Seventh International Accelerator School for Linear Colliders – Curriculum (v.4, 11/27/2012)

November 27 – December 8, 2012, Radisson Blu Hotel, Indore, India

Hosted by Raja Ramanna Center for Advanced Technology (RRCAT)

Daily Schedule

Breakfast	07:30 – 09:00
Morning	09:00 – 12:30, including ½-hour break
Lunch	12:30 – 14:00
Afternoon	14:00 – 17:30, including ½-hour break
Dinner	18:00 – 19:00
Tutorial & Homework	19:00 – 22:00

List of Courses (black: required, red and blue: elective)

	Morning	Afternoon	Evening
November 27		*Arrival, Registration*	*Reception*
November 28	Inauguration & Introduction to Physics & Future Accelerators	ILC	Tutorial & Homework
November 29	CLIC	Muon Collider	Tutorial & Homework
November 30	Joint Lecture: Linac Basics	*Site visit & hands-on training at RRCAT*	Tutorial & Homework
December 1	Joint lecture: Beam Instrumentation	Course A: Accelerator Physics Course B: RF Technology	Tutorial & Homework
December 2	Course A: Accelerator Physics Course B: RF Technology		Tutorial & Homework
December 3	Course A: Accelerator Physics Course B: RF Technology		Tutorial & Homework
December 4	Course A: Accelerator Physics Course B: RF Technology	*Excursion*	Tutorial & Homework
December 5	Course A: Accelerator Physics Course B: RF Technology		Tutorial & Homework
December 6	Course A: Accelerator Physics Course B: RF Technology		Tutorial & Homework
December 7	Course A: Accelerator Physics Course B: RF Technology	*Study Time*	*Study Time*
December 8	Final Exam	*Free time*	*Banquet;* *Student Award Ceremony*
December 9	*Departure*		

Program

	Wednesday, November 28	Thursday, November 29	Friday, November 30	Saturday, December 1
Morning 09:00 – 12:30	**Inauguration** **Welcome** – **P D Gupta** *(RRCAT)* **Introduction** – **W. Chou** *(Fermilab)* **Lecture I1 – Introduction** (3 hrs) ***Kaoru Yokoya*** *(KEK)* • Tera scale physics • Overview of future accelerators for Tera scale physics (ILC, CLIC, muon collider, γγ collider, LEP-3, LHeC, new acceleration technologies)	**Lecture I3 – CLIC** (3 hrs) ***Frank Tecker*** *(CERN)* • Klystron vs. beam driven acceleration • CLIC layout • Parameter choices & optimization • Driver beam stability • Comparison of the CLIC and ILC • Technical challenges	**Joint Lecture AB1 – Linac Basics** (3 hrs) ***Daniel Schulte*** *(CERN)*	**Joint Lecture AB2 – Beam Instrumentation** (3 hrs) ***Hermann Schmickler*** *(CERN)*
Afternoon 14:00 – 17:30	**Lecture I2 – ILC** (3 hrs) • e- and e+ sources • Bunch compressors and spin rotators • Damping rings • Main linac • Beam delivery system • Civil construction issues	**Lecture I4 – Muon Collider** (3 hrs) • Muon collider basics • Machine layout • Major sub-systems • Challenges	• **Site visit at RRCAT** ***Satish Joshi*** *(RRCAT)* • **Hands-on Training** ***P R Hannurkar*** *(RRCAT)* 1. SRF cavity measurements 2. Characterization of RF components 3. Beam profile measurement	**Course A: Accelerator Physics** **Lecture A1 – Linac** (9 hrs) ***Daniel Schulte*** *(CERN)* **Course B: RF Technology** **Lecture B1 – Room Temperature RF** (12 hrs) ***Walter Wuensch*** *(CERN)*
Evening 19:00 – 22:00	Tutorial & Homework	Tutorial & Homework	Tutorial & Homework	Tutorial & Homework

Program (cont'd)

	Sunday, December 2	Monday, December 3	Tuesday, December 4	Wednesday, December 5
Morning 09:00 – 12:30	**Course A: Accelerator Physics** **Lecture A1 – Linac** (cont'd) ***Daniel Schulte*** *(CERN)* **Course B: RF Technology** **Lecture B1 – Room Temperature RF** (cont'd) ***Walter Wuensch*** *(CERN)*	**Course A: Accelerator Physics** **Lecture A1 – Linac** (cont'd) ***Daniel Schulte*** *(CERN)* **Course B: RF Technology** **Lecture B1 – Room Temperature RF** (cont'd) ***Walter Wuensch*** *(CERN)*	**Course A: Accelerator Physics** **Lecture A3 – Damping Rings and Ring Colliders** (12 hrs) **Course B: RF Technology** **Lecture B1 – Room Temperature RF** (cont'd) ***Walter Wuensch*** *(CERN)*	**Course A: Accelerator Physics** **Lecture A3 – Damping Rings and Ring Colliders** (cont'd) **Course B: RF Technology** **Lecture B3 – LLRF & High Power RF** (9 hrs)
Afternoon 14:00 – 17:30	**Course A: Accelerator Physics** **Lecture A2 – Sources** (6 hrs) **Course B: RF Technology** **Lecture B2 – Superconducting RF** (12 hrs)	**Course A: Accelerator Physics** **Lecture A2 – Sources** (cont'd) **Course B: RF Technology** **Lecture B2 – Superconducting RF** (cont'd)	**Excursion**	**Course A: Accelerator Physics** **Lecture A4 – Beam Delivery System and Beam-Beam** (6 hrs) **Course B: RF Technology** **Lecture B2 – Superconducting RF** (cont'd)
Evening 19:00 – 22:00	Tutorial & Homework	Tutorial & Homework	Tutorial & Homework	Tutorial & Homework

	Thursday, December 6	Friday, December 7	Saturday, December 8	Sunday, December 9
Morning 09:00 – 12:30	**Course A: Accelerator Physics** **Lecture A3 – Damping Rrings and Ring Colliders** (cont'd) **Course B: RF technology** **Lecture B3 – LLRF & High Power RF** (cont'd)	**Course A: Accelerator physics** **Lecture A3 – Damping Rrings and Ring Colliders** (cont'd) **Course B: RF technology** **Lecture B3 – LLRF & High Power RF** (cont'd)	**08:00 – 12:30 Final Exam** (4.5 hrs)	**Departure**
Afternoon 14:00 – 17:30	**Course A: Accelerator physics** **Lecture A4 – Beam delivery system and beam-beam** (cont'd) **Course B: RF Technology** **Lecture B2 – Superconducting RF** (cont'd)	**Study Time**	*Free Time*	
Evening 19:00 – 22:00	Tutorial & homework	**Study Time**	Banquet at 19:00; Student Award Ceremony	

Notes on the Program:

1. There are a total of 11 school days in this year's program, excluding the arrival day (November 27) and the departure day (December 9). The time is divided as follows: 2 days for required courses, 6-1/2 days for elective courses, 1/2 day for excursion, 1/2 day for site visit and hands-on training at RRCAT, 1/2 day for study time and a final examination day.
2. The required course consists of four lectures: Introduction, ILC, CLIC and the muon collider. Every student must take this course.
3. There are two elective courses: Course A (the red course) is accelerator physics, Course B (the blue course) is RF technology. They will run in parallel. Each student will choose one of these.
4. The accelerator physics course consists of lectures on four topics: (1) linac, (2) sources, (3) damping rings and ring colliders, and (4) beam delivery system and beam-beam effects.
5. The RF technology course consists of lectures on three topics: (1) room temperature RF, (2) superconducting RF, and (3) LLRF and high power RF.
6. There is a half-day joint lecture on linac basics and another half-day joint lecture on beam instrumentation for all students.
7. The hands-on training in the afternoon of December 1 consists of three experiments: (1) SRF cavity measurements, (2) characterization of RF components, and (3) beam profile measurement. Due to time limitation, each student will choose two experiments for the training.
8. There will be homework assignments, but homework is not counted in the grade. There will be a final examination. Some of the exam problems will be taken from variations of the homework assignments. The exam papers will be graded immediately after the exam and results announced in the evening of December 8 at the student award ceremony.
9. There is a tutorial and homework period every evening. It is part of the curriculum and students are required to attend. Lecturers will be available in the evening of their lecture day during this period.
10. Lecturers have been asked to cover the basics as well as possible. Their teaching material will be made available online to the students well ahead of time (a few weeks prior to the school). Students are strongly encouraged to study this material prior to the beginning of the school.
11. Lecturers of the elective courses are required to provide lecture syllabus as soon as possible in order to help students make their selection.
12. All 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.
13. The award ceremony will honor the top (~10) students based on their exam scores.