Biology and Biotechnology in Forest Production Systems, 15 ETC- Preliminary Schedule
March 26 – June 5, 2009

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Lecturers:

Ann-Britt Edfast	ABE
András Gorzsás	AG
Benedicte Albrectsen	BA
Bengt Andersson	BAN
Beata Dedicova	BD
Björn Sundberg	BS
Catherine Bellini	CB
Ewa Mellerowicz	EM
Erik Normark	EN
Geoff Daniel	GD
Hans Grundberg	HG
Hannele Tuominen	HT
Jyri-Pekka Mikkola	JPM
Kjell Olofsson	KO
Lorenz Gerber	LG
Mattias Hedenström	MH
Mats Johnson	MJ
Öve Nilsson	ON
Petter Gustafsson	PG
Peter Immeerzel	PI
Rishi Bhalerau	RB
Thomas Moritz	TM
Torgny Näshholm	TN
Ulrika Egertsdotter	UE

Lab Assistants

David Öhman	DÖ	(SLU)
Dr. Peter Immerzeel	PI	(SLU)
Lorenz Gerber	LG	(SLU)

Location: lecture rooms and laboratories at UPSC, SLU in Umea

Literature:

1. Bowyer JL et al., "**Forest products and wood science**, 5th ed, Blackwell Publishing, 2007 (ISBN-10: 0-8138-2036-7 ISBN-13: 978-0-8138-2036-1).
2. Larson PR, "**The Vascular Cambium**" Springer-Verlag 1984 (ISBN 3-540-57165-5, ISBN 0-387-57165-5)
3. PW West., "**Growing Plantation Forests**.", Springer, 2006 (ISBN-10 3-540-32478-X and ISBN-13 978-3-540-32478-2).
4. M Fladung "**Tree transgenesis**" Springer, 2006 (ISBN -10 3-540-32198-5 and ISBN -13 978-3-540-32198-9)
5. S.M. Jain and H. Häggman, "**Protocols for Micropropagation of Woody Trees and Fruits**" (2007) Springer ISBN 978-1-4020-6351-0; ISBN 978-1-4020-6352-7 (e-book)
6. S.M. Jain, Pramod P.K. Gupta, and R.J. Newton (2007) **Somatic Embryogenesis in Woody Plants**: Volume I , Kluver Academic Press, ISBN 0-7923-3035-8 (Volume 1)
7. Selected research papers and reviews

Course requirements:

1. Obligatory attendance of all scheduled activities during the four weeks of intensive, high level immersion courses in: Introduction to the Forest Biotechnology, Clonal Propagation of Woody Plants, Wood Biology, and Forest Productivity.
2. Obligatory attendance of scheduled laboratory activities.
3. Accepted **project reports** and **scientific presentation of a project results.**
4. A review of scientific papers on a selected topic in tree biotechnology up to 4000 words (approx. 10 double spaced pages)
5. Written exam

Schedule:

Week	Date	Location	Time	Activity (Teachers)
13	Thu, Mar 26	KBC30	9.00-10.00	INTRODUCTION. Overview course elements. (EM, BD, TN)
		KBC30	10.00-12.00	LECTURE. Main topics and issues in Tree Biotechnology. (PG)
			13.00-17.00	Reading of recommended literature
	Fri, Mar 27	KBC30	10.00-12.00	LECTURE. Environmental issues and public concerns regarding growth of genetically modified trees in Europe. (BA)
		KBC30	13.00-14.30	Reading of the paper
			14.30-16.00	GROUP DISCUSSION (BA)

14	Mon, Mar 30	KBC30	9.00-10.30	LECTURE and discussion. Erik Normark, Holmenskog, Introduction to Swedish Forestry and possible biotech application
		KBC30	10.30-12.00	LECTURE and discussion. A-B Edfast, SveaSkog: TBA
	Tues, Mar 31	KBC30	9.00-10.30	LECTURE. Tree domestication. (ON)
		KBC30	10.30-12.00	LECTURE and discussion. Mats Johnsson: "SweTree Technologies - a forest biotech company: the present and the future"
			13.00-17.00	Reading of recommended literature and group discussion
	Wed, April 1		9.00-17.00	Selection of review topics and literature studies
	Thu, April 2	Seminar Room Floor 3	9.00-11.00	Presentation of review topics by students
			11.00-17.00	Ind. work on reviews
	Fri, April 3	KBC30	11.10-12.00	LECTURE. Hans Grundberg, Processum Biorafinery: Wood biorefineries – prospects of new materials and products
		KBC30	13.00-14.00	LECTURE. J-P Mikkola: 'Wood in NextGen Biorefineries: Beyond pulping'
			14.00-17.00	Reading of recommended literature and group discussion

Practical Project work

Week	Date	Location	Time	Activity (Teachers)	Deadlines
15	Mon, Apr 6	Seminar Room Floor 3	9.00-10.00	Introduction of the lab project (EM, DÖ)	
	Tue, Apr 7	Wallenberg greenhouse room 21A	9.00-12.00	Gathering of growth data and sample collection (DÖ)	growth data 1
			13.00-17.00	Ind. work on review	
	Wed, Apr 8	Wallenberg greenhouse room 21A	9.00-12.00	Gathering of growth data and sample collection (DÖ)	
			13.00-17.00	Ind. work on review	
	Thu, Apr 9	Wallenberg greenhouse room 21A	9.00-12.00	Gathering of growth data and sample collection (DÖ)	
			13.00-17.00	Free	

16	Mon, Easter				
	Tue, Apr 14	Anatomy lab	9.00-12.00	Sample preparation, Cryosectioning, microscopy (DÖ)	
			13.00-17.00	Ind. work on review and greenhouse work	growth data 2
	Wed, Apr 15	Cell wall lab	9.00-12.00	Scraping stems (PI)	
			13.00-17.00	Ind. work on review	
	Thu, Apr 16	Cell wall lab	9.00-12.00	Scraping stems (PI)	
			13.00-17.00	Ind. work on review	
	Fri, Apr 17	Cell wall lab	9.00-12.00	Start freeze-drying (PI), Anatomy, cont (DÖ)	
			13.00-17.00	Anatomy and ind. work on review	
17	Mon, Apr 20	Cell wall lab	9.00-17.00	Grinding samples, TFA hydrolysis (PI), samples ready for pyrolysis	Anatomy data due
					samples ready for pyrolysis
	Tue, Apr 21	Cell wall lab	9.00-15.00	uronic acid analysis, neutral sugar analysis (alditolacetates), klason lignin (PI)	
			15.00-17.00	Greenhouse work	growth data 3
	Wed, Apr 22	Cell wall lab	9.00-17.00	uronic acid analysis, neutral sugar analysis (alditolacetates), klason lignin (PI), alditol acetates ready for GC	samples ready for GC
	Thu, Apr 23	Cell wall lab	9.00-17.00	klason lignin (PI)	
	Fri, Apr 24	Cell wall lab	9.00-12.00	klason lignin (PI)	Reviews due
			13.00-17.00	Ind. work: Cell wall data summary	
18	Mon, Apr 27	Cell wall lab	9.00-12.00	GC and pyrolysis data interpretation (LG, PI)	
			13.00-17.00	Ind. work: Cell wall data summary	
	Tue, Apr 28	Cell wall lab	9.00-12.00	Ind. work on data and greenhouse work	growth data 4
			13.00-17.00	Ind. work on data	
	Wed, Apr 29	Cell wall lab	9.00-12.00	Final growth data summary and statistical analysis	Analysis of growth data due

			13.00-17.00	Ind. work: summary	Cell wall data	
	Thu, Apr 30	Cell wall lab	9.00-12.00	Ind. work: summary	Cell wall data	Cell wall data due
			13.00-17.00	free		
	Fri, May 1					Reviews back

PhD/MSc course: Clonal Propagation of Woody Plants

Week	Date	Location	Time	Activity (Teachers)
19	Mon, May 4	SLU	9.00-10.00	INTRODUCTION. Overview course elements. UE, BD.
		Gruprum 8	10.30-12.00	LECTURE. In vitro propagation BD
			13.00-16.00	LAB/DEMO. In vitro propagation. UE, BD
			16.00-17.00	INTRODUCTION. Student projects. UE, BD.
	Tues, May 5	SLU	9.00-10.00	LECTURE. Adventitious rooting. CB
		Gruprum 8	10.30-12.00	LECTURE. Adventitious rooting. CB
			13.00-15.00	LAB/DEMO. Cryopreservation. UE, BD.
			15.00-17.00	INDIVIDUAL STUDY. Student projects.
	Wed, May 6	SLU	9.00-10.00	LECTURE. Somatic embryogenesis. UE.
		Gruprum 8	10.30-12.00	LECTURE. Genetic transformation in gymnosperms. UE, BD
			13.00-17.00	LAB. Genetic transformation in gymnosperms. BD, UE.
			15.00-17.00	INDIVIDUAL STUDY. Student projects.
	Thu, May 7	SLU	9.00-10.30	Follow up labs and review results.
		Gruprum 8	11.00-17.00	Preparation for presentations of student projects.
	Fri, May 8	SLU	9.00-10.30	Applications of somatic embryogenesis to forestry. BAN.
		Gruprum 8	11.00-12.00	Presentations of student projects
			13.00-15.00	Presentations of student projects.
			15.00-17.00	Discussion and course evaluation.

Practical Project work (cont.)

Week	Date	Location	Time	Activity (Teachers)	Deadlines
20	Mon, May 11			Preparation of Lab project presentations and lab report	
	Tue, May 12			Preparation of Lab project presentations and lab report	
	Wed, May 13		9.00-12.00	Project presentation by students (EM, PI, DÖ, HT)	Lab report due

PhD/MSc course: Wood Biology

Week	Date	Location	Time	Activity (Teachers)
20	Thu, May 14	KB4C10	9.00–9.45	Introduction, course presentation. (EM)
			10.00–12.00	Chemistry, structure and ultrastructure of wood (GD)
			13.00–15.00	Cont.
			15.00–17.00	Exercise/Light microscopy of wood samples (GD, KO, EM)
	Fri, May15	KB4C10	8.30–9.45	Microscopy and labelling techniques of wood components (GD)
			10.00–10.15	Intro, Wood analysis, possibilities and challenges (em)
			10.15–11.00	Wood wet chemistry (PI)
			11.15–12.00	Wood analysis MS pyrrolysis (LG)
			13.00-13.45	Wood analysis NMR (MH)
			14.00-14.45	Wood analysis FT-IR (AG)
		UPSC	15.00-17.00	Cell wall lab tour and demonstration of instruments
			at home	Reading of selected literature covering GD lectures/ 3 papers
21	Mon, May 18	KB4C10	8.30 – 9.15	Wood development and wood properties/ (impact of external and internal cues) (BS)
			9.30 – 10.15	Model system and tools to study the molecular control of wood formation. (BS)
			11.00 - 11.45	Molecular control: transcriptional regulation (BS)
				Research seminars plant hormones:
			13.00-13.45	Auxin and wood development (RB)
			14.00–14.45	Ethylene and wood development (BS)

			15.00-15.45	GAs and wood development (TM)
			at home	Reading of selected literature/ One on each research topic and one on wood development/ 4 papers
	Tue, May 19	KB4C10	8.30 – 12.00	Wood cell walls, biosynthesis and remodelling. Molecular control of cell shape, ultrastructure and wall chemistry (EM)
		Skogis	13.00-15.00	Fiber lab demo (TM)
			15.00-17.00	Reading of selected literature
	Wed, May 20			**Research seminars wood development:**
		KB4C10	8.30–9.15	Molecular control of cambial activity/dormancy (RB)
			9.30-10.15	Molecular control of xylem cell death (HT)
			10.00–12.00	Reading of selected literature on paper on each topic
			13.00–15.00	Group discussion on examination questions
			15.00-17.00	Oral "examination/discussion" on questions/BS, HT, EM

MSc course in Forest Production Systems

Week	Date	Location	Time	Activity (Teachers)
22	Mon, May 25			Introductory lecture, reading (TN)
	Tue, May 26			Lecture/reading (TN)
	Wed, May 27			Excursion (TN)
	Thu, May 28			Lecture/reading (TN)
	Fri, May 29			Student presentations (TN)

23	1-Jun – 4- Jun			Corrections of reports and reviews, ind. Studies for exam
	5-Jun	KB4C10	9.00-12.00	Written exam, all corrected final assignments