Indian Bio-Medical Skills Consortium

IBSC Modules

Sl No	Subject
1	Anatomy and Physiology
2	Fundamentals of Electricity and Electronics
3	Healthcare Technology Function and Operation
4	Healthcare Technology Problem Solving and Troubleshooting
5	Healthcare Information Technology
6	Healthcare Technology Management
7	Healthcare Safety & Standards
8	NABH & NABL Accreditation
9	Product Development, Testing, Evaluation, & Modification
10	Medical Terminology for Engineers
11	Risk Management / Safety
12	Radiation Safety
13	Medical Device Regulatory
14	Facilities / General Management
15	Service Delivery Management

Detail Course Content

1. **Anatomy & Physiology**	2. **Fundamentals of Electricity and Electronics**
1. The Human Body: An Orientation 2. Cells and Tissues 3. Skin and Body Membranes 4. Hematological System 5. Eye, Ear and Endocrine System 6. Skeletal and Muscular System 7. Nervous System 8. Cardiovascular System 9. Respiratory System 10. Digestive, Excretory & Reproductive System	1. Transducers 2. Calculations and Conversions 3. Active & Passive Devices, Solid State Devices, (Analog & Digital) 4. Circuits & Components 5. Oscillators 6. CRTs, X-Ray tubes, Photomultipliers 7. AC Power 8. Display devices. 9. Test Equipment 10. Power Distribution & Storage Systems
3. Healthcare Technology and Function	**4. Healthcare Technology Problem Solving & Troubleshooting**
1. Understand physiological concepts as applicable to healthcare technology (e.g., PEEP sphygmomanometer, manometer, Korotkoff sounds, Einthoven's triangle, 10-20-10 EEG pattern).	1. Identify and resolve fault conditions of modules/subsystems including power supplies. 2. Prioritize repairs of medical devices based on level of risk and/or urgency.

2. Understand normal function, use, and underlying technology of test equipment (electrical safety analyzer, defibrillator analyzer, electro surgical analyzer, physiologic simulators, DVM, meters). 3. Understand normal function and underlying technology of monitoring systems (e.g., EtCO2, ECG, EEG, non-invasive blood pressure, invasive blood pressure, pulse oximetry, fetal monitor, respiration). 4. Understand normal function and underlying technology of laboratory equipment (e.g., centrifuges, water baths, analyzers, cryostats, microtomes). 5. Understand normal function and underlying technology of imaging devices (e.g., Ultrasound, Radiographic / Fluoroscopy). 6. Understand normal function and underlying technology of diagnostic equipment (e.g., otoscope, ophthalmoscope, audiometer, uroflow meter). 7. Understand normal function and underlying technology of infusion equipment (e.g., feeding pumps, infusion devices, syringe pumps, PCA pumps). 8. Understand normal function and underlying technology of life support equipment (e.g., defibrillators, anesthesia machines, ventilators, balloon pumps, external pacemakers). 9. Understand normal function and underlying technology of therapeutic equipment (e.g., infant warmers, ultrasound therapy, hypo/hyperthermia, aspirators, SCD, Bilirubin light).	3. Differentiate between a device error and a use error (User Training, Applications) to determine appropriate action. 4. Differentiate between an issue with a localized monitoring device on a network and a system-wide problem. 5. Identify the fault conditions and apply appropriate corrective action for monitoring systems (EtCO2, ECG, EEG, non-invasive blood pressure, invasive blood pressure, pulse oximetry, fetal monitor, respiration). 6. Identify the fault conditions and apply appropriate corrective action for laboratory equipment (Centrifuges, Water Baths, Analyzers, cryostats, microtomes). 7. Identify the fault conditions and apply appropriate corrective action for diagnostic equipment (otoscope, ophthalmoscope, audiometer, uroflow meter). 8. Identify the fault conditions and apply appropriate corrective action for infusion equipment (feeding pumps, infusion devices, syringe pumps, PCA pumps). 9. Identify the fault conditions and apply appropriate corrective action for therapeutic equipment (infant warmers, ultrasound therapy, hypo/hyperthermia, aspirators, SCD, Bilirubin light, defibrillators, external pacemakers). 10. Identify the fault conditions and apply appropriate corrective action for operating room equipment (electro surgical generators, video equipment, tourniquets, sterilizers, warmers).

10. Understand normal function and underlying technology of operating room equipment (e.g., electro surgical generators, video equipment, lasers, tourniquets, sterilizers, warmers).	
5. Healthcare Information Technology	**6. Healthcare Technology Management**
A. Foundations 1. Hardware a. Topology b. PCs / Laptops / Servers c. Wiring / Structured Cabling / Connectors d. Switches / Hubs / Routers e. Wireless Communications 2. Software / Middleware / Applications a. EMR/EHR b. Healthcare Information Systems (PACs, LIS, RIS) c. Network Protocols (IP, CCP, UDP) d. Operating Systems B. Function and Operation 1. Hardware a. PCs, Switches, Patch Panels b. Networks, Topology c. Peripherals 2. Integration a. Bedside Medical Device Integration (BMDI) b. Medical Device Integration (MDI) (Labs, Printers, etc.) c. Mobile Devices (Handhelds, Smart Phones, Tablets, etc.) 3. Test Equipment a. Cable Test Devices (Copper, Fiber) b. Network Test Devices 4. Security C. Problem Solving 1. Computer Networks 2. Integration 3. PCs, Switches, Hubs	1. Product Selection / Vendor Selection a. Technology Assessment b. Healthcare Technology Strategic Planning 2. Project Management a. Capital Planning b. Return on Investment (ROI) Analysis 3. Life Cycle Analysis 4. Usability/Compatibility Assessment a. Device/System Upgrade Planning b. Clinical Device Use and/or Application 5. Device Integration Planning a. Clinical Systems Networking 6. Coordinating Device Interoperability / Interfacing 7. EMI/RFI Management a. Quality Management b. Pre-clinical Procedure Set-up / Testing c. Clinical Trials Management (Non-investigational) d. Participation in Clinical Procedures (e.g., surgery) 8. Interpretation of Codes and Standards 9. Other Technology Management Responsibilities

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7. Healthcare Safety & Standards	8. NABH & NABL Accreditation
1. Electrical – Micro / Marco-shock, Electrical Safety Testing 2. Chemical - Material Safety Data Sheet 3. Biological - Universal Precautions 4. Fire (Class, Fire Extinguishers) 5. Regulations, Codes and Standards (CSA Standards, Electromedical, Laser Safety, Low Pressure Connecting Assemblies (Medical Gases), Stability and Transport) 6. Biomedical Waste Management i) Non-Hazardous ii) Hazardous (Radioactive waste, Discarded Glass, pressurized Containers, Chemical Waste, Cytotoxic Waste, Plastic Disposables, Liquid Wastes)	1. Access, Assessment & Continuity of Care (AAC), & Management of Medication (MOM) For NABH 2. Care of Patients (COP) For NABH 3. Patient Rights & Education (PRE), Responsibilities Management (ROM), Human Resource Management (HRM) for NABH 4. Hospital Infection Control (HIC), Continuous Quality Improvement (CQI) for NABH 5. Facility management & Safety (FMS), Information Management System (IMS) For HABH. 6. Documentation Requirements & Implementation Guidelines for NABH & NABL 7. Accreditation Process of NABH & NABL 8. Accreditation criteria & their interpretations for NABH 9. Accreditation and International perspective of NABL 10. Final Assessment of NABL & NABH
9. Product Development, Testing, Evaluation, & Regulatory Compliance	**10. Medical Terminology for Engineers**
1. Regulatory Compliance Activities 2. New Product Testing & Evaluation 3. Documentation Development / Management. 4. Human Factors Engineering 5. Product / Systems Quality Management 6. Device Modifications 7. Medical Device Design 8. Product Research and Development 9. Medical Device Concept Development / Invention 10. Other Product Development Responsibilities 11. Product Sales / Sales Support	1. Disease and Treatment 2. Circulation, Blood and Immunity 3. Respiration and Digestion 4. Urinary and Male Reproductive System 5. Female Reproductive System, Pregnancy and Birth 6. Endocrine and Nervous Systems, Behavioral Disorders 7. The Senses 8. The Skeleton and Muscular Systems 9. The Skin
11. Risk Management / Safety	**12. Radiation Safety**

1. Patient Safety 2. Product Safety / Hazard Alerts / Recalls 3. Incident / Untoward Event Investigation 4. Engineering Assessment of Medical Device Failures 5. Root Cause Analysis 6. Medical Device Incident Reporting 7. Infection Control 8. Failure Mode and Effect Analysis 9. Hazardous Materials 10. Other Risk Management / Safety Responsibilities	12. X-Ray Equipment and Production 13. Radiation Units for Measurement of Radioisotopes 14. Radiation Units for Measurement of Ionizing Radiation 15. Personal Maximum Permissible Doses 16. Proposed I.C.R.P. New Maximum Permissible Doses 17. Radiation Detection and Monitoring 18. Basic Principles of Radiation Protection 19. Leak Test and Storage of Radiographic Exposure Devices 20. Biological Effects of Ionizing Radiation 21. Nuclear Regulatory Commission Regulations 22. Documentation and Record Keeping 23. Transportation of Radioactive Material
13. Medical Device Regulatory	**14. Facilities / General Management**
1. Medical Devices, In –vitro devices, Biologics & Combination Products: Introductory Module 2. FDA Regulations and Guidelines on Medical Devices 3. European Union Regulatory Guidelines on Medical Devices 4. Medical Device Regulations from Indian perspective 5. Management of the risks associated with Medical devices 6. Biocompatibility Studies and Medical Devices 7. Clinical Trials: Medical Devices 8. Overview of In – Vitro Device Regulation 9. Overview of Combination Products Regulation 10. Dossier preparation in CTD format, eCTD submissions	1. Hospital Building plan Review and Hospital building design 2. Emergency Electrical Power and Medical Gas system testing 3. Facility emergency preparedness activities 4. Supervise Manage / Direct Facilities Management and facility / Utility Remediation planning, other facility Management Responsibilities. 5. Budget develop / Execution, Business, / Operation, Plan development, / Management. Committee Management, Performance Improvement. 6. Personnel Management / Supervision, Staffing, Staff skills, Competency assessment, Policy, / Procedure management, / Development.
15. Service Delivery Management	
1. Technician / Service Supervision 2. Equipment Repair and Maintenance	

3. Equipment Acceptance 4. Service Contract Management 5. Equipment Performance Testing 6. Maintenance Software Administration 7. Develop Test/Calibration/Maintenance Procedures 8. Parts/Supplies Purchase and/or Inventory Management 9. Other Service Delivery Responsibilities. 10. Technical Library / Service Manuals Management	