PH.D. PRE-COURSE WORK EXAMINATION SYLLABUS

Paper II: Recent Advances in Critical Care Technology

Sr. No.	Topic	Details	Hours
1	Advanced Mechanical Ventilation	- Adaptive support ventilation (ASV) - Neurally adjusted ventilatory assist (NAVA) - Automated weaning protocols - High-frequency oscillatory ventilation advancements	3
2	Extracorporeal Life Support	- VV and VA ECMO: latest technologies and management - ECCO2R techniques and applications - Anticoagulation strategies in ECLS - Molecular Adsorbent Recirculating System (MARS)	3
3	Hemodynamic Monitoring	- Pulse contour analysis and thermodilution techniques - Echocardiography in critical care: advanced applications - Microcirculation assessment technologies - Non-invasive cardiac output monitoring	3
4	Neuromonitoring in ICU	- Multimodal monitoring in traumatic brain injury - Advanced EEG monitoring and seizure detection - Cerebral microdialysis techniques - Optic nerve sheath diameter assessment	3
5	Renal Replacement Therapies	- Continuous renal replacement therapy innovations - Hybrid therapies: CRRT with adsorption - Bioartificial kidney developments - Fluid overload management technologies	3
6	Sepsis Management Technologies	- Rapid diagnostic techniques for pathogen identification - Endotoxin removal devices - Immunomodulation therapies - AI-driven sepsis prediction and management	3
7	Advanced Monitoring Systems	- Wireless patient monitoring - Predictive analytics for patient deterioration - Integration of multi-parameter data	3

Sr. No.	Topic	Details	Hours
		- Closed-loop systems in critical care	
8	Nutrition Support Technologies	- Indirect calorimetry advancements - Smart enteral feeding systems - Automated parenteral nutrition compounding - Microbiome modulation in critical illness	3
9	Point-of-Care Diagnostics	- Ultrasound technologies in critical care - Rapid molecular diagnostic platforms - Advanced blood gas analysis systems - Continuous glucose monitoring in ICU	3
10	Telemedicine in Critical Care	- Tele-ICU models and implementation - Remote patient monitoring technologies - AI-assisted alerting systems - Virtual reality applications in ICU	3
11	Organ-Specific Support Technologies	- Ventricular assist devices and artificial hearts - Extracorporeal liver support systems - Artificial lung technologies - Brain-computer interfaces in neurocritical care	3
12	Emerging Technologies in Critical Care	- 3D printing applications in ICU - Nanotechnology in critical care medicine - Robotic systems for patient care and rehabilitation - Biosensors and smart materials in ICU	3

Total Hours: 36