

**145. Fluid Dynamics (3)**

Prerequisite: Engr 70, 165, Math 81. Stream function, velocity potential function, conformal transformation with applications to engineering problems.

**150. Magnetic and Electric Circuits (3)**

Prerequisite: Physics 4B, Math 77 (or concurrently). Fundamentals of magnetic circuits; basic laws of direct-current and of single and polyphase alternating-current circuits; transient phenomena in simple circuits; principles of electrical instruments.

**150L. Magnetic and Electric Circuits Laboratory (1)**

Use of electrical instruments; experiments and computations on magnetic, direct- and alternating-current circuits, single and polyphase, and on transient phenomena in simple circuits. (3 lab hours)

**151. Electrical Machinery (3)**

Prerequisite: Engr 150, 150L. Principles of direct- and alternating-current machinery and of other energy-conversion devices and associated apparatus.

**151L. Electrical Machinery Laboratory (1)**

Experiments and computations on direct- and alternating-current machinery and on other energy-conversion devices and associated apparatus. (3 lab hours)

**152. Electrical Circuit Analysis (3)**

Prerequisite: Engr 150, 150L; Math 81. Complex circuits, locus diagrams, network theorems, coupled circuits, nonlinear circuit elements, non-sinusoidal waves, pulses, transients, unbalanced three-phase circuits, symmetrical components, synthesis and design of circuits; applications of matrix algebra, Fourier series and integral, Laplace transforms.

**152L. Electrical Circuit Analysis Laboratory (1)**

Experiments and computations on networks, bridge circuits, coupled circuits, non-sinusoidal waves, pulses, transients, unbalanced three-phase circuits, and symmetrical components; experimental data analyzed according to modern data-analysis techniques. (3 lab hours; field trips)

**153. Electrical Transmission (3)**

Prerequisite: Engr 152, 152L, 155, 155L. Principles of transmission of electrical energy over wires at power and communication frequencies and through wave guides and space at ultra-high frequencies; filter circuits; design of transmission systems.

**153L. Electrical Transmission Laboratory (1)**

Experiments and computations involving electrical transmission of energy, including filter circuits. (3 lab hours; field trips)

**155. Electric and Magnetic Fields (3)**

Prerequisite: Engr 150, 150L, Math 81. Advanced topics in electricity and magnetism; fields and waves; emphasis on applications to engineering.

**155L. Electric and Magnetic Fields Laboratory (1)**

Advanced experiments and computations in electricity, magnetism, and in electro-magnetic fields and waves. (3 lab hours; field trips)

**156. Electronics (2)**

Prerequisite: Engr 150, 150L. Electron tube and semiconductor electronics; introduction to basic systems; engineering applications and considerations.

**156L. Electronics Laboratory (1)**

Laboratory experiments in electronics; engineering applications. (3 lab hours)