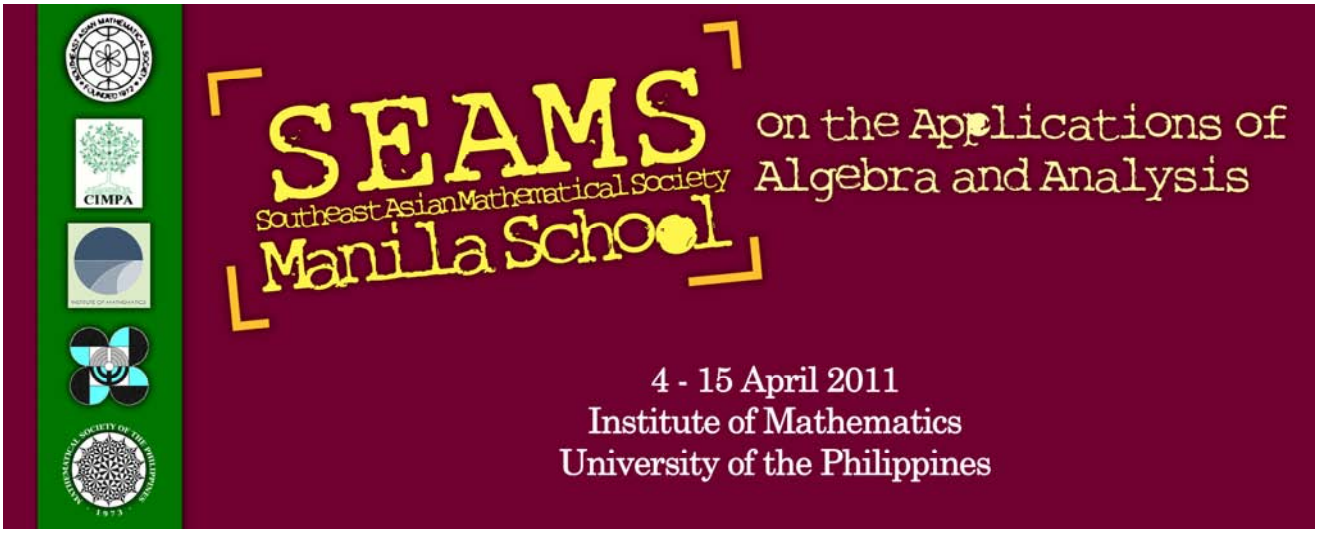

Terminal Report

SEAMS Manila School on the Applications of Algebra and Analysis

4-15 April 2011
Manila, Philippines

Organized by the
Institute of Mathematics
University of the Philippines

with the support of
CIMPA
Mathematical Society of the Philippines
Philippine Council for Industry, Energy and Emerging Technology Research and Development
National Research Council of the Philippines
Office of the President, University of the Philippines
***and the* Southeast Asian Mathematical Society**

SEAMS Manila School
on the Applications of Algebra and Analysis
4-15 April 2011, Manila, Philippines

I. Summary

The SEAMS School of Mathematics is planned by the Southeast Asian Mathematical Society (SEAMS) as a series of intensive two-week study programs that aim to bridge undergraduate mathematics education and the research-level mathematics done in other study and training programs such as the CIMPA Research Schools. The Schools will be held in the member countries of SEAMS by leading academic institutions or the national mathematical society. The SEAMS School is inspired by the successful EMALCA School organized by the UMALCA (Latin American and Caribbean Mathematical Union).

The SEAMS-Manila School on the Applications of Algebra and Analysis was the first of the SEAMS Schools. Held on 4-15 April 2011 at the University of the Philippines Diliman (UP Diliman or UPD), it was organized by the Institute of Mathematics, University of the Philippines Diliman (UP Diliman) for the Southeast Asian Mathematical Society (SEAMS), with support from CIMPA, the Philippine Council for Industry, Energy and Emerging Technology Research and Development, the Mathematical Society of the Philippines (MSP), the National Research Council of the Philipines and the Office of the President of the University of the Philippines.

The SEAMS Manila School consisted of ten days of lectures on special topics on the applications of algebra and analysis, with problem-solving sessions held at the close of each lecture day. Problems/exercises were given during each lecture, which participants were asked to work on in the evening. Solutions were discussed during the problem-solving session of the next day.

Participants were introduced to topics and concepts that lead to active areas of research. In particular, the following mini-courses were conducted:

Introduction to Partial Differential Equations (MC1) (15 hours)
Number Theory, Coding and Cryptography (MC2) (20 hours)
Introduction to Mathematical Modeling (MC3) (15 hours)

Lecturers came from the faculty of the University of the Philippines and Ateneo de Manila University.

The call for applications was posted in the SEAMS and MSP websites in December 2010. Participants were required to have an undergraduate degree in mathematics and were either current masters students of mathematics or have plans to pursue research and higher studies. Priority was given to applicants with no access to advanced mathematical education.

Twenty-seven (27) applicants were selected by the organizing committee to be participants of the SEAMS Manila School. There were 10 participants from Southeast Asia (outside the Philippines), 4 participants from Metro Manila, and 13 participants from regions outside Metro Manila. Of these 13 participants, 6 came from the southernmost Philippine island of Mindanao. In addition to the official participants, around 10 graduate students from the Institute of Mathematics and other nearby schools attended partially the lectures.

The SEAMS Manila School was held at the Computational Sciences Research Center (CSRC) of the UPD College of Science. The classroom had computer terminals and free internet access for all participants. All participants from outside Metro Manila were housed at the dormitory of the UPD School of Labor and Industrial Relations (3-9 April) and at the NISMED (National Institute for Science and Mathematics Education Development) Hostel (10-16 April), about 200 meters from the CSRC.

Snacks and lunch during all school days were provided by the School. A School Dinner was held during the second school day at the official residence of the UPD Chancellor. The closing program and dinner was held at the Institute of Mathematics. Participants went on a tour of Manila on Saturday 9 April. The next day, they visited the city of Tagaytay (70 kms outside Manila) to view the famous Taal Lake and volcano.

II. Scientific Objectives and Rationale for the School

Provide master's level graduate students and advanced undergraduates in Southeast Asia an accessible introduction to special topics in applied algebra and analysis to that lead to areas of research.

Encourage participants to pursue further studies in mathematics and do mathematical research.

III. Organizers and Lecturers

The SEAMS Manila School was organized by
Marian P. Roque (Director, SEAMS Manila School)
Fidel R. Nemenzo (President, SEAMS) and
Jose Maria P. Balmaceda (Director, UPD Institute of Mathematics)
with assistance from the School Secretariat composed of Ariel Paningbatan, Kelvin Lagota, Clarisson Canlubo, Guey Ruiz, Chuckie Balbuena and Eric Arances.

The lectures were given by the following:

1. Carlene Arceo
   Associate Professor, Institute of Mathematics, UPD
   PhD, University of the Philippines (analysis)
2. Julius Basilla
   Associate Professor, Institute of Mathematics, UPD
   PhD, Sophia University (number theory)
3. Evangeline Bautista
   Associate Professor, Mathematics Department, Ateneo de Manila University
   PhD, Ateneo de Manila University (coding theory)
4. Rowena Alma Betty
   Assistant Professor, Institute of Mathematics, UPD
   PhD, Tohoku University (coding theory)
5. Richell Celeste
   Assistant Professor, Institute of Mathematics, UPD
   PhD, University of the Philippines (analytic number theory)
6. Laarni dela Cruz
   Assistant Professor, Institute of Mathematics, UPD
   PhD, Kyoto University (mathematical modeling)
7. Jose Maria Escaner IV
   Associate Professor, Institute of Mathematics, UPD
   PhD, University of the Philippines (analysis)
8. Jose Ernie Lope
   Associate Professor, Institute of Mathematics, UPD
   PhD, Sophia University (analysis)
9. Fidel Nemenzo
   Professor, Institute of Mathematics, UPD
   PhD, Sophia University (number theory)
10. Marian Roque
    Professor, Institute of Mathematics, UPD
    PhD, University of the Philippines (analysis)
11. Cheryl Talaue
    Assistant Professor, Institute of Mathematics, UPD
    PhD, University of the Philippines (applied mathematics)
12. Lilibeth Valdez
    Assistant Professor, Institute of Mathematics, UPD
    PhD, University of the Philippines/University of Nice Sophia-Antipolis (coding theory)

The problem-solving sessions held at the end of the each school day were facilitated by young faculty members of the UPD Institute of Mathematics Ariel Paningbatan, Kelvin Lagota, Clarisson Canlubo.

V. The Participants

Non-Philippine participants

Chanthida LY (Cambodia), Royal University of Phnom Penh
Sokunthy PY (Cambodia), Royal University of Phnom Penh
Ajat ADRIANSYAH (Indonesia), Economic University of Indonesia
Ikha MAGDALENA (Indonesia), Institut Teknologi Bandung
Dhisa MINERVA (Indonesia), Institut Teknologi Bandung
Renny SYAFRINEL (Indonesia), Universitas Jenderal Soedirman
Gnord MAYPAOKHA (Laos), National University of Laos
Thongsouk SAYBOUNHEAUNG (Laos), National University of Laos
Muhammad Ikhwan AZLAN (Malaysia), Universiti Kebangsaan Malaysia
Abdullah YAHYA (Malaysia), Mara University of Technology

Philippine participants from outside Manila

Hernando ABALOS Jr (Philippines), Pangasinan State University
Ceilo Fe BLASING (Philippines), University of the Philippines Mindanao
Joemar CAPUYAN (Philippines), Central Mindanao University
Greig Bates FLORES (Philippines), Silliman University
Glee Ann LUMAUAG (Philippines), Central Mindanao University
Kenneth PEREZ (Philippines), Mindanao State University Iligan Institute of Technology
Rommel REAL (Philippines), University of the Philippines Mindanao
Jess Claire SANCHEZ (Philippines), University of the Philippines Mindanao
Grace DELOS REYES (Philippines), Philippine Cultural College
Avelino IGNACIO (Philippines), Meycauayan College
Nessa Amie PENAFLOR (Philippines), General Emilio Aguinaldo National High School
Crisanto GALAY (Philippines)
Normalyn PANTINO (Philippines), De La Salle University Dasmarinas

Philippine participants from Manila
Clint Harry ANGELES (Philippines), University of the Philippines Diliman
Robert Jay CEJO (Philippines), University of the Philippines Diliman
Daryl GRANARIO (Philippines), University of the Philippines Diliman
John Gabriel PELIAS (Philippines), University of the Philippines Diliman

VI. The School Programme

Mini Courses:

Introduction to Partial Differential Equations (PDE)
Number Theory, Cryptography and Coding Theory (NTCC)
Introduction to Mathematical Modeling (MM)

Week 1 (4-8 April)

	S	M	T	W	TH	F	SA
8:30 – 9:00	Arrival	Opening Program					Excursion (9:00 - 4:00)
9:00 – 10:30		**PDE 1**	**PDE 3**	**PDE 5**	**PDE 7**	**PDE 9**	
10:30 – 10:45		Break	Break	Break	Break	Break	
10:45 – 12:15		**PDE 2**	**PDE 4**	**PDE 6**	**PDE 8**	**PDE 10**	
12:15 – 1:30		Lunch Break	Lunch Break	Lunch Break	Lunch Break	Lunch Break	
1:30 – 3:30		**NTCC 1**	**NTCC 2**	**NTCC 3**	**NTCC 4**	**NTCC 5**	
3:30 – 4:00		Break	Break	Break	Break	Break	
4:00 – 5:30		**Problem Solving**	**Problem Solving**	**Problem Solving**	**Problem Solving**	**Problem Solving**	
6:30 – 8:30			School Dinner				

Week 2 (11-15 April)

	SU	M	T	W	TH	F	SA
9:00 – 10:30	Free Day	**MM 1**	**MM 3**	**MM5**	**MM 7**	**MM 9**	Departure
10:30 – 10:45		Break	Break	Break	Break	Break	
10:45 – 12:15		**MM 2**	**MM 4**	**MM 6**	**MM 8**	**MM 10**	
12:15 – 1:30		Lunch	Lunch	Lunch	Lunch	Lunch	
1:30 – 3:30		**NTCC 6**	**NTCC 7**	**NTCC 8**	**NTCC 9**	**NTCC 10**	
3:30 – 4:00		Break	Break	Break	Break	Break	
4:00 – 5:30		**Problem Solving**	**Problem Solving**	**Problem Solving**	**Problem Solving**	Closing Program	
6:30 – 8:30							

Mini-Course 1: INTRODUCTION to PARTIAL DIFFERENTIAL EQUATIONS

PDE 1 *Monday 4 April 9:00-10:30am*
General introduction
Marian Roque

PDE 2 *Monday 4 April 10:45am-12:15pm*
Review of ordinary differential equations
Jose Ernie Lope

PDE 3 *Tuesday 5 April 9:00-10:30am*
Existence and uniqueness theorems
Jose Ernie Lope

PDE 4 *Wednesday 5 April 10:45am-12:15pm*
Transport equation
Marian Roque

PDE 5 *Wednesday 6 April 9:00-10:30am*
Heat equation - separation of variables
Jose Ernie Lope

PDE 6 *Wednesday 6 April 10:45am-12:15pm*
Wave equation
Marian Roque

PDE 7 *Thursday 7 April 9:00-10:30am*
Elliptic partial differential equations
Marian Roque

PDE 8 *Thursday 7 April 10:45am-12:15pm*
Existence and uniqueness theorems for PDEs
Jose Ernie Lope

PDE 9 *Friday 8 April 9:00-10:30am*
Variational formulation
Marian Roque

PDE 10 *Friday 8 April 10:45am-12:15pm*
Finite difference method for the heat equation
Jose Ernie Lope

Mini-Course 2: NUMBER THEORY, CRYPTOGRAPHY and CODING THEORY

NTCC 1 *Monday 4 April 1:30-3:30pm*
Fidel Nemenzo
review of number theory
primes, congruences, Euler-Fermat theorem
quadratic reciprocity

NTCC 2 *Tuesday 5 April 1:30-3:30*
Fidel Nemenzo
public-key cryptography
one-way and trap door functions
Rivest-Shamir-Adleman (RSA) scheme
Goldwasser-Micali probabilistic encryption

NTCC 3 *Wednesday 6 April 1:30-3:30*
Julius Basilla
the discrete log problem
Diffie-Hellman key exchange
El-Gamal cryptosystem

NTCC 4 *Thursday 7 April 1:30-3:30*
Richell Celeste
arithmetic functions
L-functions, Riemman zeta-function
prime number theorem

NTCC 5 *Friday 8 April 1:30-3:30*
Julius Basilla
primality tests
AKS algorithm
some prime factorization methods

NTCC 6 Monday 11 April 1:30-3:30
Fidel Nemenzo
Review: rings, fields, vector spaces
polynomial rings, cosets
linear codes

NTCC 7 *Tuesday 12 April 1:30-3:30*
Rowena Alma Betty
parameters of a linear code
generator matrices
parity check matrices

NTCC 8 *Wednesday 13 April 1:30-3:30*
Banjo Bautista
nearest neighbor and syndrome decoding
perfect codes
Hamming codes, Golay codes and BCH Codes

NTCC 9 *Thursday 14 April 1:30-3:30*
Lilibeth Dicuangco Valdez
cyclic codes

NTCC 10 Friday 15 April 1:30-3:30
Rowena Alma Betty
dual codes
weight enumerators

McWilliams Theorem

Mini-Course 3: INTRODUCTION to MATHEMATICAL MODELING

MM 1 *Monday 11 April 9:00-10:30am*
Jose Ernie Lope
Simple ODE and PDE models

MM 2 *Monday 11 April 10:45am-12:15pm*
Carlene Arceo
Logistic, Malthusian and Verhulst Population Modeling

MM 3 *Tuesday 12 April 9:00-10:30am*
Jose Maria Escaner IV
Epidemic modeling: The S-I-R Model

MM 4 Wednesday 12 April 10:45am-12:15pm
Carlene Arceo
Verhulst with predation model
Predator-prey system

MM 5 Wednesday 13 April 9:00-10:30am
Jose Ernie Lope
Parameter estimation

MM 6 Wednesday 13 April 10:45am-12:15pm
Laarni dela Cruz
Tsunami modeling

MM 7 Thursday 14 April 9:00-10:30am
Jose Maria Escaner IV
Epidemic modeling: HIV Transmission model

MM 8 Thursday 14 April 10:45am-12:15pm
Carlene Arceo
Shallow flooding: de St. Venant equations

MM 9 Friday 15 April 9:00-10:30am
Cheryl Talaue
Biological systems theory

MM 10 Friday 15 April 10:45am-12:15pm
Jose Maria Escaner IV
Modeling in Finance

VII. Summary and Recommendations

The inaugural SEAMS School held in Manila was held on 4-15 April 2011 at the University of the Philippines. The School featured lectures and problem-solving sessions on the applications of algebra and analysis.

There were twenty-seven (27) participants, including ten (10) from other countries in Southeast Asia (Cambodia, Laos, Malaysia and Indonesia). Chosen from among many applicants, the participants (except for one) had the minimum mathematical background, but either had no immediate access to advanced mathematical instruction or were at the start of graduate studies. All of them expressed interested in pursuing mathematical research in the future. The participants of the SEAMS Manila School have set up an online group to continue staying in touch with and inform each other of progress in studies.

The lone participant without undergraduate mathematics education has a degree in demographics and statistics. He requested that he be allowed to join the School as a full-paying participant. Because of his experience at the School, he is now seriously considering doing graduate studies in mathematics. Participants from outside Manila were thankful for the lectures- which began from accessible introductions and went on to more advanced topics- and the problem solving sessions. They however said that upon returning to their home regions they return to harsh conditions for study and research, where they are loaded with work or have no access to advanced training. At least two of them have expressed their intention to come to Manila to enter graduate school. The School organizers have asked the Mathematical Society of the Philippines to help provide opportunities for continuing mathematical training (outside the universities) for these regions.

Likewise SEAMS will be asked to provide follow-up activities for the countries like Cambodia and Laos. Unfortunately, plans for a SEAMS School in Cambodia have been set aside due to logistical constraints. But SEAMS is strengthening links with some members of the Laotian mathematics community, including the two participants in the School. The goal is to get Laos to be active in SEAMS by helping organize

the Laos Mathematical Society. The presence of a mathematical society will help facilitate mathematical activities as well as cooperation and collaboration with mathematicians in the region.

More efforts should be made to encourage the participation of potential researchers in countries like Cambodia and Laos. The organizers tried to contact mathematicians in Brunei and Burma through their mathematical societies but received no response.

It is clear that initiatives like the SEAMS School should be followed with support activities within the countries involved in order to help ensure that the learnings result in further mathematical studies or research on the part of the participants. It has also been suggested that SEAMS Schools be planned in places where CIMPA Research Schools will be held, as bridging or preparatory training for the latter.

The Southeast Asian Mathematical Society and the UP Diliman Institute of Mathematics (local organizers) wish to thank CIMPA for its assistance and generous support for this inaugural SEAMS School. They also gratefully acknowledge the support of the the Philippine Council for Industry, Energy and Emerging Technology Research and Development, the Mathematical Society of the Philippines, the National Research Council of the Philippines and the Office of the President of the University of the Philippines.

Financial Report

			France	Philippines				
			CIMPA	UP MATH	PCIEERD	MSP	UP-OP	NRCP
I.	**Accommodation expenses** of 10 non-Philippine and 9 Philippine participants from outside Metro Manila							
	• UP-SOLAIR Dormitory (April 2-10)			1,000				
	• UP-NISMED Hostel (April 10-16)		1,059					
II.	**Air fare and other travel support** (see attached breakdown)							
	• Return travel fare of 8 non-Philippine participants		1,880					
	• Travel (air fare/boat fare) of 6 Philippine participants from outside Metro Manila)		475					
	• Van rental (2 days)		92					
	• Airport transfers			72				
III.	**Food expenses during the school**							
	• Lunch, snacks, coffee at €4.16/day x 40 participants and staff x 10 days				1,667			
	• School Dinner							317
	• Closing socials and additional food expenses			333				
IV.	**Organizational Expenses** • Supplies, communication, banners, miscellaneous expenses			120				
	• Room and facilities rental (10 days)			267				
	• Photocopying, printing of course notes and proceedings, materials						333	
	• Field trip expenses (food and entrance fees)			104				
VI.	**Lecturer and staff gratuity**							
	• Lecturers (€8.3/hour x 50 hours)					417		
	• Secretariat support (6 persons)					250		
	TOTAL EXPENSES*	**€ 8,380**	3,500	1,896	1,667	667	333	317
		PhP 502,760	210,000	113,760	100,000	40,000	20,000	19,000
	COST-SHARING	**100%**	41.8%	22.6%	19.9%	8.0%	3.9%	3.8%

Acronyms and notes:
CIMPA: International Center for Pure and Applied Mathematics, France
PCIEERD: Philippine Council for Industry, Energy and Emerging Technology Research and Development, Department of Science and Technology
UP MATH: UP Institute of Mathematics
MSP: Mathematical Society of the Philippines
UP-OP: University of the Philippines Office of the President
UP SOLAIR: UP School of Labor and Industrial Relations
UP NISMED: UP National Institute of Science and Mathematics Education Development

*Foreign currency conversion rate: € 1 = PhP 60

BREAKDOWN OF CIMPA TRAVEL REIMBURSEMENTS

	8 FOREIGN PARTICIPANTS	ORIGIN	AIRFARE	BUS /TAXI /BOAT	CIMPA SUPPORT IN EURO €
1.	Ikha MAGDALENA	Indonesia	$88+179.4		190
2.	Dhisa MINERVA	Indonesia	$88+179.4		190
3.	Ajat ADRIANSYAH	Indonesia	$288		200
4.	Muhammad Ikhwan AZLAN	Malaysia	MYR 859		200
5.	Chantida LY	Cambodia	US$280	$19	210
6.	Py SOKOUNTHY	Cambodia	US$280	$19	210
7.	Gnord MAYPAOKHA	Laos	PhP17,311	ThB1,556+ US25	340
8.	Thongsouk SAYBOUNHEAUNG	Laos	PhP17,311	ThB1,556+ US25	340
	6 PHILIPPINE PARTICIPANTS FROM OUTSIDE METRO MANILA				
1.	Joemar CAPUYAN	Mindanao	P4,408.56		75
2.	Glee Ann LUMAUAG	Mindanao	P4,408.56		75
3.	Kenneth PEREZ	Mindanao	P2,561.68	P2,111	75
4.	Cielo Fe BLASING	Mindanao	P5,258.56		85
5.	Rommel REAL	Mindanao	P4,854.56		80
6.	Jess Claire SANCHEZ	Mindanao	P5,054.56		85
	TOTAL				**€ 2,355***

*Some currency conversions were rounded up (because of lack of small bills)
http://www.xe.com/ucc/convert/?Amount=1&From=USD&To=EUR, 08 April 2011, 4:30 a.m.

1.0 THB = 0.0232615 EUR
1.0 PHP = 0.0162058 EUR
1.0 USD = 0.69889 EUR
1.0 MYR = 0.230628 EUR
1.00 EUR = 61.7048 PHP
200,000.00 KHR = 50.4409 USD
200,000.00 KHR = 35.2663 EUR