Linac Professional Education Platform Contents

1. **Access to radiotherapy content library**
    - Medical Physics textbook (contents below)
    - Physics Quality Assurance textbook (contents below)
    - Service Technician textbook (contents below)
    - Quizzes for each chapter
2. **Access to SIMAC**
    - clinical medial linear accelerator simulator for both Klystron and magnetron based linacs.
3. **Classroom platform to monitor and teach material**
    - Student access management
    - Grading features
    - Transcript records
4. **SIMAC Labs**
    - Labs on clinical medical linear accelerator procedures

Physics Textbook

-Ion Chambers in Medical Linacs
-Ion chamber current collection
-Linac Calibration
-Dose Rate Control
-Dose rate servo

Chapter 7: Klystrons

-Microwave power sources for medical linear accelerators
-Klystron overview
-Description of the klystron's mode of operation
-Bunching process
-Klystron saturation
-Klystron Modelling
-Magnetic focusing
-Klystron construction

Chapter 8: Magnetrons

-Mode of Oscillation
-Magnetron anode and RF
-Resonant modes
-Mode separation
-Magnetron cathode
-Bunch formation in rotational motion
-Output coupler and frequency tuning
-Magnetron operating values

Chapter 9: Modulators

-Resonant Charging
-Pulse Forming Network (PFN)
-Thyratron switch
-PFN Discharge
-Pulse transformer
-Pulse noise

Chapter 10: Waveforms

-Pulse timing in a medical linear accelerator
-Pulsed nature of the linear accelerator
-Relationship between gun injection, reflected RF power, and beam output

Physics Quality Assurance Textbook

Service Technician Textbook

-Linac Calibration
-Dose Rate Control
-Dose Rate Servo

Chapter 7: Carousel
-Mechanical Makeup of the Carrousel
-Flattening Filters

Chapter 8: Collimator
-The Collimator Jaws and Light Field
-The Multi-Leaf Collimator (MLC)

Chapter 9: Klystron
-Microwave Power Sources for Medical Linear Accelerators
-Klystron Overview
-Description of the Klystron's Mode of Operation
-Bunching Process
-Klystron Saturation
-Magnetic Focusing
-Klystron Construction

Chapter 10: Magnetron
-Power Sources
-Mode of Oscillation
-Magnetron Anode and RF
-Resonant Modes
-Filament heater cutback
-Bunch Formation in Rotational Mode
-Output Coupler and Frequency Tuning
-Magnetron Operating Values

Chapter 11: Modulators
-PFN Discharge
-PFN Charging
-Thyratron Switch
-Pulse Transformer
-Modulator Module Preventative Maintenance

Chapter 12: Safety Theory
-Safety Concepts
-Systems
-STAMP

Chapter 13: Linac Hazards
-Disabling linac operation when servicing
-Transmission waveguide
-Presence of other hazardous materials in the linear accelerator - Material Safety Data Sheets
-Ozone
-Mechanical hazards in medical linear accelerators
-Electric Shock Hazard

-Microwave Tube Operating Hazards
-High Temperature Surfaces
-Laser Beams
-Other safety areas

Chapter 14: Linac Incidents

-Incident at Białystok, Poland
-Incident at Zaragoza, Spain
-Therac 25 accidents
-Varian Symmetry Recall

Chapter 15: Interlocks

-Case Study 1: Therac 25
-Case Study 2: Spain Incident
-Case Study 3: Poland Incident
-Varian Interlock Upgrade
-Interlocks & Safety Systems Summary

Chapter 16: Waveforms and Numbers

-Pulse timing in a medical linear accelerator
-Pulsed nature of the linear accelerator
-RF Reflected pulse
-Typical values, and the use of preventative maintenance

Chapter 17: Heat Management

-Sources of heat in medical linacs
-Water cooling
-Cooling circuits for two accelerator configurations
-Accelerator temperature control

Chapter 18: AFC

-Principles of an Automatic Frequency Control system
-AFC systems for linear accelerator frequency control
-AFC components

Chapter 19: Preventive Maintenance

-Scheduling
-Downtime Reduction

Chapter 20: Corrective Maintenance

-Service request Process
-Site Preparation
-Trouble Shooting
-Repairs
-Commissioning and Decommissioning
-Maintenance Management
-Parts
-Waste Disposal

SIMAC Labs

SIMAC Version 1 Labs:

-Beam Loading
-Energy Correction with Bending Magnet
-Flattening Filters
-Beam Steering Part 1
-Beam Steering Part 2
-Adjusting the RF Driver
-Adjusting the Klystron Pulse Voltage
-Beam Finding

SIMAC Version 2 Labs:

-The PFN charging cycle
-The de spiking circuit
-Magnetron output power
-RF reflected pulse
-Electron Gun
-Beam loading for travelling wave accelerator with diode gun
-Beam loading for standing wave accelerator with triode gun
-RF feedback phase adjustment for travelling wave accelerator
-Steering for 270 degree bend magnet
-Steering for slalom style bending magnet
-270 degree bending magnet
-Slalom style bending magnet
-Klystron pulse voltage
-Electron beam angle of incidence on target
-Effect of feedback loop on travelling wave load line
-Effect of energy switch on load line for a standing wave accelerator