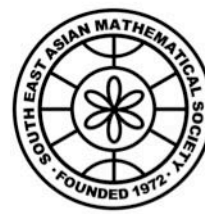


**REPORT on
SEAMS School on Numbers, Matrices and
Graphs**

ITB Bandung, Indonesia
November 4-16, 2013

Organized by
Combinatorial Mathematics Research Group
Faculty of Mathematics and Natural Sciences
Institut Teknologi Bandung (ITB), Indonesia

with the support of



SEAMS School
on Numbers, Matrices and Graph
4-16 November 2013, ITB, Bandung, Indonesia

I. Summary

The South East Asian Mathematical Society initiates the SEAMS School of Mathematics as a series of intensive 10-day workshop. The purpose of this school is to provide opportunity for undergraduate as well as master students to have an



advanced learning experience in mathematics, and to introduce a research-based learning. This school can be also considered as a preparation for students to be able to attend the CIMPA Schools. A leading academic institution or national mathematical society from each country member of SEAMS is eligible to hold such a school under a selection procedure.

This SEAMS school consisted of 10 days of lectures on the fundamental theories in numbers, matrices and graphs. Their interactions between these three fields were also discussed. There were 4 mini-courses, namely (1)



Number theory with applications to cryptography and coding, (2) Graphs and matrices: How are they related?, (3) Numbers in graph labeling and (4) Metric dimension of graphs. During afternoon, we provided problem-solving sessions. In these sessions, the participants were divided into groups of 5-6 people to discuss and solve some selected problems from the problem sheet given by the instructors.

All lecturers who taught in this school have long-research contributions in these topics as well as extensive teaching experience. They were from best universities in Indonesia, namely Institut Teknologi Bandung West Java, Universitas Indonesia Jakarta, and Universitas Jember East Java. We were also grateful to have Professor Michel Waldschmidt from Universite Pierre et Marie Curie - Paris 6, France to teach in this school.

The call for applicants was posted in the SEAMS website as well as IndoMS and InaCombS mailing lists. Participants were required to be in the final year of his/her undergraduate program in mathematics, or were either current master students of mathematics or have plans to pursue research and higher studies.

Forty seven (47) applicants were selected by the organizing committee to be participants of this SEAMS School. As a result, there were 36 selected participants consisting of 3 from Cambodia, 2 from Vietnam, 2 from Malaysia, 1 from the Philippines, 1 from Thailand and 27 participants from Indonesia. The participants from Indonesia came from various provinces. In total, there were 2 participants from Mataram Nusa Tenggara Barat, 2 from East Java, 2 from Yogyakarta, 2 from Jakarta and the remaining participants from Institut Teknologi Bandung, West Java. Actually, there were many more candidates from other provinces interested and wanted to come, however since they had to support themselves then they could not afford to come to Bandung to join the school.

The SEAMS School on Numbers, Matrices and Graphs was held at the Multimedia Room 9311 near the department of Mathematics, Institut Teknologi Bandung. The room has excellent equipment for LCD, sound system as well as white boards. It also has free Internet access. All participants as well as lecturers from outside Bandung were housed at the Bumi Sawunggaling Hotel (3-16 November 2013), about 300 meters from the campus of ITB.

Snacks (2 times) and lunches during all school days were provided by the Committee. One-day excursion was also conducted in the middle of school for all participants and lecturers. We went to Tangkuban Pahu, an active volcano not far from Bandung. During the trip, the participants had an opportunity to get closer to each other, share experience as well as informal discussion in different topics. On the back to Bandung, the participants had an opportunity to enjoy the Sundanese traditional food in a restaurant.



II. Scientific Objectives and Rationale for the School

In general, a SEAMS school has objective to provide a training in mastering advanced and/or interrelated topics in mathematics as well as to introduce research-based learning for undergraduate, master students as well as master

holders in Southeast Asia. A SEAMS school also encourages participants to pursue further studies in mathematics and do mathematical research.

In particular, this SEAMS school focuses on studying the interaction between number theory, matrices and graphs.

III. Organizers and Lecturers

The scientific committees of this SEAMS school were Prof. Mirka Miller (University of Newcastle, Australia) and Prof. Edy Tri Baskoro (ITB, Indonesia). The organizing committee consisted of

- Professor Edy Tri Baskoro (Vice President, SEAMS), and
- Dr. Suhadi Wido Saputro (ITB)

with assistance from the School Secretariat composed of Amrullah, Des Welyyanti, Dian Kastika Syofyan, Dinny Fitriani, Finny Oktariani, Ira Apni Purwasih, Irwansyah, Kristiana Wijaya, Novi Erwina, Novri Mardiana and Sigit Pancahayani.

Eight professors (in alphabetical order) gave lectures, as follows.

1. Aleams Barra, Ph.D
Assistant professor, Institut Teknologi Bandung, Indonesia
2. Edy Tri Baskoro, Ph.D
Professor, Institut Teknologi Bandung, Indonesia.
3. Intan Muchtadi Detiena, Ph.D
Associate Professor, Institut Teknologi Bandung, Indonesia
4. Suhadi Wido Saputro, Ph.D
Assistant Professor, Institut Teknologi Bandung, Indonesia
5. Slamun, Ph.D
Professor, Universitas Jember, Indonesia
6. Kiki A. Sugeng, Ph.D
Associate Professor, Universitas Indonesia, Indonesia
7. Djoko Suprijanto, Ph.D
Lecturer, Institut Teknologi Bandung (ITB), Indonesia
8. Michel Waldschmidt, Ph.D
Professor, Université Pierre et Marie Curie (Paris 6), France.

In the original plan, Professor Fidel Nemenzo from University of the Philippines Diliman Philippines agreed to give lectures in this school. However, due to some important reasons, he could not manage to come and deliver his lectures in this school. To overcome this situation, Professor Waldschmidt and Professor Edy Tri Baskoro gave more lectures to fulfill Fidel's lecture slots and more problem-solving sessions were also added.

IV. The Participants

There were 36 participants in this school, consisting of 3 from Cambodia, 2 from Vietnam, 2 from Malaysia, 1 from the Philippines, 1 from Thailand, and 27 from Indonesia. The complete list is as follows.

No	Name	F/M	Position	University	Country
1	Ahmad Fauzan Fibriansyah	M	Undergraduate Student	Institut Teknologi Bandung	Indonesia
2	Alfi Yusrotis Zakiyyah	F	Master Student	Institut Teknologi Bandung	Indonesia
3	Antik Estika Hader	F	Undergraduate Student	Institut Teknologi Bandung	Indonesia
4	Ari Dwi Hartanto	M	Master in Math	Universitas Gadjah Mada	Indonesia
5	Baiq Nurul Srifathona	F	Undergraduate Student	Universitas Mataram	Indonesia
6	Bima Prihasto	M	Master Student	Institut Teknologi Surabaya	Indonesia
7	Charles Rivadulla Repizo	M	Ph.D Student	Ateneo de Manila University	Philippines
8	Darmajid	M	Ph.D Student	Institut Teknologi Bandung	Indonesia
9	Defita	F	Undergraduate Student	Institut Teknologi Bandung	Indonesia
10	Do Trong Hoang	M	Ph.D Student	Institute of Mathematics	Vietnam
11	Ferryansyah	M	Master student	Institut Teknologi Bandung	Indonesia
12	Fudrin	M	Undergraduate Student	Institut Teknologi Bandung	Indonesia
13	Hidayatul Mayyani	F	Undergraduate Student	Universitas Mataram	Indonesia
14	M. Taufik bin M. Yusof	M	Bachelor in Math	National University of Malaysia	Malaysia
15	Moh. Yasya Bahrul Ulum	M	Undergraduate Student	Institut Teknologi Surabaya	Indonesia
16	Mov Sreymom	F	Undergraduate Student	Khemarak University	Cambodia
17	Muhamad Zaki Riyanto	M	Master in math	Universitas Ahmad Dahlan	Indonesia
18	Nattawat Boonyoung	M	Master in Math	Ramkhamhaeng University	Thailand
19	Nguyen Huyen Moui	M	Master in Math	Institute of Mathematics	Vietnam

20	Penh Reasey	M	Undergraduate Student	Khemarak University	Cambodia
21	Puguh Wahyu Prasetyo	M	Master in Math	Surya College of Education	Indonesia
22	Roeun Saron	M	Bachelor in Math	Khemarak University	Cambodia
23	Sigit Pancahayani	M	Master in Math	Institut Teknologi Bandung	Indonesia
24	Siti Noor Farwina	F	Master Student	Universiti Sains Malaysia	Malaysia
25	Siti Zahidah	F	Undergraduate Student	Institut Teknologi Bandung	Indonesia
26	Yosua Kanichi Susilo	M	Undergraduate Student	Universitas Indonesia	Indonesia
27	Amrullah	M	Ph.D Student	Institut Teknologi Bandung	Indonesia
28	Des Welyyanti	F	Ph.D Student	Institut Teknologi Bandung	Indonesia
29	Dian Kastika Syofyan	F	Ph.D Student	Institut Teknologi Bandung	Indonesia
30	Finny Oktariani	F	PhD in Science	Institut Teknologi Bandung	Indonesia
31	Ira Apni Purwasih	F	Ph.D Student	Institut Teknologi Bandung	Indonesia
32	Irwansyah	M	Ph.D Student	Institut Teknologi Bandung	Indonesia
33	Kristiana Wijaya	F	Ph.D Student	Institut Teknologi Bandung	Indonesia
34	Dinny Fitriani	F	Master Student	Institut Teknologi Bandung	Indonesia
35	Novry Erwina	F	PhD Student	Institut Teknologi Bandung	Indonesia
36	Novi Mardiana	F	Master Student	Institut Teknologi Bandung	Indonesia

V. School Program

Mini-Courses:

1. Introduction to Number Theory with applications to cryptography and coding theory (NCC), **Michel Waldschmidt, Djoko Suprijanto.**
2. Graphs and Matrices: How are they related? (GM), **Kiki A. Sugeng, Aleams Barra, Intan Muchtadi Detiena.**
3. Numbers in Graph Labeling (GL), **Slamin, Kiki A. Sugeng.**
4. Metric Dimension of Graphs (MDG), **Edy Tri Baskoro, Suhadi Wido Saputro.**

Week 1

Hour	Sun, 3	Mon, 4	Tue, 5	Wed, 6	Thu, 7	Fri, 8	Sat, 9
08.30 - 09.00	Arrival	Opening program	Free day (public holiday)	GM2	MDG4	NCC4	Excursion
09.00 - 10.30		MDG1					
10.30 - 10.45		Break		Break	Break	Break	
10.45 - 12.15		MDG2		NCC1	NCC2	GM4	
12.15 - 13.30		Lunch		Lunch	Lunch	Lunch	
13.30 - 15.00		GM1		GM3	NCC3	MDG5	
15.00 - 15.15		Break		Break	Break	Break	
15.15 - 17.00		MDG3		problem solving	Problem solving	Problem solving	

Week 2

Hour	Sun, 10	Mon, 11	Tue, 12	Wed, 13	Thu, 14	Fri, 15	Sat, 16
08.30 - 09.00	Break	NCC5	GM5	GM7	GL1	GL4	Departure
09.00 - 10.30							
10.30 - 10.45		Break	Break	Break	Break	Break	
10.45 - 12.15		Problem solving	NCC7	GM8	GL2	GL5	
12.15 - 13.30		Lunch	Lunch	Lunch	Lunch	Lunch	
13.30 - 15.00		MDG6	GM6	MDG7	GL3	Problem solving	
15.00 - 15.15		Break	Break	Break	Break	Break	
15.15 - 17.00		NCC6	Problem solving	Problem solving	NCC8	Closing	

Mini-course 1: Introduction to Number Theory with applications to cryptography and coding theory (NCC) – 13hours 30minutes

NCC1 Wednesday 6 Nov, 10.45 -12.15

Michel Waldschmidt

Introduction to cryptography

NCC2 Thursday 7 Nov, 10.45 -12.15

Michel Waldschmidt

Structure of finite abelian groups, cyclic groups, Euler function

NCC3 Thursday 7 Nov, 13.30 -15.00

Michel Waldschmidt

Structure of multiplicative group of the ring $\mathbb{Z}/n\mathbb{Z}$

NCC4 Friday 8 Nov, 08.30 - 10.30

Michel Waldschmidt

Chinese Remainder and Quadratic reciprocity laws

NCC5 Monday 11 Nov, 08.30 - 10.30

Michel Waldschmidt

Elgamal cryptosystem

NCC6 Monday 11 Nov, 15.15 - 17.00

Djoko Suprijanto

MDS codes over finite fields and finite abelian group

NCC7 Tuesday 12 Nov, 10.45 - 12.15

Djoko Suprijanto

MDS codes over finite fields and finite abelian group

NCC8 Friday 15 Nov, 15.15 - 17.00

Djoko Suprijanto

MDS codes over finite fields and finite abelian group

Mini-course 2: Graphs and Matrices: How are they related? (GM) – 13hours 30minutes

GM1 Monday 4 Nov, 13.30 - 15.00

Aleams Barra

Matrices, eigenvalues, generalized inverses

GM2 Wednesday 6 Nov, 08.30 - 10.30

Intan M. Detiena

Rank and Minors

GM3 Wednesday 6 Nov, 13.30 - 15.00

Intan M. Detiena

Path matrix and integer generalized inverses

GM4 Friday 8 Nov, 10.45 - 12.15

Intan M. Detiena

Moore Penrose inverse and 0-1 incidence matrix

GM5 Tuesday 12 Nov, 08.30 - 10.30

Aleams Barra

Eigenvalues of some graphs and Determinant

GM6 Tuesday 12 Nov, 13.30 - 15.00

Kiki A. Sugeng

Bounds of eigenvalues of graph

GM7 Wednesday 13 Nov, 08.30 - 10.30

Kiki A. Sugeng

Energy of a graph, Anti adjacency matrix

GM8 Wednesday 13 Nov, 10.45 - 12.15

Kiki A. Sugeng

Laplacian matrices of graphs

Mini-course 3: Numbers in graph labeling (GL) – 8hours 30minutes

GL1 Thursday 14 Nov, 08.30 - 10.30

Slamin

Edge-magic total labeling

GL2 Thursday 14 Nov, 10.45 - 12.15

Slamin

Edge-magic total labeling

GL3 Thursday 14 Nov, 13.30 - 15.00

Kiki A. Sugeng

(a,d)-vertex antimagic total labeling

GL4 Friday 15 Nov, 08.30 - 10.30

Kiki A. Sugeng

(a,d)-vertex antimagic total labeling

GL5 Friday 15 Nov, 10.45 - 12.15

Slamin

Total edge irregular labeling in graphs

Mini-course 4: Metric dimension of graphs (MDG) – 11hours 15minutes.

MDG1 Monday 4 Nov, 09.00 - 10.30

Edy Tri Baskoro

Metric dimension of trees

MDG2 Monday 4 Nov, 10.45 - 12.15

Edy Tri Baskoro

Metric dimension of trees

MDG3 Monday 4 Nov, 15.15 - 17.30

Suhadi Widodo Saputro

Metric dimension of a product of graphs

MDG4 Thursday 7 Nov, 08.30 - 10.30

Edy Tri Baskoro

Necessary conditions for graphs with certain metric dimension

MDG5 Friday 8 Nov, 13.30 - 15.00

Suhadi Widodo Saputro

Characterization of graphs of order n with metric dimension $n-3$

MDG6 Monday 11 Nov, 13.30 - 15.00

Suhadi Widodo Saputro

Partition dimension of graphs

MDG7 Wednesday 13 Nov, 13.30 - 15.00

Edy Tri Baskoro

Characterization of graphs of order n with metric dimension 2

VI. Conclusion

It is a great pleasure to report that the SEAMS school on Numbers, Matrices and Graphs held in Bandung Indonesia went very well with a great success. According to the participants, the courses in this school were informative and useful since the courses provided a lot of knowledge and gave the participants a chance to have interesting discussion among them. The participants found the lectures were inspiring, updating and going into detail. The group

assignments in the afternoon problem-solving sessions were considered to be very useful for the participants to digest the morning courses. By doing so, they could understand more deeply on the subjects. This group assignment also increased their confidents in sharing their knowledge to each other and to solve more complex and/or advanced problems together. They could also learn how to work collaboratively with peers from other countries. Most of the students felt that this kind of opportunity was very rare.



Most of the participants considered that the SEAMS schools should be conducted regularly and frequently in different countries in Southeast Asia to develop a culture of learning and doing mathematics in this region. It would also function as a forum for learning experience exchanges in doing mathematics among undergraduate students. By participating in this school, the students could enhance their mathematical knowledge and learning as well as research skills. Therefore, we would like to recommend to have more SEAMS schools held in this region in 2014 and in the future. Thank you to CIMPA for the significant supports for conducting these SEAMS Schools.



Comparing with CIMPA School, this school has the same length, namely a 10 working-day school. The duration of this school is considered to be too lengthy because the students have to leave their classes from their universities. Also, the living and transport costs spent by the local students (from other provinces) are also expensive and they have to support themselves. Therefore, for the next SEAMS schools we would like to propose to have shorter ones, namely 7-working-day schools.

The South East Asian Mathematical Society and Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung wish to thank CIMPA for its assistance and generous support for this inaugural SEAMS School. The organizer is also grateful to CDC International Mathematics Union, and the Directorate General of Higher Education, Ministry of Education and Culture Indonesia for the financial support. We also thank the Indonesian Mathematical Society and Indonesian Combinatorial Society for the endorsement.

SEAMS School on Numbers, Matrices and Graphs
4-16 November 2013
Institut Teknologi Bandung, Bandung Indonesia

Financial Report

NO	ITEM	CIMPA	CDC IMU	FMNS ITB	RG - DIKTI	TOTAL	
						Amount in Rupiah	Amount in Euros
I.	Accommodation expenses						
	6 non-Indonesian Participants : Sawunggaling Hotel (Nov 3-16)	Rp26,000,000				Rp26,000,000	€ 1,733
	3 non-Indonesian Participants : Sawunggaling Hotel (Nov 3-16)		Rp9,906,000			Rp9,906,000	€ 660
	1 non-Indonesian Speaker: Sawunggaling Hotel (Nov 5-11)	Rp3,500,000				Rp3,500,000	€ 233
	2 Indonesian speakers from other cities (Nov 12-17)	Rp4,500,000				Rp4,500,000	€ 300
II.	Airfares and other travel supports						
	Return travel fares of 6 non-Indonesian Participants (2 Cambodia, 1 Philippines, 1 Thailand, 1 Malaysia, 1 Vietnam)	Rp24,675,000				Rp24,675,000	€ 1,645
	Return travel fares of 3 non-Indonesian participants (1 Cambodia, 1 Vietnam, 1 Malaysia)		Rp10,350,000			Rp10,350,000	€ 690
	Airport transfers for 1 non-Indonesian speaker				Rp1,900,000	Rp1,900,000	€ 127
	Bus rental for tour (1 day)				Rp917,500	Rp917,500	€ 61
III.	Living Allowances of 9 non- Indonesian Participants	Rp4,500,000	Rp2,250,000			Rp6,750,000	€ 450
IV.	Food expenses during the school						
	Lunches, snacks and coffee at Rp 56.000 /day x 40 participants x 9 days			Rp20,160,000		Rp20,160,000	€ 1,344
	Dinners			Rp8,000,000		Rp8,000,000	€ 533
V.	Organizational expenses						
	Supplies, communication, banners, miscellaneous expenses				Rp4,966,950	Rp4,966,950	€ 331
	Room and facilities rental (10 days)				Rp2,902,500	Rp2,902,500	€ 194
	Photocopying, printing of lecture notes, materials				Rp3,438,000	Rp3,438,000	€ 229
	Field trip expenses (food and entrance fees)				Rp3,096,000	Rp3,096,000	€ 206
	Souvenirs for invited speakers				Rp2,170,000	Rp2,170,000	€ 145
VI.	Staff Expenses						
	Lecturers				Rp7,012,500	Rp7,012,500	€ 468
	Secretariat and additional supports				Rp5,250,000	Rp5,250,000	€ 350
	TOTAL EXPENSES	Rp63,175,000	Rp22,506,000	Rp28,160,000	Rp31,653,450	Rp145,494,450	€ 9,700
		€ 4,212	€ 1,500	€ 1,877	€ 2,110	€ 9,700	
	COST-SHARING	43.4%	15.5%	19.4%	21.8%	100%	

Acronyms and notes:

CIMPA: International Center for Pure and Applied Mathematics, France

CDC IMU: International Mathematical Union

FMNS ITB: Faculty of Mathematics and Natural Sciences Institut Teknologi Bandung

RG - DIKTI: Research Grant of Edy Tri Baskoro from DIKTI

SEAMS School on Numbers, Matrices and Graphs

ITB Bandung Indonesia

4-16 November 2013

No	Name	Institution	Country	TRAVEL Breakdown					
				Flight			Jakarta-Bandung	Total (Rounded)	Total in E
1	Mov Sreymom	Khemarak University	Cambodia	Rp3,796,380			Rp600,000	Rp4,425,000	€ 295
2	Roeun Saron	Khemarak University	Cambodia	Rp3,796,380			Rp600,000	Rp4,425,000	€ 295
3	Charles Rivadulla Repizo	Ateneo de Manila University	Philippines	SGD 230	USD 267			Rp5,250,000	€ 350
4	M. Taufik bin M. Yusof	National University of Malaysia	Malaysia	MYR 566				Rp2,025,000	€ 135
5	Nattawat Boonyoung	Ramkhamhaeng University	Thailand	Rp553,900	SGD 233	THB 2625		Rp3,750,000	€ 250
6	Do Trong Hoang	Institute of Mathematics, Hanoi	Vietnam	USD 380			Rp330,000	Rp4,800,000	€ 320
TOTAL								Rp24,675,000	€ 1,645

Kurs
Euro 15,000
USD 11,542
THB 380
SGD 9,210
MYR 3,550