



ELECTRICAL MACHINES - I

PROF. TAPAS KUMAR BHATTACHARYA

Department of Electrical Engineering
IIT Kharagpur

TYPE OF COURSE : Rerun | Core | UG

COURSE DURATION : 12 weeks (26 Jul'21 - 15 Oct'21)

EXAM DATE : 24 Oct 2021

PRE-REQUISITES : Basic Electrical Technology: Knowledge of elementary calculus

INTENDED AUDIENCE : UG Electrical Engineering as core subject. UG Mechanical and Mining Engineering as Elective subject.

INDUSTRIES APPLICABLE TO : BHEL, CESC, NTPC, WBPDC

COURSE OUTLINE :

Transformer and D.C rotating machine will be the main topics to be discussed in this course. Three phase transformer connection & vector group. Parallel operation of transformers. Autotransformer. Basic constructional features of D.C machine. Elementary lap and wave winding used in armature. Emf and torque equations of D.C. machine – generator and motor mode. Armature reaction and its effect. Compensating winding. Shunt, series and compound machines. Generator characteristics. Motor characteristics. Efficiency, Basic tests.

ABOUT INSTRUCTOR :

Tapas Kumar Bhattacharya has over thirty years of teaching experience at IIT Kharagpur. Taught signals & system core course at IIT Kharagpur several times. Area of research interest is in the field of electrical machines and special electrical machines and circuits.

COURSE PLAN :

Week 1: Single phase Ideal transformer and basic equations. Its equivalent circuit.

Week 2: Core loss: Eddy current and hysteresis loss

Week 3: Taking Leakage flux, winding resistances and core loss in the equivalent circuit of the transformer.

Week 4: Exact and approximate equivalent circuit. Phasor diagram. Regulation & efficiency.

Week 5: Open circuit and short circuit tests. Estimation of equivalent circuit parameters.

Week 6: Three phase transformer and various connections with vector groups.

Week 7: DC machine constructional features and basic idea of its operation. Armature winding, commutator segments and brushes.

Week 8: Lap and wave windings and number of parallel paths in armature circuit. Emf equation.

Week 9: Torque equation. Separately excited and shunt generator characteristics.

Week 10: Armature reaction and its ill effects. How to nullify the effects of armature reaction.

Week 11: Shunt, series and compound motor characteristic.

Week 12: Starting, speed control and braking of DC motor. Testing.