

## Second International Accelerator School for Linear Colliders – Curriculum (v.3.4, 10/08/2007)

October 1-10, 2007, Ettore Majorana Center, Erice (Sicily), Italy

### Daily Schedule

Breakfast	08:00 – 09:00
Morning	09:00 – 12:30, including ½-hour break (San Domenico)
Lunch	12:30 – 14:30
Afternoon	14:30 – 18:00, including ½-hour break (San Domenico)
Tutorial & homework	18:30 – 21:00 (San Francesco)
Dinner	21:00 –

### List of Courses

	Morning	Afternoon	Evening
October 1		<i>Arrival, registration</i>	<i>Reception</i>
October 2	Introduction	Sources & bunch compressors	Tutorial & homework
October 3	Damping ring I	Linac I	Tutorial & homework
October 4	Damping ring II	Linac II	Tutorial & homework
October 5	LLRF & high power RF	<i>Excursion</i>	Tutorial & homework;
October 6	Superconducting RF I	Beam delivery & beam-beam	Tutorial & homework
October 7	Superconducting RF II	Instrumentation & control I	Tutorial & homework
October 8	Instrumentation & control II; Operations	CLIC	Tutorial & homework
October 9	<i>Final exam</i>	Conventional facilities; Physics & detectors	<i>Banquet</i> <i>Student Award Ceremony</i>
October 10	<i>Departure</i>		

Program

	Tuesday, October 2	Wednesday, October 3	Thursday, October 4	Friday, October 5
Morning 09:00 – 12:30	<p><b>Opening remarks</b> (10)</p> <p><b>Lecture 1 – Introduction</b> (180) <b>Nick Walker</b> (DESY)</p> <ul style="list-style-type: none"> <li>• Why LC</li> <li>• What's ILC</li> <li>• Layout of ILC</li> <li>• Parameter choices &amp; optimization</li> <li>• Overview of accelerator issues</li> </ul>	<p><b>Lecture 3 – Damping ring I</b> (180) <b>Andy Wolski</b> (Univ. of Liverpool)</p> <ul style="list-style-type: none"> <li>• Role of damping rings</li> <li>• High-level overview of structure, and principles of operation</li> <li>• Review of basic linear beam dynamics</li> <li>• Damping ring lattice</li> <li>• Radiation damping (derivation of damping times, and the need for a damping wiggler in LC damping rings)</li> <li>• Quantum excitation and equilibrium beam emittances</li> </ul>	<p><b>Lecture 3 – Damping ring II</b> (180) <b>Andy Wolski</b> (Univ. of Liverpool)</p> <ul style="list-style-type: none"> <li>• Brief overview of technical systems</li> <li>• R&amp;D challenges for selected technical components <ul style="list-style-type: none"> <li>➢ injection/extraction kickers</li> <li>➢ damping wiggler</li> </ul> </li> <li>• Brief overview of beam dynamics issues</li> <li>• Selected beam dynamics issues <ul style="list-style-type: none"> <li>➢ impedance effects</li> <li>➢ electron cloud effects</li> </ul> </li> </ul>	<p><b>Lecture 5 – LLRF &amp; high power RF</b> (180) <b>Stefan Simrock</b> (DESY)</p> <ul style="list-style-type: none"> <li>• RF system overview</li> <li>• LLRF</li> <li>• Timing and synchronization</li> <li>• Modulators</li> <li>• Klystrons</li> <li>• RF distribution</li> </ul>
Afternoon 14:30 – 18:00	<p><b>Lecture 2 – Sources &amp; bunch compressors</b> (180) <b>Masao Kuriki</b> (KEK)</p> <ul style="list-style-type: none"> <li>• e- gun</li> <li>• e+ sources</li> <li>• Polarized sources</li> <li>• Bunch compressors</li> <li>• Spin rotator</li> </ul>	<p><b>Lecture 4 – Linac I</b> (180) <b>Peter Tenenbaum</b> (SLAC)</p> <ul style="list-style-type: none"> <li>• Tutorials of linac basics</li> <li>• Standing wave linacs and structures</li> <li>• SRF parameter constraints</li> <li>• Beam loading and coupling</li> <li>• Lorentz force detuning</li> </ul>	<p><b>Lecture 4 – Linac II</b> (180) <b>Peter Tenenbaum</b> (SLAC)</p> <ul style="list-style-type: none"> <li>• Linac lattice</li> <li>• Emittance preservation</li> <li>• RF field stability</li> <li>• Wakefield and dampers</li> <li>• HOMs</li> <li>• Alignment issues</li> <li>• Vibration issues</li> <li>• Beam based alignment</li> </ul>	<p><b>Excursion to Segesta</b> <b>(Bus leaving from Porta Trapani at 14:00)</b></p>
Evening 18:30 – 21:00	Tutorial & homework	Tutorial & homework	Tutorial & homework	Tutorial & homework

Program (cont'd)

	Saturday, October 6	Sunday, October 7	Monday, October 8	Tuesday, October 9
Morning 09:00 – 12:30	<b>Lecture 6 – Superconducting RF I</b> (180) <b>Kenji Saito</b> (KEK) <ul style="list-style-type: none"> <li>• Superconductivity basics</li> <li>• SRF specifics and constraints</li> <li>• Cavity design</li> <li>• Cryogenics</li> <li>• ILC cryomodules</li> </ul>	<b>Lecture 6 – Superconducting RF II</b> (180) <b>Kenji Saito</b> (KEK) <ul style="list-style-type: none"> <li>• Material issues</li> <li>• Cavity fabrication and tuning</li> <li>• Surface preparation</li> <li>• Gradient limit and spread</li> <li>• Power Coupler</li> <li>• HOM Couplers</li> <li>• Slow and fast tuner</li> <li>• ILC design</li> </ul>	<b>Lecture 8 – Instrumentation &amp; control II</b> (90) <b>Marc Ross</b> (Fermilab) <ul style="list-style-type: none"> <li>• Electronics</li> <li>• Data processing</li> </ul> <b>Lecture 9 – Operations</b> (90) <b>Marc Ross</b> (Fermilab) <ul style="list-style-type: none"> <li>• Reliability</li> <li>• Availability</li> <li>• Remote control and global network</li> </ul>	<b>08:00 – 12:30 Final exam</b> (270)
Afternoon 14:30 – 18:00	<b>Lecture 7 – Beam delivery &amp; beam-beam</b> (180) <b>Andrei Seryi</b> (SLAC) <ul style="list-style-type: none"> <li>• Overview</li> <li>• Beam-beam interaction and crossing angle</li> <li>• Collimation</li> <li>• Accelerator-detector interface, shielding and beam dump</li> <li>• Background and detector protection</li> <li>• Beam monitoring and control at final focus</li> </ul>	<b>Lecture 8 – Instrumentation &amp; control I</b> (180) <b>Marc Ross</b> (Fermilab) <ul style="list-style-type: none"> <li>• Beam monitoring</li> <li>• Precision instrumentation</li> <li>• Feedback systems</li> <li>• Energy stability</li> <li>• Orbit control</li> </ul>	<b>Lecture 10 – CLIC</b> (90) <b>Frank Tecker</b> (CERN) <ul style="list-style-type: none"> <li>• Room temperature RF cavities</li> <li>• CLIC design</li> <li>• Differences between CLIC and ILC</li> <li>• Challenges to CLIC</li> </ul> <b>Study time</b> (90)	<b>Lecture 11 – Conventional facilities</b> (90) <b>Atsushi Enomoto</b> (KEK) <ul style="list-style-type: none"> <li>• Overview</li> <li>• Tunneling</li> <li>• Site requirement</li> </ul> <b>Lecture 12 – Physics &amp; detectors</b> (90) <b>Jim Brau</b> (Univ. of Oregon) <ul style="list-style-type: none"> <li>• Tera scale physics</li> <li>• Physics beyond 1 TeV</li> <li>• ILC vs. LHC</li> <li>• Detectors</li> </ul>
Evening 18:30 – 21:00	Tutorial & homework	Tutorial & homework	Tutorial & homework	19:00 Banquet at Elimo Restaurant Student Award Ceremony

Notes to the Program:

1. Compared to the last LC school, one major change is that the number of lectures is reduced from 21 to 12. Each lecture will be covered by one lecturer.
2. Another change is the social time during/after dinner.
3. Total of 8 lecture days, Oct 2 – Oct 9, with one afternoon excursion/free. No hands-on courses this time (not because it is not desirable).
4. In order to reduce students' homework load, there will still be homework assignments, but no homework due for grade. Instead, there will be a final exam, and some of the exam problems are to be taken from the homework assignments. Lectures 11 and 12 take place after the final exam. So they do not take part in the exam. The exam papers will be graded right after the exam and results announced late afternoon on Oct. 9 at the Student Awards Ceremony.
5. During registration, each student will be assigned to a small group (1 or 2 people from each region). We will encourage students to do homework with their group. But we won't enforce it. We will also allow students to change group if they feel more comfortable.
6. Every day in the last hour of the homework time, some students or representatives of groups will be invited to the blackboard and demonstrate the solutions.
7. Lecturers should be strongly suggested to cover the basics as well as possible. Their teaching material should be made available (on-line) to the students well ahead of time (~ 1 month prior to the school).
8. Lecturers should be available in the evening of their lecture day during the tutorial & homework time.
9. Lecturers are responsible for the design of homework and exam problems as well as the answer sheet. They are also responsible for grading the exams.
10. The awards ceremony will honor top (~10) students based on their exams.