Report on

The 21st Jyväskylä Summer School

University of Jyväskylä
August 8th – August 19th 2011

Organizing Committee:

Janne Ihalainen, Chairman
Markku Sakkinen, Vice-chairman
Jussi Maunuksela
Raino Mäkinen
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Acknowledgements for the 21st Jyväskylä Summer School

We wish to thank all Summer School Students and Lecturers for their contribution to the 21st Jyväskylä Summer School!

We would also like to thank the Faculty of Mathematics and Science and the Faculty of Information Technology and their Departments, as well as the Graduate Schools that took part in this year's Summer School.

In addition, we wish to give our acknowledgements for the external financiers of the 21st Jyväskylä Summer School:

- The EU FP7 VALORGAS project
- The Centre for International Mobility (CIMO)
- The COST Action FP0802
- The Finnish Academy of Science and Letters, Mathematics Fund
- The International Summer School ISOPHOS (Center for HYbrid and Organic Solar Energy, University of Rome Tor Vergata)
- The Marie Curie Training Network on muscle Z disk protein complexes (MUZIC)
- The research consortium 'Low cost PV' under the research program Photonics and Modern Imaging funded by the Academy of Finland
- Åbo Akademi University

Finally, we would like to express our appreciation for the help of several people in the following organisations and parties:

- The City of Jyväskylä
- Museum of Central Finland
- Jyväskylän työväenyhdistys
- Päijänne-Ristelyt Hilden Oy
- The Student Union of the University of Jyväskylä
- ISSSM International Summer School in Systematic Musicology
- Maahisen Muki ja Mela
- Vihtavuoren Pamaus
- Meloiloa Ry

The Organizing Committee of the 21st Jyväskylä Summer School

Executive summary

The 21st Jyväskylä Summer School was organized by the Faculty of Mathematics and Science and the Faculty of Information Technology at the University of Jyväskylä in Finland. The Summer School took place from the 8th till 19th of August 2011 and offered 21 courses for advanced Master's students, graduate students and post-doctoral students in a number of fields of natural sciences and information technology. In total 334 participants attended the courses (Figure 1).

The Organizing Committee of the Summer School is selected annually. The Organizing Committee of the 21st Jyväskylä Summer School was chaired by Prof. Janne Ihalainen (Vice-chairman; Dept. of Biological and Environmental Science). The other members of the Committee were Prof. Markku Sakkinen (Vice-chairman; Computer Science and Information Systems), Prof. Markus Ahlskog (Dept. of Physics), academy researcher fellow Karoliina Honkala (Dr.; Dept. of Chemistry), Prof. Raino Mäkinen (Department of Mathematical Information Technology), Dr. Hannes Luiro (Department of Mathematics and Statistics), Dr. Jussi Maunuksela (Renewable Energy Programme), Coordinator Dr. Kirsi Ruusuniitty (Jyväskylä Summer School), and for the period May-August, Summer Secretary Kirsikka Sillanpää (Jyväskylä Summer School).

The 21st Jyväskylä Summer School received 335 applications from students outside of the University of Jyväskylä. 157 students enrolled in the University of Jyväskylä registered for the courses before the deadline. Hence, the total number of applicants reached 492. Finally, a total of 334 students attended the School. There were altogether 49 lecturers in the Summer School courses.

Accommodation was arranged in cooperation with the Kortepohja student village, Summer Hostel Rentukka and Hotel Alba. The number of students accommodated in Kortepohja reached 134 whereas 49 stayed in Rentukka. 16 students and 31 lecturers were accommodating in Hotel Alba.

Tutors were assigned to both academic and social tasks by the course coordinators and the Summer School office. The tutors provided valuable assistance in helping to organize lectures as well as the social program especially concerning the course events. They also functioned as a useful channel to receive direct feedback from the participants during the School.

As a result of the feedback and experiences from previous Summer Schools, 16 events of social activities were organized during the School. The social events constituted a balanced ensemble of Finnish culture and outdoor activities. The social program of the 21st Summer School covered both outdoor activities such as canoeing and rowing and indoor events for example movie night.

The feedback from the participants was collected with an electronic feedback form set in the webpage of the Jyväskylä Summer School. In total 115 students answered the survey, which

provided valuable information on the success of academic and social program of the Summer School.

In summary, the 21st Jyväskylä Summer School was successfully completed. The received feedback indicates that the participants found the School beneficial both in professional terms as well as in creating new contacts and social interaction with colleagues.

1. APPLICATION AND ADVERTISEMENT

The call for participants was announced via a network of partners in universities and scientific institutions around the world as well as to the students of the University of Jyväskylä.

The program and application forms for the School were available on the website of the 21st Jyväskylä Summer School from the 1st of February 2011. The deadline for applications was the 30th of April. The course coordinators of the Summer School selected students for the courses by the 17th of May 2011. However, some post-deadline applications were accepted.

2. COURSES AND LECTURES

A total of 21 courses were organized in the 21st Jyväskylä Summer School at the campuses of Mattilanniemi and Ylistö over the period of 8.-19.8.2011 (See also Table 1).

The length of the courses varied from four days to ten days. The majority of the courses were organized on the first week. In addition to lectures, most courses included exercises, demonstrations, group work or laboratory work. The teaching in the courses was provided by 37 invited external lecturers and 11 lecturers from University of Jyväskylä. Invited lecturers came from 12 different countries. Each course also had a coordinator from the University of Jyväskylä. More detailed descriptions of the courses can be found in Appendix 1.

In order to receive a certificate of attendance for a course, students had to attend at least 80 percent of the scheduled program of the course. To receive ECTS credits for the course, the students were generally required to pass the exam or complete course work or exercises in given time.

Table 1. The course schedule of the 21st Jyväskylä Summer School, lecturers and coordinators

Abbr.	Name of the course	Duration	Duration in hours (lectures + demos + lab. work)	Lecturer(s)	Coordinator(s)
BIO1	Basic Fluorescence Microscopy	8.-.12.8.	10 + 2	PhD Maria Vartiainen	Prof. Jari Ylänne
BIO2	Nonlinear microscopy - Four wave mixing (FWM) imaging techniques and their applications - from nanomaterials to biological application	15.-19.8.	15-25	Prof. Eric O Potma	Prof. Janne Ihalainen
CH1	Density Functional Theory for Nanostructures	8.-19.8.	20 + 20	Jussi Enkovaara (CSC)	Karoliina Honkala
CH3	Medicinal Chemistry	8.-.12.8.	16	Prof. Antti Poso, Dr. Krista Laine	Elina Sievänen
COM1	Modern Problems in Applied Dynamical Systems Theory	8.-.12.8.	8 + 2	Prof. Gennady A. Leonov	PhD Nikolay Kuznetsov
COM2	Processing of High Dimensional Data	8.-.12.8.	16	Prof, FiDiPro Amir Averbuch	Prof. Tapani Ristaniemi
COM3	Machine Learning for Signal Processing	15.-19.8.	16	Prof, FiDiPro Asoke Nandi	Prof. Tapani Ristaniemi
COM4	Nonlinear Optimization: Advances and Applications	15.-19.8.	15	Prof. Anders Forsgren	Prof. Kaisa Miettinen
IS1	Knowledge Management and Knowledge Management Systems in High-tech Organizations	8.-.12.8.	15	Dr. Nazmun Nahar	Dr. Nazmun Nahar
IS2	Global Knowledge Management	15.-19.8.	17 + 7,5	Prof. Dr. Franz Lehner, Prof. Dr. Jan M. Pawlowski	Jan Pawlowski
MA1	Quantitative Geometric and Functional Inequalities	8.-.12.8.	10	Nicola Fusco	Hannes Luiro
MA2	Weak Convergence, Young Measures and Quasiconvexity	8.-.12.8.	10	Jan Kristensen	Hannes Luiro
MA3	Fractal Statistics	15.-19.8.	10	Prof. Iddo Eliazar	Lasse Leskelä
PH1	Nanooptics and Plasmonics: Theoretical Concepts	8.-.12.8.	15+5	Ulrich Hohenester	Jussi Toppari
PH2	Introduction to Micro- and Nanorobotics	8.-.12.8.	20	Dr. Quan Zhou	Dr. Kirsi Ruusuniitty
PH3	Fundamentals of Ion-	15.-19.8.	10 + 6 + 2	Prof. Peter Sigmund, Prof.	Prof. Harry J.

	Matter Interaction			Harry J. Whitlow	Whitlow
PH4	Applications of X-ray microtomography on heterogeneous materials (wood and wood-based composites etc)	15.-19.8.	15	Cris Luengo, Jan Van den Bulcke, Markko Myllys, Tuomas Turpeinen	Tuomas Turpeinen, Markku Kataja
RE1	Organic and Dye Based Photovoltaics	8.-.12.8.	20	Dr. Gerrit Boschloo, Dr. Florian Schiffmann, Prof. Jouko Korppi-Tommola, Dr. Janne Halme , Dr. Moritz Riede , Dr. Thomas Kirchartz, Dr. Roderick Mackenzie, Prof. Ronald Österbacka, Prof. Tonu Pullerits	Prof. Jouko Korppi-Tommola
RE2	Optimization of Bioenergy use	15.-19.8.	21	Prof. Jukka Konttinen, Prof. Esa Vakkilainen, Prof. Martti Larmi, Ilkka Savolainen, Mikko Hupa, Riitta Keiski, Prof. Lauri Sikanen	Prof. Jukka Konttinen
RE3	Biogas Technology for Sustainable Second Generation Biofuel Production	15.-19.8.	20 + 2	Prof. Charles Banks, Dr., Michael Chesshire, Dr. David Bolzonella, Dr Cristian Cavinato, Dr Reinhold, Prof. Jukka Rintala	Prof. Jukka Rintala
STAT1	Statistical Designs in Epidemiology	8.-.11.8.	16	Esa Läärä	Prof. Antti Penttinen

3. STUDENTS

This year both the students from the University of Jyväskylä and external applicants applied to the Summer School via electronic form whereas an electronic. This differed from previous years, when local students have enrolled to courses via Korppi. Previously the problem has been that a lot of students from Jyväskylä never show up on the courses without cancelling their participation. This was a big problem especially in the courses with limited number of participants.

The Summer School received altogether 492 applications from both students from University of Jyväskylä and those from other institutes. 335 of the applicants were not enrolled in University of Jyväskylä, therefore the number of applications from JYU was 158.

From the applicants outside of the University of Jyväskylä 297 students were accepted to participate in the Summer School. Finally 208 of them registered to the School. Almost all students of the University of Jyväskylä who registered before the deadlines were accepted in the courses though some of them canceled their participation before June 28th Finally 126 students from University of Jyväskylä confirmed their participation to the Summer School.

Finally, a total number of 334 students attended the 21st Jyväskylä Summer School (the number of students who has attended at least 80 percent of the scheduled program of one course). See Figure 1 for a summary on the student numbers of the Jyväskylä Summer School over the years.

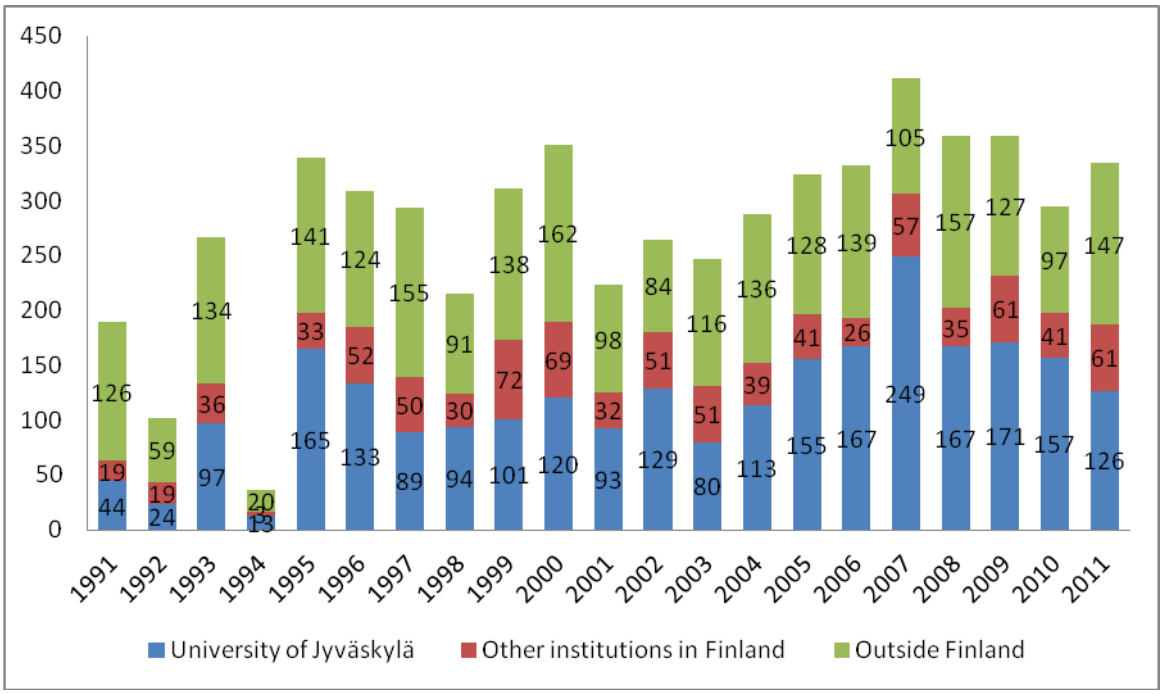

Figure 1: The numbers of Jyväskylä Summer School participants over the years.

Summer School students represented 57 different nationalities and came from 28 different countries. While the majority of the students were Finnish (36 %), the largest foreign national group was Russians (47), followed by Italians (19) and Ukrainians (13). Most of the students came from Finland: 179 students which are 54 % of all students.

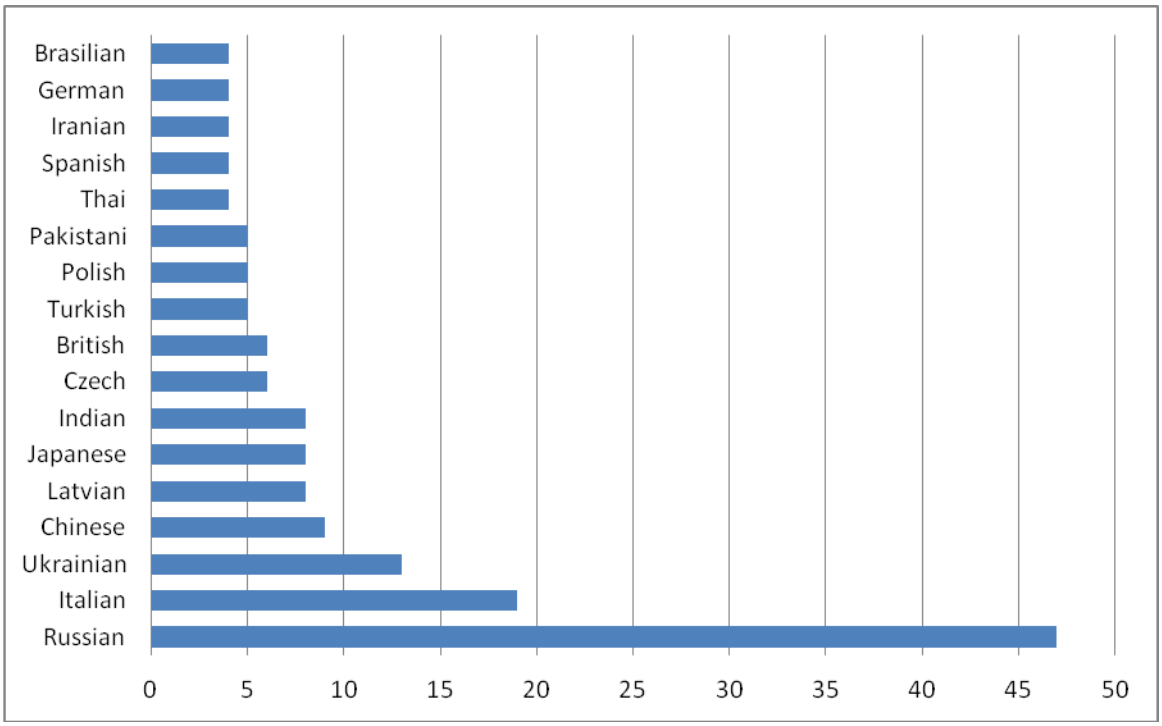

Figure 2. Most common (more than 4 participants) nationalities among of Summer School students. Finnish students are not presented here.

4. ACCOMMODATION AND SOCIAL EVENTS

As a consequence of the construction work in Kortepohja student village, the number of available rooms for the Summer School students was limited. To help accommodate all the students, rooms were also booked from Summer Hostel Rentukka. Most lecturers had a room in the Hotel Alba in Mattilanniemi campus of the university. The room reservations to all Kortepohja student village, Summer Hostel Rentukka and to Hotel Alba were made by the Summer School office.

The Summer School provided students altogether 16 social events in the evenings and during the weekend. The social program introduced the participants to the Finnish culture and the Jyväskylä region, and facilitated interdisciplinary communication and social networking between students, lecturers and organizers. The social events also acted as a counterbalance for the intensive academic work.

This year also different courses arranged separate get-together evenings for participants. Thus students were able to get to know other course participants through relaxed sauna evening or by playing games together. The students also had an opportunity to get to know Finnish nature and the region of Jyväskylä through nature trip to Leivonmäki and by canoeing and rowing around the lakes in Jyväskylä.

The Farewell party included a cruise on the lake Päijänne. For those wishing more unofficial farewell party, the opportunity for get-together in Kortepohja was arranged the next evening.

Table 2: JSS21Social events

Date	Event	Location	Number of participants (approx.)
Mon 8.8.	Guided campus tour	Campus of the University	24
Tue 9.8.	Opening ceremony	Museum of Central Finland	150
Wed 10.8.	Canoeing	Lake Tuomiojärvi	43
Wed 10.8.	Folk dance event	Seminarium	15
Thu 11.8.	Football match	Vehkalampi	12
Fri 12.8.	Sauna Evening	Kiviniemi	61
Sat 13.8.	Nature trail in Leivonmäki	Toivakka	39
Sun 14.8.	Bike excursion	Vaajakoski	13
Mon 15.8.	Finnish language lesson	MaA103	19
Mon 15.8.	Grilling in Kortepohja	Kortepohja	15
Tue 16.8.	Albert Einstein seminar	Agora 2	100
Tue 16.8.	Movie night	MaD202	34
Wed 17.8.	Canoeing	Lake Tuomiojärvi	17
Wed 17.8.	Team Rowing	Lutakko	8
Thu 18.8.	Farewell Party	Lake Päijänne	100
Fri 19.8.	Unofficial farewell party	Kortepohja/Lillukka	60

5. GET-TOGETHER EVENTS

Almost all Summer School courses arranged separate get-together evenings for participants. Thus students were able to get to know other course participants through relaxed sauna evening or by playing games together.

More than 37 percent of the foreign participants regarded the get-together event useful, but only 23 % of local students found it useful. The reason for this is that half of the local students did not attend to the event. The most common reason for this was social life or family reasons. According to the feedback from the students, the get-together event provided possibility to meet other students of the course, lecture(s) and course coordinator. After the event students felt that it was easier to communicate with lecturer(s), course coordinator and other students attending to the course. Other important issue was the relaxing atmosphere.

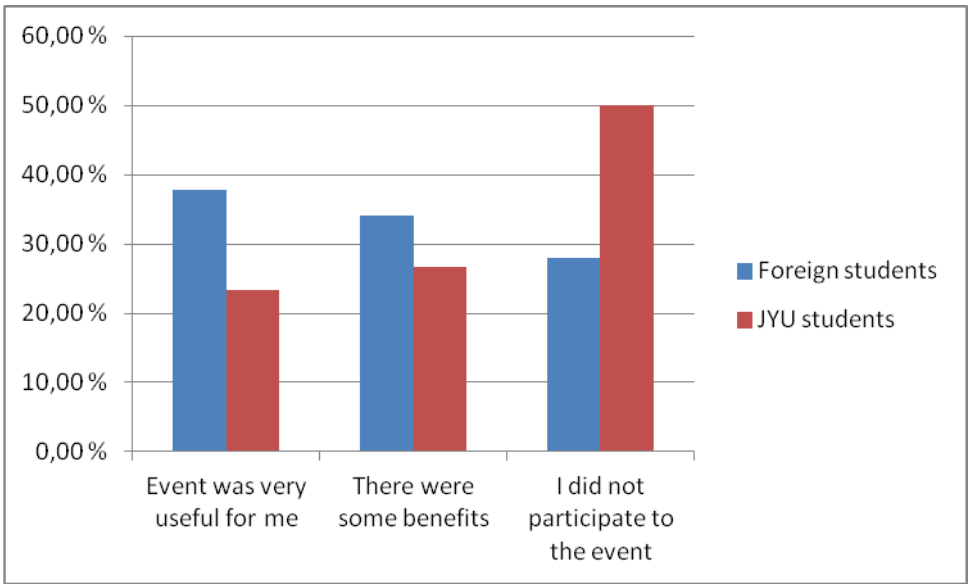

Figure 3. Usefulness of get-together event.

6. TUTORING

A total of 13 volunteer tutors assisted in 12 of the Summer School courses. Most of the tutors also completed the Summer School courses for which they were tutoring. The main task of the tutors was to act as a link between the students and the course coordinator, lecturers and the Summer School office. The tutors also provided assistance and company to students and assisted lecturers and course coordinators in various tasks. Tutors also helped to arrange a course get-together where the students from each course could get to know each other. In addition to that the tutors helped with the regular social program, especially concerning the unofficial farewell party on Friday. The tutors could obtain 2 ECTS credits for their tutoring by writing a short report on their tutoring experiences.

According to the feedback from the students, the tutors provided assistance in various tasks and helped foreign students in getting familiar with Jyväskylä and the Finnish student culture. In general, the contribution of the tutors was regarded as positive.

Based on the reports written by the tutors, tutoring was regarded as a fruitful and enjoyable experience. In the reports the tutors also made valuable suggestions for the coming years and reported practical problems encountered. While some tutors were more active in guiding foreign students in free-time activities, others focused only on the tasks given by lecturers and course coordinators. In the best cases, tutoring provided social contacts and networking opportunities with the summer school students, course coordinators and lecturers.

7. FUNDING

Based on calculations, the total expenditure of the 21ST Jyväskylä Summer School will be 133 849 €. Please see information on the received funding as well as expenses in Table 3.

Table 3: Funding and expenses of the 21st Jyväskylä Summer School.

EXPENSES (Euros)	COSTS (€)
Lecture fees (including expenses)	39 378
Travels of the lecturers	11 246
Accommodation of the lecturers	12 593
Daily allowances of the lecturers	5 280
Other costs	700
Total (include VAT)	**69 197**

GENERAL COSTS	COSTS (€)
Secretarial Costs (incl.exp.)	57 071
Social Programme	5 545
Postal Charges	865
Printed and Copied Work	836
Other Costs (coffee, lunch, office supplies)	334,29
Total	**64 652**

TOTAL (Course Costs + General Costs)	133 849

FUNDING (Euros)	(€)	%
Faculty of Mathematics and Science, University of Jyväskylä	46 180	34,5 %
Faculty of Information Technology, University of Jyväskylä	30 648	22,9 %
National Doctoral Programme in Nanoscience (NGS-NANO)	9 964	7,4 %
The research consortium 'Low cost PV'	6 882	5,1 %
The EU FP7 VALORGAS project	5 338	4,0 %
Graduate School for Energy Science and Technology (EST)	3 362	2,5 %
National Doctoral Programme in Material Physics (NGSMP)	3 162	2,4 %
Department of Mathematics and Statistics, University of Jyväskylä	2 610	1,9 %
Doctoral Programme in Particle and Nuclear Physics (GRASPANP)	2 569	1,9 %
The COST Action FP0802	2 461	1,8 %
Finnish Doctoral Programme in Stochastic and Statistics (FDPSS)	2 400	1,8 %
The Marie Curie Training Network on muscle Z disk protein complexes (MUZIC)	2 378	1,8 %
Finnish Academy of Science, Mathematics Fund	2 278	1,7 %
Department of Chemistry, University of Jyväskylä	2 057	1,5 %

Doctoral Programme in Mathematical Analysis and its applications (GSMAA)	2 048	1,5 %
Finnish Doctoral Programme in Environmental Science and Technology (EnSTe)	2 000	1,5 %
Finnish Doctoral Programme in Computational Sciences (FICS)	1 769	1,3 %
National Graduate School of Organic Chemistry and Chemical Biology (GSOCCB)	1 193	0,9 %
Department of Physics, University of Jyväskylä	1 185	0,9 %
Jyväskylä Graduate School in Computing and Mathematical Sciences (COMAS)	1 056	0,8 %
National Doctoral Programme in Informational and Structural Biology (ISB)	1 000	0,7 %
First Staff Exchanging Programme (Russia)	775	0,6 %
Tampere Graduate School for Biomedicine and Biotechnology (TGPBB)	534	0,4 %
Total	**133 849**	**100,0 %**

8. THE SYMPOSIUM "EINSTEIN TODAY"

The seminar "Einstein today" was held at Agora on Tuesday 16th of August. Seminar focused to Einstein's personal history, his political views and the legacy he left for future generations. The speakers of the seminar was Professor Jukka Maalampi from the Department of Physics at the University of Jyväskylä and University Lecturer Syksy Räsänen from the University of Helsinki. The seminar was held in English and it was open to everyone. The seminar gathered together more than 100 person interested about Einstein.

9. EVALUATION AND FEEDBACK

In order to evaluate the 21st Summer School and to develop the future Summer Schools, the students were asked to fill in an electronic feedback form. Altogether 181 participants filled in the form by the deadline of September 15th. For more details and student comments, see Appendix II.

Regarding the organization of the School, the anonymous feedback from the respondents was generally very positive. More than 95 percent of the participants will or may attend the Summer School again, and more than 71 percent (123) of the participants will certainly recommend the School to other students, while only three respondents would not recommend the School. Every fifth (18,9 %) participant regarded the JSS courses to be of major importance to their future studies or research. Only 2,9 % of students informed that they didn't benefit about the course(s).

When students were asked to evaluate the level of the courses in general, the average level of the courses was evaluated as "suitable" or "demanding" (Figure 3). The course contents also fulfilled their expectations: majority (61 %) of the courses corresponded "very well" or better with the students' expectations, with the majority of the courses achieving the grade "very well" (Figure 4).

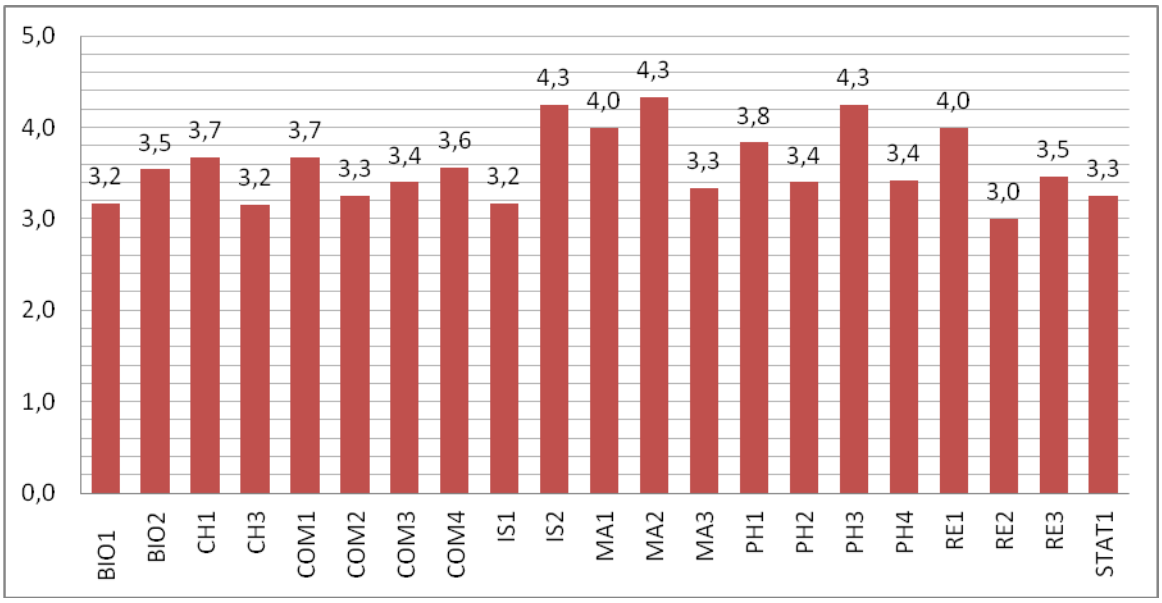

Figure 4. The average standard in JSS21 courses based on anonymous feedback from Summer School students (115 respondents). 1= "Very simple", 2= "Simple", 3= "Suitable", 4= "Demanding", 5= "Very demanding".

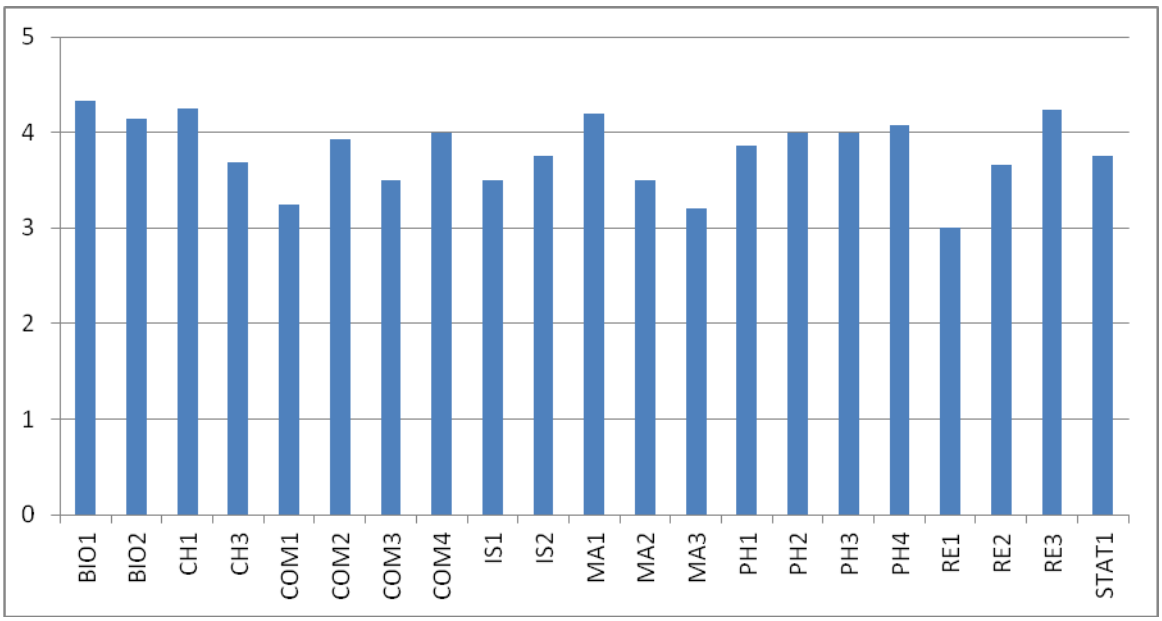

Figure 5. The average correspondence of JSS21 courses´ contents to Summer School students´ expectations based anonymous feedback (181 respondents). 1= "Nothing like expected", 2= "Poorly", 3= "Enough", 4= "Very well", 5= "Better than expected".

The practical arrangements of the school were generally regarded as highly successful (see appendix 2). The Social Program of the School received very positive feedback from the students (see appendix 2). The most highly valued events were the canoeing tours, campus tour,

sauna evenings, nature trail, dance evening and the Farewell party. The visit to the Sports and Games events hit the lowest grades in the feedback.

42 percent of the respondents received information on the Summer School from their supervisor or other staff member of their department. The second most common source was the internet which served as a source of information for almost one third of the respondents and every fifth respondent had received information on the Summer School from their friends.

10. CONCLUSION

The Jyväskylä Summer School was organized for the 21st time by the Faculty of Mathematics and Science and the Faculty of Information Technology at the University of Jyväskylä, Finland. Following the tradition of two decades, the 21st Jyväskylä Summer School offered several courses in a number of different subjects and themes.

Jyväskylä Summer School will continue to invest in the development of the Summer School. In order to improve the coming Summer Schools, a wide-scale feedback was gathered by an electronic survey system. The feedback received from lecturers and students was mainly very positive. Especially the high quality and interdisciplinary teaching as well as the large number of courses and social events were appreciated. Additionally, the possibilities for academic, professional and social networking in a multicultural environment were considered an important part of the Summer School.

Over the years, the Jyväskylä Summer School has established an important role as part of the international profile of the University of Jyväskylä. It provides valuable opportunities for networking for students and staff, and the introduction of good student material and opportunities for international cooperation to the departments involved. The Summer School has a strong tradition of providing high level courses with renowned scientists as lecturers, and continues to attract increasing numbers of students each year. Providing high-quality courses with world-renowned researchers as lecturers to gifted students from Finland and abroad will continue to be the main goal of the Jyväskylä Summer School.

Jyväskylä, 4.11.2011

Prof. Janne Ihalainen
Chair of the Organizing Committee
The 21th Jyväskylä Summer School

Dr. Kirsi Ruusuniitty
Program Coordinator
Jyväskylä Summer School

Appendix I

COURSE DESCRIPTIONS OF THE 21ST JYVÄSKYLÄ SUMMER SCHOOL

BIOLOGY (2 courses):

BIO1: Basic Fluorescence Microscopy

Time: 8.-12.8.2011
Lectures: 10 + 2 h exam or essay
Credits: 1 ECTS with lectures only and exam 2 ETC lectures, exam and practicals
Coordinator: Jari Ylänne
Number of students: 12
Lecturers: PhD Docent Maria Vartiainen and others to be announced later
Prerequisites: Basic knowledge in light microscopy and cell culture assumed
Passing: Obligatory attendance to lectures and practicals + exam or essay.
Grading: 1-5
Abstract: This course covers basics of fluorescence microscopy, confocal microscopy and total interference reflection microscopy.

The course in organized in collaboration with the Marie Curie Training Network on muscle Z disk protein complexes (MUZIC) and the MUZIC students have priority to the practicals.

BIO2: Nonlinear microscopy - Four wave mixing (FWM) imaging techniques and their applications - from nanomaterials to biological application

Time: August 15 - 19, 2011
Lectures / demostrations: 20 h
Credits: 2 ECTS
Number of students: 25
Coordinator: Janne Ihalainen and Mika Pettersson
Lecturers: Eric O Potma, University of California – Irvine, USA
Prerequisites: Basic knowledge about optical spectroscopy
Passing: Obligatory attendance at lectures + essay
Grading: Grading scale of 0 to 5

Abstract: The recent application of the FWM scheme has opened up new opportunities for investigating the nonlinear properties of microscopic and nanoscopic structures. The FWM technique, in the form coherent anti-Stokes Raman scattering (CARS) and stimulated Raman scattering (SRS) excitation schemes, has gained popularity as a vibrational imaging tool in biology and material sciences. As a biomedical imaging method, vibrational FWM continues to make an impact on the fields of lipid metabolism and lipid disease. Besides the quantitative detection of lipids in tissues, FWM vibrational microscopy also enables the detection of water, protein and nucleic acids in tissues, in addition to topically applied drugs. Beyond vibrational microscopy, the

FWM technique can be used to probe electronically resonant materials. Nonlinear optical tools are particularly relevant to the development and applications of nanomaterials. By using FWM techniques it is possible to achieve single-particle level, which facilitates detailed studies aimed at understanding the electronic properties of nanostructured materials.

In this course we will zoom into the basics of the FWM interaction and how it can be used as a probe in an optical microscope. Nonlinear light-matter interactions will be explained in an intuitive yet thorough fashion, followed by a discussion on light propagation and tight focusing. The course will then focus on different implementations of the FWM imaging technique, including CARS, SRS and optical Kerr effect microscopy. Finally, an overview will be presented of recent FWM imaging applications in biology and nanoscience, and a critical look into the future will be provided. The Jyväskylä Summer School at the University of Jyväskylä is an excellent environment to learn about this exciting new trend in nonlinear optical microscopy.

The course is organized in cooperation with the National Doctoral Programme in Nanoscience and the National Doctoral Programme in Informational and Structural Biology (ISB).

CHEMISTRY (2 courses):

CH1: Density Functional Theory for Nanostructures

Time: August 8 - 19, 2011
Lectures: 20 h Lectures + 20 h Excercises
Credits: 3 ECTS
Coordinator: Karoliina Honkala
Lecturer: Jussi Enkovaara (CSC), Karoliina Honkala (JYU)
Number of students: 40
Prerequisites: Basics in quantum mechanics and electronic structure theory and basic Unix/Linux command line usage
Passing: Obligatory attendance at lectures + passing the assignments
Grading: pass/fail
Abstract: Density-functional theory is one of the most used theoretical frameworks for ab-initio simulations of nanostructures. The course introduces the basics of the density-functional theory and time-dependent density-functional theory and discusses examples on how they can be applied to different research problems of nanostructures. The course contains both lectures and hands-on exercises.
The course discusses the fundamental physical approximations employed in density-functional calculations and presents different numerical schemes for the solution of the resulting equations. The main emphasis is in the projector-augmented wave (PAW) and real-space grid based methods. The ways to calculate different physical properties are introduced in lectures and in hands-on exercises employing the GPAW program package (wiki.fysik.dtu.dk/gpaw) together with the Atomic Simulation Environment (ASE), which is a simulation interface that can be used to setup, perform and analyze the electronic structure calculations with various different codes. The concepts of modelling simple reactions are given as well as the basics for determining thermodynamic properties from the electronic structure calculations. The examples on nanostructures include both gas-phase and supported structures applicable for e.g. catalysis and solar cells.

The course is organized in cooperation with the National Doctoral Programme in Nanoscience (NGS-NANO) and the Finnish Doctoral Programme in Computational Sciences (FICS).

CH3: Medicinal Chemistry

Time: August 8 - 12, 2011
Lectures: 16 h lectures + 2h exam
Credits: 3 ECTS
Coordinator: Elina Sievänen
Lecturers: Prof. Antti Poso, Dr. Krista Laine (University of Eastern Finland)
Prerequisites: M.Sc. or equivalent in Chemistry, Biochemistry, or Pharmacy, or related. M.Sc. students in their final term in one of the subjects are encouraged to apply as well.
Passing: Obligatory attendance at lectures + written examination
Grading: pass/fail
Abstract: Main topics of medicinal chemistry, including drug discovery and design, chemical drug delivery (including prodrugs) and physicochemical properties of drugs are covered. The lecture material will be distributed to participants. The first set of lectures (by A. Poso, 8h, 2 x 4h) deals mainly with drug discovery methods and case studies while lectures by K. Laine (8h, 2 x 4h) is mainly around chemical drug delivery, ADMET and physicochemical properties of drugs. The written examination is mandatory for credits.

The course is organized in cooperation with the National Graduate School of Organic Chemistry and Chemical Biology (GSOCCB), the Tampere Graduate Program in Biomedicine and Biotechnology (TGPBB) and the Drug Discovery Graduate School (DDGS).

COMPUTING (4 courses):

COM1: Modern Problems in Applied Dynamical Systems Theory

Dates: August 8 - 12, 2011
Lectures: 8 h lecturers + 2h exercises
Credits: 1 ECTS
Course Coordinator: PhD Nikolay Kuznetsov
Lecturer: Prof. Gennady A. Leonov, St.Petersburg State University
Prerequisites: General knowledge of differential equations, algebra and calculus
Passing: Obligatory attendance at lectures + exercises
Grading: Pass/fail
Abstract: The course is devoted to modern problems and research methods of applied dynamical systems. It is focused on connection between classical methods of qualitative theory of differential equations and current trends of analysis of applied dynamical systems. The following questions is considered

- local analysis of stability and instability
- bifurcation analysis and chaos
- global stability analysis (stability in large)
- localization and analysis of limit cycles
- localization and analysis of attractors (boundedness, dimension, Lyapunov exponents)

Application of proposed methods to biological systems, synchronization systems and automatic control is demonstrated. Also development of effective analytical-numerical methods for the analysis of dynamical systems is discussed.
Some references:

1. Leonov G.A. Strange Attractors and Classical Stability Theory. St. Petersburg University Press, 2009.
2. Kuznetsov N.V., Stability and Oscillations of Dynamical Systems: Theory and Applications. Jyväskylä University Printing House, 2008
3. Boichenko V.A., Leonov G.A., Reitmann V. Dimention Theory for Ordinary Differential Equations. "Teubner", 2005. (Preface, Contents).
4. Yakubovich V.A., Leonov G.A., Gelig A.Kh. Stability of Stationary Sels in Control Systems with Discontinuous Nonlinearities. Singapoure: World Scientific, 2004. (Preface, Contents, Review).
5. Leonov G.A. Mathematical Problems of Control Theory. An Introduction. Singapoure: World Scientific, 2001. (Preface, Contents).
6. Leonov G.A., Burkin I.M., Shepeljavyi A.I. Frequency Methods in Oscillation Theory. Kluwer Academic Publishers, 1996. (Preface, Contents).
7. Leonov G.A., Ponomarenko D.V., Smirnova V.B. Frequency-Domain Methods for Nonlinear Analysis. Theory and Applications. World Scientific, Singapure, 1996. (Preface, Contents).

The course is organized in cooperation with the Finnish Doctoral Programme in Computational Sciences (FICS), the Graduate School in Computing and Mathematical Sciences (COMAS) and Centre for International Mobility (CIMO).

COM2: Processing of High Dimensional Data

Dates: August 8 - 12, 2011
Lectures: 16 h lectures
Credits: 2 ECTS
Course Coordinator: Prof. Tapani Ristaniemi
Lecturer: Prof, FiDiPro Amir Averbuch, University of Jyväskylä
Prerequisites: Basics of analysis and linear algebra
Passing: Obligatory attendance at lectures + exam
Grading: Grading scale of 0 to 5

Abstract: The goal of the course is to present recent mathematical methods for the description and analysis of high dimensional data sets, with emphasis on spectral methods. In particular, we will try to understand the mathematical foundations of those algorithms for tasks such as organization and visualization of data clouds, dimensionality reduction, supervised learning, clustering, classification, regression, rankings and more. In the past few years, there has been significant progress in the development of methods for dimensionality reduction of high dimensional data. We will present some of these methods with applications to data mining, data security, process control, search and more. We will develop a good sense of when to apply them. The course will provide a sound basis for developing new algorithms.

- Lecture 1 - Introduction.
- Lecture 2 - Review of the required results from linear algebra. Singular value decomposition, embedding theorems.
- Lecture 3 - Principal component analysis.
- Lecture 4 - ISOMAP and LLE, Laplacian Eigenmaps.
- Lecture 5 - Diffusion maps, random walks, diffusion distance.
- Lecture 6 - Convergence of the graph Laplacian.
- Lecture 7 . Applications: cyber security, process control

COM3: Machine Learning for Signal Processing

Time: August 15 - 19, 2011
Lectures: 16 h lectures
Credits: 2 ECTS
Coordinator: Prof. Tapani Ristaniemi
Lecturers: Prof, FiDiPro Asoke Nandi, University of Jyväskylä
Prerequisites: Basics of analysis and linear algebra
Passing: Obligatory attendance at lectures + exam
Grading: Grading scale of 0 to 5
Abstract: There are many interesting problems that can be addressed by signal processing. With the advent of ever increasing computational power, there are some problems that were either not possible to address before or not in the way that it can be addressed now. Separate developments have taken place in learning algorithms for over more than the last thirty years. Much more recently interesting and innovative researches have been taking place in the area of Machine Learning for Signal Processing (MLSP). In these lectures, I wish to tell you about some of these efforts, relating to some of my own experiences.

COM4 : Nonlinear Optimization: Advances and Applications

Time: August 15 - 19, 2011
Lectures: 15 h lectures + work on assignments in the afternoons (don't take other course at the same time)
Credits: 3 ECTS
Coordinator: Prof. Kaisa Miettinen
Lecturers: Prof. Anders Forsgren, KTH, Stockholm
Prerequisites: Basic course on nonlinear optimization
Passing: Obligatory attendance at lectures + passing the assignments and final exam
Grading: Grading scale of 0 to 5
Abstract: The course concerns nonlinear optimization, more specifically so-called nonlinear programming problems, which are defined by smooth linear or nonlinear constraint functions. We will present modern methods for solving nonlinear programs. In particular, sequential-quadratic programming methods and interior method will be covered. Important special cases such as linear programming and quadratic programming will also be discussed. Important concepts such as convexity will be mentioned. Applications within radiation therapy and telecommunications will be discussed.
After completion of the course, students should know the basics of methods for nonlinear programming, and also have acquired knoweldge about applications. An aim is also to make the students connect nonlinear optimization to their own research.

The course is organized in cooperation with the Graduate School in Computing and Mathematical Sciences (COMAS).

INFORMATION TECHNOLOGY (3 courses):

IS1: Knowledge Management and Knowledge Management Systems in High-tech Organizations

Time: August 8 -12, 2011
Lectures: 15 h lectures
Credits: 2 ECTS
Lecturer and Coordinator: Dr. Nazmun Nahar, University of Jyväskylä
Prerequisites: Students with a background in information technology or business administration can enroll in this course.
Passing: Obligatory attendance at lectures + assignment
Grading: Grading scale of 0 to 5
Course contents and objectives: Knowledge can produce long-term sustainable competitive advantage for organizations that are technically adept and who align their culture, management, technology, and organizational elements for knowledge management. Knowledge management and knowledge management systems are multi-faceted and complex in nature. Knowledge is embedded in and carried through multiple entities; thus, providing access, retrieval, transfer, and utilization of appropriate knowledge to individuals and groups can be highly challenging for organizations. Based on my theoretical and field research in knowledge management in high-tech industries, this course brings together some of the best practices for effectively exploiting and managing knowledge. This course will endow students with the knowledge and field research skills in knowledge management and knowledge management systems. After completing the course, students will be able to:

- Understand the difference among data, information and knowledge.
- Know the taxonomy of knowledge (e.g. tacit knowledge, explicit knowledge, individual knowledge, social knowledge, declarative knowledge, procedural knowledge,

etc.) and their associated processes/issues that can enlighten the design of knowledge management systems.

- Comprehend the knowledge management processes and how the knowledge management systems support and enhance the organizational processes of knowledge creation, storage, transfer, and application.
- Understand how social software, social media, VoIP, traditional knowledge management software and new strategies help employees, customers, suppliers and globally dispersed experts collaborate and innovatively create, capture, transfer and utilize explicit and tacit knowledge.
- Know the fundamentals of, prerequisites for, methods and types of intra- and inter-companies transfer of tacit and explicit knowledge.
- Identify the strategic gaps, knowledge gaps, knowledge links, and the knowledge maps as well as know the key dimensions of a systemic knowledge management. In addition, it deals with knowledge management metrics and governance.
- Recognize the critical success factors of knowledge management and knowledge management systems, and how each factor contributes to success.
- Recognize the major problems that are encountered in managing knowledge and the utilization of knowledge management systems, and how each factor creates barrier.
- Know the future trends of knowledge management.

Readings: The most relevant chapters from the selected books as well as the relevant current journal articles, conference articles and cases will be used as lecture and reading materials. Lecture slides will be given to students. This course related all materials will be uploaded to "optima system". Students will have access to these materials through the "optima system".
Assignment Instructions: Students are required to prepare a short report either in group or individually on a contemporary topic that will be given by the lecturer. Detailed guidelines for writing the report will be given to students during this course.

IS2: Global Knowledge Management

Time: August 15 - 19, 2011
Lectures: 10 h of self-study, 17 h of lectures, 7,5 h of discussion, 25,5 h of group work
Credits: 2 ETCS
Coordinator: Jan Pawlowski
Lecturers: Prof. Dr. Franz Lehner, University of Passau, Prof. Dr. Jan M. Pawlowski, University of Jyväskylä
Number of students: 15-25
Prerequisites: Basic knowledge (bachelor degree) in information systems / computer science
Evaluation: You are invited and requested to actively participate during the workshops. Furthermore, you will need to prepare an assignment of a KM-related problem (max. five pages).
Grading: Grading scale of 0 to 5
Abstract: Knowledge management has been discussed for the past decades - however, the environ-ment changes due to several constraints and trends. In this course, we discuss knowledge management from a global, integrated perspective. One example is the integration of work and learning, e.g., integrating knowledge management and e-learning: processes, systems, and technologies are merged on the conceptual as well as the implementation level. However, in practice, learning is usually separated from business processes, such as daily operations. Additionally, knowledge management and e Learning systems are handled by different departments (e.g., KM by the IT department, e learning by the HR department). To be competitive in the international market, staff development plays a more and more important role. To improve this process learning and knowledge exchange needs to be integrated on both, the process and systems level. Moreover it is of vital importance to share knowledge in globally distributed teams. In particular in knowledge-intensive organizations, new competences are necessary to efficiently acquire, share and distribute knowledge across organizations and borders.
This course will discuss the integration of concepts, processes, and systems of knowledge management and e-Learning in a global context. How can business processes be integrated with learning and knowledge processes in a multinational environment? How can processes be designed to integrated knowledge management and e-Learning? How to design systems and interfaces for an integrated knowledge and learning system? How to successfully act in global organizations, projects and teams. Consequently, the course takes a broad view of the

subject, covering communications, in-formation management, tools, and knowledge management capability as well as knowledge management success factors. We will focus on knowledge in a variety of organisational contexts ranging from virtual, project, multinationals, small and medium-sized businesses to the public sector. In an increasingly inter-connected world, knowing how to manage and measure integrated knowledge management processes to meet new opportunities and challenges is becoming a growing priority. The main objective of the course is to explore the activity of managing knowledge and learning processes from different perspectives, providing you with conceptual frameworks and models, practical management tools and guidelines.

IS3: Modelling Internet Applications CANCELLED

Time: August 15 - 19, 2011
Lectures: 4h lectures, 30h practical group work, 6h of individual group support
Credits: 3 ECTS
Coordinator: Prof. Markku Sakkinen, University of Jyväskylä
Lecturer: Assoc. Prof. Dr. Wieland Schwinger, Johannes Kepler University Linz
Prerequisites: Basic knowledge in database systems, programming, information modelling and web techologies of advantage
Number of Students: 15-25
Passing: Passing the course is based on the achievements during the practical group work and the appropriate presentation thereof in form of a written report and/or oral presentation.
Grading: Grading scale of 0 to 5
Abstract: Goal of this course is to gain an overview on existing modelling languages for designing web applications. The course will comprise a lectures to familiarize the participants with the necessary overview on the characteristics of web applications, requirements for Web modeling methods and the specific aspects. Special focus will be on the Web modelling language WebML being developed from the Politecnico di Milano and having originated from an EU-funded research project. Particular attention will be given on a recent type of web applications - so call ubiquitous Web applications. Such ubiquitous Web applications are characterised by the need to consider the use of context to adapt the services provided by the Web applications accordingly.
During the practical part of the course students will employ the Web application development tool WebRatio which is based on the Web modeling language WebML. It is foreseen that students work in groups to model a specific web application, i.e. a simple form of social network, and summarize their findings with respect the coverage of the encountered requirements by the applied modelling language.
Students are highly recommended to bring their own computers. Students should install the tool "WebRatio" (a free academic licence) to their local machines.

MATHEMATICS (3 courses):

MA1: Quantitative Geometric and Functional Inequalities

Time: August 8 - 12, 2011
Lectures: 10 h lectures
Credits: 2 ECTS
Coordinator: Hannes Luiro
Lecturer: Nicola Fusco, Pisa, Italia
Prerequisities: The course is aimed at graduate students but strong advance undergraduate students with the appropriate background might also find it suitable. The basic knowledge on the theory of functions of bounded variation and the sets of finite perimeter would be useful but not necessary. A fair knowledge of Hausdorff measures and Sobolev functions is also required. A good reference for the background material is the book by L.C. Evans and R.F.Gariepy: Lecture notes on measure theory and fine properties of functions.
Passing: Obligatory attendance at lectures + completing the exercises
Grading: Pass/fail
Abstract: We shall start by quickly recalling the basic properties of sets of finite perimeter and with a presentation of two proofs of the isoperimetric inequality: the one given by De Giorgi in the '50s and a more recent one given by Gromov. These two proofs will be the starting point to discuss three different approaches to the quantitative isoperimetric inequality, based respectively on symmetrization arguments, on mass transportation

and on the regularity theory of minimal surfaces. Then we will conclude by showing how these different techniques may be used to treat also the stability of the Sobolev inequality and other inequalities involving the eigenvalues of the p-laplacian operator.

The course is organized in cooperation with the Graduate school in Mathematics and its applications and the Finnish Academy of Science and Letters (Mathematics Foundation).

MA2: Weak Convergence, Young Measures and Quasiconvexity

Time: August 8 - 12, 2011
Lectures: 10 h lectures
Credits: 2 ECTS
Coordinator: Hannes Luiro (Assist.)
Lecturers: Jan Kristensen, Oxford, GB
Prerequisities: The course is aimed at graduate students with basic knowledge of Lebesgue integration, measure theory, functional analysis, including weak and weak* convergence, and Sobolev functions and functions of bounded variation. All the background material can be found in –for instance- the book of L.C. Evans and R.F.Gariepy: Lecture notes on measure theory and fine properties of functions.
Passing: Obligatory attendance at lectures + completing the exercises
Grading: pass/fail
Abstract: The course starts with a brief review of weak and weak* convergence of sequences of functions and measures. Next, classes of Young measures are introduced and shown to describe the one-point statistics of such sequences. The focus then shifts to the case where the converging sequences consist of distributional derivatives of vector-valued Sobolev functions, and more generally, functions of bounded variation. In this scenario we aim to discuss aspects of Compensated Compactness, and in particular the duality between gradient Young measures and Morrey's notion of quasiconvexity. Along the way we encounter problems concerning semicontinuity of integral functionals, and the notions of laminates and rank-one convex functions.

The course is organized in cooperation with the Graduate school in Mathematics and its applications and the Finnish Academy of Science and Letters (Mathematics Foundation).

MA3: Fractal Statistics

Time: August 15 – 19, 2011
Lectures: 10 h
Credits: 2 ECTS
Coordinator: Lasse Leskelä (lasse.leskela@jyu.fi)
Lecturers: Prof. Iddo Eliazar, Holon Institute of Technology, Israel
Prerequisites: Undergraduate-level probability theory and calculus
Passing: Obligatory attendance at lectures + passing the exam (to be returned after the summer school)
Grading: Pass/fail

Abstract: The course will cover an array of "Fractal Statistics" observed in a host of scientific fields ranging from physics and chemistry to finance and biology: Pareto and Levy laws; anomalous diffusion; 1/f noises; long-range correlations; Frechet and Weibull laws; self-similarity. We will present a cohesive overview of "Fractal Statistics" using motivations from physics, economics, and queueing theory. Applying the theory of Poisson processes, we will establish a unified approach explaining the universal emergence and ubiquity of "Fractal Statistics".

The course is organized in cooperation with the Finnish Doctoral Programme in Stochastic and Statistics (FDPSS).

FDPSS

PHYSICS (4 courses):

PH1: Nanooptics and Plasmonics: Theoretical Concepts

Dates: August 8 - 12, 2011
Credits: 2 ECTS
Lectures: 15 h Lectures + 5 h Exercises
Coordinator: Jussi Toppari
Lecturer: Ulrich Hohenester (Karl-Franzens-Universität Graz)
Prerequisites: Quantum Mechanics
Passing: Obligatory attendance at lectures + passing the exercises
Grading: Pass/fail
Abstract: In this series of lectures I will present the basic theoretical concepts underlying nanooptics and plasmonics. Bridging the gap between the micrometer length scale of light and the length scale of nanostructures is one of the key issues of nanotechnology, and is of paramount importance for numerous applications ranging from (bio)sensors and solar cells to optical and quantum communication technology. In plasmonics, focusing of light on a nanometer length scale is achieved by binding light to coherent charge-density oscillations of metallic nanosstructured, so-called surface plasmons.

The lecture will be based on a course of "Nano and quantum optics" taught at the Karl-Franzens university Graz in 2010. I will start with a brief discussion of Maxwell's equation in matter, introducing the concepts of evanescent fields and TE/TM modes for layered structures. For a metal/dielectric interface I will present the concept of surface plasmons, and will discuss their basic physical properties as well as applications such as sensors or waveguides. I will also briefly address metamaterials, the Veselago lense and the perfect lense, and optical cloaking.

In the second part of my lecture I will address plasmonic nanoparticles, in particular their coupling with quantum emitters, such as molecules or quantum dots. This will be done by introducing the dyadic Green function and the photonic local density of states (LDOS), as well as a few elements of the quantum optics toolbox. I will show that the optical properties of quantum emitters can be strongly altered by placing them in the hot spots of plasmonic nanoparticles. I will discuss imaging of plasmonic fields by means of optical and electron microscopy, as well as possible applications of particle plasmons.

The course is organized in cooperation with the National Doctoral Programme in Nanoscience and the National Graduate School in Material Physics.

The National Doctoral Programme in Nanoscience
NGS-NANO

PH2: Introduction to Micro- and Nanorobotics

Dates: August 8 - 12, 2011
Lectures : 20 h lectures
Credits: 3 ECTS
Coordinators: Dr. Kirsi Ruusuniitty
Lecturer : Dr. Quan Zhou (Aalto University, Finland)
Prerequisites: Basic knowledge of microsystems
Passing: Obligatory attendance at lectures + passing the open exam
Grading: Grading scale of 0 to 5

Abstract: Micro- and nanorobotics is a rapidly advancing technology that is important for both scientific research and new industry applications. The interdisciplinary course covers the various aspects of micro- and nanorobotics, from essential sensors and actuators, to design, construction, analysis and control of micro- and nanorobots, as well as related physics and applications of micro- and nanorobotics.

The course is organized in cooperation with the National Doctoral Programme in Nanoscience.

PH3: Fundamentals of Ion-Matter Interaction

Time: August 15 – 19, 2011
Lectures: Lectures 10 h, Exercises 6 h, Lab 2 h, private study 5 h, exam: 10 h : 33 h
Credits: 3 ECTS
Coordinator: Prof. Harry J. Whitlow
Lecturers: Prof. Peter Sigmund, Prof. Harry J. Whitlow
Prerequisites: MSc: Physics, Applied Physics, Theoretical Physics
Passing: Obligatory attendance at lectures and exercises + exam
Grading: pass/fail
Course outline:
Lecture 1-2: Elementary penetration theory (Coulomb scattering, Electronic and nuclear scattering, Statistics, Stopping and straggling, Multiple scattering)
Lecture 3-4: Scattering theory (Classical, Quantal, Ionization, Charge exchange, Channeling and blocking)
Lecture 5-6: Stopping theory (Swift ions, Slow ions, Nuclear stopping)
Lecture 7-8: Straggling and multiple scattering (Collisional straggling, Charge-exchange straggling, Multiple scattering, Analysis of stopping measurements)
Lecture 9-10: Ion ranges and radiation effects (Ion range and penetration depth, Collision cascades and radiation damage, Ionization cascades, Electron emission and sputtering)

The course is organized in cooperation with the Graduate School in Particle and Nuclear Physics.

PH4: Applications of X-ray microtomography on heterogeneous materials (wood and wood-based composites etc)

Time: August 15 - 19, 2011
Lectures: 15 h lectures + 11 h hands-on
Credits: 3 ECTS
Coordinator: Tuomas Turpeinen, Markku Kataja
Lecturers: Cris Luengo (Uppsala University), Jan Van den Bulcke (Ghent University), Markko Myllys (University of Jyväskylä), Tuomas Turpeinen (University of Jyväskylä)
Number of students: The number of participants is restricted to 26. COST Action FP0802 is able to provide financial support (lump sum of EUR 600) for up to 15 participants.
Prerequisites: Basic knowledge in programming
Passing: Obligatory attendance at lectures + final report
Grading: Pass/fail
Abstract: The rapid development of table-top scale X-ray micro computed tomography (XµCT) devices has made it possible for many laboratories to obtain such a device for their specific material analysis needs. A modern XuCT scanner is capable to acquire high quality images in micrometer resolution and provides an excellent tool for quantitative analysis of various materials. However, the image processing tools provided by the XuCT scanner manufacturers are not sufficient for extensive image analysis and in order to fully benefit of the possibilities of XµCT it is important to understand the concepts the 3D image processing as well the theory of X-ray imaging.

On this course we will give you a short overview of XµCT including behavior of X-rays, the scanner geometry, optimization of the scanning parameters, and preparation of the sample. We will discuss standard XµCT image processing phases, namely image preprosessing, segmentation and analysis. We will introduce some existing image processing algorithms that are suitable for XµCT image processing and, thus, provide an extensive set of image processing tools for various analysis purposes.

The course is organized in cooperation with the COST Action FP0802 and the National Graduate School in Material Physics.

RENEWABLE ENERGY (3 courses):

RE1: Organic and Dye Based Photovoltaics

International School on Organic Photovoltaics (ISOPHOS)

Time: August 8 – 12, 2011
Credits: 2 ECTS
Lectures: 20 h lectures
Course coordinator: Prof. Jouko Korppi-Tommola
Lecturers: Gerrit Boschloo, Florian Schiffmann, Jouko Korppi-Tommola, Janne Halme, Moritz Riede, Ronald Österbacka, Thomas Kirchartz, Roderick Mackenzie ja Tõnu Pullerits
Prerequisites: M.Sc. in chemistry or physics, recent review articles on polymer and dye solar cells (Chem.Rev., 2010,110,6595-6663)
Passing: Obligatory attendance at lectures + practical problems or essey
Grading: Pass/fail
Abstract: Teaching focuses on fundamental principles of polymer based and dye sensitized solar cells and recent advances in science and technology in both fields. Both of these 3rd generation technologies approach the magic 10% efficiency mark and have promise to become competitive mass products in the silicon governed PV market.

Besides 20 hours of lectures obtaining the credits includes solving practical problems and writing an essay on a topic given. The course is suited to late phase Master students, Ph.D. students as well as PhD's and researchers from chemistry, physics and engineering.

The course is run in co-operation with the International Summer School ISOPHOS (Center for HYbrid and Organic Solar Energy, University of Rome Tor Vergata) and sponsored by a research consortium 'Low cost PV' under the research program Photonics and Modern Imaging funded by the Academy of Finland and Åbo Akademi University.

RE2: Optimization of Bioenergy use

Time: August 15 - 19, 2011
Lectures: 21 h
Credits: 4 ECTS
Coordinator: Prof. Jukka Konttinen
Lecturers: Prof. Jukka Konttinen (University of Jyväskylä), Prof. Esa Vakkilainen (Lappeenranta University of Technology), Prof. Martti Larmi (Aalto University), Ilkka Savolainen (VTT Technical Research Centre of Finland), Mikko Hupa (Åbo Akademi), Riitta Keiski (University of Oulu) and Prof. Lauri Sikanen (University ot Eastern Finland)
Prerequisites: M. Sc. level skills in the field of energy are required.
Passing: Obligatory attendance at lectures + study memorandum (opintopäiväkirja) and a special homework (harjoitustyö).
Grading: Grading scale of 0 to 5
Abstract: The objective of the course is to give an overview of current bioenergy use and how to optimize future utilization. State-of-the-art technology in bioenergy will be reviewed, including: current topics of research and development, future aspects, unresolved problems and needs for further research. The lectures will be divided into the following topics: Future of bioenergy in Finland, bioenergy production in small scale, torrefaction, fluidized bed technologies, pellet production and use, gasification/biorefinery and liquid transport fuels. The lecturers of the course include Professor Jukka Konttinen (JYU), Prof. Esa Vakkilainen (LTU), Prof. Martti Larmi (Aalto), Prof. Antti Oksanen (TUT) and some other specialists from research institutes and universities in Finland. A detailed list of lecturers and programme outline will be announced later. Completing the course includes a study memorandum and a homework exercise.

The course is organized in cooperation with the Graduate School for Energy Science and Technology (EST).

RE3: Biogas Technology for Sustainable Second Generation Biofuel Production

Time: August 15 - 19, 2011
Lectures: 20 h lectures + 2 h excursion + 2 h exam
Credits: 2 ECTS
Coordinator: Prof. Jukka Rintala (jrintala@cc.jyu.fi)
Lecturers: Prof. Charles Banks and Dr. Andrew Salter (University of Southampton, UK), Michael Chesshire (Biogen Greenfinch), Dr. David Bolzonella (University of Verona, Italy), Dr Cristian Cavinato (University of Venice, Italy), Dr Reinhold Waltenberger (University of Natural Resources and Life Sciences, Vienna, Austria) and Prof. Jukka Rintala (University of Jyväskylä)
Level: Graduate, undergraduate
Number of student: 50
Passing: Obligatory attending to lectures and excursion + passing the exam

Grading: pass/fail
Abstract: This course presents the fundamentals and most recent developments in biogas technology for sustainable renewable energy production and nutrient management. Anaerobic microbiology, biochemistry and reactor design are described as well as the application of biogas technology in municipal and industrial waste management and in industrial-scale energy production from agro-wastes and crops. The concept of biogas production from food waste as second generation biofuel source, including the collection, pretreatment and process optimisation is presented as well as its energy and mass balance and carbon foot print for sustainability criteria. The different potential uses of the produced biogas and the digestate are also discussed, including environmental impacts and benefits on greenhouse gas emissions and nutrient recycling.

The course is organized in cooperation with the Graduate school for Energy Science and Technology (EnSTe) and the Graduate School for Energy Science and Technology (EST) and supported by **EU FP7 VALORGAS project**.

STATISTICS (1 course):

STAT1: Statistical Designs in Epidemiology

Time: August 8 - 11, 2011
Credits: 2 ECTS
Lectures: 16 h lectures
Course coordinator: Prof. Antti Penttinen
Lecturer: Esa Läärä (University of Oulu, Finland)
Prerequisites: Basic knowledge on probability calculus and statistical inference; knowledge of survival analysis is recommendable but not necessary.
Passing: Obligatory attendance at lectures + homework and exam
Grading: Grading scale of 0 to 5
Abstract: Epidemiologic research deals with occurrence and determinants of health-related states and events in human and animal populations. Often the interest concerns cause-effect relationships between suspected risk factors and various diseases, the strength of such relationships usually being statistically assessed by relative risk type of comparative parameters. As randomized experiments are ethically unfeasible in most instances, the study designs are typically observational, involving the possibility of bias due to confounding, selection and measurement error. Another challenge is posed by the rarity of many diseases with negative implications on the precision of relative risk estimates.
The course covers the main types of epidemiologic designs. It builds on the distinctions concerning the concepts of study population, study base, and sampling strategy. Study populations can be closed or open, and the study base may be cross-sectional or longitudinal. Measurement of risk factor data can be based on full census of the study base, or on some outcome-selective sampling strategy, such as traditional case-control study, density sampling including nested case-control design, and case-cohort sampling. The properties of various designs are compared in terms of their statistical validity and efficiency in estimating the target parameters as well as their practicality in concrete research settings. Implications to statistical data analysis based on the designs are briefly outlined.

Appendix II

STUDENT FEEDBACK FROM THE ELECTRONIC SURVEY ON THE 21TH JYVÄSKYLÄ SUMMER SCHOOL

Feedback was gathered from the 21th Jyväskylä Summer School students (115 respondents) on an electronic survey form in the web page of the Summer School. The survey consisted of multiple choice questions and open answers and produced valuable information for the improvement of future Summer Schools. Below are summaries on the students' evaluation of the practical arrangements as well as free commentary and suggestions for improvement on individual courses.

Students' satisfaction with the practical arrangements:

Students found the general practical arrangements to be well organized (Figure 1). The organization of most social program events was considered satisfactory or excellent (options "Ok" and "Loved it!" on the survey).

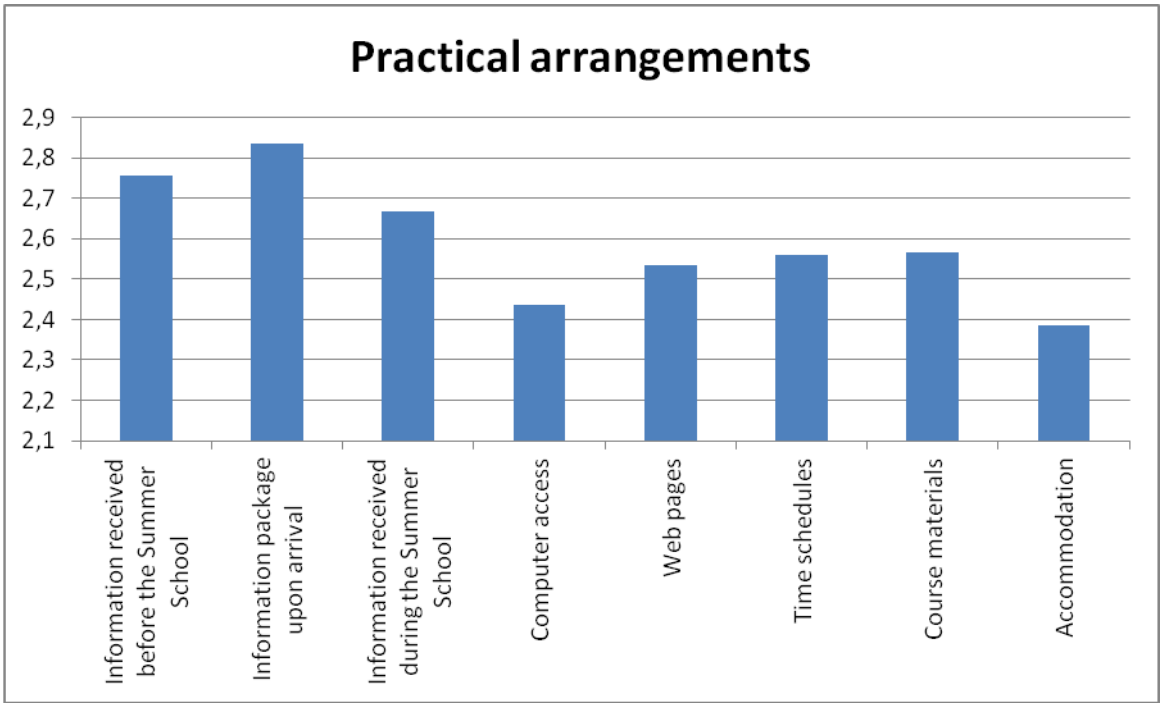

Figure 1: General satisfaction of respondents with the practical arrangements. 1 = "Poorly organized", 2 = "Ok", 3 = "Well organized"

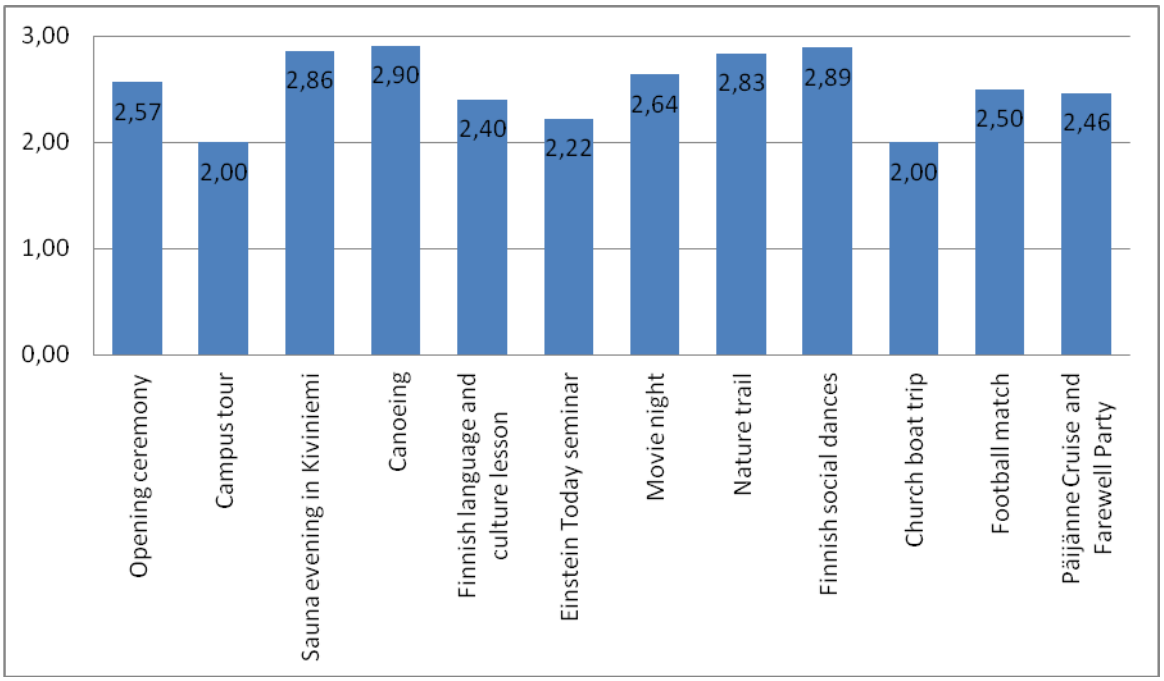

Figure 2: General satisfaction with the social program events. 1 = "Poorly organized, 2 = "Ok", 3 = "Loved it!"

Feedback of JSS21: Graphic representation:

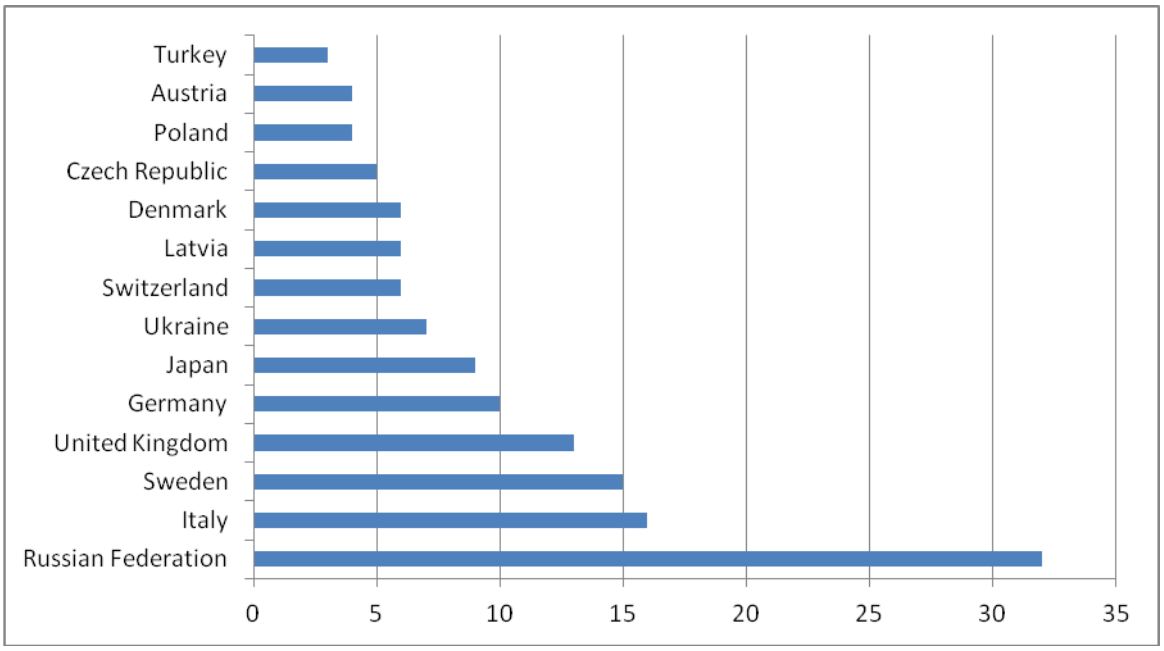

Figure 3: The countries from where Summer School students came from. Finland is not included to the figure.

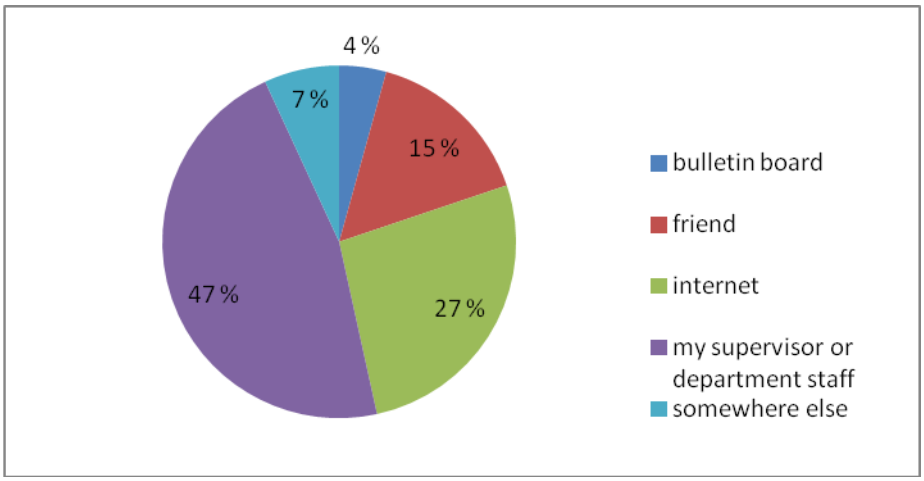

Figure 4: Figure 5 shows where Summer School students got information about the Summer School.

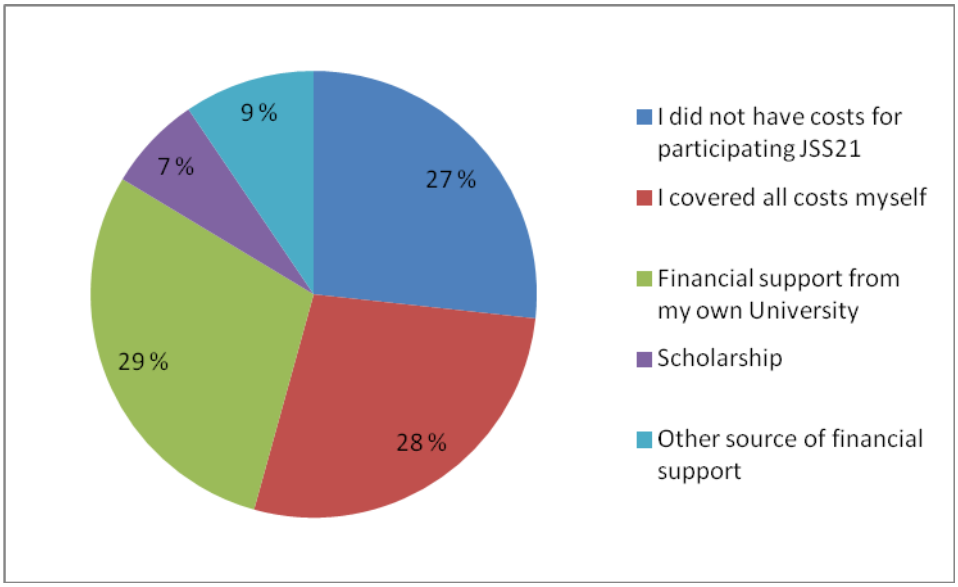

Figure 5. Figure 6 shows how summer school student financed their participation to the Summer School.

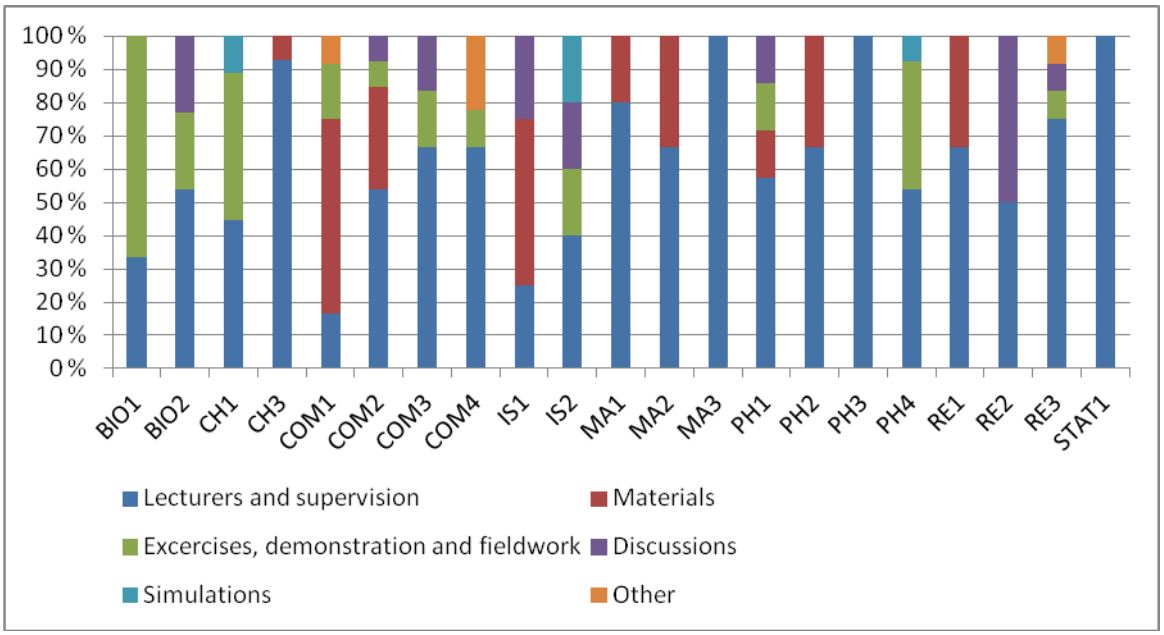

Figure 6. The summer school students were asked what was best in the course. Some courses did not include simulations, exercises, demonstrations and fieldworks.

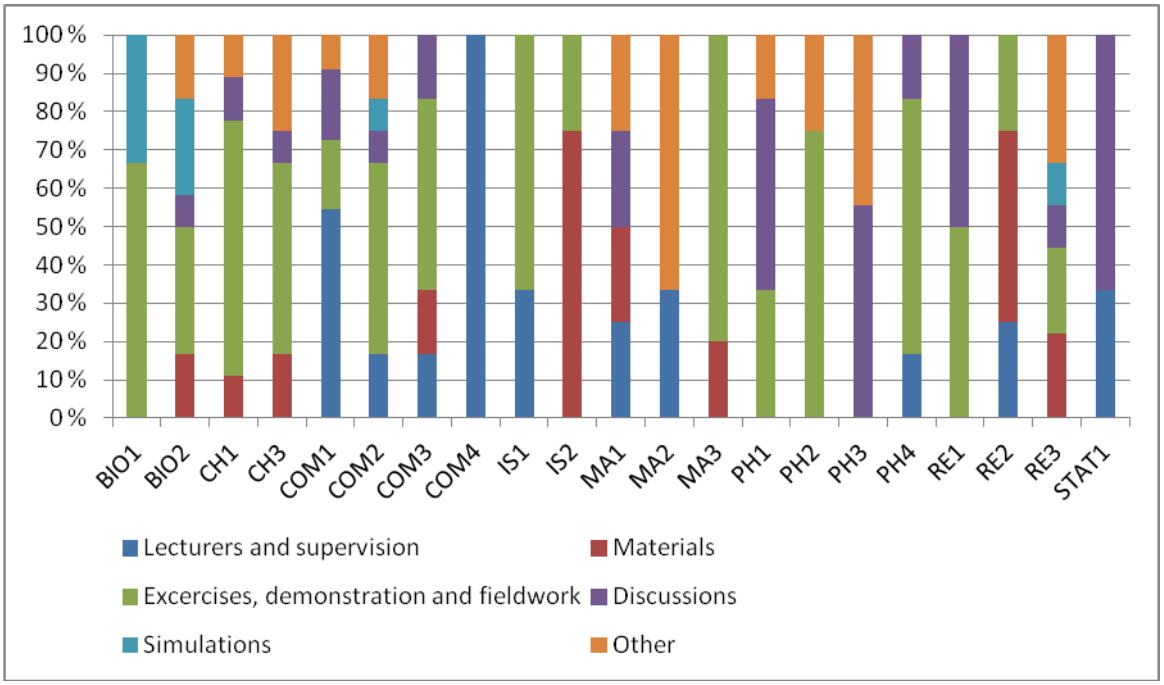

Figure 7. The summer school students were asked what could be done better in the courses.

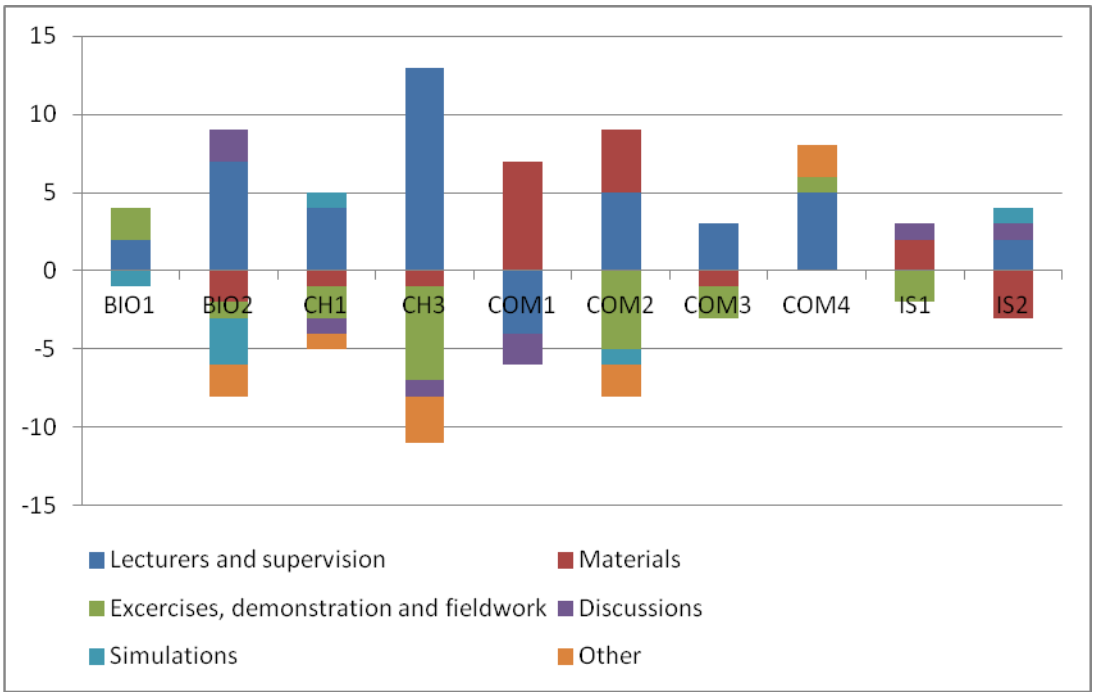

Figure 8. The difference between the best issue in the course and the issue which could be done better (courses BIO1 – IS2).

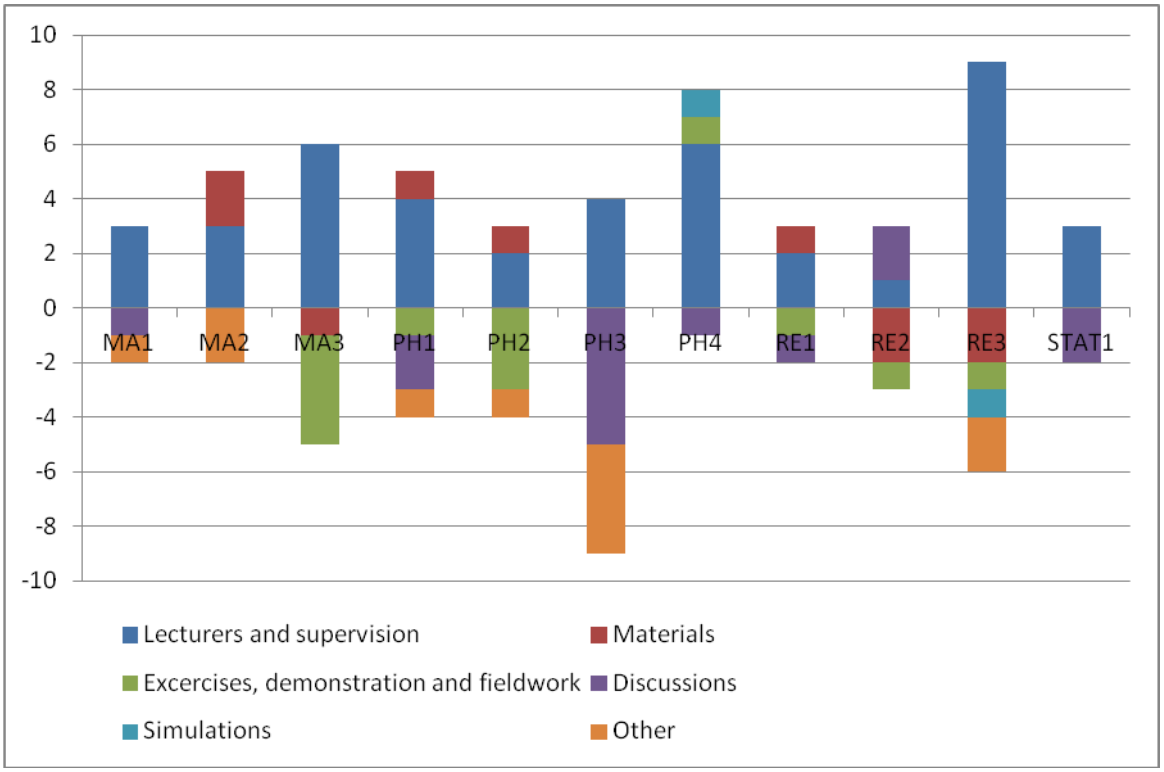

Figure 9. The difference between the best issue in the course and the issue which could be done better (courses MA1 – STAT1).

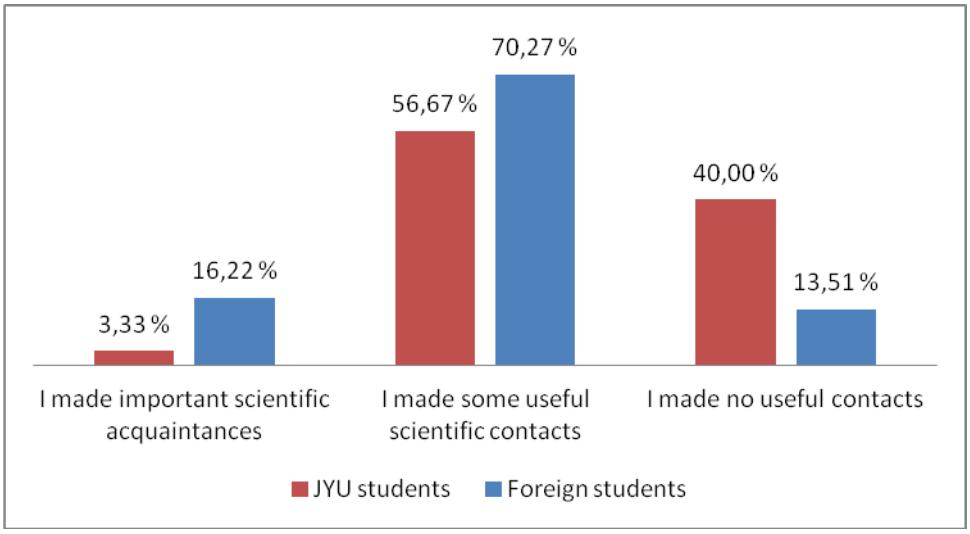

Figure 10. Summer school students were asked to evaluate how much their have done useful scientific contacts during the Summer School.

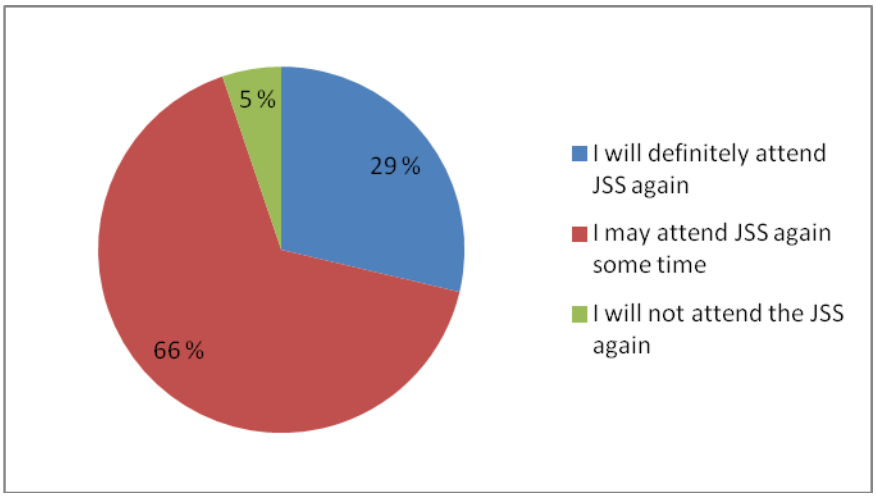

Figure 11. Summer School students were asked if they will participate to the Jyväskylä Summer School in the future. Only 5 % of students will not attend to the JSS in the future.

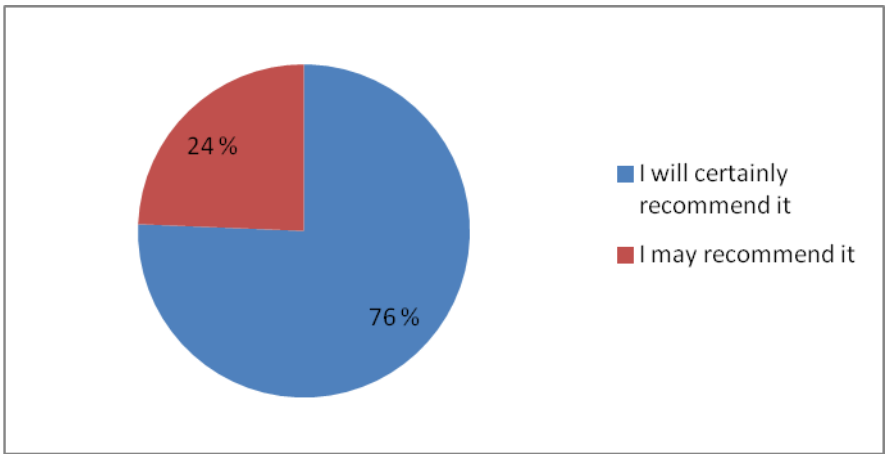

Figure 12. Most summer school students (76 %) will certainly recommend the Summer School to other students and 24 % may recommend it. There was none of student answering that they would not recommend the School to other students.

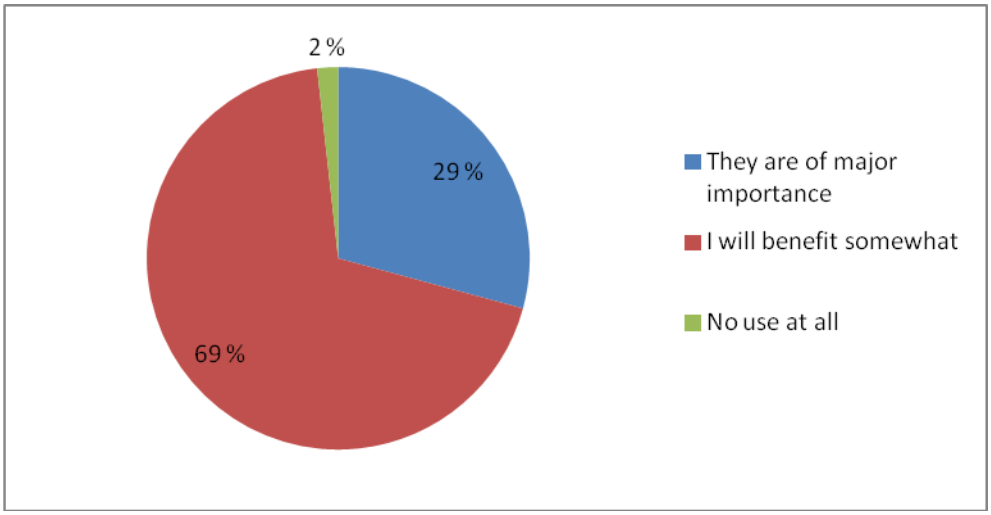

Figure 13. Question: How useful do you think the JSS courses you attended will be for your future studies/research?

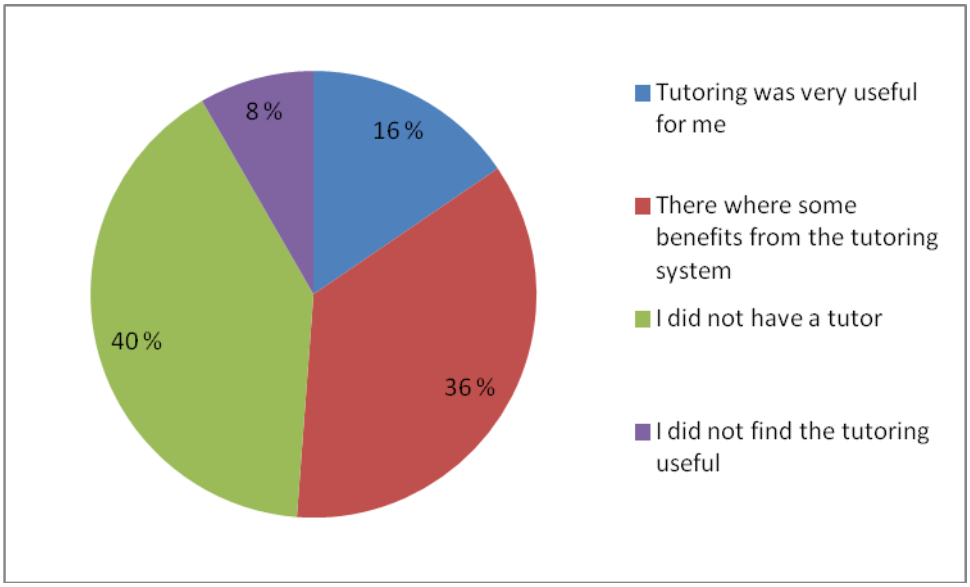

Figure 14. Usefulness of tutoring during the Summer School.