Discipline	ELECTRICAL APPARATUS part II code: 39 summer semester	
Specialty	RENEWABLE ENERGY SOURCES	
ECTS credits: 7	Form of assessment: Exam	
Lecturer	Assoc. prof. PhD Eng. / scientific title/ Tatyana Dimova /name/ Room 834E Phone: +359 898472772 E-mail: t.dimova@tu-varna.bg	
Department	ELECTRICAL ENGINEERING AND ELECTROTECHNOLOGIES	
Faculty	ELECTRICAL ENGINEERING	

Learning objectives:

Compulsory subject for full students in Renewable energy sources from the Faculty of Electrical Engineering of Technical University Varna for receiving the degree Bachelar.

The course gives the possibility for specialists to obtain engineering knowledge and skills for creating and developing projects while using electrical apparatus, as managers in manufacturing, repairing, commercial and exploitation organizations concerned with electrical apparatus. On this basis, the specialists study the specific terminology, the essence of the given parameters, indexes and characteristics of the electrical apparatus. They also obtain knowledge and skills when choosing, offering to the market, manufacturing and repairing of the apparatus.

"Electrical apparatus II" discusses isolation systems, electrical discharge and electrical arc, commutations in electrical schemes, contacts and contact systems. Processes and modes of operation of the apparatus are taught from where one can determine the parameters, indexes and characteristics of the apparatus, their possibilities for exploitation and their demands for protection against dangerous for them and for electrical appliances overloading.

CONTENTS:

Training Area	Hours lectures	Hours exercises
Classification of low voltage electrical apparatus. Insulation in electrical appliances. Application categories and operating modes of electrical apparatus.	5	
Discharge and electrical arc in electrical devices. Arc extinguishing devices for different types and values of power supplies.	3	
Electrical control devices - electromagnetic contactors and relays. Device, principle of operation, nominal parameters, characteristics, selection criteria.	12	
Electrical apparatus for distribution and protection. Disconnectors, circuit breakers, overload protection, fuses, minimum and maximum voltage switches.	10	
Basic electrical wirings for the control and protection of various types of electrical machines. DOL starters, reversers on AC and DC electrical machine, “delta-star” starters, automatic backup power and much more.	5	
Laboratory exercises		
Investigation of electrical arc. Experimental determination of characteristics of the arc (AC power supply)		2
Introduction with the parameters of different designs of electromagnetic contactors.		2
Investigation of different electromagnetic contactors modes - exploration, connection, testing, determination of switching capability, etc.		2
Investigation of different types electromagnetic relays - relay characteristic, determining the time of switching on and off, calculating the coefficients of safety and return.		4
Investigation of Solid State Relay DC/AC. Experimental determination of characteristics of the apparatus.		3
Investigation of overload relays - protection curve at different relay settings.		2
Investigation of circuit breaker and motor protection. Experimental determination of protection curve and comparison of the obtained characteristics		2
Investigation of fuses. Experimental determination of protection curve and comparison with the protection curve of a circuit breaker.		3
Investigation of three types of residual current circuit breakers.		2
Learning, connecting, testing and describing the DOL starter		2
Investigation of reversing magnetic starter - connecting, testing and describing		2
Investigation of “star-delta” starter power wiring diagram with timer.		2
Investigation of backup power supply - electrical wiring connecting, testing and describing.		2
Course worke		
Students explore free electro-technical software that is called CADe SIMU. With its help, they compose and study a large number of electrical		10

circuits for control and protection. Getting to know with the process of creating a circuit design, insert symbols from vast libraries, saving, print, and collect the diagrams they made. They learn to size electrical circuits and select electrical devices to protect different types of loads.		
Setting individual tasks to complete. Preparation of an explanatory text on the principle of operation of electrical circuits, study of electrical interlocks and others.		5
TOTAL: 75 h	**30**	**45**