

Ph.D. PRE-COURSE WORK EXAMINATION SYLLABUS

Paper II: Recent Advances in Dialysis Technology

Sr. No.	Topic	Details	Hours
1	Advanced Hemodialysis Techniques	<ul style="list-style-type: none"> - High-flux dialysis and hemodiafiltration - Expanded hemodialysis (HDx) with medium cut-off membranes - Nocturnal hemodialysis and short daily dialysis - Advances in home hemodialysis technology 	3
2	Innovations in Dialysis Membranes	<ul style="list-style-type: none"> - Biocompatible membrane materials - Nanotechnology in dialysis membrane design - Protein-leaking membranes and their applications - Functionalized membranes for specific toxin removal 	3
3	Vascular Access Technologies	<ul style="list-style-type: none"> - Advanced grafts and catheter materials - Endovascular techniques for access management - Vascular access surveillance systems - Novel approaches to reduce access-related infections 	3
4	Peritoneal Dialysis Advancements	<ul style="list-style-type: none"> - Automated peritoneal dialysis systems - Remote monitoring in PD - Biocompatible PD solutions and novel osmotic agents - Wearable artificial kidney concepts for PD 	3
5	Extracorporeal Blood Purification	<ul style="list-style-type: none"> - Continuous renal replacement therapy (CRRT) innovations 	3

Sr. No.	Topic	Details	Hours
		<ul style="list-style-type: none"> - Plasma exchange and immunoadsorption techniques - Liver support systems: MARS, Prometheus - Extracorporeal CO2 removal in conjunction with RRT 	
6	Fluid Management Strategies	<ul style="list-style-type: none"> - Bioimpedance analysis for dry weight assessment - Ultrafiltration profiling and sodium modeling - Volume assessment using lung ultrasound - Wearable devices for fluid status monitoring 	3
7	Dialysis Water Treatment	<ul style="list-style-type: none"> - Advances in reverse osmosis technology - Ultrapure dialysate production systems - Online monitoring of water quality - Portable water treatment systems for home hemodialysis 	3
8	Anticoagulation in Dialysis	<ul style="list-style-type: none"> - Regional citrate anticoagulation protocols - Heparin-free dialysis techniques - Novel anticoagulants in hemodialysis - Monitoring and management of anticoagulation in dialysis 	3
9	Dialysis Adequacy and Kinetic Modeling	<ul style="list-style-type: none"> - Online clearance monitoring systems - Advanced urea kinetic modeling - Middle molecule clearance assessment - Personalized dialysis prescription using AI algorithms 	3

10	Bone and Mineral Metabolism Management	<ul style="list-style-type: none"> - Novel phosphate binders and calcimimetics - Vitamin D analogs and PTH management - Various molecular markers of MRD in CKD - Advances in diagnosing and treating adynamic bone disease 	3
11	Cardiovascular Complications in Dialysis	<ul style="list-style-type: none"> - Intradialytic hypotension prevention strategies - Sudden cardiac death risk assessment and prevention - Management of atrial fibrillation in dialysis patients - Novel approaches to vascular calcification 	3
12	Artificial Intelligence in Dialysis	<ul style="list-style-type: none"> - Predictive models for AKI and CKD progression - Machine learning for dialysis prescription optimization - AI-assisted vascular access monitoring - Big data analytics in dialysis outcomes research 	3

Total Hours: 36