

INTEGRATED LABORATORIES

Code: 322059

Main Scientific Area: Automation, energy and cyber-physical systems

Lecturer: Marta Filipa da Silva Alves

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 108h

ECTS: 6,0

Objectives

Students should be able to:

1. Correctly perform the lighting circuit divisions, sockets and driving force in an installation.
2. Perform, Interpret and assemble the electrical scheme of the electrical panel of a dwelling;
3. Acquire sensitivity to suit over load and contact protection equipment indirect to the places to be installed;
4. Create escape and circulation paths with the correct distribution of emergency armatures;
5. Perform, interpret and assemble the wiring diagram of the electrical panel of a collective installation, containing column board, column boxes and individual fraction feeds;
6. Make an assembly with a central alarm and detectors, through home automation.
7. Recognize, analyze and perform the assembly of the energy counting circuit. Assign possible reactive power offsets and perform their assembly.
8. Recognize the neutral regime to perform and make your equipotential bonding.

Learning Outcomes

1. Identify the different electrical equipment used in signaling and emergency circuits.
2. Interpret circuit diagrams. Proceed with the installation of electrical panels with their circuit protections and equipotential bonds.
3. Identify several types of detectors. Use and configure alarm centers.
4. Identify configurations through home automation systems and know the respective components. Identify energy systems and energy consumption. Know the principles of consumption management. Scale the compensation of reactive energy. Understand the electric energy tariff system.
5. Implement electric control and power circuits for motor control. Connect and control single-phase and three-phase electric motors. Know and implement circuits with timers. Turn on control systems for liquid levels through pumps.

6. Interpret and acknowledge mountable speaker schemes, their cables and protections contained in these diagrams, as well as assign the corresponding neutral system.

Course Contents

1.1. Signaling and calling circuits: Ring circuit; Circuit Board of electronic targets; Alarm circuit with use of relays; Signaling circuits and emergency lighting.

1.2. Electrical cabinets: Installation of a panel of columns comprising: Assembly of boxes or frames; Assembly of equipment and devices - Circuit breakers, Fuse cutters, etc .; Assembly of the meter.

1.3. Connections and functional tests.

1.4. Mounting of an Electrical Panel of a Residential Use Installation: Mounting of the frame structure; Installation of control and protection devices: Inrush cutting apparatus. Switches / disconnectors; Circuit breakers.

1.5. Connection of devices and functional tests.

1.6. Equipotential bonding - reading box, electrode and earth bus. 6/14

2. Alarms

2.1. Fire detection

2.2. Motion detectors.

2.3. Glass break detectors.

2.4. Systems of observation.

2.5. Central alarm systems.

3. Power systems.

3.1. Electric energy consumption: Power and energy consumption; Electricity tariff system; Characterization of consumption in distribution networks; Forecast of consumption.

3.2. Reactive energy: Power factor; Abacus for the calculation of reactive energy compensation; Usual types of compensation; Measurement of power factor; Power Factor Compensation; Reactive power management in distribution networks.

4. Control systems: Contactors; Relays; Photocells; Inductive detectors; Capacitive detectors.

4.1. Feedback systems: Symbology; Electrical schematics.

4.2. Motors: Three-phase motor; Single-phase motor; Application of course ends; Inverter motor command.

4.3. Starting of three - phase star - delta motor; Star - inverting triangle.

4.4. Timers. 4.5. Level control systems: Level buoys; Level relays.

5. Design of electrical installations:

5.1. Descriptive memory; Terms of reference; Sizing of cables for the feeding of electrical machines; Sizing of protection of electrical machines; Schematic drawing of electrical boards.

6. Integrated view of the general design of the electrical installation of the collective zones of a residential building / offices (presentation of a case study).

6.1. Based on existing schemes perform the assembly of parts of some of the main existing facilities in a building. In particular, install two to three of the following facilities: Building supply (Column amount); Common services (lighting, outlets and specific equipment); Emergency lights; Telecommunications; Video door phone / Doorphone; SADI / SADIR Facilities; Home automation.

Recommended Bibliography

Guia Técnico das Instalações Eléctricas, J. Lima Morais, J. M. Gomes Pereira (Ed. Certeil, 2006) ColectivPro, - Técnica e Certificação de Instalações Eléctricas – Schneider Electric - Eng^o L. M. Vilela Pinto (2007) Install Express, Eng^o L. M. Vilela Pinto (Ed. Certeil, 2004) MG CALC, Eng^o L.M.Vilela Pinto (Ed. Merlin Gerin) Regras Técnicas das Instalações Eléctricas de baixa Tensão, Imprensa Nacional-Casa da Moeda, 2006. RTIEBT- Regras Técnicas das Instalações Eléctricas de Baixa Tensão, 1^a Edição Anotada, Certeil / DGGE, 2006 Instalações Eléctricas de Baixa Tensão - Projecto, Execução e Exploração: Origem e Interpretação das RTIEBT e Principais Diferenças Face ao 740/74, DGEG / Constantino Vital Sopa Soares; Certeil, 2006. BOSSI, António; SESTA, Ezio, Instalações Eléctricas. Hemus Editor. (s.d.). CAMPOS, J. Freitas; SANTOS, Serafim, Instalações Eléctricas. Plátano Edições Técnicos. (s.d.). NISKIES, Júlio; MACINTYRE, A. J., Instalações Eléctricas. Livros Técnicos e Científicos Editora. (s.d.). BRADSHAW, Vaughn, Building Control Systems. John Wiley Sons. 1993. MARTSON, R. M., Alarmes Electrónicos. Editorial Presença. (s.d.) BOSSI, António; SESTA, Ezio, Instalações Eléctricas. Hemus Editor. (s.d.). PAIVA, José Pedro Sucena, Redes de Energia Eléctrica. Uma Análise Sistemática. (s.d.) Outros Recursos: Facturas de energia eléctrica; Tarifário de venda de energia eléctrica a clientes finais. Grupo EDP. MATIAS, José, Automatismos Industriais. Didáctica Editora. (s.d.). PINTO, António; ALVES, Vítor, Tecnologias, 10.º Ano. Curso Tecnológico de Electrotecnia e Electrónica. Porto Editora. (s.d.). PINTO, António, Práticas Laboratoriais e Oficiais. Porto Editora. (s.d.). Guias Técnicos da Direcção Geral de Energia. (s.d.) BRADSHAW, Vaughn, Building Control Systems. John Wiley Sons, 1993. GRAZIANI, Javier, Domótica, Sistemas de Controlo para Vivendas. Paraninfo, Janeiro de 2000.

Learning and Teaching Methods

The syllabus contents are interconnected with the objectives of the UC, through examples analyzed in the theoretical-practical classes. With the visualization of schematics and assemblies, students will have the perception of how to interpret an assembly to proceed with its execution. The practical work carried out in the practical classes is fundamental for students to gain sensitivity to the use of the material as well as to its full functioning. There is at least one practical work for each content. Content 1 corresponds to objective 1.2, 3 and 4; content 2 corresponds to objective 5; Content 3 corresponds to Objective 6; contents 4,5 and 6 correspond to objective 7 and 8.

Assessment Methods

Approval in this course unit is obtained with a grade equal to or higher than 10 (ten), in a scale of 0 to 20, resulting from the evaluation of the theoretical-practical component. Subject has assessment time (practical project). have a minimum grade of 10 values ??for this project If the student does not obtain the minimum grade, he / she can do it by exam of 2 hours (one practice and one theoretical)