are listed, which overlap to a large extent with the desired learning outcomes formulated for the Master's program in Aircraft Engineering (cf. Chapter 4.1), although the focus lies especially on the construction and design of engines and power systems for aircraft and space applications. The program aims at qualifying students for leading positions in engineering, but also in scientific research and development. To this end, organizational and managerial skills are imparted which enable graduates to successfully plan and manage complex engineering projects.

5.2 Concept and Structure of the Study Program

Since the mid-1990s, the department has closely cooperated with colleagues at the University of Stuttgart. Both institutions contributed to the development of the Master's program; a double degree program is in its planning stages. Each year the two universities exchange students (primarily Ph.D. candidates), and international summer schools are organized on a regular basis. Currently, about 35-40 students are enrolled in the Master's program, 12 of whom are foreign students.

During the first year, students take a number of compulsory courses which provide a broad base of knowledge in engine construction and design, analytical and numerical methods as well as structural dynamics and space engineering, supported by classes in Business English. Also, there is a variety of elective course units on offer which focus on a number of specialized topics in the field of aircraft engines. In the third semester, students are involved in an obligatory practical team project. The experts assume that the final term is dedicated entirely to the Master's thesis (even though this does not become quite clear in the description of the study program).

5.3 General Findings and Impressions of the Expert Panel

The experts found that this Master's program, to a considerable extent, lives up to the goal of increasing SSAU's level of internationalization in teaching and learning. The cooperation with Stuttgart is beneficial in many ways, and the curriculum clearly shows the impact taken by the German partners. The faculty and students displayed a high level of motivation, openness and enthusiasm for their work and a particularly strong interest in cooperating with partners abroad. The experts especially appreciate that some of the Master's students already got the chance to participate in international conferences. Nevertheless, they advocate a further sharpening of the program's international profile: in particular, students should be

given more time and opportunity to improve their written and spoken English and to develop their intercultural competence.

From the experts' point of view, the academic level of the program is certainly satisfactory by international standards. The peers found the integrated approach of the program especially convincing: students and teachers jointly contribute to the full development of complex systems. In this way, students may specialize on certain topics without losing sight of the "bigger picture". The department works with state-of-the art software products that are widely used by researchers and engineers worldwide (CHEMKIN, FLUENT, CFX, ANSYS etc.)

In accordance with the wishes of the students who participated in the on-site talks, the experts would be in favor of introducing more practical, application-oriented components into the curriculum. At present, theoretical instruction still plays a dominant role in the program, which makes it difficult for students to acquire the social and practical skills they need to meet the challenges of their future workplace.

6. Aircraft and Aerospace Engineering: Heat, Electrojet Engines and Power Facilities of Aircraft (Doctorate)

6.1 Intended Learning Outcomes

The central objective of the program is to prepare students for a career as scientific researchers, either at a higher education institution or in industry. Graduates should be able to carry out research and development projects independently and/or as part of international research groups. They are expected to "*have knowledge of the energy basis, circuits, parameters, workflows, specifications and design of engines and power plants of aircrafts for various purposes …*" (cf. self-report of SSAU). Also, they should have the competence to teach undergraduate students in the field of aerospace engineering and be able to communicate their research results to the scientific community both in their native language and in English.

6.2 Contents and Structure of the Study Program

On their way to the degree "Candidate of Sciences", students spend most of their time working on their own research projects under the guidance of their supervisor. Over the course of three years, they take additional classes that prepare them for their future tasks as professional teachers and researchers (as, for example, courses on the history and philosophy of science or on the tools and methods of scientific research and third level teaching). An English language course is also part of the curriculum. Beyond that, students can choose from a number of elective topics to specialize in.

Additionally, students must have at least 50 hours of practical teaching experience and a minimum of three scientific publications in order to receive the degree. (All of the doctoral aspirants participating in the on-site talks had already published in English; some of them had also participated in international conferences.) Finally, final examinations are taken both in the general educational subjects and in the core discipline. Most of the students work at the university full-time or take up positions in industry in addition to or in direct connection with the doctoral program.

6.3 General Findings and Impressions of the Expert Panel

A lot of what has been said regarding the Master's program on flight engines (cf. chapter 5.3) applies equally to the doctoral program. As far as academic standards are concerned, the experts have no doubt that the aspirants are well prepared for their future tasks in research and development. However, it would be advisable to introduce more international components into the curriculum, as e.g. a larger number of classes in English or cooperative projects with international partners. One joint project with the University of Stuttgart is currently being planned, which the peers appreciate.

7. Physics and Astronomy: Devices and Methods of Experimental Physics (Doctorate)

7.1 Intended Learning Outcomes

The intended learning outcomes of the doctoral program in experimental physics strongly overlap with those described for the doctoral program in the field of aerospace engineering (cf. chapter 6.1). The main objective of the program is to produce a new generation of young scientists in "various fields of experimental physics", which, however, are not specified any further in the self-report. Basic teaching skills and foreign language competences are also part of the graduates' desired qualification profile.

7.2 Concept and Structure of the Study Program

The basic structure of the program seems to be the same as described in chapter 6.2 (research work complemented by general educational courses, subject-specific electives and the gathering of teaching experience). However, it does not become quite clear in the self-report whether the regular duration of the program is three years (180 ECTS) or four years (240 ECTS). Based on the on-site talks and the information provided for the other doctoral program, the experts assume that the three year option is correct.

At present, 10 doctoral candidates are enrolled in the program, all of whom are employed as research assistants by the university.

7.3 General Findings and Impressions of the Expert Panel

The elective part of the curriculum covers quite a large variety of topics (optics and photonics, microelectronics, nanoelectronics etc.). Accordingly, the aspirants and the members of faculty seem to be involved in a wide range of research projects on very diverse topics. There seems to be no common mission or shared strategy in teaching and research within the department. Even though each of the research areas mentioned is certainly of high interest and relevance, the program as such suffers from the absence of a clear profile and a coherent concept.

During the on-site talks, the peers missed the lively and inspiring working atmosphere they had encountered in other departments of the university. Research activities seem to suffer from a lack of financial means, and only limited efforts seem to be taken to acquire third-party funding. The experts' general impression is that aspirants receive little support from the university in promoting their career: for example, publications in English or participation in international conferences seem to be the exception.

On these grounds, the experts conclude that the department should take increased efforts to facilitate the career path of its doctoral candidates. In particular, aspirants should get more opportunities to gather international experience and should be more strongly encouraged to build up their foreign language competence. Funds raised from external sources should be used for the promotion of aspirants to the greatest possible extent.

III. Appendix

1. Statement of the University in Response to the Evaluation Report

Page 1: The language of teaching in three Master's programs is English (Applied Mathematics and Physics: Mathematical Modeling and Information Technologies in Photonics; Power Units and Energy Systems of Aircraft: Flight Type Engines Manufacturing; Design, Construction and CALS Technology in Aviation Engineering).

Page II-6: «To the experts' knowledge, an international office does not exist at SSAU» - it exists, of course (nobody from the experts' team asked about the international office, which is located in front of the office of the Pro-rector's for Extra-curricular Activity and it was very easy to visit it), there is also the International Office website (http://ssau.ru/struct/otd/common/int/) and a Pro-rector for International Activity (Prof. V.D.Bogatyryov).

Page II-6: «During the site visit, some lecturers also uttered the wish to have more opportunity for interactive teamwork with students instead of lectures, which, however, is often prevented by the tightly knit curricula». – it isn't true, according to the Federal State Educational Standard and the curriculum's structure the use of interactive forms is obligatory in the volume of 40% of the discipline's workload and it is provided by approved curricula and discipline's programs, the evidence you can find here (uop.ssau.ru).

Page II-7: «However, in case of a failed exam, it is not possible for students to take the course once more in order to close their gaps before re-sitting the examination, which the experts regard as a critical aspect of the student assessment system». – the University has a system of additional paid services and students have opportunity to have extra classes with the teacher, if it is necessary – the dean's offices organize these processes in the beginning of the semester.

Page II-7: «The same goes for the fact that there is usually only one examiner present during oral examinations, without a second member of faculty acting as a "counterbalance" to guarantee impartiality and fairness». – In such cases upon the application of the student the Dean constitutes a committee, which includes the discipline's teacher, the Head of the corresponding chair (or the most qualified teacher) and the Dean's office representative acting as a "counterbalance".

Page II-8: «The estimated average student workload of 27 hours per credit point (with a maximum of 60 Credit points awarded per academic year) » - it's, actually, 36 hours (including all the types of internal workload: classroom hours, self-study, control…).

Page II-8: «…the experts have gained the overall impression that so far, the implementation of the ECTS system has happened on a formal level, but is not yet fully ingrained into the academic culture and organizational structures…» - the ECTS system is fully ingrained into all the systems of academic planning, calculation of teaching staff' and students' academic workload.

Page II-8: «It has remained unclear whether the university issues key ECTS documents…» - you can find them here http://uop.ssau.ru/attachment.php?id=791.

Page II-8: «In any case, this seems unlikely, as academic mobility still seems to be no real option for the majority of SSAU students». – Diploma Supplements have ECTS, besides the International Office arranges (upon the application of the student) an international form of the document (nobody inquired for it during the site visit).

Page II-11: «Foreign languages and intercultural competences, if at all, are imparted only to a very marginal extent». – There had to be fulfilled an analysis of curricula and disciplines' work programs, which were provided to the agency and the experts.

Page II-12: «Most importantly, detailed course descriptions were not submitted; hence the contents of the curriculum do not become fully transparent from the self-report alone». –The disciplines' forms were provided to AKKORK (40 pages of disciplines' forms + work programs, in total more than 90 pages of information about the program and separate disciplines).

Page 18: «In the light of this claim, the experts were disappointed to learn that the textbooks

and scripts used by faculty and students were almost exclusively in Russian, and that English was hardly ever used as a language of communication in class. The members of faculty involved in the program have hardly worked or published abroad». – Part of English content is available for downloading here http://uop.ssau.ru/?page=231, http://uop.ssau.ru/?page=232, http://uop.ssau.ru/?page=233, http://uop.ssau.ru/?page=234. In the course of the interview they said that the work with the group of Chinese students if realized in English every year. We agree that there was also discussed the issue when there is no need to hold lectures in English when all the students are Russian. In the teachers' questionnaires there is pointed out that Astafiev, Boldyrev and Komarov have publications in English and international work experiences (In addition to them V.G.Shakhov and V.A.Frolov can be listed).

Page II-13: «For example, students are encouraged to "think in terms of software" from an early stage, but on the other hand do not seem to receive a thorough understanding of numerical methods». – It's a wrong conclusion. In the general list of disciplines there are fundamental and imparting an understanding of mathematical methods ones, for example, Modern problems of aeronautical science, techniques and technology; Methodology and methods of scientific research; Mathematical modeling of mechanical systems and processes; Structural design of aircraft; Conceptual design of aircraft; Aircraft equipment; Reliability and availability of aircraft; Aircraft manufacturing procedure; Strength stability and resource of aerotechnics; Experimental tests of safety of aerostructure; Design and technology of construction producing from composite materials – where software is used only as a tool, and all the prerequisites and conclusions are drawn and estimated by the students themselves. During interview much time was spent on the discussion with Shakhov about Bernoulli's relation, special methods, including FEM (finite element method), discrete vortex method.

Page II-13: «As a result, students are not fully prepared to assume responsible tasks in research and development, even though this is one of the desired learning outcomes of the program». – It's a final result of the program, which is a requirement against graduates, not students. Besides, majority of graduates hold leading positions, the experts could find it out during the interview with graduates.

Page II-17: «Based on the on-site talks and the information provided for the other doctoral program, the experts assume that the three year option is correct». – How could it be not clear

for the experts' team? They have received all the curricula, where is stated, how many years, when the exams, number of ECTS points and so on.

Page II-17: «There seems to be no common mission or shared strategy in teaching and research within the department. Even though each of the research areas mentioned is certainly of high interest and relevance, the program as such suffers from the absence of a clear profile and a coherent concept». – Research, fulfilled by the aspirants of the program 03.06.01 «Physics and astronomy» covers indeed a wide range of issues, including producing of aircraft hardware, which requires research in the field of mircrooptics, sensory and micro-nanoelectronics. Nevertheless the research is fulfilled within the framework of the major 03.06.01 «Physics and astronomy», being united by a general problem – development and production of hardware for aerospace industry.

Page II-17: «…publications in English or participation in international conferences seem to be the exception». – Publications in English are not an exception, below publications in English of A.N.Agafonov, A.V.Piyakov, B.O.Volodkin, who graduated from this major, are given:

1. B.O. Volodkin, V.S. Pavelyev, K.N. Tukmakov, A.N. Agafonov, B.A. Knyazev, Yu.Yu. Choporova, A.K. Kaveev, G.I. Kropotov "Silicon diffractive optical elements for transformation of terahertz novosibirsk free electron laser radiation", Techn. Digest of Int. Conf. on Las. Appl. Technol. (LAT 2013), 18-22 June 2013, Moscow, LAT-04, p.43-44 (2013).
2. A.N. Agafonov, B.O. Volodkin, S.G. Volotovsky, A.K. Kaveev, B.A. Knyazev, G.I. Kropotov, K.N. Tukmakov, V.S. Pavelyev, E.V. Tsygankova, D.I. Tsypishka, Yu.Yu. Choporova, "Optical elements for focusing of Terahertz laser radiation in a given two-dimensional domain", Optical memory and neural networks (Information Optics), V. 23, N 3, pp. 185-190, (2014).
3. Agafonov, A.N. Diffractive lenses for high-power terahertz radiation beams / A.N. Agafonov, M.G. Vlasenko, B.O. Volodkin, V.V. Gerasimov, A.K. Kaveev, B.A. Knyazev, G.I. Kropotov, V.S. Pavelyev, I.G. Palchikova, V.A. Soyfer, M.F. Stupak, K.N. Tukmakov, E.V. Tsygankova, Yu. Yu. Choporova // Bulletin of the Russian Academy of Sciences: Physics. – 2013. – Vol. 77, Issue 9. P. 1164-1166.
4. Agafonov, A.N. Silicon diffractive optical elements for high-power monochromatic te-

rahertz radiation / A.N. Agafonov, B.O. Volodkin, A.K. Kaveev, B.A. Knyazev, G.I. Kropotov, V.S. Pavel'ev, V.A. Soifer, K.N. Tukmakov, E.V. Tsygankova, Yu.Yu. Choporova //, Optoelectronics, Instrumentation and Data Processing. – 2013. – Vol. 49,Issue 2– P. 189-195

5. B.A. Knyazev, I.A. Azarov, V.S. Cherkassky, Yu.Yu. Choporova, V.V. Gerasimov, Ya.V. Getmanov, E.V. Grigorieva, M.A. Dem'yanenko, D.G. Esaev, A.K. Kaveev, I.N. Kotelnikov, V.N. Kruchinin, M.V. Kruchinina, V.V. Kubarev, G.N. Kulipanov, S.N. Makarov, M.S. Mitkov, L.A. Mostovich,A.K. Nikitin, P.A. Nikitin, I.G. Palchikova, V.S. Pavelyev, D.G. Rodionov, S.V. Rykhlitsky, T.V. Salikova, M.A. Scheglov, O.A. Shevchenko, V.A. Shvets, S.S. Serednyakov, D.A. Skorokhod, M.F. Stupak, N.A. Vinokurov, M.G. Vlasenko, B.O. Volodkin, V.B. Voloshinov, M.A. Zavyalova, G. N. Zhizhin, Advances in optics and photonics in the terahertz region at SPIN workstation of Novosibirsk free electron laser, Technical Digest MPLP'2013, VI International Symposium "Modern Problems of Laser Physics", Novosibirsk, Russia, August 25-31, 2013, P. 97-98

6. Knyazev, B. Diffractive optical elements for the terahertz region / B. Knyazev, Yu. Choporova, V. Gerasimov, M. Vlasenko, V. Pavelyev, B. Volodkin, A. Agafonov, K. Tukmakov, A. Kaveev, G. Kropotov, E. Tsygankova, M. Stupak, I. Palchikova // The 2-nd International Conference "Terahertz and Microwave radiation: Generation, Detection and Applications", TERA-2012, 20-22 June. - 2012. - P.111.

1. A CHARGED DUST PARTICLE INJECTOR Semkin N.D., Piyakov A.V., Voronov K.E., Shepelev S.M., Bogoyavlenskii N.L.

Instruments and Experimental Techniques. 2006. Т. 49. № 3. С.440-445. (переводная)

2. A LINEAR ACCELERATOR FOR SIMULATING MICROMETEORITES Semkin N.D., Piyakov A.V., Voronov K.E., Bogoyavlenskii N.L., Goryunov D.V.

Instruments and Experimental Techniques. 2007. Т. 50. № 2. С.275-281. (переводная)

3. ION'S FORMATION AND PHOTO ISSUE AT INTERACTION OF HIGH-SPEED DUST PARTICLES WITH OPTICAL GLASS

Semkin N.D., Voronov K.E., Piyakov A.V., Novikov L.S.

In collection: European Space Agency, (Special Publication) ESA SP 5th European Conference on Space Debris.

Сер. "Proceedings of the 5th European Conference on Space Debris"

Darmstadt, 2009. (abstracts in English)

4. SIMULATION OF MICROMETEORITES USING AN ELECTRODYNAMICAL ACCELERATOR Semkin N.D., Voronov K.E., Piyakov A.V., Piyakov I.V.
Instruments and Experimental Techniques. 2009. Т. 52. № 4. С. 595-601. (переводная)
5. ELECTRIC CHARGE AND FIELD IN THE MENISCUS OF A DIELECTRIC FLUID
Semkin N.D., Piyakov A.V., Telegin A.M., Voronov K.E., Piyakov I.V.
Technical Physics. The Russian Journal of Applied Physics. 2013. Т. 58. № 5. С. 640-646. (переводная)
6. AN INJECTOR OF CHARGED LIQUID PARTICLES
Semkin N.D., Piyakov A.V., Voronov K.E., Kalaev M.P., Telegin A.M.
Instruments and Experimental Techniques. 2013. Т. 56. № 2. С. 225-232. (переводная)
7.Cyclic Dust Particles Accelerator. Semkin N.D., Piyakov A.V.,Pogodin A.P.
9th international Conference on "Protection of Materials and Structures from Space Environment"
ICPMSE-9 May 20-23, 2008, s. 19 (abstracts)
8. A Linear Accelerator for Simulating Micrometeorites
Semkin N.D., Voronov K.E., Piyakov A.V.,Pogodin A.P.,Andrushenko A.B.
9th international Conference on "Protection of Materials and Structures from Space Environment"
ICPMSE-9 May 20-23, 2008, s. 20(abstract)

1. Volkov A.V., Pavelyev V.S., Moiseev O.Yu., Eropolov V.A., Volodkin B.O., Tukmakov K.N.: Thin copper film for plasma etching of quartz. Optical Memory and Neural Networks (Information Optics), Allerton Press, Vol. 18, No. 1, 2009 pp 40 – 43.
2. Solovyev V.S., Volodkin B.O., Volkov A.V., N.L. Kazansky, Relaxation of supramolecular structures in polydimethylsiloxane films. Mendeleev Commun., Elsevier, № 19, С. 342-343, 2009.
3. Volodkin B.O., Solovyev V.S., Volkov A.V., Supramolecular structures in polydimethylsiloxane films for fabrication of micro and nano relief, International Conference «Optical Techniques and Nano-Tools for Material and Life Sciences» (OTN4MLS-2010), Minsk, Belarus, Vol.1, pp.185-188, 2010
4. B. Knyazev, Yu. Choporova, V. Gerasimov, M. Vlasenko, V. Pavelyev, B. Volodkin, A.

Agafonov, K. Tukmakov, A. Kaveev, G. Kropotov, E. Tsygankova, M. Stupak, I. Palchikova «Diffractive optical elements for the terahertz region", The 2-nd International Conference "Terahertz and Microwave radiation: Generation, Detection and Applications", p.111, TERA-2012, Moscow, Russia, 20-22 June, 2012.

5. Boris Knyazev, Yulia Choporova, Maxim Vlasenko, Vladimir Pavelyev, Boris Volodkin, Agafonov Andrey, Konstantin Tukmakov, Andrey Kaveev, Grigory Kropotov, Ekaterina Tsygankova, Mikhail Stupak, Irina Palchikova «Study of diffractive optical elements using high-
power radiation of terahertz Novosibirsk free electron laser" IRMMW-THz 2012, 37th International Conference on Infrared, Millimeter and Terahertz Waves University of Wollongong, Australia September 23 - 28, 2012.

Page II-18: «Funds raised from external sources should be used for the promotion of aspirants to the greatest possible extent». – In the SSAU there is a grants' system, as well as language trainings abroad, organized under the program of competitiveness enhancement; target money is assigned for it. It's hard to tell about the general mission, as the Aspirant's degree is elite piece-training and every aspirant works, in general, on his or her subject. Variety of Physics and Astronomy is very broad and it's not reasonable to join technologies of nanoelectronics with instruments for satellites.