Basic Accelerator Theory for Medical Physics Students

6 hrs lectures
2 hrs labs

Lesson	Topic	Duration	Labs & Procedures			
Electron Beams	Electron Path Through the Medical Linac	75 minute lecture	Lab 4	Lab 5	Lab 7	
	Gun Emision - Thermionic Emission					
	Gun Emision - Dispenser Cathodes					
	Gun Emision - Thermionic Diode					
	Gun Emision - Diode electrical characteristics					
Accelerator Waveguides	Direct Acceleration	75 minute lecture	Lab 14	Lab 15	Procedure 2	Procedure 3
	Serries Adding of electron energy					
	Waveguides					
	Phase Velocity and guide wavelength					
	Acceleration timing					
Photon Beams 1	Thick target spectrum	75 minute lecture				
	Beam quality specification					
	Bremsstrahlung directional dependance					
	Bremsstrahlung production efficiency					
Photon Beams 2	Bremsstrahlung in Simac	75 minute lecture	Lab 6			
	Results of bremssrahlung calculations in Simac					
Medical linac configuration	Medical Linac configurations - Accelerator with 270° bend magnet	75 minute lecture				
	Medical Linac configurations - Travelling Wave Accelerator with "Flight Path"					
	Medical Linac configurations - In-line accelerators					
	Medical Linac configurations - Differences between Elekta and Varian Linacs					
	Medical Linac configurations - In-line linac features					

Quality Assurance of Linear Accelerators for Medical Physics Residents 6 hrs lectures
4 hrs labs

Lesson	Topic	Duration	labs		
Photon Beams	Beam Flattening Energy dependence of beam flattening and beam flatness Beam Symmetry	60 minute lecture	Procedure 6	Lab 20	Lab 27
Medical linac configuration	Treatment head configuration - photon & electron modes Treatment head configuration - Comparison of treatment head organisation Treatment head configuration - Geometric penumbra Treatment head configuration - Transmission penumbra	60 minute lecture	Procedure 6		
Beam Steering	Beam symmetry - Varian steering system Elekta beam steering system	60 minute lecture	Lab 17	Lab 18	
Beam Dosimetry & PRF- 1	Ion Chambers in medical linacs Ion chamber current collection	60 minute lecture			
Beam Dosimetry & PRF- 2	Linac calibration	120 minute lecture	Lab 21	TG51 simulator	

Maintenance of Linear Accelerators for Medical Physicists 7.5 hrs lectures
12 hrs labs

Lesson	Topic	Duration	labs				
Accelerator Waveguides	Review accelerator waveguides Wave impedance Real Accelerator Structures Standing Wave and Travelling Wave acceleratting waveguides Energy Switch	60 minute lecture	Lab 14	Lab 15	Procedure 4	Procedure 5	Lab 16
Electron Beams	Gun Emision - Gun Current control	30 minute lecture	Lab 13				
Medical Linac configuration	Linac Mode Configuration - Rotating method of positioning treatment head components Linac Mode Configuration - linear Linac Mode Configuration - Mode control	60 minute lecture	Lab 22	Lab 23	Lab 24	Lab 25	
Beam Steering	Beam symmetry - Symmetry Interlock	30 minute lecture					
Klystrons	Klystron Overview Description of klystron model of operation Magnetic focussing	60 minute lecture	Lab 2	Lab 3	Lab 19	Procedure 7	Procedure 9
Magnetron	Mode of oscillation Resonant modes magnetron cathode Bunch formation in rotational mode Magnetron operating values - performance chart Magnetron operating values - magnetron impedance matching and load matching	60 minute lecture	lab 11	Procedure 8			
Modulator	Resonant charging Pulse forming network Thyratron switch	60 minute lecture	Lab 9	Lab 10	Lab 26		
	Pulse timing for an accelerator with triode gun and klystron RF source	60 minute					

Waveforms	Pulse timing for a travelling wave, diode gun wit magnetron sourse	60 minute lecture	Lab 12				
	Pulsed nature of the linear accelerator						
Beam Dosimetry & PRF	Dose rate control	30 minute lecture					
	Dose rate servo						