



# Mathematics in Southeast Asia:

## Project Proposals

Commission for Developing Countries,  
International Mathematical Union

# Mathematics in Southeast Asia: Challenges and Opportunities

## Project Proposals

### Project Proposal 1 (Cambodia): Integration Technology in Mathematics Education in Cambodia

Name of the project: Integration Technology in Mathematics Education in Cambodia

Main aim of the project: Foster mathematical development in Cambodia

Location of the project: (1) Khemarak University, (2) Royal University of Phnom Penh, (3) National Institute of Education

Target group: Student and Teacher of High School, Student and Lecturer University

Mathematical Field: Open to all fields, but start from Algebra, Geometry and Calculus.

Current funding (if any): not yet valuable

Necessary funding: 40.000 USD per year

Contact person: Dr. Chan Roath and Dr. Chhit Wornarith

Position: Chair of the Mathematics Development Program

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Phone number: +855 11 69 70 38 / +855 12 802 755

Institution and Address: Department of Mathematics, Khemarak University

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City: Phnom Penh

Zip Code: +855

#### Description:

In the last 5 years, internet systems start to provide the service covering all location of Cambodia. Availabilities of students and teachers to use computers and smart phones to access internet website and web application give development for integration New Technology in teaching school materials (mathematic, physical, chemistry..).

Members of Mathematics Development Program in cooperation with Cambodian Mathematical Society has created a new project to adapt the technology into the high-school program. There are a lot of freeware program that teachers can uses for interactive learning with students. But the problems of the local teacher in Cambodia are the language barrier. Another problem is the financial, because of the need to to organize the training on using the new technology. Now most of teachers can use computer just for office purpose but not for solving or researching mathematical problems. The project plan divides into 3 steps:

1. Making documents in National Language (translating helpfiles, adding examples from didactic books, additional material from advanced teacher and students,...)
2. Organizing training for Teachers in a test region and following-up the process of integration. After correction program, using feedbacks from trainees and users, we can make minimum training program for secondary high-school teachers (3 last levels before completing high-school).

3. Organize training for teachers (mathematics) in the whole country and making website that can help in solving problems using the technology in interactive learning and researching mathematics. Create group of specialists for giving special training and answering to the questions of the users.

Plan of the integration will take two years period from beginning of 2015 to the end 2016. The first year will cover points 1 and 2 of above mentioned. The third point needs to develop on the second year after successful completion of two first points.

We hope that the next generation of Cambodian teachers (mathematics) will be able to use IT in the learning process with students and that researchers can use the technology in their work. The long-term result anticipates that future students will be able to adapt the technology for their future lives and works.

## **Project Proposal 2 (Indonesia): Improvement IndoMS member on Publication: Challenges and Opportunities**

Name of the project:

**Improvement IndoMS member on Publication: Challenges and Opportunities**

Main aim of the project:

**This activity is intended to improve the quality of IndoMS members in the area of research collaboration, publication through a well-organized configuration of seminars, and conferences at the national or international level**

Location of the project:

1. National Conference on Mathematics Education Year 2015 at University of Gorontalo-Sulawesi-Indonesia
2. South East Asian Mathematical Society-Gadjah Mada University , International Conference on Mathematics and Its Applications, year 2015 at UGM Yogyakarta-Indonesia
3. Asian Mathematical Conference (AMC) at year 2016, it is planning to be held at Bali-Indonesia
4. Collaboration on seminar with Indonesian Combinatorics Society (InaComb)

Target group:

**Member of IndoMS**

Mathematical Field:

**8 Research Group Teams of IndoMS**

Current funding (if any):

**The funding is applied to CDC IMU for year 2014-2016**

Necessary funding:

**Financial support for accomodation of invited speakers and research participants  
If possible also for airfare ticket.**

Contact person:

(Prof.Dr. Budi Nurani Ruchjana

Position: President of IndoMS

email: [budintr@unpad.ac.id](mailto:budintr@unpad.ac.id), Phone number: +6281320937740

Institution and Address:

(Mathematics Department , University of Padjadjaran

Street Jl. Raya Bandung Sumedang Km. 21 Jatinangor

Sumedang 45363-West Java-Indonesia)

Description:

**IndoMS (Indonesian Mathematical Society)** or formerly known as "*Himpunan Matematika Indonesia*" is a forum for mathematicians and the users of mathematics as well as people who have interest in enhancing mathematics in Indonesia. The Society is a scientific, non-profit, non-governmental and professional organization. It was established on July 15,1976 in Bandung, West Java. In 2013 IndoMS has more than 1.300 active members consisting of university lecturer on mathematics, statistics , mathematics education and computer sciences researchers from 33 provinces in Indonesia and mathematics educator from elementary, junior and senior high schools. The objectives of IndoMS are:

- a. to enhance and extend mathematical knowledge,
- b. to enhance and extend education in the mathematical sciences, and
- c. to increase the role of mathematics in Indonesia.

To achieve these objectives, IndoMS has activities such as:

- a. hold meetings for the purpose of hearing and discussing communications from members of the Society and others on mathematical subjects as well as mathematical education

- b. publish such communications on mathematical subjects as a means of providing information and knowledge for members as well as the public through 4 journal that we publish (Journal of the Indonesian Mathematical Society/JIMS, IndoMS Journal on Mathematics Education/JME, IndoMS Journal on Statistics/JStats and IndoMS Journal on Industrial and Applied Mathematics/JIAM)
- c. improve the competences of members of the Society through education and training
- d. promote mathematics and its application to the public in supporting the national development in Indonesia
- e. build mathematical cooperation with other mathematical societies around the world
- f. receive donation in order to support activities of the Society
- g. conduct other related activities according to the mission of the organization.

The composition field research result based on IndoMS survey of mathematical research in Indonesia in year 2009 are following:

1. Statistics (21%)
2. Mathematics Education (18%)
3. Applied Mathematics (17%)
4. Analysis and Geometry (11%)
5. Computational Science (11%)
6. Mathematical Finance (5%)
7. Graph and Combinatorics (4%)
8. System and Control Theory (3%)

IndoMS is very active to do several mathematical events such as conference, seminar, exchange lecturer and collaboration with other association from Indonesia and abroad, for example IndoMS has a collaboration with South East Asian Mathematical Society (SEAMS), European Women in Mathematics (EWM), International Mathematics Union (IMU) and many of mathematical society in the world. Starting in 2009 IndoMS organized **IICMA2009** IndoMS International Conference on Mathematics and its Applications 2009 funded by Higher Education of Ministry of Education and Culture. From 2009-2011 JIMS also has funded by Higher Education to be an international journal on mathematics.

The activities of IndoMS for year 2013-2016 as following:

- a. IndoMS has obtained the similar grant to organize the 2nd IICMA 2013 at Department of Mathematics-University Gadjah Mada-Yogyakarta and we also got funding to organize a workshop of curriculum for undergraduate program in Indonesia, including study program of mathematics, mathematics education, statistics and computer sciences.
- b. In year 2013 IndoMS apply the grant of CRDF Global Professional Skill Program to increase capabilities and qualities of IndoMS members, specially in writing paper for international journal of research proposal in 8 group areas of field of research such as above illustration.
- c. IndoMS also be a member of SEAMS and a new Asia Mathematical Society (AMS), so some activities of IndoMS also follow the activities of SEAMS and AMS. For example for 2013 we will follow SEAMS Council meeting at Ho Chi Minh-Vietnam

For year 2014-2016, IndoMS will has several meeting and we need a financial supporting from CDC IMU. The activities are:

- a. In year 2014 we will organize a National Conference on Mathematics and IndoMS Congress at ITS-Indonesia and we will follow an International Mathematics Conference at Seoul-Korea
- b. In year 2015 we will organize a National Conference on Mathematics Education at Gorontalo-Indonesia
- c. Year 2015 we will organize a South East Asia Mathematical Society-Gadjah Mada University (SEAMS-GMU) International Conference on Mathematics and Its Applications at Department of Mathematics UGM-Yogyakarta-Indonesia
- d. In the year 2016 IndoMS we will prepare to organize Asian Mathematical Conference (AMC) at Bali-Indonesia.

### **Project Proposal 3 (Malaysia): Malaysian Mathematics Outreach Initiative**

Name of the project:

**Malaysian Mathematics Outreach Initiative**

Main aim of the project:

Motivate and inspire the Malaysian school children about the nature of mathematics

Location of the project:

Universiti Kebangsaan Malaysia, Universiti Teknologi Mara, Universiti Malaya (these 3 universities to cover the central part of Malaysia), Universiti Teknologi Malaysia (to cover the southern region), Universiti Sains Malaysia (the northern region) and Universiti Malaysia Terengganu (Eastern region)

Target group:

School children/School teachers

Mathematical Field: General mathematics

Current funding (if any):

Nil – we use to get funding from the our main Telecommunication Company but this stopped about 4 years ago.

Necessary funding:

6.000 Euro per year

Contact person:

Professor Dr Mohd Salmi Md Noorani

Position: Deputy Dean (Postgraduate and International Affairs)

email: msn@ukm.my

Phone number: +603-89215433

Institution and Address:

School of Mathematical Sciences

Faculty of Science and Technology

Universiti Kebangsaan Malaysia

Bangi, Selangor

43600

Malaysia

Description:

This initiative was started by a yearly grant from Malaysia's main telecom company about 7 years ago and it ran for about 3 years before it stopped since the company changed its focused and concentrated on other educational issues. During these 3 years, the team consisting of academics from the aforementioned universities have ran outreach programs focusing on school children in the form of maths camp and teaching & learning workshops for school teachers. The main objectives are to motivate and inspire the young minds of Malaysia what mathematics is all about. In a country where the education is so exam-oriented – most of the teachers' task is to obtain 'A' grades in the respective exam - and parrot-fashion learning is somewhat a norm, it is important for us to educate these young children that there is more to mathematics than memorizing formulas and doing drill exercises. It is no secret that this scenario has in a way spoiled the true image of mathematics in the eyes of these young children. We have designed the content of the camp to include hands-on activities to bring home the creative aspect of mathematics, talks about the nature of mathematics, small modelling projects etc. We even have a math-oriented treasure hunt activity and math song-and-dance event. For a reading of our experience in conducting these camps, see *Exposing the Fun Side of Mathematics via Mathematics Camp, Procedia – Social and Behavioural Sciences, Vol. 8, 2010, pgs 338-343*. We very much hoped that this exposure will change the student's perception of mathematics into a more positive one.

We are proud to say that from our experience with the school children that this is indeed the case. The children now realize that mathematics is everywhere – a behind-the-scene science – and its applicability is not restricted to unrealistic text book exercises. Indeed, the children now have a completely new perspective about mathematics. We believe this in turn will no doubt encourage more participation of Malaysia's best young minds to venture into mathematical science related areas. As to the teaching and learning workshops, our aim is to expose to the teachers as to what's new in mathematics nowadays. This could be in the form of new methods of teaching via ICT. Also new mathematics that is a hot area of research is also exposed to the teachers. Problematic areas of school mathematics are discussed so that the best mode of teaching is agreed upon. Moreover materials from the aforementioned maths camp are also exposed to them in a train-the-trainer fashion. Even though the teachers have attested that they have learned a lot from these workshops, it is in general difficult for them to further pursue these ideas at their respective schools since activities of this nature are not in the school's list of top priorities. Thus it is pertinent that we continue these camps and workshops.

The requested funding will allow us to conduct at least 4 activities per year (at a cost of about 1.500 Euro per camp/workshop) where each region will conduct its own activity. Each activity is over a 3 days/2 nights period and the bulk of the money will cover the children's subsistence cost (which is not paid for by their respective schools) during this period. On average there are about 80 children per activity. We usually target schools from rural areas since urban schools are normally better off in the form of resources. Workshop for teachers is normally conducted concurrently. To save cost, graduate students are roped in to be facilitators during these camps. On a last note, we hope this funding will also allow us to finish the maths camp modules which were initiated during the period of the previous sponsor. We sincerely hope that these modules will enable teachers and educators alike to conduct camps and workshops just by using these modules.

**Project Proposal 4 (The Philippines): Capacity-building for calculus teachers in the new senior high school curriculum**

**PHILIPPINES PROJECT PROPOSAL 1**

**PROJECT NAME:** Capacity-building for calculus teachers in the new senior high school curriculum

**PROJECT AIM:** The proposed project aims to help address the massive need for competent calculus teachers in the country, due to the introduction of calculus in the new senior high school curriculum, through the conduct of intensive teacher-training programs in selected regions of the Philippines.

**LOCATION OF THE PROJECT:** Selected regions in the Philippines

**TARGET GROUP:** In-service teachers of selected public high schools who will be identified as potential calculus teachers

**MATHEMATICAL FIELD:** Mathematics Education

**CURRENT FUNDING:** None at the moment.

**NECESSARY FUNDING:** Euro 10,000 for the conduct of one 10-day training program with 40 participants each. The initial target is to conduct at least five programs in the poorer regions in the Philippines (in Visayas and Mindanao). The number of participants and programs may be increased with the availability of additional funds.

**CONTACT PERSON:** Dr. Jose Maria P. Balmaceda

**POSITION:** Chair, Technical Committee for Mathematics, Commission on Higher Education and Professor of Mathematics

**INSTITUTION AND ADDRESS:** Institute of Mathematics, University of the Philippines Diliman. Email: joey@math.upd.edu.ph, jose.balmaceda@gmail.com



## DESCRIPTION OF THE PROJECT:

In 2013, the Philippine Congress passed a law prescribing two additional years to basic education (Grades 11 and 12). By 2018, all high school graduates in the country would have completed Kindergarten, 6 years of primary education, 4 years of Junior High School, and 2 years of Senior High School. Grade 11 will be introduced in school year 2016-2017 and Grade 12, in 2017-2018. The new senior high school curriculum includes at least one year of instruction in calculus. Currently, calculus is not part of the basic education curriculum, but is offered only in a small number of select science-oriented public high schools or elite private high schools. One of the biggest challenges in implementing the new senior high school curriculum is the need for competent calculus teachers.

The training program will cover a period of 10 days. Trainers will be provided by the Mathematical Society of the Philippines and the Technical Committee for Mathematics of the Commission of Higher Education, to be comprised by experienced calculus teachers paired with master high school teachers. The selection of regions and participants will be coordinated with the Department of Education

References: <http://www.gov.ph/k-12/> and <http://www.deped.gov.ph/index.php/resources/facts-figures> and <http://>

**Project Proposal 5 (The Philippines): 2015 SEAMS-Philippines School on Group Theory, Discrete Geometry, and Linear Algebra**

**PHILIPPINES PROJECT PROPOSAL 2**

PROJECT NAME: 2015 SEAMS-Philippines School on Group Theory, Discrete Geometry and Linear Algebra

PROJECT AIMS: To strengthen the mathematical foundations of master's level graduate students and advanced undergraduates by providing an accessible introduction to special topics in mathematics that will encourage them to pursue higher studies in mathematics and to do research.

LOCATION OF THE PROJECT: Institute of Mathematics, University of the Philippines, Diliman

TARGET GROUP: Master's level students and advanced undergraduate students from Cambodia, Laos, Myanmar, Brunei, and underdeveloped provinces of Philippines, Indonesia and Thailand.

MATHEMATICAL FIELD: Group Theory, Discrete Geometry and Linear Algebra

CURRENT FUNDING: None at the moment.

NECESSARY FUNDING: Euro 15,000 to cover travel and living expenses of participants

CONTACT PERSON: Dr. Jose Maria P. Balmaceda

POSITION: Chair, Technical Committee for Mathematics, Commission on Higher Education, and Professor

INSTITUTION AND ADDRESS: Institute of Mathematics, University of the Philippines Diliman. Email: joey@math.upd.edu.ph, jose.balmaceda@gmail.com

## DESCRIPTION OF THE PROJECT:

The proposed school will be part of the SEAMS (Southeast Asian Mathematical Society) Schools. The first SEAMS School was conducted in 2011 in Manila, and subsequently in Hanoi and Bandung. The SEAMS School is inspired by the successful EMALCA Schools of UMALCA (Latin America and Caribbean Mathematical Union). The school consists of a ten-day program of intensive lectures and problem solving sessions on selected topics in group theory, discrete geometry and linear algebra. The specific topics will be aligned with the scientific programme of the SEAMS Schools. The target participants will be master's level students and advanced undergraduate students from underdeveloped regions in Southeast Asia with little or no access to advanced mathematical education and research. The lecturers will be experienced professors and researchers from the Institute of Mathematics, UP Diliman and other leading Philippine universities. One or two lecturers may be invited from universities outside the Philippines. The expected number of participants is 40.

References: <http://www.seams-math.org>, <http://www.math.upd.edu.ph>

## **Project Proposal 6 (Singapore): Asian Research School in Discrete Mathematics**

### Proposal from Singapore

#### *Name of the project:*

**Asian Research School in Discrete Mathematics** – This is not an existing project, But the proposed name for one that can happen if funding is available

#### *Main aim of the project:*

Foster development of discrete mathematics in Asia, particularly Southeast Asia

#### *Location of the project:*

Universities in Southeast Asia, But Singapore Mathematical Society Would be happy to serve as the initial contact point

#### *Target group:*

Graduate students and young mathematical scientists in Asia, particularly Southeast Asia, working in discrete mathematics

#### *Mathematical Field:*

Discrete Mathematics

#### *Current funding (if any):*

None – Not an existing project

#### *Necessary funding:*

30,000 USD per year (preferably for 5 years)

#### *Contact person:*

Prof LING San

*Position:* President, Singapore Mathematical Society

*email:* [lingsan@ntu.edu.sg](mailto:lingsan@ntu.edu.sg)

*Phone number:* +65 6592 7526

#### *Institution and Address:*

College of Science

Nanyang Technological University

60 Nanyang Drive

SBS---01s---45

Singapore 637551

Republic of Singapore

#### *Description:*

This is a proposal for a new program to be implemented if funding can be secured. Ideally it should be owned collectively by the mathematical community in Southeast Asia, but the Singapore Mathematical Society would be happy to serve as the initial point of contact and even run the project in the initial years.

The main intention of the project is to run a two---week intensive research school annually, to be conducted by international experts, on selected topics in discrete mathematics. The targeted participants are graduate students and young mathematical scientists in Asia, particularly Southeast Asia. The reason for the choice to focus on discrete mathematics, rather than including various other branches of mathematics, is two---fold:

1. Asia, and particularly Southeast Asia, already has a sizeable presence of researchers and graduate students in different subareas of discrete mathematics, so such a project will provide sustained assistance to a large group of mathematical scientists, and can potentially lead to the emergence of an area of excellence for the region, within a relatively shorter timeline.
2. Discrete mathematics is quite broad, including topics such as: graph theory, combinatorics, cryptography, coding theory, and most of these areas are already represented in the region.

Many branches of discrete mathematics have close connections with 'application'---fields such as information technology and communication. Excellence in these branches of discrete mathematics is likely to translate into further capabilities in areas of economic or social benefits – something that can be appreciated by governments and communities. This can in turn translate into new support for the development of mathematical sciences and mathematics education.

The intention is to bring together about 20---25 graduate students and young researchers annually, not just from Southeast Asia but also, say, up to 30% from other selected regions in Asia, such as China and India, for an intensive course that can help bridge the gap between a general graduate education in discrete mathematics and what is needed for research in modern problems in the field. The inclusion of participants from outside Southeast Asia will add to the diversity of the group and help broaden the participants' network, while Southeast Asians remain the main group of beneficiaries of the project.

Ideally, the research school should be held at locations where the costs are low, the number of local participants is significant, and which are easily accessible to foreign participants. This will, however, require discussion among the members of the community in the region. If need be, Singapore is prepared to host the inaugural school should funding be available, but cost can be a drawback.

Funding for a project of this nature (education, for a region and in an area of specialization, on a sustained basis) is hard to come by in Southeast Asia. There have indeed been ad hoc funding opportunities for research schools, but the ad hoc nature means that such schools can only be planned as one---off events and not an annual one with the long---term objective of creating a defined area of excellence within the region. Other funding mechanisms (e.g., most agencies in Singapore) tend to focus on research and do not necessarily support educational activities. Funding that can sustain a 5---year plan for this project would make it feasible for it to be launched.

## **Project Proposal 7 (Thailand): Indochina Mathematical Science Initiative, IMSI**

### **Project Proposal for CDC**

Name of the project: **Indochina Mathematical Science Initiative, IMSI**

Main aim of the project:

Foster mathematical development in countries in the Indochina subregion

Location of the project:

Centre of Excellence in Mathematics (CEM), Post Graduate Education and Research Development Office (PERDO), Commission on Higher Education, Ministry of Education, Thailand, consisting of 19 member universities led by Mahidol University.

Target group:

Graduate schools for PhD Students

Mathematical Field:

Open to all fields of Mathematical Science, including Mathematical Statistics

Current funding:

None

Necessary funding:

100,000 Euro per year

Contact person:

Prof. Yongwimon Lenbury

Position: Director of the Centre of Excellence in Mathematics, Commission on Higher Education, Ministry of Education

email: scylb@yahoo.com

Phone number: 662 201 5340

Institution and Address:

Department of Mathematics, Faculty of Science, Mahidol University

Street: Rama 6 Rd.

City: Bangkok, Thailand

Zip Code: 10400

Description:

Postgraduate study and research in mathematics in some countries in the Indochina region are lagging far behind many neighboring countries in Asia, not to mention the rest of the world. It is imperative that this situation is remedied in order that regional stability, both politically and economically, may be maintained.

The Indochina Mathematical Science Initiative (IMSI) aims at promoting and developing post graduate education and research in mathematical science among countries in the Indochina subregion; namely,

1. Laos
2. Burma
3. Cambodia
4. Thailand, and
5. Vietnam.

IMSI, proposed by the Centre of Excellence in Mathematics (CEM), Thailand, is to provide support for activities involving collaboration and academic exchange in mathematics research and post graduate education, as well as organization of trainings, workshops, or conferences by universities or mathematics centers in the Indochina subregion. This also includes scholarships for graduate students from countries in the Indochina region who are doing PhD work in Mathematical Science at member universities of CEM in which graduate studies are carried out in English. Support is provided for visiting lectureships or experts in order to enhance the existing strength of postgraduate programs in the subregion.

## **Project Proposal 8 (Vietnam): An International PhD Program at Institute of Mathematics Hanoi**

### **APPLICATION FOR**

#### **An International PhD Program at Institute of Mathematics Hanoi**

##### **1. Name of Project:**

International PhD Program at Institute of Mathematics Hanoi for students from South East Asian countries

##### **2. Information on Host Institution**

- Name: Institute of Mathematics Hanoi
- Address: 18 Hoang Quoc Viet Road, Hanoi, Vietnam
- Website: [www.math.ac.vn](http://www.math.ac.vn); E-mail: [vientoan@math.ac.vn](mailto:vientoan@math.ac.vn)
- Phone: (+ 84) 4 37563474
- Fax: (+84) 4 37564303
- Director: Prof. Le Tuan Hoa (Phone: (+ 84) 4 37563474/ext. 204 or (+84) 4 37564428; E-mail: [lthoa@math.ac.vn](mailto:lthoa@math.ac.vn))

##### **3. Brief presentation of the Institute of Mathematics Hanoi**

The Institute of Mathematics of Vietnam Academy of Science and Technology (VAST) - known under the name Institute of Mathematics Hanoi (IMH) - was founded in 1969 and started its activities in 1970. During over 40 years of its existence, despite of various challenges the IMH has always tried its best efforts to build its research capacity and continue to develop. As a result, the IMH is recognized as one of leading research institutes of Vietnam and contributes significantly to the development of the mathematics profession in Vietnam. It was once recognized by The World Academy of Science for the developing countries (TWAS) as an Excellent Center.

It is located inside VAST. It has two buildings with much equipment, a good library and free internet access for all members, students and guests.

At the present the IMH has 79 faculty members, among them 18 full professors and 11 associate professors. 53 faculty members have PhD. degree. The IMH has 10 research laboratories (called departments) and a Post-graduate Training Center.

The VAST is not a university. So, the IMH, as a member institute of VAST, has no bachelor program. However it does have master program (started in 1996) and PhD. Program (started in 1978). Until now the IMH has awarded nearly 150 PhD. degrees to Vietnamese mathematicians.

The IMH already had some experience with an international educational programs. Since 2007-2008, IMH also offers an International Master Program (IMP), where students study the first academic year at IMH and the second year in oversea if the IMH can find enough financial support from partner institutions for them. During the years 2007 – 2011 this IMP was supported by the so-called Project 322 of the Ministry of Education and Training of Vietnam. That means, the Vietnam Government gave grants to students of this IMP for the first year at IMH as well as second year study abroad. Most of students of the IMP studied well abroad. Many of them could get grants to pursue further PhD theses. Some of them already received PhD degrees and returned to work in Vietnam. This support came to the end in 2011. Since then, the IMH has to find grants for students of the IMP from partner institutions from abroad (mainly from France). In the academic year 2008-2009 and 2010-2011, four students from Cambodia have successfully finished the first year of study of this IMP at IMH, and then continued the second year in France. All of them received financial support from CIMPA to pay their local expenses in Hanoi.

##### **4. Brief description of Project**

**a) Goal:** To support some students from South East Asian countries (outside Vietnam) to come to IMH for doing PhD. theses.

**b) Schemes:**

- Only the best faculty members of IMH will participate in this scheme as thesis advisors. The IMH provide students full study fee, office and working facilities.
- VAST will give support to cover the running cost of International PhD. program of IMH;
- IMU will give grants to foreign students to come to IMH for the study (travel + local expenses in Hanoi);
- Careful selection of subjects so that one can guarantee the quality of PhD. theses of the program.
- For the first 5 years: Each year one new PhD. student will be selected.

**c) Benefits:**

- Low cost program (compared with giving grants to study in developed countries in Europe, America or Australia) while thesis level is guaranteed.
- To form research groups and research networks inside ASEAN: Thank to short distances, after the completion of PhD. study alumni fellows could easily keep contact with or even travel to his/her former advisor and research groups at IMH in order to continue to do research. This also helps to prevent brain-drain from ASEAN.
- To mobilize financial sources as well as scientific capacities from research institutions in the region and IMU in training PhD. students in Mathematics.
- A better international reputation for the IMH as the host institution.

**d) Estimated cost (in USD)**

Year	Number of students	From IMH	From VAST	From IMU	Total cost
2015	1	1 000	2 000	8 000	11 000
2016	2 (1 new comer + 1 continued)	2 000	4 000	16 000	22 000
2017	3 (1 new comer + 2 continued)	3 000	6 000	24 000	33 000
2018	3 (1 new comer + 2 continued)	3 000	6 000	24 000	33 000

**Notes**

- Travel to Vietnam from an ASEAN country: in average 300\$
- Minimal local expenses in Hanoi: 300\$ for rent and 300\$ for meal/month
- Each year, starting from 2018, one PhD. could be defended.

**e) Subjects for the first phase**

- Algebra (Algebraic Geometry, Commutative Algebra)
- Optimization and Control Theory



## 5. **Appendix:** List of possible advisors and their research capacities

### **1. Professor Ngo Viet Trung**

- Research Area: Commutative Algebra, Algebraic Geometry and Combinatorics
- Number of publications listed in MathSciNet: 92
- 5 selected recent papers:
  - i. Terai, Naoki; Trung, Ngo Viet: Cohen-Macaulayness of large powers of Stanley-Reisner ideals. *Adv. Math.* 229 (2012), no. 2, 711–730.
  - ii. Minh, Nguyen Cong; Trung, Ngo Viet: Cohen-Macaulayness of monomial ideals and symbolic powers of Stanley-Reisner ideals. *Adv. Math.* 226 (2011), no. 2, 1285–1306.
  - iii. Herzog, Jürgen; Hibi, Takayuki; Trung, NgôViệt; Zheng, Xinxian: Standard graded vertex cover algebras, cycles and leaves. *Trans. Amer. Math. Soc.* 360 (2008), no. 12, 6231–6249.
  - iv. Ngo Viet Trung; Verma, Jugal: Mixed multiplicities of ideals versus mixed volumes of polytopes. *Trans. Amer. Math. Soc.* 359 (2007), no. 10, 4711–4727.
  - v. Herzog, Jürgen; Hibi, Takayuki; Trung, NgôViệt: Symbolic powers of monomial ideals and vertex cover algebras. *Adv. Math.* 210 (2007), no. 1, 304–322.

### **2. Professor Nguyen TuCuong**

- Research Area: Commutative Algebra and Algebraic Geometry
- Number of publications listed in MathSciNet: 50
- 5 selected recent papers:
  - i. Cuong, Nguyen Tu; Goto, Shiro; Truong, Hoang Le: The equality  $l_2=q_l$  in sequentially Cohen-Macaulay rings. *J. Algebra* 379 (2013), 50–79.
  - ii. Cuong, Nguyen Tu; Quy, Pham Hung: A splitting theorem for local cohomology and its applications. *J. Algebra* 331 (2011), 512–522.
  - iii. Cuong, Nguyen Tu; Nhan, Le Thanh; Nga, Nguyen ThiKieu: On pseudo supports and non-Cohen-Macaulay locus of finitely generated modules. *J. Algebra* 323 (2010), no. 10, 3029–3038.
  - iv. Cuong, Nguyen Tu; Nam, Tran Tuan: A local homology theory for linearly compact modules. *J. Algebra* 319 (2008), no. 11, 4712–4737.
  - v. TuCuong, Nguyen; Van Hoang, Nguyen: On the vanishing and the finiteness of supports of generalized local cohomology modules. *Manuscripta Math.* 126 (2008), no. 1, 59–72.

### **3. Professor Le Tuan Hoa**

- Research Area: Commutative Algebra, Algebraic Geometry and Combinatorics
- Number of publications listed in MathSciNet: 54
- 5 selected recent papers:
  - i. Hoa, LêTuân; Morales, Marcel: Non-linear behaviour of Castelnuovo-Mumford regularity. *J. Algebra* 356 (2012), 207–215.
  - ii. Chardin, Marc; Dao Thanh Ha; LêTuânHoa: Castelnuovo-Mumford regularity of Ext modules and homological degree. *Trans. Amer. Math. Soc.* 363 (2011), no. 7, 3439–3456.
  - iii. LêTuânHoa; Trần Nam Trung: Partial Castelnuovo-Mumford regularities of sums and intersections of powers of monomial ideals. *Math. Proc. Cambridge Philos. Soc.* 149 (2010), no. 2, 229–246.
  - iv. Hellus, Michael; Hoa, LêTuân; Stückrad, Jürgen: Gröbner bases of simplicialtoric ideals. *Nagoya Math. J.* 196 (2009), 67–85.

v. LêTuânHoa: Finiteness of Hilbert functions and bounds for Castelnuovo-Mumford regularity of initial ideals. *Trans. Amer. Math. Soc.* 360 (2008), no. 9, 4519–4540.

#### 4. **Professor Phung Ho Hai**

- Research Area: Representation Theory and Algebraic Geometry
- Number of publications listed in MathSciNet: 27
- 5 selected recent papers:
  - i. Esnault, Hélène; Hai, PhùngHô: The fundamental groupoid scheme and applications. *Ann. Inst. Fourier (Grenoble)* 58 (2008), no. 7, 2381–2412.
  - ii. PhùngHô Hai: Tannaka-Krein duality for Hopf algebroids. *Israel J. Math.* 167 (2008), 193–225.
  - iii. Esnault, Hélène; Hai, PhùngHô: Packets in Grothendieck's section conjecture. *Adv. Math.* 218 (2008), no. 2, 395–416.
  - iv. Esnault, Hélène; Hai, PhùngHô; Sun, Xiaotao: On Nori's fundamental group scheme. *Geometry and dynamics of groups and spaces*, 377–398, *Progr. Math.*, 265, Birkhäuser, Basel, 2008.
  - v. Hai, PhùngHô; Lorenz, Martin: Koszul algebras and the quantum MacMahon master theorem. *Bull. Lond. Math. Soc.* 39 (2007), no. 4, 667–676.

#### 5. **Professor Nguyen QuocThang**

- Research Area: Number Theory and Algebraic Geometry
- Number of publications listed in MathSciNet: 53
- 5 selected recent papers:
  - i. Thảng, NguyễnQuốc: On Galois cohomology of semisimple groups over local and global fields of positive characteristic, III. *Math. Z.* 275 (2013), no. 3-4, 1287–1315.
  - ii. Bac, Dao Phuong; Thang, Nguyen Quoc: On the topology of relative and geometric orbits for actions of algebraic groups over complete fields. *J. Algebra* 390 (2013), 181–198.
  - iii. Bac, Dao Phuong; Thang, Nguyen Quoc: On a relative version of a theorem of Bogomolov over perfect fields and its applications. *J. Algebra* 324 (2010), no. 6, 1259–1278.
  - iv. Thảng, NguyễnQuốc; Tân, NguyễnDuy: On the Galois and flat cohomology of unipotent algebraic groups over local and global function fields. I. *J. Algebra* 319 (2008), no. 10, 4288–4324.
  - v. Thảng, NguyễnQuốc: On Galois cohomology of semisimple groups over local and global fields of positive characteristic. *Math. Z.* 259 (2008), no. 2, 457–467.

#### 6. **Professor Hoang Xuan Phu**

- Research Area: Optimization and Numerical Analysis
- Number of publications listed in MathSciNet: 67
- 5 selected recent papers:
  - i. Phu, H. X.; Bock, H. G.: A common regularization for three reservoir optimal control problems. *J. Optim. Theory Appl.* 157 (2013), no. 1, 199–228.
  - ii. Phu, H. X.; Pho, V. M.: Some properties of boundedly perturbed strictly convex quadratic functions. *Optimization* 61 (2012), no. 1, 67–88.
  - iii. Hoang Xuan Phu: Minimizing convex functions with bounded perturbations. *SIAM J. Optim.* 20 (2010), no. 5, 2709–2729.
  - iv. Phu, Hoang Xuan: Outer  $\Gamma$ -convexity in vector spaces. *Numer. Funct. Anal. Optim.* 29 (2008), no. 7-8, 835–854.

- v. Phu, Hoang Xuan: Supremizers of inner  $\gamma$ -convex functions. *Math.Methods Oper. Res.* 67 (2008), no. 2, 207–222.

### **7. Professor Nguyen Dong Yen**

- Research Area: Optimization and Numerical Analysis
  - Number of publications listed in MathSciNet: 88
  - 5 selected recent papers:
- i. Lee, G. M.; Tam, N. N.; Yen, N. D.: Stability of linear-quadratic minimization over Euclidean balls. *SIAM J. Optim.* 22 (2012), no. 3, 936–952.
  - ii. Le Thi, Hoai An; Pham Dinh, Tao; Yen, Nguyen Dong: Properties of two DC algorithms in quadratic programming. *J. Global Optim.* 49 (2011), no. 3, 481–495.
  - iii. Mordukhovich, B. S.; Nam, N. M.; Yen, N. D.: Subgradients of marginal functions in parametric mathematical programming. *Math.Program.* 116 (2009), no. 1-2, Ser. B, 369–396.
  - iv. Yen, N. D.; Yao, J.-C.; Kien, B. T. Covering properties at positive-order rates of multifunctions and some related topics. *J. Math. Anal. Appl.* 338 (2008), no. 1, 467–478.
  - v. Lee, GueMyung; Nguyen Nang Tam; Nguyen Dong Yen: Quadratic programming and affine variational inequalities. A qualitative study. *Nonconvex Optimization and its Applications*, 78. Springer-Verlag, New York, 2005. xiv+345 pp. ISBN: 0-387-24277-5.

### **8. Professor Le Dung Muu**

- Research Area: Optimization
  - Number of publications listed in MathSciNet: 64
  - 5 selected recent papers:
- i. Anh, P. N.; Kim, J. K.; Muu, L. D.: An extragradient algorithm for solving bilevel pseudomonotone variational inequalities. *J. Global Optim.* 52 (2012), no. 3, 627–639.
  - ii. Quoc, Tran Dinh; Muu, Le Dung: Iterative methods for solving monotone equilibrium problems via dual gap functions. *Comput. Optim. Appl.* 51 (2012), no. 2, 709–728.
  - iii. Hoai An, Le Thi; Tao, Pham Dinh; Nam, Nguyen Canh; Muu, Le Dung: Methods for optimizing over the efficient and weakly efficient sets of an affine fractional vector optimization program. *Optimization* 59 (2010), no. 1, 77–93.
  - iv. Muu, L. D.; Quoc, T. D. Regularization algorithms for solving monotone Ky Fan inequalities with application to a Nash-Cournot equilibrium model. *J. Optim. Theory Appl.* 142 (2009), no. 1, 185–204.
  - v. Muu, Le D.; Nguyen, V. H.; Quy, N. V. On Nash-Cournot oligopolistic market equilibrium models with concave cost functions. *J. Global Optim.* 41 (2008), no. 3, 351–364.

### **9. Associate Professor Truong Xuan Duc Ha (female)**

- Research Area: Optimization
  - Number of publications listed in MathSciNet: 28
  - 5 selected recent papers:
- i. Eichfelder, Gabriele; Ha, Truong Xuan Duc: Optimality conditions for vector optimization problems with variable ordering structures. *Optimization* 62 (2013), no. 5, 597–627.
  - ii. Jahn, Johannes; Ha, Truong Xuan Duc: New order relations in set optimization. *J. Optim. Theory Appl.* 148 (2011), no. 2, 209–236.

- iii. Ha, Truong Xuan Duc: The Ekelandvariational principle for Henig proper minimizers and super minimizers. *J. Math. Anal. Appl.* 364 (2010), no. 1, 156–170.
- iv. Ha, Truong Xuan Duc: Lagrange multipliers for set-valued optimization problems associated with coderivatives. *J. Math. Anal. Appl.* 311 (2005), no. 2, 647–663.
- v. Ha, T. X. D.: Some variants of the Ekelandvariational principle for a set-valued map. *J. Optim. Theory Appl.* 124 (2005), no. 1, 187–206.

**10. Dr. Bui TrongKien**

- Research Area: Optimization
- Number of publications listed in MathSciNet: 26
- 5 selected recent papers:
  - i. Kien, B. T.; Toan, N. T.; Wong, M. M.; Yao, J. C.: Lower semicontinuity of the solution set to a parametric optimal control problem. *SIAM J. Control Optim.* 50 (2012), no. 5, 2889–2906.
  - ii. Toan, N. T.; Kien, B. T.: Subgradients of the value function to a parametric optimal control problem. *Set-Valued Var. Anal.* 18 (2010), no. 2, 183–203.
  - iii. Kien, B. T.; Wong, M.-M.; Wong, N. C.; Yao, J. C.: Degree theory for generalized variational inequalities and applications. *European J. Oper. Res.* 192 (2009), no. 3, 730–736.
  - iv. Kien, B. T.: Lower semicontinuity of the solution map to a parametric generalized variational inequality in reflexive Banach spaces. *Set-Valued Anal.* 16 (2008), no. 7-8, 1089–1105.
  - v. Kien, Bui Trong; Wong, Mu-Ming; Wong, Ngai-Ching On the degree theory for general mappings of monotone type. *J. Math. Anal. Appl.* 340 (2008), no. 1, 707–720.

**11. Professor Vu Ngoc Phat**

- Research Area: Control Theory and Differential Equations
- Number of publications listed in MathSciNet: 107
- 5 selected recent papers:
  - i. Thuan, M. V.; Phat, V. N.: Optimal guaranteed cost control of linear systems with mixed interval time-varying delayed state and control. *J. Optim. Theory Appl.* 152 (2012), no. 2, 394–412.
  - ii. Phat, V. N.; Khongtham, Y.; Ratchagit, K.: LMI approach to exponential stability of linear systems with interval time-varying delays. *Linear Algebra Appl.* 436 (2012), no. 1, 243–251.
  - iii. Phat, Vu N.; Jeyakumar, V.: Stability, stabilization and duality for linear time-varying systems. *Optimization* 59 (2010), no. 3-4, 447–460.
  - iv. Phat, V. N.; Ha, Q. P.:  $H^\infty$  control and exponential stability of nonlinear nonautonomous systems with time-varying delay. *J. Optim. Theory Appl.* 142 (2009), no. 3, 603–618.
  - v. Nam, P. T.; Phat, V. N.: Robust stabilization of linear systems with delayed state and control. *J. Optim. Theory Appl.* 140 (2009), no. 2, 287–299.

Hanoi, March 6th, 2014

Le Tuan Hoa

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