

# Report on

## SEAMS-IMH-CIMPA SCHOOL ON COMBINATORICS

### Hanoi, March 9-20, 2015

<http://math.ac.vn/conference/seams15/>

#### I. Scientific report

##### Organizers:

- Phan Thi Ha Duong (Institute of Mathematics, Associate Professor),
- Prof. Le Tuan Hoa (Institute of Mathematics, Professor),
- Phung Ho Hai (Institute of Mathematics, Professor)
- Nguyen Dong Yen (Institute of Mathematics, Professor).

##### Lecturers given by:

- Prof. Robert Cori (Université Bordeaux 1),
- Assoc. Prof. Christophe Crespelle (Ecole Normale Supérieure de Lyon),
- Assoc. Prof. Phan Thi Ha Duong (Institute of Mathematics),
- Dr. Vu Duc Minh (Hanoi University of Science),
- Dr. Tran Thi Thu Huong (Institute of Mathematics) There were 19 students selected for the school.

**Schedule:** March 9-21 (12 days), 2 lectures per day.

##### Titles of the courses:

Lectures of combinatorics (Prof. Phan Thi Ha Duong and Prof. Robert Cori): 10 lectures

Exercices of combinatorics (PhD. Tran Thi Thu Huong): 4 lectures

Lecture of algorithms (Prof. Christophe Crespelle): 5 lectures

Exercices of algorithms (PhD. Vu Duc Minh): 3 lectures

A detailed schedule and contents of lectures were put on the website of the school:

website: <http://math.ac.vn/conference/seams15/> (see also Appendix 2)

In the weekend during school, a trip outside Hanoi was organized for all participants.

#### II. Administrative report

- The school was planned by VAST at the end of 2014.

- Later on, CIMPA agreed to support this school, and VIASM agreed that the financial support of CIMPA will be only used to support students from South East Asia outside Vietnam.

- The school was announced at the website of VAST: website: <http://math.ac.vn/conference/seams15/> (see Appendix 1)

- The deadline for application was February 20, 2015. There were 19 applications. Among them there were 8 applications from students outside Vietnam (from South East Asia) and 11 Vietnamese students. Most of them are master students. Some of them are PhD. Students, and a few of undergraduate students from Vietnam (see List 1 below). The grants were announced on March 1, 2015. However, a Philippines student could not participate the school, because he could not get the visa.

- First students came on March 8th, and last students left the institute on March 22st.

**List 1. List of Students**

| No | Name                      | Place&Date of birth      | Sex    | Position               | Address                            |
|----|---------------------------|--------------------------|--------|------------------------|------------------------------------|
| 1  | Fithri Annisatun Lathifah | Boyolali, 03/27/1993     | Female | Under-Graduate student | Sebelas Maret University           |
| 2  | Ni Luh Dewi Sintiar       | Singaraja, 05/08/1992    | Female | Graduate student       | Ganesha University of Education    |
| 3  | Yeva Fadhilah Ashari      | Surakarta, 04/25/1992    | Female | Under-Graduate student | Sebelas Maret University Surakarta |
| 4  | Frey Kurnita Sari         | Karanganyar, 09/03/1992  | Female | Under-Graduate student | Sebelas Maret University Surakarta |
| 5  | Debi Oktia Haryeni        | Bukittinggi, 10/16/1991  | Female | Graduate student       | Institute Teknologi Bandung        |
| 6  | Desi Rahmadani            | Rantauprapat, 04/14/1991 | Female | Graduate student       | Institute Teknologi Bandung        |
| 7  | Daryl Q. Granario         | 04/09/1990               | Male   | Graduate student       | University of the Philippines      |
| 8  | Bui Van Chien             | Vietnam, 03/14/1986      | Male   | Graduate student       | Paris 13 University                |
| 9  | Nguyễn Thị Thúy Nga       | Vĩnh Phúc, 12/02/1991    | Female | Graduate student       | Institute of Mathematics (VAST)    |
| 10 | Võ Thị Phương Thủy        | Quảng Ngãi, 09/25/1992   | Female | Graduate student       | Institute of Mathematics (VAST)    |
| 11 | Bùi Thị Thủy              | Hà Nội, 11/04/1991       | Female | Graduate student       | Institute of Mathematics (VAST)    |

|    |                     |                          |        |                        |                                 |
|----|---------------------|--------------------------|--------|------------------------|---------------------------------|
| 12 | Trần Quang Tuệ      | TT Huế,<br>12/07/1992    | Male   | Graduate student       | Institute of Mathematics (VAST) |
| 13 | Dương Giao Kỳ       | An Giang,<br>11/20/1991  | Male   | Graduate student       | Institute of Mathematics (VAST) |
| 14 | Nguyễn Năng Thiều   | Vĩnh Phúc,<br>12/03/1991 | Male   | Graduate student       | Institute of Mathematics (VAST) |
| 15 | Nguyễn Hữu Thịnh    | Nghệ An,<br>08/10/1990   | Male   | Graduate student       | Institute of Mathematics (VAST) |
| 16 | Vũ Thị Kim Nhung    | 11/4/1989                | Female | Graduate student       | Institute of Mathematics (VAST) |
| 17 | Lê Hữu Thiện        | 2/9/1990                 | Male   | Graduate student       | Institute of Mathematics (VAST) |
| 18 | Nguyen Thi Viet Ha, | Hanoi, 06/08/1993        | Female | Under-graduate student | Hanoi, Vietnam                  |
| 19 | Trần Hồng Yến       | 30/6/1987                | Female | Under-graduate student | Hanoi, Vietnam                  |

### III. Financial report

Preliminary, the budget from CIMPA should only cover expenses of foreign students.

19 students were admitted to the school. However, only 7 foreign students get financial supports from CIMPA.

VAST pay the lunch for all lectures and Vietnamese students, Honorarium for 5 lecturers, Drinks and Stationary, printing supply expenses.

All foreign students came on March 8th. Six of them left on March 21st and the last one left on March 22nd .

Totally VAST spent 149.329.800 VND (One hundred forty nine million three hundred twenty nine thousand and eight hundred Vietnamese dong). This included 120.784.800 VND (equivalent 5 118 EUR) paid for foreigners.

*We are now asking the CIMPA to pay back this amount (5 118 EUR – five thousand one hundred and eighteen Euro).*

Below is the detail of expenses

#### List 2. Financial report

| Contents (March 9-20, 2015) | Paid by          |                   |
|-----------------------------|------------------|-------------------|
|                             | VAST<br>(in VND) | CIMPA<br>(in EUR) |
|                             |                  |                   |

|  |                      |                  |
|--|----------------------|------------------|
| <b>Expense for lecturers</b>                 | <b>16.650.000</b>    |                  |
| Honorarium for 5 lecturers                   | 8.250.000            |                  |
| Hotel expenses for lecturers                 | 3.600.000            |                  |
| Living expenses for lecturers                | 4.800.000            |                  |
| <b>Expense for students</b>                  | <b>10.550.000</b>    | <b>5.151</b>     |
| Travel expenses for 7 International students |                      | 1.974            |
| Meal expenses for 12 Vietnamese students     | 9.390.000            |                  |
| Meal expense for 7 International students    |                      | 1.155            |
| Hotel expenses for 7 International students  |                      | 1.989            |
| Drinks for 19 students                       | 1.160.000            |                  |
| <b>Other expenses</b>                        | <b>1.345.000</b>     |                  |
| Stationary, printing supply expenses         | 1.345.000            |                  |
| <b>Total (I+II+III)</b>                      | <b>28.545.000VND</b> | <b>5.118 EUR</b> |

In the file 15SEAMS\_School\_docu\_Full and 15SEAMS\_Payment\_Foreigners we scan all documents concerning expenses for 7 foreign students (see Appendix 3).

The original are kept at VAST and after CIMPA will approve this report, we will send it to CIMPA by post.

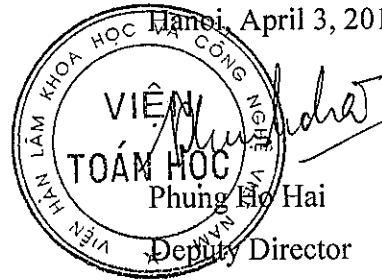
#### 4. Conclusion

The SEAMS-school was a great success. Students had opportunity to learn Combinatorics, knowledge of Enumerative Combinatorics and Graph Theory, then algorithms on some classes of graphs. Students also had opportunity to meet some distinguish professors who taught at the school.

Students in the region also had opportunity to meet each other, that could lead to a collaboration between them in the future.

On this occasion, the organizers and the Institute of Mathematics, VAST would like to thank SEAMS and CIMPA for supporting the idea to organize this international school for students, and especial thank to CIMPA for generous financial support, without it we cannot invite foreign students to come.

Hanoi, April 3, 2015



## ***Appendix 1. Announcement***

The SEAMS school on Combinatorics provide the audience with knowledge of Enumerative Combinatorics and Graph Theory, then algorithms on some classes of graphs.

Dates: March 9, 2015 – March 20, 2015.

### ***Organizing Institutions:***

- Institute of mathematics – Vietnam Academy of Science and Technology (IMH).
- Centre International de Mathématiques Pures et Appliquées (CIMPA).
- South-East Asia Mathematical Society (SEAMS).

### ***Main Sponsors:***

- Centre International de Mathématiques Pures et Appliquées (CIMPA).

### ***Organizers:***

Phan Thi Ha Duong (Institute of Mathematics, Associate Professor), Le Tuan Hoa (Institute of Mathematics, Professor), Phung Ho Hai (Institute of Mathematics, Professor) and Nguyen Dong Yen (Institute of Mathematics, Professor).

Audience: Final year Undergraduate and Graduate students in Mathematics and Informatics.

### ***Main Lecturers:***

Prof. Robert Cori, Prof. Phan Thi Ha Duong, Prof. Christophe Crespelle, PhD. Tran Thi Thu Huong, PhD. Vu Duc Minh.

Undergraduate students and graduate students can apply to participate in this school by sending application (form below) via email at [IMH-Seams15@math.ac.vn](mailto:IMH-Seams15@math.ac.vn)

Language: English.

## *Appendix 2. Program*

### **LECTURES**

Robert CORI: Combinatorics of words and Permutations and their statistics. This mini-course is composed of the following subjects:

- combinatorics of words

+ generalities

+ automata and rational generating functions

+ dyck words and catalan numbers, different objects counted by these numbers (trees, non crossing partitions, etc..)

- permutations and their statistics:

+ descents, ascents, eulerian number,

+ cycles and stirling number.

- Christophe CRESPELLE: Structure of chordal graphs and algorithms. This lecture deals with the class of chordal graphs, which are those graphs containing no induced cycles of length at least 4. We give several characterizations of the class using: 1) minimal separators 2) simplicial elimination schemes and 3) intersection graphs of subtrees of a tree.

We show how to use the lex-bfs algorithm in order to perform the recognition of the class and compute the chromatic number in linear time. Finally, we consider the minimal completion problem of an arbitrary graph into a chordal graph, i.e. adding a set of edges that makes the input graph become chordal and which is minimal for inclusion among such sets, and we explain the connections with the treewidth parameter of arbitrary graphs.

- PHAN Thi Ha Duong: Introduction to combinatorics. In this course, I present basic notions in combinatorics and classical methods for enumerative combinatorics objects. It will cover the notions of sets and multisets, compositions and partitions of integer, binomial and multinomial Theorems, Stirling numbers of the first kind and of the second kind, the principles of Dirichlet and of Inclusion and Exclusion, formal power series and generating function.

## SCHEDULE

|      |   |                     |
|------|---|---------------------|
| 9/3  | 8H30: OPENING CEREMONY OF THE SC<br>8H45 -10H45: PHAN | 14H -16H: TRAN      |
| 10/3 | 8H30-10H30: CORI<br>11H -12H: TRAN                    | 14H -16H: PHAN      |
| 11/3 | 8h30-10h30: CORI<br>11H -12H: TRAN                    | 14H -16H: PHAN      |
| 12/3 |   | 14H -16H: PHAN      |
| 13/3 | 8H30-10H30: PHAN<br>11H -12H: TRAN                    | 14H -16H: CORI      |
| 16/3 | 8H30-10H30: CRESPELLE<br>11H -12H: VU                 | 14H -16H: CORI      |
| 17/3 | 8h30-10h30: CORI                                      | 14H -16H: CRESPELLE |
| 18/3 | 8H30-10H30: CRESPELLE                                 | 14H -16H: VU        |
| 19/3 |   | 14H -16H: CRESPELLE |
| 20/3 | 8H30-10H30: CRESPELLE                                 | 14H -16H: VU        |



**Appendix 3. Content of the file 15  
SEAMS\_School\_docu\_Full (Concerning 7  
foreign students)**

| <b>Name</b>                    | <b>Page</b> |
|--------------------------------|-------------|
| <b>I. Yeva Fadhilah Ashari</b> |             |
| 1. Application                 | 1           |
| 2. Recommendation letter       | 2           |
| 3. Study Transcript            | 3           |
| 4. Boarding pass               | 5           |
| 5. E-ticket                    | 8           |
| 6. Passport                    | 16          |

|                              |    |
|------------------------------|----|
| <b>II. Daryl Q. Granario</b> |    |
| 1. Application               | 18 |
| 2. Recommendation letter     | 19 |
| 3. Boarding pass             | 20 |
| 4. E-ticket                  | 22 |
| 5. Passport                  | 27 |

|                                |    |
|--------------------------------|----|
| <b>III. Debi Oktia Haryeni</b> |    |
| 1. Curriculum vitae            | 29 |
| 2. Boarding pass               | 31 |
| 3. E-ticket                    | 33 |
| 4. Passport                    | 38 |

|                                      |    |
|--------------------------------------|----|
| <b>IV. Fithri Annisatun Lathifah</b> |    |
| 1. Application                       | 40 |
| 2. Recommendation letter             | 41 |
| 3. Study Transcript                  | 42 |
| 4. Boarding pass                     | 44 |
| 5. E-ticket                          | 47 |
| 6. Passport                          | 55 |

|                          |    |
|--------------------------|----|
| <b>V. Desi Rahmadani</b> |    |
| 1. Curriculum vitae      | 57 |
| 2. Boarding pass         | 59 |
| 3. E-ticket              | 61 |
| 4. Passport              | 66 |

|                                  |     |
|----------------------------------|-----|
| <b>VI. Frety Kurnita Sari</b>    |     |
| 1. Application                   | 68  |
| 2. Recommendation letter         | 69  |
| 3. Study Transcript              | 70  |
| 4. Boarding pass                 | 72  |
| 5. E-ticket                      | 75  |
| 6. Passport                      | 83  |
| <b>VII. Ni Luh Dewi Sintiari</b> |     |
| 1. Recommendation letter         | 85  |
| 2. Study Transcript              | 86  |
| 3. Boarding pass                 | 88  |
| 4. E-ticket                      | 90  |
| 5. Passport                      | 100 |