Syllabus

Introductory motion:

- Physical dimension;
- streamlines and path lines;
- hydrodynamic pressure;
- Bernoulli's theorem;
- adiabatic expansion.

Equation of motion:

- Equation of continuity;
- equation of motion of inviscid liquid and Bernoulli's equation;
- steady motion and conservative forces;
- circulation and Kelvin's theorem;
- vorticity;
- irrotational motion and velocity potential;
- the energy equation;
- kinetic energy and Kelvin's minimum energy theorem.

Two-dimensional motions:

- Rate of change of vorticity;
- stream function and pressure equation;
- streaming motions;
- complex potential and complex velocity;
- stagnation points;
- circle theorem;
- motion past a cylinder;
- Joukowaski transformation;
- Blasius theorem.

Two-dimensional source and sink:

- Doublets;
- combination of source and stream;
- source and sink of equal strength;
- source and sink in a stream;
- the method of image;
- source outside a cylinder.

Vortex motions:

- Vortex lines;
- tubes and filaments;
- rectilinear vortex;
- circular vortex;
- and vortex doublets;
- kinetic energy of a system of vortices;
- vortex in or outside of a circular cylinder;
- vortex sheet;
- single infinite row of vortices and Karman's vortex street.

Three-dimensional motions:

- Three dimensional axi-symmetric motions and Stoke's stream function;
- three-dimensional sources in a uniform stream;
- Butler's sphere theorem;
- sphere in a stream and moving cylinders.

Hydrodynamic waves:

- Mode of energy transmission;
- mathematical representation of wave motion and conditions at the free surface;
- surface waves;
- speed of propagation and wave length;
- progressive and standing waves;
- kinetic energy of waves; group velocity and wave at interface.