



SOUTH EAST ASIAN MATHEMATICAL SOCIETY

SEAMS SCHOOL PROPOSAL

Topics in Stochastic Analysis

Yogyakarta, Indonesia

3-11 August 2016

Organized by

Sanata Dharma University

2016

SEAMS SCHOOL PROPOSAL

1. The proposed title, place and dates of the SEAMS School

Title of the SEAMS School :	Topics in Stochastic Analysis
Place :	Sanata Dharma University, Yogyakarta, Indonesia
Dates :	3-11 August 2016

2. Organizers (write the names, place of work, and email address, if you have more than two then add the necessary lines)

1. Name :	Dr. Herry Pribawanto Suryawan
Institution :	Department of Mathematics, Sanata Dharma University, Yogyakarta, Indonesia
Email and Phone :	herrypribs@usd.ac.id , +62 (0) 274 883 037 ext 2314
2. Name :	Dr. Kristine Joy E. Carpio
Institution :	Department of Mathematics, De La Salle University, Manila, Philippines
Email and Phone :	kristine.carpio@dlsu.edu.ph , +63 915 890 8705

3. Short Description of the **Scientific Content**, the **Aim** of the proposed school and the potential **Impact** to the local academic system and/or society. (max 100 words)

The SEAMS School will focus on topics in stochastic analysis such as basics of stochastic calculus and its applications to finance, biology, insurance, control as well as advanced topics including fractional Brownian motion and interacting particle systems. After the School is finished, the participants are expected to have broad knowledge and sufficient background to start research in this area. The school is expected as a mean to build cooperation between mathematicians in the region. This will improve in a significant way the development and quality of mathematical teaching and research in Indonesia, and in particular in Sanata Dharma University.

4. The speakers of the school (name, address, email, male/female). Give the percentage of female speakers.

1. Name	:	Dr. Dumaria Rulina Tampubolon (female)
Institution	:	Department of Mathematics, Bandung Institute of Technology, Bandung, Indonesia
Email and Phone	:	dumaria@math.itb.ac.id , +62 (0) 81802275544
2. Name	:	Dr. Erik Baurdoux (male)
Institution	:	London School of Economics, London, United Kingdom
Email and Phone	:	e.j.baurdoux@lse.ac.uk , +44 (0) 20 7955 6717
3. Name	:	Dr. Herry Pribawanto Suryawan (male)
Institution	:	Department of Mathematics, Sanata Dharma University, Yogyakarta, Indonesia
Email and Phone	:	herrypribs@usd.ac.id , +62 (0) 274 883 037 ext 2314
4. Name	:	Prof. Dr. Jose Luis da Silva (male)
Institution	:	Centro De Ciencias Matematicas, University of Madeira, Portugal
Email and Phone	:	joses@staff.uma.pt , +351 291 705185

5. Name	:	Dr. Kristine Joy E. Carpio (female)
Institution	:	Department of Mathematics, De La Salle University, Manila, Philippines
Email and Phone	:	kristine.carpio@dlsu.edu.ph , +63 915 890 8705
6. Name	:	Dr. Torben Fattler (male)
Institution	:	Department of Mathematics, University of Kaiserslautern, Germany
Email and Phone	:	fattler@mathematik.uni-kl.de , +49 (0) 631 205 2256
7. Name	:	Dr. Wolfgang Bock (male)
Institution	:	Department of Mathematics, University of Kaiserslautern, Germany
Email and Phone	:	bock@mathematik.uni-kl.de , +49 (0) 631 205 4492
8. Name	:	Dr. Y. G. Hartono (male)
Institution	:	Department of Mathematics, Sanata Dharma University, Yogyakarta, Indonesia
Email and Phone	:	yghartono@usd.ac.id , +62 (0) 274 883 037 ext 2311

Percentage of female speakers: 25% (2 of 8 speakers)

5. Describe in a few lines the local institution related to this school, including the main academic program and its strengths in teaching program and research. Give also the internet site of the local institutions. Do you plan to have a website of this SEAMS school?

We propose that a SEAMS School "Topics in Stochastic Analysis" be held at Sanata Dharma University, Yogyakarta, Indonesia. The university official website is www.usd.ac.id.

Sanata Dharma University is a private university founded in 1955. It currently has eight faculties, namely: Faculty of Teacher Training and Education, Faculty of Economics, Faculty of Letters, Faculty of Science and Technology, Faculty of Pharmacy, Faculty of Psychology, Faculty of Theology, and Faculty of Postgraduate Programs. Among of them, Faculty of Teacher Training and Education is the most established.

The Sanata Dharma university provides excellence atmosphere for teaching-learning process and also for research. There are sufficient and convenient facilities such as class rooms, meeting rooms, computer laboratories, library with good collections of books and journals, internet access all over the campus to support various scientific events.

Department of Mathematics itself is under the Faculty of Science and Technology. It is a young department, as it was established in 1993. The lecturers' qualifications comprise of 57% PhD and 43% Masters. The mathematics department focuses to deliver applied mathematics to the students. It has also strong research in various fields of applied mathematics (fluid dynamics, optimal control, stochastic models) and statistics. In 2015, together with the Department of Mathematics education, we initiate the master programme on mathematics educations which some focus also in mathematics modelling. We also successfully organized in the same year a SEAMS School on Modeling and Simulation for the Environmental Phenomena, and an international conference on mathematics and mathematics education.

Despite of its young age, the Department of Mathematics of Sanata Dharma University wants to participate further in the promotion and development of mathematics locally, regionally and even internationally. Therefore, we propose that a SEAMS School in 2016 to be held at Sanata Dharma University. As a mean of communication and information we have a website for the school: www.usd.ac.id/workshop/seams2016 .

6. Provide information on the number and distribution of expected participants. Give the percentage of female participants who will attend the school.

The proposed SEAMS School is expected to serve final-year undergraduate, masters, and first-year PhD students. We anticipate having 30-40 (selected) participants with 75% participants from Indonesia and 25% participants from South East Asia neighboring countries. We will invite female students to attend the school with percentage at least 40%.

7. Describe the objectives and the program of the proposed school, including the courses (max 5 courses), speakers (in each course), abstracts (8 lines for each course) and tentative schedule of the whole proposed school.

The proposed SEAMS School will focus on some topics in stochastic analysis starting with review on probability theory and stochastic processes, basics of stochastic calculus (Ito calculus), its applications to mathematical finance and insurance, and mathematical biology. We also plan to expose advanced topics such as fractional Brownian motion, interacting particle systems and stochastic control theory, as an overview of the research topics in this area. The ideas of organizing the proposed school are:

- To establish cooperation and collaboration between participants and institution in South East Asian countries.
- To popularize the subject of stochastic analysis which is an extremely useful branches of mathematics with huge range of applications.
- To give experiences to participants (students from South East Asian countries) for learning special topics in mathematics from experts in the field.
- To prepare participants to attend a bigger events (e.g. CIMPA schools) on the related topics and also to give necessary background for those who would like to pursue higher educations (master, PhD) in stochastic analysis and related fields.
- To exchange knowledge, experience and culture between participants.

After attending the School we expect that the participants will have vast knowledge and solid background to initiate research in stochastic analysis. In order to broaden the impact of the school to the mathematical community we plan to publish the lecture notes.

The school will take place Wednesday-Thursday, 3-11 August 2016 in Kampus III Sanata Dharma University, Paingan, Sleman, Yogyakarta. Participants with funding from CIMPA will be lodged in a hotel/guest house nearby the venue of the school. For other participants, there is a list of hotels in Yogyakarta which can be found in the school website. The organizer will also assist for finding accommodation, upon request from the participants. During the school, morning tea, lunch and afternoon coffee break will be provided in the venue of the school.

Courses

[1]. Course: **Basics of Stochastic Calculus**

Lecturers: Prof. Dr. Jose Luis da Silva

Objective: to introduce the theory of stochastic calculus towards its applications to some branches of science.

Abstract: Most of real world phenomena are unpredictable. Hence, mathematical modeling of these problems need the so-called stochastic calculus. In this course we will learn the basics of Ito stochastic calculus such as stochastic integral, stochastic differential equations (SDEs), Ito processes, and Markov properties of the solutions of SDEs. This course serves as a foundation for some other courses in the school. The lectures start by a crash course on the basic concepts of measure-theoretic probability

theory and stochastic processes such as random walk, Markov chain, martingales and Brownian motion.

[2]. Course: **Mathematical Finance and General Insurance**

Lecturers: Dr. Erik Baurdoux and Dr. Dumaria Rulina Tampubolon

Objective: to provide the basic theory of mathematical finance both in discrete and continuous time, theory of optimal stopping, and general insurance mathematics.

Abstract: This course will provide a rapid introduction into mathematical finance, both in discrete and continuous time. Starting from the classical binomial model and Black Scholes models, more recent models will be discussed. We then start the optimal stopping theory with the classical secretary problem which allows us to illustrate in a rather simple setting some fundamental properties of more general optimal stopping problems. Finally, participants will be introduced to general insurance mathematics, in particular to some general insurance businesses in which probability models need to be used in determining the premium rate and in predicting outstanding claims liability.

[3]. Course: **A Mathematical Model of Gene Regulatory Networks**

Lecturer: Dr. Kristine Joy E. Carpio

Objective: to develop an application of Markov chains in modelling gene regulatory networks.

Abstract: We make use of Markov chains to model the dynamics of a Gene Regulatory Network (GRN). The lecture would start with an introduction of GRN and the several ways in which we could model these systems (ODEs, Boolean model, R. Thomas' model). We would also have a discussion of discrete-time Markov chains before finally applying these to discrete models of GRNs.

[4]. Course: **Introduction to Stochastic Optimal Control**

Lecturers: Dr. Y. G. Hartono and Dr. Herry Pribawanto Suryawan

Objective: to give a short exposition to the theory of stochastic optimal control with some applications.

Abstract: Stochastic Optimal control is a branch of stochastic analysis which lies in the intersection of optimal control theory and probability theory. The topic arises when we wish to control a continuous-time random dynamical system optimally. In this short course we will see some simple problems of stochastic optimal control problem coming from applied mathematics, economics and engineering fields. The heart of the course will be the two main approaches in the theory, that is Pontryagin maximum principle and Bellman dynamic programming. We will compare both approaches and expose their advantages and drawbacks. We start the lecture by reviewing the basics of deterministic optimal control theory.

[5]. Course: **Advanced Topics in Stochastic Models**

Lecturers: Dr. Wolfgang Bock and Dr. Torben Fattler

Objective: to introduce two advanced topics (fractional Brownian motion and interacting particle systems) as an overview to research areas in stochastic analysis.

Abstract: We discuss a generalization of the Brownian motion which is known as fractional Brownian motion (FBM). Basic properties (non-Markovian, long/short-range dependence, Gaussianity, non-martingale, etc) and some of its representations will be

discussed. The stochastic calculus with respect to FBM will be mentioned. Some mathematical models using FBM coming from the fields of physics, biology, engineering and economy will be also briefly exposed. Interacting particle systems will be introduced briefly, including some examples from physics and biology, construction and exposition of some applications.

Schedule

Below is the tentative schedule of the proposed SEAMS School.

Time	3 Aug	4 Aug	5 Aug	6 Aug	7 Aug	8 Aug	9 Aug	10 Aug	11 Aug
08.30-10.00	<i>HPS</i>	<i>JLdS</i>	<i>KJC</i>	E X C U R S I O N	S U N D A Y (free day)	<i>EB</i>	<i>YGH</i>	<i>WB</i>	<i>TF</i>
10.00-11.30	<i>JLdS</i>	<i>EB</i>	GD 10-11			<i>DRT</i>	<i>HPS</i>	<i>WB</i>	<i>GD*</i>
11.30-12.30	Lunch	Lunch	Lunch 11-12.30			Lunch	Lunch	Lunch	Lunch
12.30-14.00	<i>JLdS</i>	<i>KJC</i>	<i>EB</i>			<i>DRT</i>	<i>HPS</i>	<i>TF</i>	<i>GD*</i>
14.00-15.30	<i>KJC</i>	<i>EB</i>	<i>JLdS</i>			<i>YGH</i>	<i>WB</i>	<i>TF</i>	closing
15.30-16.00	Break	Break	Break			Break	Break	Break	
16.00-17.00	GD	GD	GD			GD	GD	GD	

Note:

- In between two lectures (10.00 and 14.00 there will be small breaks around 10 minutes).
- The fonts in italic correspond to the initial name of the lecturers:
DRT: Dumaria Rulina Tampubolon
EB: Erik Baurdoux
HPS: Herry Pribawanto Suryawan
JLdS: Jose Luis da Silva
KJC: Kristine Joy Carpio
TF: Torben Fattler
WB: Wolfgang Bock
YGH: Y.G. Hartono
- GD means group discussion (tutorial by the lecturers or independent group works).
- GD* means special group discussion (presentation of the projects or contributed talks by the participants.)
- Total hours of lectures (talks): 36 hours (24 x 1.5 hours)
 Total hours of group discussions: 10 hours

8. Provide information about provisional budget and the expected funding.

Provisional Budget (in Euro)

No	Item	Details	Sources		Total
			CIMPA	Others	
1	Tickets				
	Overseas Participants	10 X 400	4000		4000
	Speakers (overseas and local)	4 X 1000 1 X 400 1 X 200		4600	4600
2	Accommodation				
	Participants	10 X 100	500	500	1000
	Speakers	4 X 250 1 X 120 1 X 50		1170	1170
3	(partial) Support for Indonesian participants			500	500
4	Food Expenses	9 X 50 X 2,5		1125	1125
5	Local Transport			200	200
6	Supplies and Printings			150	150
7	Living Expenses for overseas participants	10 X 100	500	500	1000
8	Social program (Excursion)			500	500
	TOTAL		5000	9245	14245

Note: At least 2/3 of **CIMPA support** can be used for travel, accommodation and/or living expenses of young researchers (less than 38 or recent PhD) from neighbouring countries of the activity; at most 1/3 at most can be used for lecturers (economy class travel and/or standard living expenses).

CIMPA support cannot be used for: reimbursements for participants living in developed countries (even if their nationality is from a developing country); registration fees; proceedings; organizational expenses.

Expected Funding (in Euro)

No	Item	Confirmed (Yes/Not Yet)	Total
1	CIMPA	Not Yet	5000
2	Sanata Dharma University	Yes	3000
3	DAAD	Not Yet	3000
4	IMU	Not Yet	2000
5	Participants' registration fee	Not Yet	500
6	Misc Sponsor	Not Yet	750
	TOTAL		14250

9. Provide CVs for the organizers (**2 pages max** for **each person**, including current publications).

Curriculum Vitae



Dr. Herry Pribawanto Suryawan

Department of Mathematics, Sanata Dharma University
Mrican, Tromol Pos 29, Yogyakarta 55002, INDONESIA
Office phone: +62 (274) 883037 ext: 2314
Email: herryprips@usd.ac.id

Personal details

Place and Date of Birth : Magelang, 4 March 1982
Gender : Male
Nationality : Indonesia
Residential Address : Jl. Jembatan Merah 60D, Prayan Wetan, Gejayan
Yogyakarta 55282, Indonesia
Postal Address : Department of Mathematics, Sanata Dharma University
Mrican, Tromol Pos 29, Yogyakarta 55002, Indonesia

Education

1. Doctor (in Mathematics), University of Kaiserslautern, Germany
October 2009-October 2013
2. Master (in Mathematics), Bandung Institute of Technology, Indonesia
August 2006-March 2008
3. Bachelor (in Mathematics), Gadjah Mada University, Indonesia
August 2000-March 2004

Research Interest

1. Probability Theory and Stochastic Analysis
2. Stochastic Models in Physics and Biology
3. White Noise Analysis and Its Applications

Teaching Employments

1. Lecturer, Department of Mathematics, Sanata Dharma University, Indonesia
2005-present
2. Teaching Assistant on Vector Analysis, Complex Analysis and Functional
Analysis, University of Kaiserslautern, Germany, 2010-2013
3. Teaching Assistant on Complex Analysis and Multivariable Calculus, Bandung
Institute of Technology, Indonesia, 2006-2008

Teachings

- Undergraduate: calculus, geometry, real analysis, complex analysis, stochastic differential equations
- Graduate: mathematical problem solving

Selected Publications

- Wolfgang Bock, Jose Luis da Silva and **Herry P. Suryawan**, 2015, Local times for multifractional Brownian motion in higher dimensions: a white noise approach. Submitted to a peer-reviewed international journal. Preprint available at: <http://arxiv.org/abs/1408.0189>.
- **Herry P. Suryawan**, 2015, A white noise analysis approach of Volterra processes, *International Journal of Modern Physics: Conference Series* vol. 36, article id 1560005 p. 1-11.
- **Herry P. Suryawan**, 2014, Donsker's delta function of the generalized mixed fractional Brownian motion, *Proceedings of the International Seminar on Innovation in Mathematics and Mathematics Education-Yogyakarta State University*, article id A-7 p. 45-52.
- **Herry P. Suryawan**, 2014, A problem on measures in infinite dimensional spaces, *Proceedings of National Conference on Mathematics, Mathematics Education and Computation-Sebelas Maret University*, p. 171-178.
- **Herry P. Suryawan**, 2014, A white noise analysis approach to the self-intersection local times of a Gaussian process, *Journal of Indonesian Mathematical Society* vol. 20 no. 2, p. 111-124.
- Martin Grothaus, Felix Riemann and **Herry P. Suryawan**, 2014, A white noise approach to the Feynman integrand for electrons in random media, *Journal of Mathematical Physics* vol. 55, article id 013507, p. 1-16.
- **Herry P. Suryawan**, 2013, A White Noise Approach to Self-intersection Local Times and Feynman Integrals for Quantum Particles in Random Media, *Munich: Dr. Hut Verlag*.
- **Herry P. Suryawan**, 2011, Generalized mixed fractional Brownian motion as a generalized white noise functionals, *Jurnal MATSTAT* vol. 11 no. 1, p. 10-19.
- **Herry P. Suryawan**, 2010, A white noise approach to mixed fractional Brownian motion, *Jurnal SIGMA* vol. 13 no. 1.
- Hendra Gunawan, Idha Sihwaningrum and **Herry P. Suryawan**, 2010, Fractional integral operators and Olsen's inequalities on non-homogeneous spaces, *The Australian Journal of Mathematical Analysis and Applications* vol. 7, Issue 1, article 14.
- **Herry P. Suryawan** and Hendra Gunawan, 2009, Keterbatasan operator integral fraksional di ruang Morrey tak homogen yang diperumum, *Prosiding Konferensi Nasional Matematika XIV*, Sriwijaya University, p. 153-162.
- **Herry P. Suryawan**, 2009, A white noise approach to mixed fractional Brownian motion, *Jurnal SIGMA* vol. 12 no. 1, p. 79-89.

Curriculum Vitae



Dr. Kristine Joy E. Carpio

Department of Mathematics, De La Salle University
One Archers Place, 2311 Taft Avenue, Manila, PHILIPPINES
Office phone: +63 915 890 8705
Email: kristine.carpio@dlsu.edu.ph

: Personal details

Place and Date of Birth : Iligan City, 27 April 1977
Gender : Female
Nationality : Philippines
Residential Address : One Archers Place, 2311 Taft Avenue, Malate Manila
Postal Address : Department of Mathematics, De La Salle University
2401 Taft Avenue, Malate Manila, Philippines

Education

1. Doctor (in Mathematics), The Australian National University, Australia
November 2002-October 2006
2. Master (in Applied Mathematics), UP Diliman, Quezon City, Philippines
June 1998-May 2001
3. Bachelor (in Mathematics), UP Diliman, Quezon City, Philippines
June 1994-April 1998

Research Interest

1. Stochastic Processes and Its Applications
2. Applied Mathematics
3. Investments

Teaching Employments

1. Lecturer, Department of Mathematics, De La Salle University, Philippines
2007-present
2. Tutor, Australian National University, 2005-2006
3. Tutor, University of Canberra, 2003
4. Instructor, University of Philippines Diliman, Quezon City, 1998-2002

Teachings

- Business Mathematics (undergraduate)
- Elementary Linear Algebra (undergraduate)
- Ordinary Differential Equations (undergraduate)
- Elementary Analysis (undergraduate)
- Real Analysis (graduate)
- Stochastic Processes (graduate)

Selected Publications

- **Carpio, K.J.E.**, Bernot, G., Comet, J-P and Diener, F., 2015, Probabilistic gene network, *Proceedings of the Strasbourg Spring School on Advances in Systems and Synthetic Biology*, p. 77-90.
- **Carpio, K.J.E.**, 2014, On long-range dependence of Markov chains, *Proceedings of the 10th Taiwan-Philippines Symposium on Analysis*, p. 113-118.
- **Carpio, K.J.E.**, Lim, A.M.G. and Roncal, C.K.M., 2012, Forecasting day-ahead electricity prices of Singapore through ARIMA and wavelet-ARIMA, *DLSU Business and Economics Review* 22 (1), p. 97-118.
- **Carpio, K.J.E.**, 2012, Long-range Dependence of Markov Chains: Theory and Examples, *Lambert Academic Publishing*.
- **Carpio, K.J.E.**, 2011, Generating Solutions to the n-Queens Problem: Using 2-Circulant Matrices, Maximal Cliques and 0-1 Integer Programming, *Lambert Academic Publishing*.
- **Carpio, K.J.E.**, 2011, On Multicollinearity and Artificial Neural Networks: Theory and Examples, *Lambert Academic Publishing*.
- **Carpio, K.J.E.**, 2009, Long-range dependence of continuous-time Markov chains on a countable state space, *Proceedings of the 11th Science and Technology Congress*.
- Aguilar, A.S., **Carpio, K.J.E.**, Lim, E.B.K., and Ocampo, A.T.D., 2009, A comparison of fuzzy programming models in portfolio allocation, *5th Asian Mathematical Conference Proceedings*, p. 663-670.
- **Carpio, K.J.E.** and Daley, D.J., 2007, Long-range dependence of Markov chains in discrete time on countable state space, *Journal of Applied Probability* 44 (4), p. 1047-1055.
- **Carpio, K.J.E.**, 2007, Long-range dependence of positive Harris chains, *Proceedings of the 7th Taiwan-Philippines Symposium in Mathematics* Matimyas Matematika 30(2-3), p.1-8.
- **Carpio, K.J.E.**, 2007, Long-range dependence of stationary processes in single-server queues, *Queueing Systems* 55 (2), p. 123-130.
- **Carpio, K.J.E.**, 2007, Mathematics makes me wonder, *Essays in Education* 21, p. 58-69.