Module Handbook

Program:

“Industrial Electrotechnics”

(Lima and Arequipa)

July, 2014
Lima-Arequipa
Perú

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Fundamentals of Chemistry Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Fundamentals of Chemistry</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-01</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
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<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Chemistry</td><td>QG1010</td><td>1</td></tr>
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</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="3">Lima:
- Lawrence Salmon</td><td colspan="2">Arequipa:
- Heloina Berroa</td></tr>
<tr><td>Lecturers</td><td colspan="3">Lima:
- Laurence Salmon
- Huguez Ames
- Enrique Cáceres
- José Flores
- Ulises Quiroz
- Alfredo Ugarte</td><td colspan="2">Arequipa:
- Heloina Berroa
- Robert Almendariz
-</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">QG1010</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
</table>
</td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>QG1010</td><td>3.5</td><td>3.4</td><td>124</td><td>4</td></tr>
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</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Materials and Mathematics knowledge, and computing skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Discover the structure and properties of matter and types of links in nature inorganic and organic substances.
- Interpret the chemical reactions and the stoichiometric fundamental knowledge.
Skills:
- Design chemical equations and apply stoichiometry in organic and inorganic chemical reactions.
- Assess the feasibility of a chemical reaction in organic and inorganic substances
Competences:
- Predicted by different methodologies both inorganic and organic chemical reactions
- Evaluate the properties of natural and synthetic, and combustible materials</td></tr>
<tr><td>Content</td><td colspan="5">Matter. Mixtures. States of Aggregation of Matter. The Atom. Periodic Table of the Elements. Chemical Bond. Types Chemical Bonding and Intermolecular Forces. Scattered and Homogeneous Systems. Chemical reaction. Inorganic Chemicals. Stoichiometry. Solutions. Acidity and Basicity of Solutions. Electrochemistry and its applications. Industrial Chemical Process - Inorganic Chemicals. Organic Compounds. Industrial Chemical Process - Organic Compounds.</td></tr>
<tr><td>Study and examination</td><td colspan="5">- Practical / laboratory: preparations with review, functional projects, lab reports</td></tr>
</table>

requirements and forms of examination	- *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- Chang, Raymond (2002) Química. México D.F.: McGraw-Hill (540/CH518/2007) - Ebbing, Darrell (1997) Química General. México D.F.: McGraw-Hill. (540/E11). - Gillespie, Ronald (1989) Chemistry. Boston: Allyn and Bacon (540/G39). - Malone, Leo (1992) Introducción a la química. México D.F.: Limusa (540/M19).

Physics Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-02</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="3">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="3">- Physics I</td><td>MG1010</td><td>1</td></tr>
<tr><td colspan="3">- Physics II</td><td>MG2010</td><td>2</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="3">- Lima
Silvia Espinoza</td><td colspan="2">- Arequipa
Juan Carlos Grande</td></tr>
<tr><td>Lecturers</td><td colspan="3">Lima:
- Silvia Espinoza
- Jerson Araos
- Nicolás Herencia
- Carlos Soca
- Penélope Vargas</td><td colspan="2">Arequipa:
- Juan Carlos Grande
- Juan Yucra
- Juan Muñoz</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">MG1010</td><td>3.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">MG2010</td><td>3.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
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<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>MG1010</td><td>4.5</td><td>3.1</td><td>137</td><td>5.0</td></tr>
<tr><td>2</td><td>MG2010</td><td>4.5</td><td>3.6</td><td>146</td><td>5.0</td></tr>
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<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Elementary Mathematics knowledge, and computing skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Analyze and evaluate the application of the basic principles governing the phenomena of classical physics.
Skills:
- Apply the basic principles governing the phenomena of classical physics to specific situations and associated with real situations.
Competences:
- Reasoned argument in oral and written form, using scientific language correctly, on situations or problems related to the experimental sciences applied to your professional future.</td></tr>
<tr><td>Content</td><td colspan="5">Physics I: Thermometry. Expansion. Heat. Calorimetry. Phase change. Thermal balance. Heat transfer. Thermodynamics. Thermal expansion of solids. Thermodynamic processes. Zeroth law, first and second laws. Thermodynamic laws. Simple Harmonic Motion (SHM). Energy in SHM. Simple pendulum. Damped and forced movement. Mechanical resonance. Waves on a string. Melde's Experiment. Forced Harmonic Motion. Waves. Stationary waves. Sound. Doppler effect. Optics. Reflection, refraction of light. Geometrical Optics. Mirrors and lenses.

Physics II: Physical Magnitudes. Vectors. Sum of vectors. Components of vectors. Unit Vectors. Statics. Force. Newton's First and Third Laws. Free body diagrams. Representation of the forces existing in a body or system. Concurrent forces. First condition of equilibrium. Applications. Force or torque moment. Second condition of</td></tr>
</table>

	equilibrium. Kinematics. Uniform linear movement. Acceleration. Uniform linear motion with varied velocity. Free Fall. Gravity. Compound movement. Applications of circular movement. Dynamics. Newton's Second Law. Applications of dynamics. Friction. Friction in solids. Mechanical work. Power. Energy Conservation. Efficiency.
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- Bueche Frederick J. (2007) Física General. México D.F.: McGraw-Hill (530/B88/2007) - Sears, Francis W. (2004). Física universitaria. México D.F.: McGraw-Hill (530/S31/2004) - Serway, Raymond A. (1998). Física. México D.F.: McGraw - Hill. (530/S42F)

Mathematics Module

<table>
<tr><td>Degree Program</td><td colspan="4">Industrial Elechtrotecnics</td></tr>
<tr><td>Module designation</td><td colspan="4">Mathematics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4"></td></tr>
<tr><td>Code, if applicable</td><td colspan="4">EI-03</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="2">- Mathematics I</td><td>GG1010</td><td>1</td></tr>
<tr><td colspan="2">- Mathematics II</td><td>GG2810</td><td>2</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Gerald Cuzcano</td><td colspan="2">Arequipa:
- Elmer Sierra</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Gerald Cuzcano
- Xyoby Chávez
- Rafael Enciso
- José Fernández
- Alexander Peña
- Ernesto Zeña</td><td colspan="2">Arequipa:
- Marco Cuentas
- Henry Torres
- Elmer Sierra
- Roberto Choquehuayta</td></tr>
<tr><td>Language</td><td colspan="4">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>GG1010</td><td>6.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>GG2810</td><td>6.0</td><td>Lecture</td><td>40 students</td></tr>
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<tr><td>Workload</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>GG1010</td><td>6.0</td><td>3.3</td><td>167</td><td>6</td></tr>
<tr><td>2</td><td>GG2810</td><td>6.0</td><td>4.3</td><td>185</td><td>6</td></tr>
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<tr><td>Requirements according to the examination regulations</td><td colspan="4">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Formal: None
Content: Elementary Mathematics skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">After having finished the module, students are able to:
Knowledge:
- Analyze situations using science and technology knowledge of analytic geometry, differential and integral calculus.
Skills:
- Select and apply properties of differential and integral calculus to solve problems in science and technology.
Competences:
- Formulate possible solutions to problems of science and technology by analyzing and interpreting data results from the mathematical point of view.</td></tr>
<tr><td>Content</td><td colspan="4">Mathematics I: Equations and systems of equations. Cartesian plane. The equation of the straight line. Equation of the circumference. Equation of the parabola. Equation of the ellipse. Equation of the ellipse. Inequalities. Functions. Introduction to the calculus and to the limit concept. Indeterminate limits. Continuity of a function. Trigonometric functions. Trigonometric limits. Application of functions in Physics. Definition of the derivative of a function. Application of the derivative of a function. Derivatives of a function. Derivatives of some special functions and the chain rule. Implicit derivative. The antiderivative and the indefinite integral. Methods of integration: by parts and by algebraic substitution. Integration by trigonometric substitution. Methods of integration: By trigonometric substitution. Definite integral. Calculus of areas.

Mathematics II: Limits and continuity. Asymptotes and graphs of functions. Derivative</td></tr>
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	and motion. Differentials. Maximum and minimum. Flat region area. Length of a curve. Surface of revolution. Center of mass. Application problems. Volume of solids. Descriptive statistics. Fundamentals. Data presentation. Distribution of frequencies. Graphs. Application problems. Data Description. Measures of central tendency. Application problems. Bivariate tables. Combinatory analysis. Probability of an event. Calculation of probabilities. Normal distribution of probabilities. Selection of a sample. Rubric: Case analysis on the application of statistical techniques.
Study and examination requirements and forms of examination	*Partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Berman, Simon L. (1974). Calculus for the nonphysical science. New York: Richart and Winston. (515/B47)* - *Haeussler, Ernest F. (2008). Matemáticas para la administración y economía. México D.F.: Iberoamericana (510/H25/2008).* - *Larson, Ron (2006). Cálculo. México D.F: McGraw-Hill (515/L25).* - *Neuhauser, Claudia (2004). Matemáticas para ciencias. Madrid: Prentice Hall (510/N47M).* - *Pinzón, Álvaro (1973). Cálculo I - difererencial. México D.F.:Harla (515/P59).* - *Waner, Stefan (2002). Cálculo aplicado. Madrid: Paraninfo (515/W23).* - *Davis, Linda (1990). Technical mathematics with calculus. Ohio: Merrill (510/D32)* - *Johnson, Richard (1997) Probabilidad y estadística para ingenieros. México D.F.: Prentice Hall (519.2/J67)* - *Pareto, Luis (1985) Formulario de mecánica. Barcelona: CEAC S.A (620.1/P26F)*

Values and Culture Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Values and Culture</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-04</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Attitudes and Values</td><td>GG1030</td><td colspan="2">1</td></tr>
<tr><td colspan="2">- National and International Reality</td><td>GG2030</td><td colspan="2">2</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Enit Vivanco</td><td colspan="3">Arequipa:
- Karina Salas</td></tr>
<tr><td>Lecturer</td><td colspan="2">Lima:
- Enit Vivanco
- Luisa Palomino</td><td colspan="3">Arequipa:
- Karina Salas</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>GG1030</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>GG2030</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>GG1030</td><td>2.0</td><td>1.4</td><td>61</td><td>2</td></tr>
<tr><td>2</td><td>GG2030</td><td>2.0</td><td>1.3</td><td>59</td><td>2</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Recognize the importance of the practice of values, cultural diversity and develop a personal life plan.
- Analyze the components of national and international reality and proposes alternative solutions to the cyclical problem, based on ethical and moral principles that contribute to the development of society.
Skills:
- Value himself, recognize their emotions and feelings, and making decisions assuming a positive attitude, and an active and responsible behavior.
- Interpret and analyze problems of socio-cultural, economic and political reality at national and international levels, identifying potential opportunities in Peru and its insertion in the world market.
Competences:
- Display a positive attitude towards values, recognize and accept its culture, respect the diversity of its environment.
- Analyze the current situations in the components: political, economic, social and cultural, assuming a critical and reflective attitude on the national and international reality.</td></tr>
<tr><td>Content</td><td colspan="5">Attitudes and Values: Academic regulations and rules guiding the institution. Study methods and habits. Values, positive attitudes, anti-values and consequences. Self-esteem. Personal Image. Decision-making. Cultural diversity, interculturality. Rubric – Analysis of presentations proposed in order that students can recognize and accept their culture and respect the diversity. Anxiety, tension, stress and self-control techniques. Intelligent behaviour, emotional intelligence. Thought, cognitive skills
Memory and learning. Life Plan. Courtesy rules. Leadership.

National and International Reality: National and international reality. Spatial reality.</td></tr>
</table>

	Ecology and environment. Organization of group assignments. Spatial reality. Peruvian territory. Spatial reality. National and international geo-strategy and geo-politics. Social reality. National cultural diversity. Transnational migratory process. Rubric – Analysis of the migratory process. Social reality. National identity. Social reality. Worldwide perception of Peru. Political reality. Peruvian State: Political and administrative organization. Evaluation of research progress. Political reality. Peruvian decentralization process. Democracy and political parties. Economic reality. Peruvian economic model. International economic blocks. Business Outlook in Peru. Social responsibility. Economic reality: Peru as a possibility. Productive clusters and holding. Development of micro, small and medium business in Peru.
Study and examination requirements and forms of examination	*Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Berumen de los Santos, Nora María (2001). Ética del ejercicio profesional. México D.F.: Continental (179.9/B45)* - *Gomez, María Teresa (1997). Cómo educar en valores. Madrid: s.n. (179.9/G62)* - *Olcese Salvatecci, Alfieri (2002). Cómo estudiar con éxito: Técnicas y hábitos para aprender mejor. México D.F.: Alfaomega (371.302/O21)* - *Rodriguez Estrada, Mauro (2006). Aprendizaje creativo continuo. Cuando aprender es emprender. México D.F.: Trillas (370.157/R75)* - *Towers, Marc (2006). Venza a su peor enemigo: Autoestima. Madrid: Fundación Confemetal (155.2/T77)* - *Agenda Perú, Caretas y PUCP (2001) Los 50 y tantos libros que todo peruano culto debe leer. Lima: Caretas: PUCP.* - *Contreras, Carlos (2000). Historia del Perú Contemporáneo. Lima: Instituto de Estudios Peruano. (985/C81)* - *Matos Mar, José (2005). Desborde popular y crisis del estado, veinte años después. Lima: s.n. (306.2/M28)* - *Raich, Mario (2008). Más allá. Empresa y sociedad en transformación. Lima: Tecsup. (658.3A/R18)* - *Soto, Hernando de (2000). El ministerio del capital. Porqué el capitalismo triunfa en occidente y fracasa en el resto del mundo. (330.122/S71)*

Fundamentals of Mechanical Technology Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Fundamentals of Mechanical Technology</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-05</td></tr>
<tr><td rowspan="4">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td colspan="2">ID</td><td>Semester</td></tr>
<tr><td colspan="2">Mechanical Workshop</td><td colspan="2">MG1040</td><td>1</td></tr>
<tr><td colspan="2">Materials Technology</td><td colspan="2">MG2040</td><td>2</td></tr>
<tr><td colspan="2">Technical Drawing</td><td colspan="2">MG2030</td><td>2</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- David Maita</td><td colspan="3">Arequipa:
- Denis Ojeda</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- César Ortiz
- César Lecaros
- David Maita
- Luis Rojas</td><td colspan="3">Arequipa:
- Denis Ojeda
- Emerson Arroyo</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>MG1040</td><td>3.0</td><td>Workshop</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">MG2040</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td>3</td><td>MG2030</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>MG1040</td><td>3.0</td><td>1.5</td><td>81</td><td>3</td></tr>
<tr><td>2</td><td>MG2040</td><td>3.5</td><td>2.5</td><td>108</td><td>4</td></tr>
<tr><td>3</td><td>MG2030</td><td>2.0</td><td>3.0</td><td>90</td><td>3</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content:</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Apply knowledge and develop abilities to work with tools while performing metal transformation to obtain simple parts or to perform changes and adaptations in machines and industrial equipment.
- Interpret drawings and mechanical, electrical, electronic and fluid installations and network diagrams.
- Drawing mechanical no complex systems and components using standardized norms.
Skills:
- Handle tools for metal transformation in simple mechanical parts.
- Produce drawings and mechanical, electrical, electronic and fluid installations and network diagrams
- Represent mechanical drawings using conventional drawing tools.
Competences:
- Make mechanical adaptations and interpretation of mechanical drawings.</td></tr>
<tr><td>Content</td><td colspan="5">Mechanical workshop: Safety at work. Material storing at the mechanical workshop Measurement of linear magnitudes. Plate cutting, folding and riveting. Hacksawing Liming. Measurement of linear magnitudes. Drilling, countersinking and reaming Identification of screws. Hand threading. Assembly and disassembly of mechanisms. Installation of accessories and pipelines.</td></tr>
</table>

	***Materials Technology**: Introduction to the engineering materials. Ferrous materials Ferrous Materials. Obtaining, Classification, Designation and Applications Non-Ferrous Materials. Polymeric materials. Polymeric materials. Compound materials. Measuring properties of materials. Material conformation. (Recognizing machine tools, measurement and verification). Machining processes. Plating Plating. Glued joints. Welded joints. Screw joints.* ***Technical Drawing**: Basic principles. Standardized dimensioning. Projection Systems. Sections. Full section. Types of sections. Cutting and sections. Basic electric and electronic schematics. Flow diagram. Systems of pipelines.*
Study and examination requirements and forms of examination	*Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Appold, Hans (1984). Tecnología de los metales. Barcelona: Reverté (669.9/A64)* - *Coca Rebollero, Pedro (2005). Tecnología mecánica y metrotecnia. Madrid: Pirámide (620.1/C72T)* - *Gerling, Heinrich (1989). Alrededor de las máquinas herramientas. Barcelona: Reverté (621.9/G37A)* - *Lobjois, Ch. (1984). Trazado, corte, curvado y plegado. Tecnología de la caldera. Barcelona: CEAC (697.07/L82T)* - *Appold, Hans (1984). Tecnología de los metales. Barcelona: Reverté. (669.9/A64)* - *Ashby, Michael F. (2008). Materiales para ingeniería 1. Introducción a las propiedades, las aplicaciones y el diseño. Madrid: Reverté (620.1/A81/1)* - *De Garmo, E. Paul (1988). Materiales y procesos de fabricación. Barcelona: Reverté (620.1/D36)* - *Higgins, Raymond A. (2006). Materials for engineers and technicians.Massachussetts: s.n. (620.1/H52)* - *Shackelford, James F. (2005). Introducción a la ciencia de materiales para ingenieros. Madrid: Prentice Hall (620.1/SH47/2005)* - Bachmann, Albert (1979) Dibujo técnico. Barcelona: Labor. (604.2/B13). - Giesecke, Frederick (1979) Dibujo técnico. México D.F.: Limusa (604.2/G4). - GTZ (1981) Dibujo técnico metal 1. Curso básico con pruebas. Eschborn: GTZ (604.2/M/1). - GTZ (1981) Dibujo técnico metal 2. Curso superior con pruebas. Eschborn: GTZ (604.2/M/2) - Jensen, Cecil (2004). Dibujo y diseño en ingeniería. México D.F.: McGraw-Hill (604.2/J39/2004) - Sánchez Quispe, Ismael (1991) Dibujo técnico. Lima: Vultecsa (604.2/S21). - *Spencer, Henry Cecil (2003). Dibujo Técnico. México D.F.: Alfaomega (604.2/S74/2003)*

Fundamentals of Electrical Technology Module

<table>
<tr><td>Degree Program</td><td colspan="4">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="4">Fundamentals of Electrical Technology</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4"></td></tr>
<tr><td>Code, if applicable</td><td colspan="4">EI-06</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="2">- Electricity</td><td>EG1010</td><td>1</td></tr>
<tr><td colspan="2">- Electronics</td><td>AG2010</td><td>2</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Carlos Ortiz</td><td colspan="2">Arequipa:
- Hernando Prada</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Carlos Ortiz
- Dennis Chávarry
- Carlos Cuba
- Francisco Fernández
- José Miranda
- Lennant Rojas
- César Santos</td><td colspan="2">Arequipa:
- Danny Meza
- Midward Charaja
- Carlos Quilla
- Alonso Cornejo</td></tr>
<tr><td>Language</td><td colspan="4">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">EG1010</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3.0</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AG2010</td><td>2.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>1.5</td><td>Practical</td><td>20 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>EG1010</td><td>5.0</td><td>3.1</td><td>146</td><td>5</td></tr>
<tr><td>2</td><td>AG2010</td><td>3.5</td><td>3.0</td><td>117</td><td>5</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Formal: None
Content: Elementary Mathematics knowledge</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">After having finished the module, students are able to:
Knowledge:
- Recognize constituent parts in dc and ac electrical circuits and electrical machines.
- Recognize parameters and operation principles of single-phase and three-phase electrical systems.
- Identify electronic devices and their application in industry.
Skills:
- Evaluate electrical parameters and analyze their behavior using equivalent circuit, phasorial calculation and computer applications.
- Differentiate the application areas of different electronic devices.
Competences:
- Install basic electrical circuits and analyze the behavior of electrical parameters in operational or fault conditions, using measuring instruments and performing security procedures.
- Implement basic electronics applications.</td></tr>
<tr><td>Content</td><td colspan="4">Electricity: Fundamental parameters of Electricity. Matter, atom, electrical charge, voltage generation. Electrical circuits. Voltage. Resistance. Electrical current. Fundamental Laws. Ohm's Law. Second and first Kirchoff's law. Power, energy and efficiency. Electrical Power. Efficiency. Electrical energy. Charge diagram. Magnetic field</td></tr>
</table>

	and electric field. Electromagnetism. Alternating current. Sinusoidal wave. Ohm's law in AC. Series AC circuit. Parallel AC circuit. Power in AC. Active power. Reactive power. Apparent power. Three-phase circuits. Star connection. Triangle connection. Three-phase power. Electrical protection. Fuses. Thermomagnetic. Differentials. ***Electronics**: Introduction to Electronics. Semiconductor diodes. Application of semiconductor diodes. DC voltage sources. Basic calculations in a DC voltage source* *The bipolar transistor. Basic calculations in the BJT transistor. Thyristors. Optoelectronics. Integrated circuits. Digital Logics and Circuits. Industrial Digital Systems.*
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Alcalde San Miguel, Pablo.(1998) Electrotecnia. Equipos e instalaciones electrotécnicas. Madrid: Paraninfo. (621.3 /A35).* - *Dorf, Richard C. (2006) Circuitos eléctricos. México D.F.: Alfaomega. (621.3C / D92C).* - *García Trasancos, José (1998) Electrotecnia. Barcelona: Reverté. (621.3/G25E).* - *Mileaf, Harry (1989) Curso práctico de electricidad. Vol. 1. México D.F.: Ciencia y Técnica. (621.3/M57/v.1)* - *Mileaf, Harry (1989) Curso práctico de electricidad. Vol. 2. México D.F.: Ciencia y Técnica. (621.3/M57/v.2)* - *Boylestad, Robert L. (2003). Electrónica: Teoría de circuitos. México D.F.: Prentice Hall (621.381/B78/2003.)* - *Floyd, Thomas (2006) Dispositivos electrónicos. Mexico D.F..Limusa (621.381/F59D).* - *Floyd, Thomas (2006) Fundamentos de sistemas digitales. New Jersey.Pearson Prentice Hall (621.381/F59).* - *Malvino, Albert Paul (2000) Principios de electrónica. Madrid: McGraw-Hill. (621.381/M19/2000).* - *Savant, C.J. (1992) Diseño electrónico. Circuitos y sistemas. Wilmington: Addison Wesley (621.381C/S25).*

Communications Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Communications</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-07</td></tr>
<tr><td rowspan="4">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Communication I</td><td>GG1020</td><td colspan="2">1</td></tr>
<tr><td colspan="2">- Communication II</td><td>GG2820</td><td colspan="2">2</td></tr>
<tr><td colspan="2">- Successful Presentations</td><td>GG2910</td><td colspan="2">3</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Elisa Montoya</td><td colspan="3">Arequipa:
- Daysi Flores</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Elisa Montoya
- Susan Cuentas
- Mónica Jiménez
- Miguel Ortiz
- Julia Torres</td><td colspan="3">Arequipa:
- Daysi Flores
- Manuel Linares
- David Rondón
- Sandra Romaní</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>GG1020</td><td>6.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>GG2820</td><td>5.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>GG2910</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>GG1020</td><td>6.0</td><td>1.6</td><td>137</td><td>4</td></tr>
<tr><td>2</td><td>GG2820</td><td>5.0</td><td>1.8</td><td>122</td><td>4</td></tr>
<tr><td>3</td><td>GG2910</td><td>2.0</td><td>1.4</td><td>61</td><td>2</td></tr>
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<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Entry-level skills in communication and computing skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Categorize and interpret ideas, data and explicit and implicit concepts in a text given the context in which it was generated and in which it was received.
- Base his opinion with clarity, fluency and coherence using verbal and non-verbal resources.
- Produce texts according to the specific purpose of each communication.
Skills:
- Build different types of texts.
- Select the appropriate type of argument to support their position.
- Discriminate the relevant from the complement of any text.
Competences:
- Communicate in oral or written form the themes of his profession with informative and argumentative base, applying appropriate resources to facilitate the expression of speech in specialized and non-specialized audiences.</td></tr>
<tr><td>Content</td><td colspan="5">Communication I: Human communication and information in contemporary society. Reading as a tool for communication. Text analysis: organization and integration of the text. Annotations and concept maps Bibliographical citations. APA format. Writing technical reports. Spelling rules. Capitalization. General accentuation. Special cases of accentuation. Diacritical marks. Sentence. Punctuation marks. Connectors. Paragraph. Condensed description. E-mail. Commercial writing. Communicating orally through the speech. Oral communication.</td></tr>
</table>

	***Communication II**: Communication in organizations. Assertive communication and characteristics. Techno scientific language. Technical description of the workshop. Reading comprehension. Writing. Reading comprehension. Text production. Oral comprehension and expression. Types of discussion. Argumentation as a foundation for controversy and discussion. Argumentative presentation. Administrative writing.* ***Successful presentations**: Competences in-demand today. The first contact. Individual and shared presentations. The psychological preparation. Stage fright. Presentation design. Preparation of training designs. How to improve your behaviour when you give a presentation. Emphasis and motivation in presentations. Self-confidence. Use of techniques. Presentation of techniques. Audiovisual aids. Institutional presentation. Institutional presentation. Communication styles. Formal aspects of conferences. Criteria to evaluate presentations before an audience. Presentation of topics assigned using appropriate techniques.*
Study and examination requirements and forms of examination	- *Practical: oral presentations* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *AGUIRRE, Mauricio y ESTRADA, Christian. (2007). Redactar en la universidad. Conceptos y técnicas fundamentales. Lima: UPC.BUSTOS, Juan. (2005). A escribir se aprende escribiendo. Madrid: Comunidad de Madrid Consejería de Educación.CHOMSKY, Noam. (2006). Nuestro conocimiento del lenguaje humano. Santiago de Chile: Edición Bilingüe.CLAVIJO Olarte, Amparo. (2006). Prácticas innovadoras de lectura y escritura. Bogotá: Universidad Distrital Francisco José de Caldas.REAL ACADEMIA ESPAÑOLA. (2010) Ortografía de la lengua española. Madrid: Espasa.* - *AGUIRRE, Mauricio y ESTRADA, Christian. (2007). Redactar en la universidad. Conceptos y técnicas fundamentales. Lima: UPC.* - *BUSTOS, Juan. (2005). A escribir se aprende escribiendo. Madrid: Comunidad de Madrid Consejería de Educación.* - *CHOMSKY, Noam. (2006). Nuestro conocimiento del lenguaje humano. Santiago de Chile: Edición Bilingüe.* - *CLAVIJO Olarte, Amparo. (2006). Prácticas innovadoras de lectura y escritura. Bogotá: Universidad Distrital Francisco José de Caldas* - *REAL ACADEMIA ESPAÑOLA. (2010) Ortografía de la lengua española. Madrid: Espasa.* - *Del Pozo Delgado, Pilar. (2007) Formación de formadores. Madrid: Pirámide (658.3124/D49)* - *Robbins, Stephen P. (2004) Comportamiento organizacional. Mexico D.F.: Pearson Education. (658.3A/R71).* - *Schermerhorn, John R. (2006). Administración. Mexico D.F.: Limusa. (658.3A/S29)*

Electrical Metrology Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Electrical Metrology</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-08</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Electrical Measurements</td><td>EE3010</td><td colspan="2">3</td></tr>
<tr><td colspan="2">- Applied Mathematics</td><td>EE3090</td><td colspan="2">3</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Carlos Ortiz</td><td colspan="3">Arequipa:
- Maria Teresa Mendoza</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Carlos Ortiz
- Pedro Vizarreta
- César Santos
- Ricardo Zurita</td><td colspan="3">Arequipa:
- Maria Teresa Mendoza
- Christian Vera</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">EE3010</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2.0</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td>2</td><td>EE3090</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>EE3010</td><td>4.0</td><td>3.6</td><td>137</td><td>5</td></tr>
<tr><td>2</td><td>EE3090</td><td>2.0</td><td>3.9</td><td>81</td><td>4</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Mathematics skill</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Analyze and evaluate alternating current circuits using complex numbers, phasor, differential equations and Fourier series.
Skills:
- Select and use instruments for measure electrical parameters including digital and analog instruments, applying modern technical methods of measurement.
Competences:
- Perform tests to electrical systems, analyzing and interpreting results and suggesting the corresponding improvement.</td></tr>
<tr><td>Content</td><td colspan="5">Electrical Measurement: Loads in alternating current circuits. Phasorial representation Alternating current circuits. Three-phase circuits and connections. Loads in three-phase circuits. Power and three-phase electrical energy. Fundamental concepts on measurement instruments. Measurement instruments. Analogous measurement instruments. Multifunctional instruments. Selection and connection. Instrument, Current and Voltage transformers. SCADA system. Disturbances in an electrical system. Quality of energy. Harmonics. Measurement of grounding systems. Measurement of soil resistivity. Measurement of the grounding resistance

Applied Mathematics: Complex numbers. Alternating current. Sinusoidal alternating current circuits in steady state. Fundamentals of statistics. Use of spreadsheet for linear regression. Applications of derivatives and integrals in electrical electrotechnics. Differential equations. Fourier series. Laplace transform.</td></tr>
<tr><td>Study and examination</td><td colspan="5">- Practical / laboratory: preparations with review, functional projects, lab reports</td></tr>
</table>

requirements and forms of examination	- *Lecture: partial quizzes and final written examination*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Castejon, Agustin (1998). Tecnología eléctrica. Madrid: Mc Graw-Hill. (621.3/C32)* - *Edminister, Joseph (1986) Circuitos eléctricos. México D.F.: Mc Graw-Hill (621.3C/E2C4)* - *Gilmore, Charles M. (1987). Instrumentos de medida eléctrica. Buenos Aires: Reverté. (621.381ME/G45I)* - *Karcz, Andrés M. (1992) Fundamentos de metrología eléctrica. México D.F.: Marcombo (621.3/K79)* - *Pérez Miguel Angel Alberto (2000) La amenaza de los armónicos y sus soluciones. Madrid: Thomson (621.3/P45L)* - *Ramirez Vásquez, José (1992) Medidas eléctricas. Barcelona: C.E.A.C. (621.3/R23M)* - *Roldan Viloria, José (1981) Manual de medidas eléctricas. Barcelona: C.E.A.C. (621.3M/R78)* - *Unión Fenosa (1996). Medida eléctricas: equipos de medida para baja tensión. Madrid: Paraninfo (621.3/U/M)* - *Buser, Artur (1987). Matemáticas básicas para electricidad y electrónica. México D.F.: Mc Graw-Hill (510.24/B87)* - *James, Glyn (2002) Matemáticas avanzadas para ingeniería. México D.F.: Pearson Educación (510/J19)* - *Kramer, Arthur D. (1983). Fundamentos de matemática. México D.F.: Mc Graw-Hill (510/K79F)* - *Kruglak, Haym. (1976). Teoría y problemas de matemáticas aplicadas a ciencia y tecnología. Cali: Mc Graw-Hill (510/K84T)*

Electrical Montage Module

<table>
<tr><td>Degree Program</td><td colspan="4">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="4">Electrical Montage</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4"></td></tr>
<tr><td>Code, if applicable</td><td colspan="4">EI-09</td></tr>
<tr><td rowspan="5">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="2">- Electrical Workshop</td><td>EG1040</td><td>2</td></tr>
<tr><td colspan="2">- Electrical Installation</td><td>EE3030</td><td>3</td></tr>
<tr><td colspan="2">- Montage and Electrical Installations</td><td>EE3070</td><td>3</td></tr>
<tr><td colspan="2">- Electrical Distribution Network</td><td>EE4010</td><td>4</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Ricardo Zurita</td><td colspan="2">Arequipa:
- Nestor Enriquez</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Rodolfo Cautín
- Ricardo Zurita
- Juan Chacón
- Pedro Vizarreta</td><td colspan="2">Arequipa:
- John Flores
- Carlos Quilla
- Nestor Enriquez
- Christian Vera</td></tr>
<tr><td>Language</td><td colspan="4">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>EG1040</td><td>3.5</td><td>Workshop</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">EE3030</td><td>3.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">EE3070</td><td>1.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>5.0</td><td>Practical</td><td>20 students</td></tr>
<tr><td>4</td><td>EE4010</td><td>3.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>EG1040</td><td>3.5</td><td>0.7</td><td>76</td><td>3</td></tr>
<tr><td>2</td><td>EE3030</td><td>4.5</td><td>3.0</td><td>135</td><td>5</td></tr>
<tr><td>3</td><td>EE3070</td><td>6.0</td><td>0.7</td><td>121</td><td>4</td></tr>
<tr><td>4</td><td>EE4010</td><td>3.0</td><td>2.9</td><td>106</td><td>4</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Formal: None
Content: Materials and Mathematics knowledge, and computing skill</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">After having finished the module, students are able to:
Knowledge:
- Known and apply technical standards and safety rules related with distribution networks, industrial and home electrical installations.
Skills:
- Calculate and select material, components and equipment for distribution networks, industrial and home electrical installations.
- Use computing tools to prepare projects and electrical drawings
Competences:
- Install and put in service equipment and electrical panels
- Apply troubleshooting methods to solve problems in electrical installations</td></tr>
<tr><td>Content</td><td colspan="4">Electrical Workshop: Basic operations with electrical conductors. Electrical conductors. Basic Tools Splices with solid conductors. Pig-tail splices. Tap splices. Splices with connectors. Splices with terminals. Application of welding in electrical splices. Connections and insulation of conductors. Taping of splices. Visible electrical installation. Installation of raceways. Installation of a distribution board. Installation of</td></tr>
</table>

	thermomagnetic switches and differential relays. Installation and wiring of switches with ground fault protection. Semi-visible electrical installations with PVC pipes. Embedded electrical installation. Installation of relays in control circuits. Installation of a control circuit with photoelectric detector. Installation of the direct starting mechanism, with contactor. Installation of a communication system. ***Electrical Installation**: Basics and standardization of electrical installations. Electrical symbols and schematics. Components of an electrical installation. Electrical conductors. Raceway system. Maneuver and protection devices. Electrical systems with grounding scheme and calculation of short circuits. Lighting systems. Design of an industrial electrical installation: load distribution, load chart, power installed, peak load, demand factor and simultaneity factor. Power compensation system.* *Design of an industrial electrical installation: Selection of conductors and raceway systems. Grounding system. Explosion-proof electrical installations. Safety at electrical installations.* ***Montage and Electrical Installations**: Electrical Installations. Main tools used for electrical installations. Connectors. Splices. Built-in electrical installation for lighting circuits and outlets. Preparation of circuit drawings for lighting and outlets. Electrical distribution panels. Connection of instrument transformers. Connection of multifunctional instruments. Installation of artificial light sources. Types of lamps. Installation of power supply and shunt circuits for electrical motors. Power supply and derivative circuits. Mounting of air ducts, PVC-SAP pipes and metal pipelines. Electrical motor control from a MC. Circuits for electrical motors. Star-delta switching starting of three-phase motors* *Starting of three-phase motors by means of an autotransformer. Centrifugal pumps.* ***Electrical Distribution Network**: Power distribution system. Power cables in primary distribution networks. Underground secondary distribution network. Air secondary distribution network. Primary and secondary network components. Electric safety in power distribution systems. Electrical substation. Medium voltage components of a PDS. Low voltage components of a PDS. Design and selection of the components for a power distribution substation. Transformation centres. Selection of components of a power transformation centre. Grounding System. Street Lighting – Lighting. Technical and non-technical losses in distribution systems.*
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Camarena, Pedro. (1988). Manual práctico para instaladores y montadores electricistas. México D.F.: Continental (621.3I/C22M)* - *Cultural (1995). Guía práctica de electricidad y electrónica. Madrid: Cultural (621.3EE/C/t.1), (621.3EE/C/t.2), (621.3EE/C/t.3)* - *Foley, Joseph. (1983) Fundamentos de instalaciones eléctricas. México D.F. : McGraw - Hill. (621.3I/F72)* - *Irwin, David J. (2008). Análisis básico de circuitos en ingeniería. México D.F.: Prentice Hall (621.3C/I76/2008)* - *Lagunas Marquez, Angel. (1999). Instalaciones eléctricas de baja tensión comerciales e industriales. Madrid: Paraninfo (621.3I/L17I)* - *Martínez Domínguez, Fernando. (1999). Instalaciones eléctricas de alumbrado e industriales. Madrid: Paraninfo (621.3I/M26)* - *PROCOBRE (1996). Uso del cobre. Instalaciones eléctricas. Santiago de Chile: s.n. (621.3I / P/U-C)* - *Richter, H.P. (1989) Manual práctico de instalaciones eléctricas: domésticas, granjas e industrias. México D.F.: Continental. (621.3I/R54)* - *De la Vega Ortega, Miguel (2006) Problemas de ingeniería de puesta a tierra. México D.F.: Limusa. (621.3I/D37)* - *Enriquez Harper, Gilberto (2007) El ABC del alumbrado y las instalaciones eléctricas en baja tensión. México D.F.: Limusa. (621.3I/E64B)* - *Ministerio de Energía y Minas (2006). Código nacional de electricidad. Lima: MEM (621.3/P/S)* - *Pérez Miguel, Angel Alberto (2000) La amenaza de los armónicos y sus soluciones.*

	Madrid: Thomson. (621.3/P45L) - *Roldan Viloría, José (1999). Instalaciones eléctricas para la vivienda. Madrid: Paraninfo. (621.3I/R78)* - *Schneider Electric Perú (2007) Guía de diseño de instalaciones eléctricas. Barcelona: s.n. (621.3I/SE/2007)* - *Siemens, A. G. (2000) Manual de baja tensión. Berlín: Siemens (621.3/S/2000)* - *Trashorras Montecelos, Jesús (1999) Desarrollo de instalaciones electrotécnicas en los edificios. Madrid: Paraninfo. (621.3I/T78)* - *Lagunas Márquez, Angel Landa (1999) Instalaciones eléctricas de baja tensión comerciales e industriales. Madrid: Paraninfo. (621.3I/L17I)* - *Procobre (1996). Uso del cobre en instalaciones eléctricas. Santiago de Chile: Procobre (621.3I/P/UC)* - *Santamaría, Germán (1985). Manual de automatización eléctrica. Madrid: Arco/Lebres S.A. (629.8/S21)* - *Schmeicher, Theodor (1984). Manual de baja tensión. Berlín: Siemens. (621.3M/S31)* - *Trashorras Montecelos, Jesús (1999) Instalaciones electro-técnicas en los edificios. Madrid: Paraninfo (621.3I/T78)* - *Barrero, Fermin (2004) Sistemas de energía eléctrica. Madrid: Thomson. (621.3/B25).* - *Blackburn, Lewis (2007) Protective relaying. Principles and applications. Boca Ratón: CRC Press. (621.3/B61P).* - *Enríquez Harper, Enrique (1987) Sistemas eléctricos de potencia. México D.F.: Limusa. (621.3/E64S).* - *Enríquez Harper, Gilberto (2008) Protección de instalaciones eléctricas industriales y comerciales. México D.F.: Limusa (621.319/E64).* - *Lab - VoH (2004) Circuitos de potencia y transformadores. Alberta: Lab-VoH (621.3/L/C).* - *Navarro Marquez, José (1999) Instalaciones eléctricas de alta tensión. Sistema de maniobra, medida y protección. Madrid: Paraninfo (621.3I/N28).* - *Ramírez Vásquez, José (2004). Estaciones de transformadores y distribución.Protección de sistemas eléctricos. Barcelona: CEAC. (621.3/R23E/2004)*

Electrical Machines Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Electrical Machines</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-10</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Electrical Machines I</td><td>EE3050</td><td colspan="2">3</td></tr>
<tr><td colspan="2">- Electrical Machines II</td><td>EE4020</td><td colspan="2">4</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Carlos Cuba</td><td colspan="3">Arequipa:
- Alonso Cornejo</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Carlos Cuba
- Denis Chavarry
- Aldo Camargo</td><td colspan="3">Arequipa:
- Alonso Cornejo
- Maria Teresa Mendoza</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">EE3050</td><td>4.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2.0</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">EE4020</td><td>3.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>1.5</td><td>Practical</td><td>20 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>EE3050</td><td>6.0</td><td>1.2</td><td>130</td><td>4</td></tr>
<tr><td>2</td><td>EE4020</td><td>4.5</td><td>2.4</td><td>124</td><td>4</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Materials and Mathematics knowledge</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Recognize constituent parts and operation principles of transformers, dc and ac electrical machines as well as
Skills:
- Calculate electrical machines parameters and analyze their behavior using equivalent circuits and engineering software.
Competences:
- Test electrical machines to evaluate their operation and behavior in different operation conditions and troubleshooting of them.</td></tr>
<tr><td>Content</td><td colspan="5">Electrical Machines I: Electromagnetism. The real transformer. The single-phase transformer. Equivalent circuit and single-phase transformer efficiency. Parallel operation of single-phase transformers. Connection of the three-phase transformer. Parallel connection of three-phase transformers. DC machines. Armature reaction. Separately excited DC generator and Shunt generator. Series DC generator and compound DC generator. Torque and speed in a DC motor. Synchronous machine. Equivalent circuit of the synchronous machine. Operation of a synchronous alternator. Synchronous motor.

Electrical Machines II: The asynchronous motor. Equivalent circuit of the asynchronous motor. Calculation of performance in a three-phase asynchronous motor. Loaded operation of an asynchronous motor. Insulation and level of protection. Speed control in an asynchronous motor. Vector control. Classification of single-phase motors. Three-phase motor in Steinmetz connection. Single-phase synchronous motor. Stepper motor. Selection of single-phase motors.</td></tr>
</table>

Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Chapman Stephen (2005) Máquinas eléctricas. México D.F.: Mc Graw-Hill. (621.3MO/CH523/2005)* - *Enriquez Harper, Gilberto (2007). El ABC de las máquinas eléctricas I transformadores. México D.F.: Limusa. (621.3MO/E64E/2007)* - *Kosow, Yrving L. (1993) Máquinas eléctricas y transformadores. México D.F.: Prentice Hall. (621.3MO/K77/1993)* - *Ras Oliva, Enrique (1995) Transformadores de potencia de medida y de Protección. México D.F.: Alfaomega (621.3T/R24/1995)* - *Richardson, Donald. V. (1997) Máquinas eléctricas rotativas y transformadores. México D.F.: Prentice Hall (621.3MO/R54)* - *Enríquez Harper, Gilberto (2007). Curso de transformadores y motores de inducción. México D.F.: Limusa (621.3T/E64/2007)* - *Palmer, Doc (2006). Maintenance planning and scheduling handbook. New York: McGraw-Hill (658.202/P19)*

Quality and Safety Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Quality and Safety</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-11</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Continuous Improvement</td><td>GG3020</td><td colspan="2">3</td></tr>
<tr><td colspan="2">- Safety, Health and Environment</td><td>GG4010</td><td colspan="2">4</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Luis Peña</td><td colspan="3">Arequipa:
- Alberto Ochoa</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Luis Peña
- Segundo Jiménez</td><td colspan="3">Arequipa:
- Alberto Ochoa
- José Pauca</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>GG3020</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>GG4010</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>GG3020</td><td>2.0</td><td>1.3</td><td>59</td><td>2</td></tr>
<tr><td>2</td><td>GG4010</td><td>2.0</td><td>2.3</td><td>77</td><td>3</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Basic Statistics knowledge and computing skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Design basic model of continuous improvement and quality´s system
- Design basic structure of security, healthy and environment´s system
Skills:
- Use tools for continuous improvement of quality
- Use tools for evaluate personal and environment of risk
Competences:
- Propose, implement and evaluate the improvement actions in the quality´s system
- Evaluate the risks present in the workplace and suggests control measures</td></tr>
<tr><td>Content</td><td colspan="5">Continuous Improvement: Principles and foundations of quality. Foundations for continuous improvement. Methodology of operational excellence. Building understanding. Measurement and analysis. Generating solutions. Improving and controlling. Creating institutions. Continuous Improvement – Kaizen. Problem resolution methodology. Projects of improvement. ISO 9000: 2000 Standards Series. Integrated management systems. Rubric – Case analysis: Application of continuous improvement at a corporation. Implementation of a quality management model.

Safety, Health and Environment: Prevention of labor risks. Industrial safety. Prevention of labor risks. Industrial hygiene. Environment and Industrial Social Responsibility. Systems of health, safety and environment management and social responsibility. Regulations on health, safety and environment. Electrical hazards and risks of hydrocarbons. Identification of hazards, evaluation and risk control. Control of risks to health and safety. Personal protection equipment. Environmental risks control. Preparation for emergencies. Prevention and control of spillages and fire. Preparation for emergencies. First aids.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td colspan="5">Lecture: partial quizzes, assignments and final written examination.</td></tr>
</table>

Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Crosby, Philip B (2001) La calidad no cuesta: El arte de cerciorarse de la calidad. México D.F.: Continental (658.562/C91C)* - *Gutierrez Pulido, Humberto (2005). Calidad total y productividad. México D.F.: McGraw-Hill (658.562/G96P)* - *Imai, Masaki (1992). Kaizen, México D.F.: Continental (658.562/I41)* - *Imai, Masaki (1998) Cómo interpretar el Kaizan en el sitio de trabajo. Bogotá. Mc Graw-Hill (658.562/I4)* - *Polya, G. (2004). How to solve it. A new aspect of mathematical method. New Jersey / Princeton University Press (511/P75)* - *Grimaldi, John V. (1991) Manual de seguridad industrial. Bogotá: Alfaomega. (620.86/G82M)* - *Letayf, Jorge (1998). Seguridad, higiene y control ambiental. México D.F.: Mc Graw-Hill. (658.2/L52)* - *Ramírez Cavassa, César (2007). Seguridad industrial. Un enfoque integral. México D.F: Limusa. (620.86/R22)*

Electronic Circuits Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Electronics Circuits</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-12</td></tr>
<tr><td rowspan="4">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Analog Electronics</td><td>AE3010</td><td colspan="2">3</td></tr>
<tr><td colspan="2">- Digital Electronics</td><td>AE4010</td><td colspan="2">4</td></tr>
<tr><td colspan="2">- Power Electronics</td><td>EE5010</td><td colspan="2">5</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- José Lazarte</td><td colspan="3">Arequipa:
- Danny Meza</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Alfredo Pacheco
- Francisco Camacho
- Manuel Marquez
- José Lazarte</td><td colspan="3">Arequipa:
- Hernando Prada
- Midward Charaja
- Danny Meza</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">AE3010</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AE4010</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">AE5010</td><td>2.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>AE3010</td><td>3.5</td><td>2.2</td><td>103</td><td>3</td></tr>
<tr><td>2</td><td>AE4010</td><td>3.5</td><td>2.5</td><td>108</td><td>4</td></tr>
<tr><td>3</td><td>AE5010</td><td>3.5</td><td>2.5</td><td>108</td><td>4</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Basic Electronic</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Differentiate operational and functional characteristic of discrete and integrated electronic devices in analog, digital and power electronic circuits.
Skills:
- Perform functioning tests to analog, digital and power electronic devices and basic electronic control systems.
Competences:
- Detect and solve problems in analog, digital and power electronic circuits using modern diagnoses tools and software</td></tr>
<tr><td>Content</td><td colspan="5">Analog Electronics: Semi-conductor diodes. Rectifying circuits. BJT and FET transistors. Power Transistors. Power supply sources regulated with diodes and transistors. Voltage Regulators in CI. The operational amplifier (Opamp). Linear circuits with Opamps. Oscillators and filters. Switched-Mode Power Supply.

Digital Electronics: Fundamentals of digital logics. Multivibrators: Astable and monostable. Function generator. Sequential logic. Applications of sequential logic. Synchronous counters. Devices for digital data storage. Devices of programmed logic. Graphic edition, simulation and recording. AHDL. Introduction to I.C. Microcontrollers.</td></tr>
</table>

	***Power Electronics**: Electronic switches: Power devices. Uncontrolled rectifiers. Three-phased rectifier circuits. Half-wave controller rectifiers. Full-wave controlled rectifiers. Harmonics Speed variator in an analog DC motor. Four-quadrant DC converter. Speed variator in a digital DC/AC motor. Configuration and programming of AC speed variators. Configuration of variators using a PC. Voltage regulation in generator sets. Automatic transfer boards.*
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Boylestad, Robert L. (2003) Electrónica: Teoría de Circuitos y Dispositivos electrónicos. México D.F.: Prentice Hall (621.381/B78/2003.)* - *Floyd, Thomas (1996). Fundamentos de electrónica digital. México D.F.: Limusa (621.381D/F59)* - *Malvino, Albert Paul (2000) Principios de electrónica. Madrid: Mc Graw-Hill. (621.381E/M19/2000)* - *Cannon, Don L. (1988). A fondo. Mantenimiento de sistemas digitales. Madrid: Anaya Multimedia. (621.381D/C23)* - *Hayes, John P. (1992). Diseño de Sistemas digitales y micropocesadores. Madrid: Mc Graw-Hill. (621.381D/H28)* - *Tocci, Ronald J. (2007) Sistemas digitales. Principios y aplicaciones. México D.F.: Prentice Hall. (621.381D/T65/2007)* - *Hart, Daniel (2001) Electrónica de potencia. Madrid: Pearson Educación (621.381/H22).* - *Lilen, Henri (1991) Tiristores y triacs. Barcelona: Marcombo S.A. (621.381S/L63).* - *Martínez García, Salvador (2006) Electrónica de potencia. Madrid: Paraninfo (621.381/M26P).* - *Rashid, Muhammad (2004) Electrónica de potencia. México D.F.: Pearson Educación. (621.381/R24).*

Human Resources and Labor Market Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Human Resources and Labor Market</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-13</td></tr>
<tr><td rowspan="4">Courses and Semester(s) in which the module is taught</td><td colspan="3">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="3">- Decisions Making</td><td>GG4020</td><td>4</td></tr>
<tr><td colspan="3">- Human Resources</td><td>GG5040</td><td>5</td></tr>
<tr><td colspan="3">- Induction to Labor Market</td><td>GG6030</td><td>6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="3">Lima:
- Henry Anchante</td><td colspan="2">Arequipa:
- Tania Rojas</td></tr>
<tr><td>Lecturers</td><td colspan="3">Lima:
- Henry Anchante
- Luis León
- Diana Castillo</td><td colspan="2">Arequipa:
- Tania Rojas
- Karina Salas</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>GG4020</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>GG5040</td><td>3.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>GG6030</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>GG4020</td><td>2.0</td><td>2.4</td><td>79</td><td>3</td></tr>
<tr><td>2</td><td>GG5040</td><td>3.0</td><td>2.1</td><td>92</td><td>3</td></tr>
<tr><td>3</td><td>GG6030</td><td>2.0</td><td>1.5</td><td>63</td><td>2</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Communication and computing skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Formulate strategies considering decision analysis techniques and solution, personal barriers, ethical criteria and tools for creativity and innovation in the face of a problem or opportunity.
- Design and implement processes aimed at developing the human capital of a business
- Develop strategies to help you locate and develop opportunities for employability effectively and efficiently
Skills:
- Apply techniques for problem solving and ethical decision criteria
- Use modern theories and methodologies for managing human resources.
- Use methods to tailor your personal and professional profile to job opportunities that are presented
Competences:
- Apply and develop skills in planning, analysis, troubleshooting, or taking advantage of opportunities to make effective and ethical decisions.
- Apply concepts and methodologies in the management of human resources.
- Harmonize their personal and professional profile to implement formal and relational strategies to help you locate and develop opportunities for employability effectively and efficiently</td></tr>
<tr><td>Content</td><td colspan="5">Decision Making: The classic approach. The decision-making process. Identification and description of the problem in decision-making. Practical cases. Problem resolution</td></tr>
</table>

	techniques in decision-making. Team decision-making. Interpersonal barriers to decision-making. Practical cases. Social and labor ethics. Decision-Making based on an ethical perspective. Creativity and innovation in the generation of decision alternatives. Application of Creativity and Innovation in Decision-Making. Criteria to assess solution alternatives. ***Human Resources**: Management: Fundamental skills. Management and personal supervision. Team Work. Communication in the workplace. Employee motivation. Leadership in the workplace. Workplace conflict management. Management of organizational changes. Supervision plan. Recruitment and staff selection. Individual Differences, Personality and Values in the Workplace. Training and Job Analysis. Performance and skills evaluation. Labour regulations and laws. Essay writing.* ***Induction to Labor Market**: Personal competitiveness. The résumé. Job interview, characteristics and types. Personal marketing. Employability. Employability. Types of evaluations. Staff recruitment. Understanding gestures and body language. Personal image. Professional ethics.*
Study and examination requirements and forms of examination	- *Practical: simulated job interviews.* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Espíndola, José Luis (2005) Análisis de problemas y toma de decisiones. México D.F.: Addison Wesley. (153.43/E84)* - *García, Salvador (2003) La dirección por valores. Madrid: Mc Graw-Hill (179.9/G23)* - *Jennings, David (2000) Toma de decisiones: Un enfoque integrado. México D.F.: Continental 658.1G/J39)* - *Montes, Felipe (2000). Resolución de problemas y toma de decisiones. México D.F.: Trillas (153/M84)* - *Rey Sancristán, Francisco (2003). Técnicas de resolución de problemas. Madrid: s.n. (658.2/R47T)* - *Robbins, Stephen (2004) Comportamiento organizacional. México D.F.: Pearson Educación (658.3A/R71)* - *Shermerhorn, John (2006) Administración. México D.F.: Limusa (658.3A/S29)* - *Alles, Martha. (2006) Dirección estratégica de recursos humanos. Gestión por competencias. Buenos Aires: s.n. (658.3A/A43D)* - *Chiavenato, Idalberto (2006) Introducción a la teoría general de la administración. México D.F.: Mc Graw- Hill. (658.3A/CH548/2006)* - *Covey, Stephen (2000) Los 7 hábitos de la gente altamente efectiva. Barcelona: Paidos. (658.3A/C8L)* - *Goleman, Daniel (1999) Inteligencia emocional en la empresa. Buenos Aires: Industrial Gráfica. (658.1G/G71)* - *Grados, Jaime (2001) Capacitación y desarrollo de personal. México D.F.: Trillas. (658.3A/G8C)* - *Mosley, Donald (2005) Supervisión. México D.F.: Thompson (658.302/M87)* - *Robbins, Stephen (2004) Comportamiento organizacional. México D.F.: Pearson Educación. (658.3A/R71)* - *Whetten, David (2005) Desarrollo de habilidades directivas. México D.F.: Pearson Educación. (658.409/W53)* - *Bejarano, Alberto (2011). Gestión de Carrera en la Sociedad Red. Lima: ESAN (658.4093/B37)* - *Fournies, Ferdinand (1997) Técnicas de dirección de personal. Cómo instruir para aumentar el rendimiento. México D. F.: Mc Graw-Hill (658.3A/F78).* - *Harrison, Tony (2002) Estrategia de comunicación. Técnicas de publicidad. Lima: El comercio (658.1G/P/5)* - *Mora G., Guillermo (1995) Valores humanos y actitudes positivas. Bogotá: Mc Graw-Hill (658.3A/M79)* - *Loret de Mola, Edgardo (2009). Administración de Carrera. Lima: CENTRUM* - *Temple, Inés (2010). Usted S.A. Lima: Norma*

Automation and Control Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Automation and Control</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-14</td></tr>
<tr><td rowspan="4">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Electrical Control Systems</td><td>EE4040</td><td colspan="2">4</td></tr>
<tr><td colspan="2">- Industrial Automation</td><td>EE5030</td><td colspan="2">5</td></tr>
<tr><td colspan="2">- Process Control</td><td>EE6010</td><td colspan="2">6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Denis Chavarry</td><td colspan="3">Arequipa:
- Danny Meza</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Ricardo Zurita
- Pedro Vizarreta
- Denis Chavarry
- Armanco Sarco
- Eddie Sobrado</td><td colspan="3">Arequipa:
- Danny Meza</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">EE4040</td><td>3.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>5.0</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">EE5030</td><td>2.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>3.0</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">EE6010</td><td>3.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>4.0</td><td>Laboratory</td><td>20 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>EE4040</td><td>8.0</td><td>1.1</td><td>164</td><td>5</td></tr>
<tr><td>2</td><td>EE5030</td><td>5.0</td><td>2.5</td><td>135</td><td>5</td></tr>
<tr><td>3</td><td>EE6010</td><td>7.0</td><td>2.1</td><td>164</td><td>5</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Materials and Mathematics knowledge, and computing skill</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Develop and carry out electrical control systems projects using modern controller, electrical components and software.
Skills:
- Install, configure and programing sensor, actuators and controller for electrical control systems
Competences:
- Install and put in service instrumentation equipment for electrical control systems</td></tr>
<tr><td>Content</td><td colspan="5">Electrical Control Systems: Control system. Equipment and devices of control. Symbols and electrical schematic diagrams used in electric control projects. AC motor braking systems Starting of DC motors. Development of automation projects. Failure detection techniques for automation boards. Solid-state starters. Speed variator. Control center of intelligent motors. Automation and operation of distribution substations.

Industrial Automation: Basic logic functions. Normalized programming languages. PLC architecture. Combinatory functions. Internal memory or internal BIT. PLC configuration. SET/RESET memory Function. Selection of PLCs. Pneumatics. Pneumatic control according to time and displacement. Sequential control. Counters and comparators. Arithmetic</td></tr>
</table>

	operations. Analog modules. Analog programming: Escalade. Continuous control functions. Grafcet. Paced sequence control. Sequential control with drops and bifurcations. Adjustment of speed in hydraulic systems. ***Process Control**: Instrumentation and process control. Sensors and transmitters. Measurement of pressure. Measurement of temperature. Temperature sensors and transmitters. Measurement of level. Measurement of flow. Sensors of different variables. Industrial actuators. Digital instrumentation. Modes of control. Controller tuning. Adaptive tuning. Computer-based control and supervision. Symbols in instrumentation and control.*
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Astirraga Urquiza, Julio (1994) Hornos industriales de resistencias.Teoría, cálculo y aplicaciones. Madrid: Mc Graw-Hill. (621.3MO/A83)* - *Merino Azcarraga, José María (1997). Convertidores de frecuencia para motores de corriente alterna. Madrid: Mc Graw-Hill. (621.3MO/M43)* - *Santamaría, Germán (1985). Manual de automatización eléctrica. Madrid: Arco /Libros S.A. (629.8/S21)* - *Siemens, A. G. (2000). Manual de baja tensión. Berlín: Siemens. (621.3/S/2000)* - *Allen, Bradley (2001) Controllogix 5000 controllers common procedures programming manual. New York: Allen Bradley (629.8PLC/A-2).* - *Allen, Bradley (2001) Controllogix 5000 controllers general instructions reference manual. New York: Allen Bradley (629.8PLC/A-3).* - *Marín, Francisco (2007) Diseño basado en microcontroladores. Málaga: Universidad de Málaga. (004.16/M26D).* - *Ramírez Quiroz, Elmer (1997) Controladores lógicos programables. Lima: CONCYTEC. (629.8PLC/R2).* - *Siemens A.G. (1988) Autómata programable. (S5-100u) Simatic S5. Berlín: Siemens. (629.8PLC/S-UA).* - *Creus, Solé, Antonio (2006) Instrumentación industrial. México D.F.: Alfaomega. (621.381I/C86/2006).* - *Shinskey, F.G. (1996). Sistemas de control de procesos, aplicación, diseño y sintonización. México D.F.: Mc Graw-Hill. (621.381I/S47).* - *Smith, Carlos (1991) Control automático de procesos: Teoría y práctica. México D.F.: Limusa. (621.381I/S61).* - *Szklanny, Sergio (1995) Sistemas digitales de control de procesos. Buenos Aires: s.n. (621.381I/S99).*

Electrical Maintenance Module

<table>
<tr><td>Degree Program</td><td colspan="4">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="4">Electrical Maintenance</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4"></td></tr>
<tr><td>Code, if applicable</td><td colspan="4">EI-15</td></tr>
<tr><td rowspan="4">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="2">- Transformer Maintenance</td><td>EE4060</td><td>4</td></tr>
<tr><td colspan="2">- Electric Motor Maintenance</td><td>EE5060</td><td>5</td></tr>
<tr><td colspan="2">- Electromechanical Maintenance</td><td>EE6060</td><td>6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Hermenegildo Mendoza</td><td colspan="2">Arequipa:
- Alonso Cornejo</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Rodolfo Cautín
- Ricardo Zurita
- Hermenegildo Mendoza</td><td colspan="2">Arequipa:
- Christian Vera
- Alonso Cornejo</td></tr>
<tr><td>Language</td><td colspan="4">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>EE4060</td><td>4.0</td><td>Practical</td><td>20 students</td></tr>
<tr><td>2</td><td>EE5060</td><td>4.0</td><td>Practical</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">EE6060</td><td>1.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>4.0</td><td>Practical</td><td>20 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>EE4060</td><td>4.0</td><td>3.5</td><td>135</td><td>5</td></tr>
<tr><td>2</td><td>EE5060</td><td>4.0</td><td>3.0</td><td>126</td><td>4</td></tr>
<tr><td>3</td><td>EE6060</td><td>5.0</td><td>3.0</td><td>144</td><td>5</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Formal: None
Content: instruments and tools uses skill</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">After having finished the module, students are able to:
Knowledge:
- Known and apply technical standards and safety rules in maintenance tasks of electrical machines.
Skills:
- Apply technics and methods of troubleshooting and diagnostic of electrical machines using modern testing equipment and software.
Competences:
- Apply preventive and predictive maintenance methodology for machines and electrical equipment.</td></tr>
<tr><td>Content</td><td colspan="4">Transformer Maintenance: Safety rules. Identifying transformer pieces and testing a transformer. Construction of a three-phase transformer. Calculations to establish parameters of a single-phase transformer. Selection of materials to construct a three-phase transformer. Dimensioning and construction of a mold for a coil. Welding of terminals and safety of coils. Construction of complementary elements to mount the transformer. Mounting the coil in the transformer core. Identification of the parts of a distribution transformer. Dielectric rigidity test with spinterometer. Interpretation of the physical and chemical oil test of a voltage transformer.

Electric Motor Maintenance: Diagnosis and putting into service of a divided-phase motor. Dismounting and identification of the components of a divided-phase motor. Measurements and tests to diagnose three-phase motors. Dismounting, identification and putting into service of a three-phase motor. Collection of data to reconstruct windings in three-phase motors. Insulation of slots and construction of windings. Mounting of windings to the stator. Assembling and testing a rewinding. Calculating the energy saving in an efficient motor. Detecting failures and putting into service a rewound rotor motor. Diagnosis and maintenance</td></tr>
</table>

	of a synchronous motor. Diagnosis and putting into service a DC motor. ***Electromechanical Maintenance**: Pumps and water pumping systems. Making up a centrifugal pump and its applications. Pumping systems. Mounting and alignment of couplings Electric cranes, classification, applications and preventive maintenance. Preventive and corrective maintenance of motor generator groups of welding machines. Maintenance of a synchronous generator. Maintenance of generator sets. Maintenance of electric systems of the GS. Thermographic analysis, advantages and applications. Maintenance of refrigeration and air-conditioning systems. Steam boilers. Identification of equipment and instruments for the predictive maintenance of motors. Predictive technology for diagnosing in- line motors*
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Enriquez Harper, Gilberto (2007) El ABC del control electrónico de las máquinas eléctricas. México D.F.: Limusa (621.3MO/E64E/2007)* - *Kosow Irwing L. (1993) Máquinas eléctricas y transformadores. México D.F.: Prentice Hall (621.3MO/K77/1993)* - *Kuhn, Robert (1976) Pequeños transformadores. Barcelona: Marcombo. (621.3T/K92)* - *Lab-Volt. (2004). Circuitos de potencia y transformadores. Alberta: Lab Volt. (621.3/L/C)* - *Ras Oliva, Enrique (1995) Transformadores de potencia de medida y de protección. México D.F.: Alfaomega (621.3T/R24/1995)* - *Chapman, Stephen (2004) Máquinas eléctricas. México D.F.: Mc Graw-Hill. (621.3MO/CH523).* - *Enríquez Harper, Gilberto (2007) El ABC de las máquinas eléctricas. Instalación y control de motores de corriente alterna. México D.F.: Limusa (621.3MO/E64A/2007).* - *Manzano Orrego, Juan José (2003) Mantenimiento de máquinas eléctricas. Madrid: Paraninfo. (621.3MO/M22M).* - *Puchol Vivas, José Manuel (1978) Motores de corriente alterna. México D.F.:Limusa (621.3M0/P89).* - *Sancho, Pablo Marco (1980) 121 devanados de motores trifásicos. Barcelona: G. Gili. (621.3MO/S21).* - *Smeaton, Robert (1990) Motores eléctricos. Selección, mantenimiento y reparación. México D.F.: Mc Graw-Hill. (621.3MO/S61).* - *Althouse, Andrew (1988) Modern refrigeration and air conditioning. Illinois: The Goodheart Willcox. (621.56/A43M).* - *Botero , Camilo (1987) Manual de refrigeración y aire acondicionado. México D.F.: Prentice Hall. (621.56/B76).* - *Carnicer Rojo, Enrique (1991) Aire comprimido. Madrid: Paraninfo. (621.56/C23).* - *Ramirez Vásquez, José (1994) Talleres electromecánicos bobinados. Barcelona: CEAC. (621.3M/R23T).* - *Sadiku, Matthew (2006) Elementos de electromagnetismo. México D.F.: Alfaomega. (537/S13).* - *Whitman, William (2004) Tecnología de la refrigeración y aire acondicionado. Madrid: Paraninfo. (621.56/W54T).*

Energy and Maintenance Management Module

<table>
<tr><td>Degree Program</td><td colspan="4">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="4">Energy and Maintenance Management</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4"></td></tr>
<tr><td>Code, if applicable</td><td colspan="4">EI-16</td></tr>
<tr><td rowspan="4">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="2">- Maintenance Management</td><td>MG4010</td><td>4</td></tr>
<tr><td colspan="2">- Audit and Energy Efficiency</td><td>EE5050</td><td>5</td></tr>
<tr><td colspan="2">- Electrical Maintenance Management</td><td>EE6050</td><td>6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Ricardo Zurita</td><td colspan="2">Arequipa:
Maria Teresa Mendoza</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Carlos Cuba
- Ricardo Zurita
- Carlos Ortiz
- Aldo Camargo</td><td colspan="2">Arequipa:
- Alonso Cornejo
- Christian Vera</td></tr>
<tr><td>Language</td><td colspan="4">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td>1</td><td>MG4010</td><td>3.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>EE5050</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>EE6050</td><td>2.0</td><td>Lecture</td><td>30 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>MG4010</td><td>3.0</td><td>2.0</td><td>90</td><td>3</td></tr>
<tr><td>2</td><td>EE5050</td><td>2.0</td><td>3.9</td><td>106</td><td>4</td></tr>
<tr><td>3</td><td>EE6050</td><td>2.0</td><td>3.9</td><td>106</td><td>4</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Formal: None
Content:</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">After having finished the module, students are able to:
Knowledge:
- Design, organize and manage electrical maintenance plans for companies
Skills:
- Use modern equipment and methodologies for preventive and predictive maintenance tasks
Competences:
- Develops and execute maintenance plans for installations and electrical systems</td></tr>
<tr><td>Content</td><td colspan="4">Maintenance Management: Relationship among maintenance, production and the equipment manufacturer. Stages in the management cycle. Equipment useful life. Maintenance planning and scheduling. Implementation of a maintenance system. Useful life cost. Technical and economic selection of fans and compressors. Specific costs in the useful life. Organization of maintenance and assignation of resources required for the activities. Main maintenance management indicators. Group presentation on management indicators. Financial and labour indicators. Design of a laboratory or workshop maintenance plan according to the manufacturer's information and the operational conditions. CMMS - Computerized management system. Processes, operations and components at industrial plants. Eliminating wasting. Poka- Yoke, Smed.

Audit and Energy Efficiency: Worldwide and domestic energy structure. Energy efficiency Energy audit. Energy management. Options of rates and their selection. Economic selection of electric conductors. Energy saving in lighting systems. Efficient electric motors Compensation of reactive power. Energy saving through speed variators. Maintenance in energy management.</td></tr>
</table>

	***Electrical Maintenance Management**: Administrative tools for maintenance management. Tools for maintenance planning. Tools for maintenance scheduling. Automation pilot plant. NEW MAINTENANCE TRENDS IN THE ELECTRIC INDUSTRY. Total Productive Maintenance (TPM). Reliability Centered Management (RCM). Root Cause Failure Analysis (RCFA). TECHNIQUES USED IN ELECTRICAL MAINTENANCE - Vibration analysis - Partial downloads – Thermography -Failure detection techniques un underground cables.*
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Cotler, Mel A. (1994) Maintenance programming. New Jersey: Prentice Hall. (658.2/C85).* - *Goettsche, L.D. (1998) Maintenance of instruments and Systems. New York: s.n. (621.381I/G57)* - *González Fernández, Francisco Javier (2009). Teoría y práctica del mantenimiento industrial avanzado. Madrid: Fundación Confemetal (658.202/G71/2009)* - *Hartmann, Eward H. (1998) Cómo instalar con éxito el TPM en su empresa. A través del original proceso TPM. Lima: s.n. (658.2/H2T)* - *Levitt, Joel (2009). The handbook of maintenance management. New York: Industrial Press (658.202/L54)* - *Palmer, Doc (2006) Maintenance planning and scheduling handbook. New York: McGraw-Hill (658.202/P19)* - *Wireman, Terry (2005). Developing perfomance indicators for managing maintenance. New York: Industrial Press (658.2/W72D)* - *Comisión de tarifas eléctricas (1998) Situación tarifaria en el sector eléctrico peruano. Lima: Apoyo comunicaciones. (621.3/C/S).* - *Creus Solé, Antonio (2004) Energías renovables. Barcelona: CEYSA. (531.6/C88).* - *Fernández Salgado, José María (2007) Guía completa de la energía solar térmica. Madrid: Vicente ediciones. (621.47/F42).* - *Institute of Electrical and Electronics Engineers (1996) Energy management in industrial and comercial facilities. New York: IEEE (621.3I/I/739).* - *Martínez Domínguez, Fernando (1998) Instalaciones eléctricas de alumbrado e industriales. Madrid: Paraninfo. (621.3I/M26).* - *Pérez Miguel, Angel Alberto (2000) La amenaza de los armónicos y sus soluciones. Madrid: Thomson. (621.3/P45L).* - *Toledano, José Carlos (1993) Tarifas eléctricas. Legislación y aplicaciones. Madrid: Mc Graw-Hill. (621.3/T68).* - *García Garrido, Santiago (2003) Organización y gestión integral de mantenimiento. Madrid: Díaz de Santos. (658.202/G23).* - *González Fernández, Francisco (2009) Teoría y práctica del mantenimiento industrial avanzado. Madrid: Fundación Confemetal. (658.202/G71/T).* - *Langley, Billy (1986) Plant Maintenance. Reston, Virginia: Prentice Hall. (658.2/L22)* - *Manzano Orrego, Juan José (2003) Mantenimiento de máquinas eléctricas. Madrid: Paraninfo. (621.3MO/M22M).* - *Morrow, L.C. (1984). Manual de mantenimiento industrial. Organización, ingeniería mecánica, eléctrica, química, civil, procesos y sistemas. Tomo 1. México D.F.: Continental. (658.2/M86/t.1)* - *Rey Sacristan, Francisco (2002). El automantenimiento en la empresa. Madrid: s.n. (658.2/R47A)* - *Rosales, Robert (1998) Manual del Ingeniero de Planta. México D.F. Mc Graw-Hill (658.2/R84M)*

Power Systems Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Power Systems</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-17</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Electrical Power System</td><td>EE5010</td><td colspan="2">5</td></tr>
<tr><td colspan="2">- Protection and Electrical Power Systems</td><td>EE6010</td><td colspan="2">6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="2">Lima:
- Pedro Vizarreta</td><td colspan="3">Arequipa:
- Christian Vera</td></tr>
<tr><td>Lecturers</td><td colspan="2">Lima:
- Pedro Vizarreta
- Carlos Ortiz
- Aldo Camargo</td><td colspan="3">Arequipa:
- Christian Vera
-</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td rowspan="6">Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Nr</td><td>Courses ID</td><td>Contact hours per week</td><td>Teaching Method</td><td>Class Size</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">EE5010</td><td>2.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>1.5</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">EE6010</td><td>4.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>2.0</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="4">Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.</td></tr>
<tr><td>Nr</td><td>Courses</td><td>Contact Hours per week</td><td>Private Study per week</td><td>Semester Workload</td><td>ECTS Credits</td></tr>
<tr><td>1</td><td>EE5010</td><td>3.5</td><td>3.0</td><td>117</td><td>4</td></tr>
<tr><td>2</td><td>EE6010</td><td>6.0</td><td>4.0</td><td>180</td><td>6</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Materials and Mathematics knowledge, and computing skill</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Identify the Peruvian electric system and its regulatory agencies
- Apply protections technics for generator, transformer and electric motors
Skills:
- Test and calibrate electrical protections relays
Competences:
- Coordinate protection relays for distributions systems</td></tr>
<tr><td>Content</td><td colspan="5">Electrical Power System: Conventional power centrals. Structure y generalities of Electric Power System (EPS). Non-conventional power centrals. Per-unit systems. Modeling of the synchronous machine. Modes and limits of a GS operation. Transitory phenomena. Three-phase transformer with three windings, types. Modeling a TL. Control of real power and frequency. Spinning reserve and reactive supply. Control of reactive power and voltage in an EPS. Voltage stability.

Protection and Electrical Power Systems: Transitory stability. Current and potential transformers. Calculation of faults: Unbalanced faults. Power fuse. Overcurrent relays and reconnectors. Coordination of protection between relays. Directional overcurrent relay and distance protection. Protection of synchronous generators. Schematics of teleprotection. Protection of electric motors. Protection of distribution substations. Arc Flash. Protection against overvoltage. Coordination of insulation.</td></tr>
</table>

Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Enríquez Harper, Gilberto (1983). Elementos de diseño de subestaciones eléctricas. México D.F.: Limusa (621.3/E64D)* - *Ramírez Vásquez, José (1986) Manual autodidáctico de líneas aereas. Barcelona: CEAC (621.3M/R23A)* - *Ramírez Vásquez, José (2004). Estaciones de transformadores y distribución.Protección de sistemas eléctricos. Barcelona: CEAC. (621.3/R23E/2004)* - *Trashorras Montecelos, Jesús (1998) Desarrollo de instalaciones eléctricas de distribución. Madrid: Paraninfo. (621.3I/T78D)* - *Barrero, Fermin (2004). Sistemas de energía eléctrica. Madrid: Thomson. (621.3/B25).* - *Checa, Luis María (1988) Líneas de transporte de energía. Barcelona: Marcombo S.A. (621.3/CH538).* - *Corredor Avella, Pablo (1992) Análisis de sistemas de potencia en estado estacionario. Medellín: Universidad Portifícia Bolivariana. (621.3/C77).* - *Enriquez Harper, Gilberto (1991) Introducción al análisis de redes eléctricas en sistemas de potencia. México D.F.: Limusa (621.3/E64I).* - *Navarro Marquez, José (1999) Instalaciones eléctricas de alta tensión. Sistema de maniobra, medida y protección. Madrid: Paraninfo (621.3I/N28).* - *Ramirez Rosado, Ignacio (2007) Problemas resueltos de sistemas de energía eléctrica. Madrid: Thomson. (621.3/R23).* - *Ras Oliva, Enrique (1995) Transformadores de potencia de medida y de protección. México D.F.: Alfaomega. (621.3T/R24/1995)* - *Stevenson, William (1994) Análisis de sistemas eléctricos de Potencia. México D.F.: Mc Graw-Hill (621.3/S79/1994)*

Basic English Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Basic English</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-18</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="3">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="3">- English I</td><td>GG5010</td><td>5</td></tr>
<tr><td colspan="3">- English II</td><td>GG6010</td><td>6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="3">Lima:
- Milton Chuquiruna</td><td colspan="2">Arequipa:
Julio Monjarás</td></tr>
<tr><td>Lecturer</td><td colspan="3">Lima:
- Milton Chuquiruna</td><td colspan="2">Arequipa:
- Julio Monjarás</td></tr>
<tr><td>Language</td><td colspan="5">English</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td rowspan="3">Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Nr</td><td>Courses ID</td><td>Contact hours per week</td><td>Teaching Method</td><td>Class Size</td></tr>
<tr><td>1</td><td>GG5010</td><td>6.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td></td><td>2</td><td>GG6010</td><td>6.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td rowspan="4">Workload</td><td colspan="6">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.</td></tr>
<tr><td>Nr</td><td>Courses</td><td>Contact Hours per week</td><td>Private Study per week</td><td>Semester Workload</td><td>ECTS Credits</td></tr>
<tr><td>1</td><td>GG5010</td><td>6.0</td><td>1.6</td><td>137</td><td>4</td></tr>
<tr><td>2</td><td>GG6010</td><td>6.0</td><td>1.7</td><td>139</td><td>4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Entry-level skills in communication</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Identify and effectively use basic English structures in order to read, interpret and translate texts on general topics of increasing complexity.
Skills:
- Establish basic communication in English in oral and written form.
- Understanding and interpreting basic general English texts.
Competences:
- Read, translate and interpret English texts on basic general topics.
- Speaking in basic form using simple grammatical structures of English.</td></tr>
<tr><td>Content</td><td colspan="5">English I: People and places. You and yours. Everyday life. Loves and hates. Getting from A to B. Eating and drinking. Extraordinary lives. Fact or fiction. Buying and selling. Keeping in touch. Going places. Street life.

English II: The world around us. A weekend away. Learning for the future. Leisure and lifestyle. Important firsts. At rest, at work. Special occasions. Appearances. Time off. Ambitions and dreams. Countries and cultures. Old and new. Take Care</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td colspan="5">Lecture: partial quizzes, oral and written assignments and final written examination.</td></tr>
<tr><td>Media employed</td><td colspan="5">Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.</td></tr>
<tr><td>Reading list</td><td colspan="5">- Cutting Edge - Students´ Book, Workbook, Students´.
- Resource Bank, Mini-Dictionary and Student CD. Sarah.
- Cunningham & Moor Peter with Frances Eales.</td></tr>
</table>

Management Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Electrotechnics</td></tr>
<tr><td>Module designation</td><td colspan="5">Management</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EI-19</td></tr>
<tr><td rowspan="3">Courses and Semester(s) in which the module is taught</td><td colspan="3">Courses</td><td>ID</td><td>Semester</td></tr>
<tr><td colspan="3">- Project Management</td><td>GG5020</td><td>5</td></tr>
<tr><td colspan="3">- Business Management</td><td>GG6020</td><td>6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="3">Lima:
- Edwin Ramos</td><td colspan="2">Arequipa:
- José Rojas</td></tr>
<tr><td>Lecturers</td><td colspan="3">Lima:
- Edwin Ramos
- Luis Peña</td><td colspan="2">Arequipa:
- José Rojas
- José Lima</td></tr>
<tr><td>Language</td><td colspan="5">Spanish</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Type of teaching, contact hours</td><td colspan="5">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Nr</th><th>Courses ID</th><th>Contact hours per week</th><th>Teaching Method</th><th>Class Size</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">GG5020</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1.0</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td>2</td><td>GG6020</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
</table></td></tr>
<tr><td>Workload</td><td colspan="5">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private study, including examination preparation, specified in hours.
<table>
<tr><th>Nr</th><th>Courses</th><th>Contact Hours per week</th><th>Private Study per week</th><th>Semester Workload</th><th>ECTS Credits</th></tr>
<tr><td>1</td><td>GG5020</td><td>3.0</td><td>2.3</td><td>95</td><td>3</td></tr>
<tr><td>2</td><td>GG6020</td><td>2.0</td><td>3.2</td><td>94</td><td>3</td></tr>
</table></td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">In order to pass each course of the module, student must obtain a minimal final grade of 11 (eleven). To compute the final grade, the fraction 0.5 or more is considered as a unit in favor the student. (Exam. Reg. 2013 Art. 21)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Formal: None
Content: Quality tools, communication and computing skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Develop, plan, organize and manage human and material resources in a project.
- Plans, organize, direct and control the human and material resources of a business.
Skills:
- Use modern theories and methodologies for managing resources of a business
Competences:
- Apply concepts and methodologies in the management of resources in an industrial and / or services business.</td></tr>
<tr><td>Content</td><td colspan="5">Project Management: Fundamental concepts related to projects. Identification of problems and improvement opportunities. Market research. Sales and incomes budget. Project engineering. Introduction to costs. Calculation of costs using proposed exercises. Sensitivity analysis – Differential costs. Laboratory costs. Budget of costs and investment. Expenses budget. Projected Financial statements. Projected cash flow. Financial assessment. Financial assessment. Planning the implementation. Diagrams. Planning the implementation: RED PERT-CPM. Follow-up and closing. Other project approaches. Real cases of improvement projects.

Business Management: Administrative process. Strategic planning. Organizational structure. Legal and tax aspects of a business. Group case 1. Starting up a business
Sales projection. Industrial marketing strategies. Aggregate planning. Production programming. Launching and production control. Rubric – Planning, programming and controlling the production in a business unit. Purchases, stocks and storage. Financial statements analysis. Administrative , operational and financial operators</td></tr>
</table>

	Stocks and financial operations. Rubric. Calculation and definition of cost in a business unit. Cost-volume-profit model. Financial analysis
Study and examination requirements and forms of examination	- *Practical / laboratory: preparations with review, functional projects, lab reports and oral presentations* - *Lecture: partial quizzes and final written examination.*
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Amat, Joan María (2002) Control presupuestario. Barcelona: Gestión 2000. (658.1G/A52C).* - *Colmenar Santos, Antonio (2007). Gestión de proyectos con Microsoft Project 2007. México D.F.: Alfaomega (005.368PR/C75)* - *Domingo Ajenjo, Alberto (2005). Dirección y gestión de proyectos. Un enfoque práctico. México D.F.: Alfaomega - Rama (658.404/A33)* - *Gido, Jack (1999) Administración exitosa de proyectos. México D.F.: s.n. (658.404/G44)* - *Project Management Institute (2008). A guide to the project management body of knowledge: (PMBOK Guide). Atlanta: Project Management Institute (658.404/P87/2008)* - *Chase, Richard (2000) Administración de producción y operaciones. Manufactura y servicios. Bogotá: Mc Graw - Hill. (658.5P/CH526A)* - *Kotler, Philip (2006). Dirección de marketing. México D.F.: Pearson Educación (658.8/K11).* - *Porter, Michael E. (1997) Estrategia competitiva. Técnicas para el análisis de los sectores industriales y de la competencia. México D.F.: Continental. (658.1G/P78)* - *Ross, Stephen (2006) Fundamentos de finanzas corporativas. México D.F.: McGraw-Hill (658.15/R84)* - *Schermerhorn, John R. (2006) Administración. México D.F.: Limusa (658.3A/S29).*