

Echipamente electrice I

Electrical Equipment I

Obiectiv principal

Disciplina are ca obiectiv prezentarea bazelor teoretice de functionare a echipamentelor electrice privind regimurile tranzitorii, regimuri termice, electrodinamice si izolatia echipamentelor electrice

Course Objective

The discipline purpose is presenting the theoretical basics of electrical equipments functioning , regarding the transient regimes, thermal regimes, electrodynamics and insulation of electrical equipment

Curs

3 ore/săptămână, total 42 ore

Course

3 hours weekly, 42 hours total

Echipamente electrice.

- Oportunitate. Definitii.
- Clasificare. Parametrii. Regimuri de functionare
- Solicitari termice, dielectrice, electrodinamice si de

mediu.

Comutatia circuitelor electrice.Procese tranzitorii.

- Conectarea circuitelor RL, RC, RLC tensiune continua
- si alternativa.
- Deconectarea circuitelor electrice. Tensiunea tranzitorie de restabilire. Parametrii TTR.
- Deconectarea scurtcircuitelor trifazate.
- Deconectarea a curentilor mici inductivi si capacitivi.
- Deconectarea liniei lungi, defectul kilometric.
- Deconectarea opoziției de fază

Forțe electrodinamice.

- Forțe în circuite filiforme coplanare.
- Forțe în circuite in curent alternativ monofazat si trifazat. Regim permanent si tranzitoriu. Stabilitatea electrodinamica a circuitelor electrice.
- Forțe în bare ecranate; Stabilitatea electrodinamica

Regimul termic al echipamentelor electrice

- Surse de caldura. Modalitati de transmitere a caldurii
- Legile transmiterii caldurii; Ecuatia generala a transmiterii căldurii
- Distributia spatiala a temperaturii in pereti plani cu pierderi si fara pierderi.
- Rezistenta termica a unui perete plan; Rezistenta termica a unui perete cilindric
- Incalzirea si racirea in timp uniforma a cailor de curent. Constanta termica de timp
- Incalzirea in regim intermitent
- Incalzirea in regim de scurtcircuit

Contacte electrice.

- Rezistenta de contact. Dependenta intre rezistenta de
- contact, forta de apasare in contact, temperatura in punctul de contact, caderea de tensiune pe contact.
- Regimurile termice ale contactelor.
- Vibratia contactelor.
- Migratia de material. Materiale si principii constructive.

Electrical equipment.

- Classification. Definitions. Rated parameters. Operating regimes.
- Thermal, dielectric and electrodynamic stresses.
- Environmental stresses

Electrical circuits commutation. Transient regimes

- Electrical circuits (RC,RL, RLC) connecting at dc and ac power supply sources.
- Electrical circuits disconnecting. Transient recovery voltage. Parameters.
- Three phase shortcircuits disconnecting
- Small inductive and capacitive currents disconnecting
- Long power transmission lines disconnecting.
- Disconnecting of phase opposition

Electrodynamic forces

- Electrodynamic forces between threadlike and coplanar conductors
- Electrodynamic forces in mono phase and three phase a.c. circuits; Steady state and transient regime; 3. Electrodynamic stability of electrical circuits; 4. Forces shielded bars.

Thermal regime of electrical equipment

- Heat sources. Ways of heat transmitting.
- Laws of heat transmitting. General equation of heat transmitting.
- Spatial distribution of temperature in flat walls with losses and no losses
- Thermal resistance of a planar wall; thermal resistance of a cylindrical wall.
- Uniform heating and cooling of current paths. Thermal time constant.
- Heating in intermittent regime; heating in short-circuit regime

Electrical contacts

- Contact resistance. Dependence of contact resistance, the contact pressing force, the temperature of
- contact point and the voltage drop across the contact
- Thermal regimes of the electrical contacts.
- The electrical contacts vibration
- Migration of electrical contact material . Materials and constructive principles

Electrical equipment insulation

- Overvoltages. Basic insulating level. Behavior ai short and long-term overvoltages.

Izolatia echipamentelor electrice.

- Supratensiuni. Nivele de tinere. Comportarea la supratensiuni de scurta si lunga durata.
- Izolatia solida lichida si gazoasa. Izolatia in vid.
- Protectia la supratensiuni. Descarcatorul cu rezistenta
- neliniara si suflaj magnetic.
- Descarcatoare cu oxizi metalici ZnO.
- Coordonarea izolatiei.
- Izolația compozită

- Liquid , gaseous and solid insulation. Vacuum insulation.
- Overvoltages protection.
- Surge arresters with metal oxides.
- Coordination of insulation.
- Composite insulation

Seminar

2 ore/săptămână, total 28 ore

- Studiul curentului de scurtcircuit. Alegerea intreruptoarelor
- Studiul tensiunii tranzitorii de restabilire.
- Deconectarea scurtcircuitelor apropiate.. Circuite cu doua frecvente proprii de oscilatie.
- Calculul fortelor electrodinamice in circuite filiforme
- Coplanare, Forte electrodinamice intre bare colectoare. Stabilitatea electrodinamica a circuitelor electrice.
- Transmisia caldurii prin pereti plani si cilindrici, cu pierderi si fara pierderi. Stabilitatea termica a echipamentelor electrice
- Incalzirea contactelor electrice. Forta de respingere in contact

Seminar

2 hours weekly, 28 hours total

- Shortcircuit simulation. Circuit breakers selection
- The simulation of the recovery overvoltages.
- Shortcircuit disconnecting. Circuits with two oscillation frequencies
- The computation of electrodynamic forces between filiform and threadlike circuits; busbars. Electrodynamic stability
- Transmitting of heating through the planar and cylindrical walls- numerical applications. Thermal stability computation
- The computation temperature in electrical contacts. Force rejection in electrical contacts

Laborator

2 ore/săptămână, total 28 ore

- Studiul constructiei releelor si declansatoarelor electromagnetice
- Studiul constructiei contactoarelor si intreruptoarelor de joasa tensiune
- Studiul constructiei intreruptoarelor de medie si inalta tensiune
- Studiul constructiei sigurantelor fuzibile, separatoarelor si descarcatoarelor electrice
- Studiul regimurilor termice din bobinele cu miez de fier si din caile de curent ale echipamentelor electrice
- Simularea proceselor tranzitorii din echipamentele electrice de comutatie
- Studiul experimental al contactelor electrice
- Studiul experimental al fortelor electrodinamice
- Evaluarea finală a activității de laborator

Laboratory

2 hours weekly, 28 hours total

- Study of electromagnetic relays and triggers construction
- Study of contactors and low voltage circuit breakers construction
- Study of medium and high voltage circuit breakers construction
- Study of fuses, disconnectors and surge arresters construction
- Study of thermal regimes of iron core coils and current paths of electrical equipment
- The simulation of transient regimes
- Experimental study of electrical contacts
- Experimental study of electrodynamic forces
- Final students evaluation