Advanced Fluid Mechanics Qualifying exam Syllabus

Chapter	Topics
1	Introduction to the Continuum Fluid, flow characteristics, Understanding the role of the material derivative in transforming between Lagrangian and Eulerian description Understanding the usefulness of the Reynolds Transport Theorem (RTT).
2	Basic Equation of fluid mechanics, Stream functions in three different coordinates, Continuity, Energy and Bernoulli equations.
3	Basic principles of momentum balance, The Navier -Stokes Equations and Constitutive equations, Creeping Bidirectional Flows, Non-Newtonian fluid and role of rheology in fluid mechanic
4	Multi-dimensional and unsteady fluid flow, Stokes equation, Fluid flow in non-circular ducts.
5	Inviscid flow, Euler equation, Potential flow theory and vorticity, sink and sources, Vortex.
6	Boundary layer theory Application to external flow, Summary of Boundary Layer Equations for Steady Laminar flow, Laminar Boundary Layer Flow over Semi-infinite Flat, Applications: Blasius Solution, Falkner-Skan Flow Over a Wedge and Scaling.
7	Approximate Solutions: The integral Method, Integral formulation of the basic laws and Von Karman equation.
8	Turbulent flow, Turbulent flow Models and their applications $(k - \varepsilon)$ and $(k - \omega)$ models.