

Summer School Schedule

Valuation Theory and Integral Closures in Commutative Algebra

JULY 3–15, 2006

UNIVERSITY OF OTTAWA

(Lectures on Valuation Theory) Lecturers: F.V. Kuhlmann, D. Cutkosky, H. Knaf, B. Teissier, M. Vaquié.

(Lectures on Integral Closures) Lecturers: I. Swanson, W. Bruns, A. Taylor.

Chapter and section numbers refer to the book *Integral closure of ideals, rings, and modules* by Irena Swanson and Craig Huneke. Relevant chapters will be distributed during the summer school by permission of the publisher.

All lectures will be held in **SITE C0136** at the south end of campus

Week 1

| | Monday | Tuesday | Wednesday | Thursday | Friday |
|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 9:30–10:30 | Lecture 1 | Lecture 1 | Lecture 1 | Lecture 1 | Lecture 1 |
| 11 –12 | Lecture 2 | Lecture 2 | Lecture 2 | Lecture 2 | Lecture 2 |
| 12–2 | <i>Lunch</i> | <i>Lunch</i> | <i>Lunch</i> | <i>Lunch</i> | <i>Lunch</i> |
| 2 – 3 | Lecture 3 | Lecture 3 | Lecture 3 | Lecture 3 | Lecture 3 |
| 3:30 – 4:30 | Lecture 4 | Lecture 4 | Lecture 4 | Lecture 4 | Lecture 4 |
| Evening | Discussions/ Problems | Discussions/ Problems | Discussions/ Problems | Discussions/ Problems | Discussions/ Problems |

Monday July 3

Lecture 1 (Kuhlmann & Knaf): *Valuations, value groups and valuation rings* (6.1, 6.2)

Lecture 2 (Kuhlmann & Knaf): *Properties of valuation rings* (6.4)

Lecture 3 (Swanson): *What is integral closure of ideals* (1.1 (lightly), 1.2)

Lecture 4 (Swanson): *Integral closure of rings* (2.1, 2.2 lightly)

Tuesday July 4

Lecture 1 (Kuhlmann & Knaf): *Existence of valuation rings; completions*, (6.3, 6.5)

Lecture 2 (Kuhlmann & Knaf): *Valuation theoretical invariants* (6.6)

Lecture 3 (Swanson): *Noetherian questions* (4.3.4, 4.6)

Lecture 4 (Swanson): *Valuative criterion* (6.8)

Wednesday July 5

Lecture 1 (Kuhlmann & Knaf): *Examples of valuations* (6.7)

Lecture 2 (Kuhlmann & Knaf): *Extensions of valuations, fundamental inequality*

Lectures 3 and 4 (Swanson): *Rees valuations* (10.1, 10.2, 10.4)

Thursday July 6

Lecture 1 (Kuhlmann & Knaf): *Defect, with examples, and defectless valuations*

Lecture 2 (Kuhlmann & Knaf): *Ramification theory, I*

Lecture 3 (Swanson): *Monomial ideals (integral closure, Newton polyhedra, Rees valuations)*

Lecture 4 (Swanson): *Two-dimensional regular local rings: Zariski's theory and Rees valuations*

Friday July 7

Lecture 1 (Kuhlmann & Knaf): *Ramification theory, II*

Lecture 2 (Kuhlmann & Knaf): *Hensel's Lemma and Implicit Function Theorem*

Lecture 3 (Swanson): *Divisorial valuations* (9.3)

Lecture 4 (Swanson): *Reductions and Rees valuations* (10.5)

Saturday July 8

Catch-up

Week 2

| | Monday | Tuesday | Wednesday | Thursday | Friday |
|-------------|--------------------------|--------------------------|--------------------------|--------------|--------------------------|
| 8:30–9:30 | Lecture 1 | Lecture 1 | Lecture 1 | Lecture 1 | Lecture 1 |
| 10 –11 | Lecture 2 | Lecture 2 | Lecture 2 | Lecture 2 | Lecture 2 |
| 11–12:45 | <i>Lunch</i> | <i>Lunch</i> | <i>Lunch</i> | <i>Lunch</i> | <i>Lunch</i> |
| 12:45– 1:45 | Lecture 3 | Lecture 3 | Lecture 3 | Lecture 3 | Lecture 3 |
| 2–3:30 | Lab | Lab | Lab | Lab | Lab |
| 4 – 5 | Lecture 4 | Lecture 4 | Lecture 4 | | Lecture 4 |
| Evening | Discussions/ Problems | Discussions/ Problems | Discussions/ Problems | | Discussions/ Problems |

Monday July 10

Lecture 1 (Kuhlmann): *Elimination of ramification I: the generalized stability theorem*

Lecture 2 (Swanson): *Jacobian criteria, Serre's criteria*

Lecture 3 (Amelia Taylor): *General normalization algorithms*

Lab (Amelia Taylor): *Introduction to some symbolic computer algebra packages*

Lecture 4 (Knaf) *Local uniformization of Abhyankar places in arbitrary characteristic*

Tuesday July 11

Lecture 1 (Kuhlmann): *Elimination of ramification II: henselian rationality*

Lecture 2 (Knaf) *Ideas towards general local uniformization*

Lecture 3 (Swanson): *Computing Rees valuations*

Lab (Amelia Taylor): *Computing Rees valuations*

Lecture 4 (Winfried Bruns): *Polyhedral geometry*

Wednesday July 12

Lecture 1 (Vaquié): *Extension of a valuation: key-polynomial and augmented valuation*

Lecture 2 (Cutkosky): *geometric theory of local rings, I*

Lecture 3 and Lab (Amelia Taylor): *Vasconcelos's algorithms*

Lecture 4 (Winfried Bruns): *Affine monoid rings and their normalizations*

Thursday July 13

Lecture 1 (Vaquié): *Extension of a valuation: admissible family and defect*

Lecture 2 (Teissier): *Local uniformization in characteristic p , I*

Lecture 3 (Winfried Bruns): *Algorithms for normalizations of affine monoid rings*

Lab (Winfried Bruns): *Normaliz*

Friday July 14

Lecture 1 (Vaquié): *Graded algebra associated to a valuation of $K[x]$*

Lecture 2 (Teissier): *Local uniformization in characteristic p , II*

Lecture 3 (Swanson): *Noether normalizations*

Lab (Taylor):

Lecture 4 (Swanson): *Ad hoc methods for computing integral closure*

Saturday July 15

Catch-up