

Electrical systems and networks

The discipline includes three credit modules: parameters of electrical networks and systems; modes of operation of open and closed electrical networks; course project on "Design of district electric network with a voltage of 110 kV".

The first module includes 6 content modules: basic concepts of electrical networks and systems; designs, characteristics, schemes of replacement of the simplest electric networks; parameters of schemes of replacement of elements of electric networks and their calculation; basic concepts of active and reactive energy sources; basic concepts of electricity consumers and their characteristics; power losses in the electrical network.

The second module includes 6 content modules: modes of operation of the power system; calculation schemes for the replacement of electrical systems; calculation of steady modes of operation of open electrical networks; calculation of steady modes of operation of closed electrical networks; equivalent transformation of calculation schemes of electric networks; calculation of steady modes of large power systems.

Mathematical Apparatus of Artificial Intelligence in Power Systems

The discipline includes 8 content modules: The main prerequisites for the formation of an innovative concept of electricity development; Artificial intelligence and methods and technologies of its creation; Classical control methods in power systems; Mathematical apparatus of fuzzy logic and its use in electric power problems; Practical implementation of a system with elements of artificial intelligence based on fuzzy logic controllers; Fuzzy cluster data analysis; Artificial neural networks and their models; Optimization of parameters of electric power systems on the basis of the mathematical apparatus of genetic algorithms.

Methods of organizing of flexible electrical systems

Methods of increasing the controllability of power systems, increasing the capacity of electrical networks and reducing electricity losses during transportation in electrical networks are studied. Reactive and active power flow control devices for voltage regulation on high-voltage alternating current lines (flexible alternating current transmission system FACTS) are considered.

The discipline includes 6 content modules: the urgency of the problem of improving the quality of electricity; general characteristics of devices of flexible electric power systems of alternating current; prospects and capabilities of FACTS technology in the tasks of power system control; basic devices of flexible power systems; power electronics in FACTS systems; simulation of ees with STATCOM during transients.