International School and Workshop on Commutative Algebra

– by and for young mathematicians –

September 05 - 08, 2017

Ton Duc Thang University, Ho Chi Minh City, Vietnam

Time Table

	5	6	7	8
8:00 ~ 8:50	S. Goto	L. T. T. Nhan	T. T. Phuong	K. Ozeki
9:10 ~ 11:00	K. Yoshida	K. Yoshida	K. Yoshida	K. Yoshida
11:10 ~ 11:40	T. D. M. Chau	D. T. Hiep	S. Kumashiro	H. L. Truong
13:10 ~ 15:00	K. Shimomoto	K. Shimomoto	K. Shimomoto	K. Shimomoto
15:20 ~ 15:50	N. Taniguchi	N. Matsuoka	R. Isobe	N. T. Hang
16:00 ~ 16:30	Meeting	D. V. Kien	L. P. Thao	P. T. Toan
16:50 ~ 17:50	S. Goto*	Banquet (6PM)	TBA*	

- **September 4**: Special lectures will be given by Naoki Taniguchi for undergraduate students.

- **The sessions** * will be given for undergraduate students.

Organizers
- Chu Duc Khanh (TDT Univ.)
- Truong Buu Chau (TDT Univ.)
- Tran Thi Phuong (TDT Univ.)
- Phan Thanh Toan (TDT Univ.)
- Hoang Lam (TN Univ.)
- Doan Trung Cuong (VAST)
- Naoyuki Matsuoka (Meiji Univ.)
- Le Thi Thanh Nhan (TN Univ.)
- Kazuho Ozeki (Yamagichi Univ.)
- Hoang Le Truong (VAST)

Supporting Institutions
- Ton Duc Thang University (TDT Univ.)
- Meiji University
- Institute of Mathematics, Hanoi (VAST)
- University of Science, Thai Nguyen University (TN Univ.)
- International Mathematics Union - Committee for Women in Mathematics

Program

Sep. 5 (Tue)

7:45 ∼ 8:00   Opening

8:00 ∼ 8:50   Shiro Goto (Meiji University)
Almost Gorenstein rings - towards a stratification of Cohen-Macaulay rings

9:10 ∼ 11:00   Ken-ichi Yoshida (Nihon University)
Characteristic $p > 0$ methods in commutative algebra (I)

11:10 ∼ 11:40   Tran Do Minh Chau (Thai Nguyen University of Education)
Sally modules of canonical ideals in dimension one and 2-AGL rings

13:10 ∼ 15:00   Kazuma Shimomoto (Nihon University)
Direct summand theorem and related topics (I)

15:20 ∼ 15:50   Naoki Taniguchi (Meiji University)
Generalized Gorenstein Arf rings

16:00 ∼ 16:30   A meeting on "How to support female mathematicians"

16:50 ∼ 17:50   Shiro Goto (Meiji University)
What is Commutative Algebra?
- a brief history based on the work of Emmy Noether -

Sep. 6 (Wed)

8:00 ∼ 8:50   Le Thi Thanh Nhan (Thai Nguyen University)
Non-Cohen-Macaulayness and non-sequential-Cohen-Macaulayness of modules

9:10 ∼ 11:00   Ken-ichi Yoshida (Nihon University)
Characteristic $p > 0$ methods in commutative algebra (II)

11:10 ∼ 11:40   Dang Tuan Hiep (NCTS, Taiwan & Da Lat University, Vietnam)
Quantum cohomology of the Lagrangian Grassmannian

13:10 ∼ 15:00   Kazuma Shimomoto (Nihon University)
Direct summand theorem and related topics (II)

15:20 ∼ 15:50   Naoyuki Matsuoka (Meiji University)
Pseudo-Frobenius numbers versus defining ideals in numerical semigroup rings

16:00 ∼ 16:30   Do Van Kien (Ha Noi Pedagogical University 2)
On defining ideals and Symbolic Rees algebra of defining ideals
in numerical semigroup rings of minimal multiplicity

18:00 ∼   Banquet (6:00PM)

Sep. 7 (Thu)

8:00 ∼ 8:50　Tran Thi Phuong (Ton Duc Thang University)
A Survey on the Normal Hilbert coefficients

9:10 ∼ 11:00　Ken-ichi Yoshida (Nihon University)
Characteristic $p > 0$ methods in commutative algebra (III)

11:10 ∼ 11:40　Shinya Kumashiro (Chiba University)
Ulrich ideals and GGL rings in dimension one

13:10 ∼ 15:00　Kazuma Shimomoto (Nihon University)
Direct summand theorem and related topics (III)

15:20 ∼ 15:50　Ryotaro Isobe (Chiba University)
Characterization of Generalized Gorenstein rings

16:00 ∼ 16:30　Luu Phuong Thao (Thai Nguyen College of Education)
Dimension, multiplicity and attached primes of local cohomology modules
via certain flat extensions

16:50 ∼ 17:50　TBA

Sep. 8 (Fri)

8:00 ∼ 8:50　Kazuho Ozeki (Yamaguchi University)
Almost minimal normal Hilbert coefficients

9:10 ∼ 11:00　Ken-ichi Yoshida (Nihon University)
Characteristic $p > 0$ methods in commutative algebra (IV)

11:10 ∼ 11:40　Hoang Le Truong (Institute of Mathematics)
Chern Coefficients and Cohen-Macaulay rings

13:10 ∼ 15:00　Kazuma Shimomoto (Nihon University)
Direct summand theorem and related topics (IV)

15:20 ∼ 15:50　Nguyen Thu Hang (Thai Nguyen University)
Regularity of powers of cover ideals of unimodular hypergraphs

16:00 ∼ 16:30　Phan Thanh Toan (Ton Duc Thang University)
Dedekind-Mertens lemma and content formulas for polynomials and power series

Abstracts

Almost Gorenstein rings
towards a stratification of Cohen-Macaulay rings

Shiro Goto (Meiji University)

My lecture is based on the works jointly with T. D. M. Chau, R. Isobe, D. V. Kien, S. Kumashiro, N. Matsuoka, T. T. Phuong, M. Rahimi, R. Takahashi, N. Taniguchi, H. L. Truong, and K.-i. Yoshida. I will talk about certain modifications of Gorenstein rings, say AGL rings, 2-AGL rings, and GGL rings. The purposes are to find new classes of Cohen-Macaulay rings which may be non-Gorenstein but are still close to Gorenstein rings, and to develop a good theory, giving nice applications and examples.

Sally modules of canonical ideals in dimension one and 2-AGL rings

Tran Do Minh Chau(Thai Nguyen University of Education)

This is a joint work with S. Goto, S. Kumashiro, and N. Matsuoka. Our aim is to discover a good candidate for natural generalization of almost Gorenstein rings which were introduced by V. Barucci-R. Fröberg and extended by S. Goto-N. Matsuoka-T. T. Phuong. We define 2-AGL rings in dimension one in terms of the rank of Sally modules of canonical ideals and the basic theory is developed. We also explore the case where the base rings are numerical semigroup rings over fields.

Generalized Gorenstein Arf rings

Naoki Taniguchi (Meiji University)

My talk is based on the research jointly with E. Celikbas, O. Celikbas, and S. Goto. Arf rings were introduced by J. Lipman who developed an intensive and beautiful theory of *Stable ideals and Arf rings*. On the contrary, the notion of a generalized Gorenstein ring which was defined by S. Goto and S. Kumashiro is one of the generalizations of Gorenstein rings. In this talk, for the further study of generalized Gorenstein rings, we investigate a possible characterization of generalized Gorenstein Arf rings.

What is Commutative Algebra?
a brief history based on the work of Emmy Noether

Shiro Goto (Meiji University)

This is a lecture for the students of undergraduate courses, and aims to be a guide for commutative algebra. I begin with a brief introduction of the personality of Emmy Noether, the mother of modern algebra, as well as her achievements. I do not deeply talk about mathematics, but with the definition of Noetherian rings and a few results of commutative algebra, I try to explain what Noether's doctrine was. I will also talk about how commutative algebra developed after her works. Passing through Serre's revolution, the first and second golden ages of commutative algebra will be briefly described.

Non-Cohen-Macaulayness
and non-sequential-Cohen-Macaulayness of modules

Nguyen Thi Thanh Nhan (Thai Nguyen College of Sciences)

My talk presents the topics on non-Cohen-Macaulayness and non sequential Cohen-Macaulayness of modules. Let R be a Noetherian local ring and M a finitely generated R-module. The notion of *polynomial type* $p(M)$ of M, which was introduced by N. T. Cuong, measures the non-Cohen-Macaulayness of M. By a natural way, we extended the concept of polynomial type to a so-called *sequential polynomial type* $\mathrm{sp}(M)$ of M in order to show the distance from M to the class of sequentially Cohen-Macaulay modules. The purpose is to talk about the joint works with N. T. K. Nga, P. H. Khanh, with T. D. M. Chau, T. D. Dung , and with S. Goto on polynomial type $p(M)$ and sequential polynomial type $sp(M)$.

Quantum cohomology of the Lagrangian Grassmannian

Dang Tuan Hiep (NCTS, Taiwan & Da Lat University)

The Lagrangian Grassmannian, denoted by $\mathrm{LG}(n)$, is a homogeneous space of Lagrangian subspaces of a complex symplectic vector space of dimension $2n$. This talk is devoted to the small quantum cohomology ring of $\mathrm{LG}(n)$. More concretely, we focus on the ring structure and present how to determine the quantum structure constants in the ring.

Pseudo-Frobenius numbers versus defining ideals in numerical semigroup rings

Naoyuki Matsuoka (Meiji University)

This is a joint work with Shiro Goto, Do Van Kien, and Hoang Le Truong. In this talk, I will talk about the structure of the defining ideal of the semigroup ring $k[H]$ of a numerical semigroup H over a field k, when the pseudo-Frobenius numbers of H are multiples of a fixed integer.

On defining ideals and Symbolic Rees algebra of defining ideals in numerical semigroup rings of minimal multiplicity

Do Van Kien (Hanoi Pedagogical University 2)

In this talk, we focus on describing the structure of the defining ideal of the semigroup ring $R = k[H]$ of a numerical semigroup H in the case where R has minimal multiplicity and pseudo-Frobenius numbers form an arithmetic progression. We also give some properties for the symbolic Rees algebra of the defining ideal in this case.

A Survey on the Normal Hilbert coefficients

Tran Thi Phuong (Ton Duc Thang University)

This talk will give a survey on the relations between the normal Hilbert coefficients and the depth of the associated graded ring with respect to a normal filtration.

Ulrich ideals and GGL rings in dimension one

Shinya Kumashiro (Chiba University)

The purpose of this talk is to find relation between generalized Gorenstein property (GGL property for short) and existence of Ulrich ideals in dimension one.

Characterization of Generalized Gorenstein rings

Ryotaro Isobe (Chiba University)

The notion of a generalized Gorenstein local ring (GGL ring for short) is one of the generalizations of Gorenstein rings.

In this talk, I explain about a characterization of GGL rings in terms of their canonical ideals and related invariants.

Dimension, multiplicity and attached primes of local cohomology modules via certain flat extensions

Luu Phuong Thao (Thai Nguyen College of Education)

This is a joint work with Le Thanh Nhan and Tran Nguyen An. Let $(R, \mathfrak{m})$ be a Noetherian local ring, M a finitely generated R-module, $\mathfrak{P} \in \mathrm{Spec}(\widehat{R})$ and $\mathfrak{p} = \mathfrak{P} \cap R$. In this talk, we provide some connections between the two sets of attached primes $\mathrm{Att}_{\widehat{R}_{\mathfrak{P}}}\big(H^{i+r_{\mathfrak{P}}}_{\mathfrak{P}\widehat{R}_{\mathfrak{P}}}(\widehat{M}_{\mathfrak{P}})\big)$ and $\mathrm{Att}_{R_{\mathfrak{p}}}\big(H^{i}_{\mathfrak{p}R_{\mathfrak{p}}}(M_{\mathfrak{p}})\big)$, where $i \geq 0$ is an integer and $r_{\mathfrak{P}} = \dim(\widehat{R}_{\mathfrak{P}}/\mathfrak{p}\widehat{R}_{\mathfrak{P}})$. Then, we compute the dimension and multiplicity of $H^{i+r_{\mathfrak{P}}}_{\mathfrak{P}\widehat{R}_{\mathfrak{P}}}(\widehat{M}_{\mathfrak{P}})$ in terms of that of $H^{i}_{\mathfrak{p}R_{\mathfrak{p}}}(M_{\mathfrak{p}})$ respectively.

Almost minimal normal Hilbert coefficients

Kazuho Ozeki (Yamaguchi University)

This is based on a joint work with S. Masuti and M. E. Rossi. The normal Hilbert coefficients play an important role in commutative algebra. The purpose of this talk is to give a characterizaton of the normal associated graded ring which has an almost minimal first Hilbert coefficient.

Chern Coefficients and Cohen-Macaulay rings

Hoang Le Truong (Institute of Mathematics)

In this study, we investigate the relationship between the index of reducibility and Chern coefficients for primary ideals. Therefore, the main result of this study provides a characterization of a Cohen-Macaulay ring in terms of its index of reducibility, Cohen-Macaulay type, and the Chern coefficients for parameter ideals. As corollaries to the main theorem, we obtain characterizations of a Gorenstein ring in terms of its Chern coefficients for parameter ideals.

Regularity of powers of cover ideals of unimodular hypergraphs

Nguyen Thu Hang(Thai Nguyen University)

Let $\mathcal{H}$ be a unimodular hypergraph over the vertex set $[n]$ and let $J(\mathcal{H})$ be the cover ideal of $\mathcal{H}$ in the polynomial ring $R = K[x_1, \ldots, x_n]$. We show that $\operatorname{reg} J(\mathcal{H})^s$ is a linear function in s for all $s \geqslant r \left\lceil \frac{n}{2} \right\rceil + 1$ where r is the rank of $\mathcal{H}$. Moreover for every i, $a_i(R/J(\mathcal{H})^s)$ is also a linear function in s for $s \geqslant n^2$.

Joint work with Tran Nam Trung (Institute of Mathematics, Vietnam).

Dedekind-Mertens lemma and content formulas for polynomials and power series

Phan Thanh Toan (Ton Duc Thang University)

Let $R[X]$ and $R[\![X]\!]$ be the polynomial ring and the power series ring respectively over a commutative ring R with identity. For $f \in R[\![X]\!]$, denote by A_f the content ideal of f, i.e., the ideal of R generated by the coefficients of f. In this talk we present content formulas showing relationship between $A_f A_g$ and A_{fg}.

This is a joint work with Byung Gyun Kang and Mi Hee Park.

List of participants

	Full Name	Affiliation
1	Tran Nguyen An	Thai Nguyen University of Education
2	Vũ Tuấn Anh	University of Science, Ha Noi
3	Mai Hoàng Biên	University of Science
4	Tran Do Minh Chau	Thai Nguyen University of Education
5	Truong Buu Chau	Ton Duc Thang University
6	Phạm Ngô Thành Đạt	Đại học Khoa Học tự Nhiên TP.HCM
7	Trần Tấn Đạt	Ho Chi Minh University of Pedagogy
8	Hồ Văn Định	University of Natural Sciences Ho Chi Minh City
9	Nguyen Thi Dung	Thai Nguyen University
10	Tran Duc Dung	Thai Nguyen University of Science
11	Trương Hữu Dũng	Dong Nai University
12	Nguyen Thu Hang	Thai Nguyen University of Education
13	Tang Khai Hanh	University of Science, VNU-HCM
14	Chu Thị Thu Hiền	HCMUS
15	Dang Tuan Hiep	NCTS, Taiwan & Da Lat University, Vietnam
16	Lê Ngọc Hiếu	Ho Chi Minh City University of Science
17	Dinh Van Hoang	University of Antwerp
18	Nguyễn Khánh Huy Hoàng	Dong Nai University
19	Tran Ngoc Hoi	Đại học Khoa Học tự Nhiên TP.HCM
20	Tran Thi My Huynh	Saigon Technology University
21	Tran Thien Khai	Tra Vinh University
22	Chu Duc Khanh	Ton Duc Thang University
23	Nguyen An Khuong	University of Technology
24	Do Van Kien	Ha Noi Pedagogical University 2
25	Nguyen Ngoc Ky	University of Technology, VNU-HCM
26	Nguyen Thi My Le	Dong Nai University
27	Nguyên Hong Loan	Vinh University
28	Le The Long	HCMUS
29	Bùi Kim Minh	Ho Chi Minh City University of Science
30	Pham Hong Nam	Thai Nguyen University of Science
31	Tran Tuan Nam	Ho Chi Minh University of Pedagogy
32	Lê Hoài Nam	Ho Chi Minh University of Pedagogy
33	Nguyen Thi Kieu Nga	Ha Noi Pedagogical University 2
34	Phạm Quang Nghĩa	Ho Chi Minh City University of Science
35	Ngô Thị Ngoan	Thai Nguyen College of Sciences, Hanoi Institute of Mathematics
36	Le Thi Thanh Nhan	Thai Nguyen University
37	Nguyễn Hữu Trí Nhật	Khoa Toán - Tin, ĐH KHTN HCM
38	Phùng minh nhật	Đại học khoa học tự nhiên
39	Nguyễn Hồ Minh Phước	Saigon Technology University
40	Nguyen Thi Thanh Tam	Graduate student
41	Nguyễn Văn Thành	Ho Chi Minh University of Technology, VNU-HCM
42	Luu Phuong Thao	Thai Nguyen University of Education
43	Vo Ngoc Thieu	Ton Duc Thang University
44	Phan Thanh Toàn	Tôn Đức Thắng University
45	Ngô Thị Bảo Trân	Saigon Technology University
46	Nguyen Minh Tri	Dongnai university
47	Châu Chí Trung	Đại học Khoa Học tự Nhiên TP.HCM
48	Võ Hữu Lê Trung	Ho Chi Minh University of Pedagogy
49	Hoang Le Truong	Institute of Mathematics

50	Nguyen Anh Tuan	Faculty of Information Technology, University of Science, HoChiMinh City
51	Nguyễn Khánh Tùng	University of Science, Vietnam National University Ho Chi Minh City
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53	Phan Ngoc Yen	Ho Chi Minh University of Pedagogy
54	Đỗ Ngọc Yến	Ho Chi Minh University of Pedagogy
	Vietnamese	

55	Shiro Goto	Meiji University
56	Kazuho Ozeki	Yamaguchi University
57	Naoyuki Matsuoka	Meiji University
58	Tran Thi Phuong	Ton Duc Thang University
59	Ken-ichi Yoshida	Nihon University
60	Kazuma Shimomoto	Nihon University
61	Naoki Taniguchi	Meiji University
62	Hirotaka Higashidaira	Meiji University
63	Kaori Shimada	Meiji University
64	Shinya Kumashiro	Chiba University
65	Ryotaro Isobe	Chiba University
	Japanese	