


Discipline	ELECTRICAL MACHINES, PART 1 code: 35 winter semester	
Specialty	RENEWABLE ENERGY SOURCES	
ECTS credits: 7	Form of assessment: Continuous assessment	
Lecturer	Assoc. prof. PhD Eng. MAIK STREBLAU Room: 702E Phone: +359 52 383 540 E-mail: streblau@tu-varna.bg	
Department	ELECTRICAL ENGINEERING AND ELECTROTECHNOLOGIES	
Faculty	ELECTRICAL ENGINEERING	

Learning objectives:

The subject "Electric Machines, part 1" is included in the curriculum for students majoring in "Renewable Energy Sources" and it is studied in the fifth semester.

The aim of the subject is to provide fundamental knowledge about the operation principles, constructions, characteristics, operating modes and energy correlations of transformers and induction machines.

Required knowledge from previously studied subjects includes: "Mathematics, part 1", "Mathematics, part 2", "Physics", "Theoretical Electrical Engineering, part 1", "Theoretical Electrical Engineering, part 2" and "Electrical Measurements".

Connections with other subjects are made with: "Electrical Machines, part 2", "Electric Apparatus, part 1", "Electric Apparatus, part 2", "Electromechanical Systems", "Electrical Micromachines" and "Wind Plants and Systems".

PART 1. TRANSFORMERS	Hours Lectures	Hours Laboratories	Hours Course Work
Construction and principle of operation of single-phase transformer. Mathematical model and equivalent circuit. Name plate data.	3	2	
No-load operation of a transformer	2	2	
Short circuit operation of a transformer	2	2	
Transformer on load	2	2	
Three – phase transformers. Transformer winding diagrams and vector groups	2	2	
Transformer magnetic field. Magnetization current of single phase and three-phase transformers	2		
Parallel operation of transformers	1	2	
Unbalanced load of three-phase transformers	2	2	
Overvoltage in transformers	2		
Autotransformers	1		
Design of single-phase transformer			7
PART 2. INDUCTION MACHINES	Hours Lectures	Hours Laboratories	Hours Course Work
Windings of AC machines. EMFs of AC windings	2	2	8
Determining the terminals of a three-phase induction motor		2	
MMF and magnetic fields of AC machines	2		
Construction and principle of operation of induction machine. Equivalent circuit. Vector diagrams	3		
Induction machine operation modes	2		
Studying the no-load characteristics of a three-phase induction motor		2	
Studying the short circuit characteristics of a three-phase induction motor		2	
Induction motor starting and speed regulation	2		
Studying the working characteristics of induction motor with squirrel-cage rotor		2	

Studying the mechanical characteristics of induction motor with wound rotor		2	
Studying the working characteristics of induction motor with pole-changing winding		2	
Studying the characteristics of induction motor supplied by three-phase and single-phase grid		2	
TOTAL: 75 h	30	30	15