Module Handbook

Program:

“Industrial Automation and Electronics”

(Lima)

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Lima-Arequipa
Perú

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Instituto de Educación Superior Tecnológico Privado Tecsup No1 RM: No 153-84-ED(17/02/1984) RD No 054-2005-ED (24/02/2005)

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Modules and Courses

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		Industrial Electrical Installations	2	3
		Electricity	1	5
EA2	Fundamentals of Chemistry	Chemistry	1	4
EA3	Physics	Physics I	1	5
		Physics II	2	5
EA4	Mathematics	Mathematics I	1	6
		Mathematics II	2	6
EA5	Communications	Communications I	1	4
		Communications II	2	4
		Successful Presentations	3	2
EA6	Values and Culture	Attitudes and Values	1	2
		National and International Reality	2	2
EA7	Fundamentals of Technology	Technical Drawing	2	3
		Applied Informatics	2	3
EA8	Industrial Instrumentation	Industrial Instrumentations I	3	5
		Industrial Instrumentations II	4	4
		Pneumatic and Hydraulic Systems	3	5
EA9	Electronic Circuits	Electronics	2	5
		Electronic Devices and Circuits I	3	4
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EA10	Applied Mathematics	Fluids and Heat technology	3	5
		Applied Mathematics	3	3
EA11	Quality and Safety	Continuous Improvement	3	2
		Safety, Health and Environment	4	3
EA12	Electrical Installations and Machines	Electrical Machines	4	4
EA13	Automatic Control	Automatic Control I	4	4
		Automatic Control II	5	4
		Automation Projects	6	4
EA14	Applied Programming	Applied Programming I	4	6
		Applied Programming II	5	4
		Microcontrollers	5	4
		Programmable Logic Controllers	5	4
EA15	Human Resources and Job Market	Decisions Making	4	2
		Human Resources Management	5	3
		Induction to Labor Market	6	2
EA16	Management	Maintenance Management	4	3
		Projects Management	5	3
		Business Management	6	3

Nr	Module	Courses	Semester	ECTS Credits
EA17	Power Electronics and Maintenance	Electronic Maintenance	5	4
		Power Electronics	6	5
EA18	Basic English	English I	5	4
		English II	6	4
EA19	Industrial Systems	Industrial Processes and Operation	6	4
		Industrial Processes Supervision and Control	6	4
		Industrial Data Communications	6	4

Fundamentals of Chemistry Module

<table>
<tr><td>Degree Program</td><td colspan="4">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="4">Fundamentals of Chemistry</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4"></td></tr>
<tr><td>Code, if applicable</td><td colspan="4">EA2</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td>Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td></td><td>- Chemistry</td><td>QG1010</td><td colspan="2">1</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="4">- José Flores</td></tr>
<tr><td>Lecturers</td><td colspan="4">- José Flores
- Laurence Salmón
- Ulises Quiroz</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">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>
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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>QG1010</td><td>3.5</td><td>4</td><td>115</td><td>4</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: Materials and Mathematics knowledge, and computing skills</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">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="4">The matter. States of the matter’s aggregation. The atom. Elements of periodic table. Link chemist - types of chemical bonds and Intermolecular forces. Chemistry Reaction. Stoichiometry. Acidity and basicity Solutions. Electrochemistry and its applications. Industrial Chemical Processes - inorganic and organic compounds.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td colspan="4">- Practical / laboratory: preparations with review, functional projects, lab reports
- Lecture: partial quizzes and final written examination.</td></tr>
<tr><td>Media employed</td><td colspan="4">Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.</td></tr>
<tr><td>Reading list</td><td colspan="4">- 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).</td></tr>
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Mathematics Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Mathematics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA4</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">- Mathematics I</td><td>GG1010</td><td colspan="2">1</td></tr>
<tr><td colspan="2">- Mathematics II</td><td>GG2010</td><td colspan="2">2</td></tr>
<tr><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Rafael Enciso</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Rafael Enciso
- Alexander Peña
- Ernesto Zeña</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>GG1010</td><td>6.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>GG2010</td><td>6.0</td><td>Lecture</td><td>40 students</td></tr>
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<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>GG1010</td><td>6.0</td><td>5</td><td>175</td><td>6</td></tr>
<tr><td>2</td><td>GG2010</td><td>6.0</td><td>6</td><td>190</td><td>6</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 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 situations using science and technology knowledge of analytic geometry, differential and integral calculus.
- Develop and use differential equations to solve problems of strength of materials, thermodynamics and fluid mechanics.
- Using discrete and continuous probability models, used mainly in solving maintenance problems.
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="5">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.</td></tr>
</table>

	***Mathematics II**: Limits and continuity. Asymptotes and graphs of functions. Derivative 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.*
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)*

Physics Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</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">EA3</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="5">- Ronald Rocha</td></tr>
<tr><td>Lecturers</td><td colspan="3">- Ronald Rocha
- Jerson Araos
- Nicolás Herencia</td><td colspan="2">- Carlos Soca
- Penélope Vargas</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.
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<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>2</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>5</td><td>145</td><td>5</td></tr>
<tr><td>2</td><td>MG2010</td><td>5</td><td>5</td><td>153</td><td>5</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 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.</td></tr>
</table>

	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)

Electricity Applications Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Electricity Applications</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA1</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>- Electricity</td><td>EG1010</td><td>1</td></tr>
<tr><td>- Industrial Electrical Installations</td><td>EA2010</td><td>2</td></tr>
<tr><td>- Electrical workshop</td><td>EG1030</td><td>1</td></tr>
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</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Lennart Rojas</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Lennart Rojas
- Ricardo Zurita
- Pedro Vizarreta</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">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">EA2010</td><td>2.0</td><td>Lecture</td><td>30 students</td></tr>
<tr><td>2</td><td>Practical</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">EG1030</td><td>0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Workshop</td><td>20 students</td></tr>
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<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>EG1010</td><td>5.0</td><td>4</td><td>153</td><td>5</td></tr>
<tr><td>2</td><td>EA2010</td><td>4</td><td>2.25</td><td>118</td><td>3</td></tr>
<tr><td>3</td><td>EG1030</td><td>3</td><td>1</td><td>85</td><td>3</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</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 in dc and ac electrical circuits and electrical machines.
- Recognize parameters and operation principles of single-phase and three-phase electrical systems.
- Select appropriate electrical conductors, in low voltage installations.
Skills:
- Evaluate electrical parameters and analyze their behavior using equivalent circuit, phasorial calculation and computer applications.
- Select and install the control components of commercial and industrial use.
Competences:
- Install basic electrical circuits and analyze the behavior of electrical parameters in operational or fault conditions, using measuring instruments and performing security procedures.
- Install control components of commercial and industrial use, using procedures and electrical norms.</td></tr>
<tr><td>Content</td><td colspan="5">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</td></tr>
</table>

	field 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.* ***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 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.*
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 y 2. México D.F.: Ciencia y Técnica. (621.3/M57/v.1 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).* - *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)*

Values and Culture Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</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">EA6</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Attitudes and Values</td><td>GG1030</td><td>1</td></tr>
<tr><td>- National and International Reality</td><td>GG2030</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Luisa Palomino</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Luis Palomino
- Amiraida Vivanco
- Pedro Flores</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>2</td><td>74</td><td>2</td></tr>
<tr><td>2</td><td>GG2030</td><td>2.0</td><td>1.5</td><td>73</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.</td></tr>
</table>

	***National and International Reality**: National and international reality. Spatial reality. 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)*

Communications Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</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">EA5</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Communications I</td><td>GG1020</td><td>1</td></tr>
<tr><td>- Communications II</td><td>GG2020</td><td>2</td></tr>
<tr><td>- Successful Presentations</td><td>GG3010</td><td>3</td></tr>
</table>
</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Elisa Montoya</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Elisa Montoya
- Mónica Jiménez
- Miguel Ortiz</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>GG2020</td><td>5.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>GG3010</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>2.5</td><td>144</td><td>4</td></tr>
<tr><td>2</td><td>GG2820</td><td>5.0</td><td>2.5</td><td>132</td><td>4</td></tr>
<tr><td>3</td><td>GG2910</td><td>2.0</td><td>2</td><td>74</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: 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.

Communication II: Communication in organizations. Assertive communication and</td></tr>
</table>

	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)*

Quality and Safety Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</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">EA11</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Continuous Improvement</td><td>GG3020</td><td>3</td></tr>
<tr><td>- Safety, Health and Environment</td><td>GG4010</td><td>4</td></tr>
</table>
</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Segundo Jiménez</td></tr>
<tr><td>Lecturer</td><td colspan="5">- Segundo Jiménez</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>1.5</td><td>72</td><td>2</td></tr>
<tr><td>2</td><td>GG4010</td><td>2.0</td><td>1.5</td><td>74</td><td>3</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: 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)*

Basic English Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</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">EA18</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">- English I</td><td>GG5010</td><td colspan="2">5</td></tr>
<tr><td colspan="2">- English II</td><td>GG6010</td><td colspan="2">6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Milton Chuquiruna</td></tr>
<tr><td>Lecturer</td><td colspan="5">- Milton Chuquiruna</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</td><td>135</td><td>4</td></tr>
<tr><td>2</td><td>GG6010</td><td>6.0</td><td>1</td><td>135</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 Automation and Electronics</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">EA16</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Project Management</td><td>GG5020</td><td>5</td></tr>
<tr><td>- Business Management
- Maintenance Management</td><td>GG6020
MG4010</td><td>6
4</td></tr>
</table>
</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Ramos, Edwin</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Edwin Ramos
- Luis Peña
- Luis Sampén</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
3</td><td>GG6020
MG4010</td><td>2.0
3.0</td><td>Lecture
Lecture</td><td>40 students
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>2.5</td><td>102</td><td>3</td></tr>
<tr><td>2
3</td><td>GG6020
MG4010</td><td>2.0
3.0</td><td>5
1</td><td>105
92</td><td>3
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</td></tr>
</table>

	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 Stocks and financial operations. Rubric. Calculation and definition of cost in a business unit. Cost-volume-profit model. Financial analysis. ***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.*
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	- *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)* - *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)* - *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).*

Human Resources and Labor Market Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</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">EA15</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Decisions Making</td><td>GG4020</td><td>4</td></tr>
<tr><td>- Human Resources Management</td><td>GG5040</td><td>5</td></tr>
<tr><td>- Induction to Labor Market</td><td>GG6030</td><td>6</td></tr>
</table>
</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Henry Anchante</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Henry Anchante
- Pedro Flores</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>1</td><td>65</td><td>2</td></tr>
<tr><td>2</td><td>GG5040</td><td>3.0</td><td>3</td><td>103</td><td>3</td></tr>
<tr><td>3</td><td>GG6030</td><td>2.0</td><td>2</td><td>76</td><td>2</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: 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 as the most important problem or opportunity facing
- 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">Decisions Making: The classic approach. The decision-making process. Identification and description of the problem in decision-making. Practical cases. Problem resolution techniques in decision-making. Team decision-making. Interpersonal barriers to</td></tr>
</table>

	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*

Fundamentals of Technology Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Fundamental of Technology</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA7</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Technical Drawing</td><td>MG2030</td><td>2</td></tr>
<tr><td>- Applied Informatics</td><td>IG1010</td><td>2</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Rosa Trujillo</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Rosa Trujillo
- Lennart Rojas</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>MG2030</td><td>2.0</td><td>Lecture</td><td>40 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">IG1010</td><td>0</td><td></td><td></td></tr>
<tr><td>3</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>MG2030</td><td>2.0</td><td>1</td><td>72</td><td>3</td></tr>
<tr><td>2</td><td>IG1010</td><td>3.0</td><td>2.5</td><td>97</td><td>3</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 skill</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Interpret drawings and mechanical, electrical, electronic and fluid installations and network diagrams.
- Analyze the operation of components and mechanical systems, by using design drawings.
- Design mechanical no complex systems and components using standardized norms.
Skills:
- Produce drawings and mechanical, electrical, electronic and fluid installations and network diagrams
- Represent mechanical drawings using conventional drawing tools.
- Represent mechanical drawings using design software.
Competences:
- Design Mechanical components using computer design software following a design methodology.</td></tr>
<tr><td>Content</td><td colspan="5">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.

Applied Informatics: Administrative Tools in Windows 7. Control panel. Windows 7 maintenance. Fundamentals and network components. Network protocols: NetBios and TCP/IP. Network devices: switches and routers. WLAN fundamentals. Sever-based networks. Advanced Excel: Formulas and functions. Advanced Excel: Pivot tables. Advanced Excel: Data Tables, database functions. Algorithms: Pseudocode and flow charts. Program structure. Types of data and variables. Conditional structure. Multiple</td></tr>
</table>

	condition statements and repetitive structures. Design and implementation of a project.
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	- *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)* - *Gomez Vieites, Alvaro (2003) Redes de computadoras e Internet. México D.F.: Alfaomega. (004.67R/G62)* - *Halsall, Fred (2006) Redes de computadores e internet. Madrid: Pearson Educación (004.67R/H17).* - *McFredies, Paul (2008) Excel 2007. Fórmulas y funciones. Madrid: Anaya Multimedia. (005.368E/M12).* - *Tanenbaum, Andrews (2003) Redes de computadoras. México D.F.: Pearson Educación (004.67R/T19)* - *Vila Velasquez, Fermi (2004) VBA Excel 2002/2000:49 ejercicios prácticos. México D.F.: Alfaomega (005.368E/V61).*

Applied Mathematics Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Applied Mathematics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA10</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Fluids and Heat Technology</td><td>MA3010</td><td>3</td></tr>
<tr><td>- Applied Mathematics</td><td>AA3050</td><td>3</td></tr>
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<tr><td>Person responsible for the Module</td><td colspan="5">- Daniel Mendoza</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Anwar Yarin
- Daniel 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>1</td><td>MA3010</td><td>2</td><td>Lecture</td><td>40 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AA3050</td><td>4</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1</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>MA3010</td><td>2</td><td>5</td><td>116</td><td>5</td></tr>
<tr><td>2</td><td>AA3050</td><td>5.0</td><td>1.75</td><td>131</td><td>3</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: 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:
- Identify the fundamental laws of compressible and incompressible fluids.
- Recognize the functioning principle of pumps and compressors, heat exchangers and boilers, air conditioning and industrial refrigeration as well as their application to the industry.
- Identify the application of advanced mathematics to different technological areas.
- Apply statistical tools for data analysis.
Skills:
- Dimension pumps and compressors according to the load to be supported.
- Use transforms to obtain transfer function of control systems.
Competences:
- Use calculus to develop solutions for technology-related problems.
- Select pieces of equipment used in heat and fluid transfer.</td></tr>
<tr><td>Content</td><td colspan="5">Fluids and Heat Technology: Fluid properties, statics and dynamics. Pumps. Compressors. Thermodynamic principles. First Law of Thermodynamics. Heat transmission. Boilers. Assignment: Selection of the elements of a pumping system according to the fluid physical and chemical properties. Refrigeration and air conditioning

Applied Mathematics: Applications of statistics to technology. Application of linear regression. Common parameters in electrical signals. Applications of derivatives and integrals. First-order differential equations. Differential equations. Applications of differential equations to basic sciences. Applications of differential equations to technology. Laplace Transforms. Fourier Series.</td></tr>
<tr><td>Study and examination requirements and forms</td><td colspan="5">- Practical / laboratory: preparations with review, functional projects, lab reports
- Lecture: partial quizzes and final written examination</td></tr>
</table>

of examination	
Media employed	*Blackboard, slides, beamer presentations, demonstration of lab examples and experiments, lab development tools and equipment.*
Reading list	- *Mott, Robert (2006) Mecánica de fluidos. México D.F.: Pearson Educación. (620.106/M88)* - *Hicks, Tyler Gregory (1986) Bombas: Selección y aplicación. México D.F.: Continental S.A.(621.6/H4)* - *Roselló Coría, Francisco (1983) Energía y máquinas térmicas. México D.F.: Limusa (536/R84)* - *Bloch, Heinz P. (1998) Guía práctica para la tecnología de los compresores. México D.F.: Mc Graw-Hill. (621.5G/B6)* - *Charte Ojeda, Francisco (2008) Calculos Estadísticos con EXCEL. Anaya (005.368/C525)* - *Zill, Dennis G.(2009) Ecuaciones Diferenciales. Cencage Learning (515.35/77)* - *Vincent del Toro (1988). Fundamentos de Ingeniería Eléctrica. Prentice Hall (621.3/D4)* - *Kreyszig, Erwin (2004) Matemáticas avanzadas para ingeniería. México D.F.: Limusa (510/K7)* - *Davis, Linda (1990) Technical Mathematics with Calculus. Ohio: Merrill Pub. Co. (510/D32)* - *Robert L. Borrelli/Courtney S. Coleman (2005). Ecuaciones Diferenciales. Oxford: Alfaomega (515/B74)*

Industrial Instrumentation Module

<table>
<tr><td>Degree Program</td><td colspan="4">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="4">Industrial Instrumentation</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4"></td></tr>
<tr><td>Code, if applicable</td><td colspan="4">EA8</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">- Industrial Instrumentations I</td><td>AA3070</td><td>3</td></tr>
<tr><td colspan="2">- Industrial Instrumentations II</td><td>AA4050</td><td>4</td></tr>
<tr><td colspan="2">- Pneumatics and Hydraulic Systems</td><td>MA3020</td><td>3</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="4">- Manuel Alvarado</td></tr>
<tr><td>Lecturers</td><td colspan="4">- Manuel Alvarado
- Ernesto Godinez
- Manuel Soto</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">MM4120</td><td>3</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">MM5100</td><td>2</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">MM5100</td><td>2</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>1</td><td>Laboratory</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>MM4120</td><td>5</td><td>2.5</td><td>134</td><td>5</td></tr>
<tr><td>1</td><td>MM4120</td><td>5</td><td>3</td><td>136</td><td>4</td></tr>
<tr><td>2</td><td>MM5100</td><td>3</td><td>2.5</td><td>120</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: Basic Electronic</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">After having finished the module, students are able to:
Knowledge:
- Identify the function of the different elements part of a control system.
- Recognize the different forms available to measure industrial variables.
- Apply the instrument calibration concepts.
- Identify the functions and advantages of digital instruments.
Skills:
- Select sensors and meters to measure a given variable.
- Install and operate Pneumatic and Hydraulic systems.
- Install and perform functioning tests to Programmable Control Logical for electrohydraulic and electro Pneumatic systems.
Competences:
- Design, detect and solve problems in Pneumatic and Hydraulic systems using diagnoses tools and software.
- Configure digital control transmitters and valves.
- Configure and tune single loop process controllers.</td></tr>
</table>

Content	***Industrial Instrumentations I*** *: Processes and variables. Metrology. Pressure measurement* *Pressure transducers. Temperature measurement. Electrical temperature sensors. Flow measurement. Level and flow measurement processes. Proximity and displacement meters* *Miscellaneous variable measurement. Final control elements. Automatic control valves. Safety in instrumentation.* ***Industrial Instrumentations II****: Patterns of pressure and temperature. Industrial instrument calibration. Digital instrumentation. Digital transmitters and smart control valves. Digital equipment for registry and storing. Digital controllers. Functions in digital controllers. Selection of controllers. Field instrument and panel commissioning. Wireless communication in digital instruments. Installation of industrial instruments. Instrumentation for dangerous areas. Installation of instruments in dangerous areas.* ***Pneumatics and Hydraulic Systems****: Components of a pneumatic installation. Manifold valves. Control of the actuator speed. Pressure switch and vacuum switch. Electro pneumatics. Programmed logic. Stage transition command graph. Sequences. Fundamentals of oleo-hydraulics. Hydraulic pump. Generation of flow. Pressure relief valves. Manifold valves. Hydraulic actuators: cylinders. Motors. Electrohydraulics. Hydraulic proportional control. Regulation with proportional electronics. Hydraulic blueprints*
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	- *Considine, Douglas M. (1993). Process/Industrial Instruments and controls handbook. New York: Mc Graw-Hill. (621.381I/C74)* - *Creus Sole, Antonio (2006). Instrumentación industrial. México D.F.:Alfaomega. (621.381I/C85/2006)* - *Kerlin, Thomas (1982) Industrial temperature measurement. Massachutte: ISA. (621.381I/K44)* - *Norton, Harry (1984). Sensores y actualizadores. Barcelona: G. Gili S.A. (621.381I/N82)* - *Spitzer, David W. (1990) Industrial Flow Measurement. North Carolina: ISA (621.381I/S58)* - *Szklanny, Sergio (1995) Sistemas digitales de control de procesos. Buenos Aires: s.n. (621.381I/S9).* - *Smith, Carlos (1991) Control automático de procesos: Teoría y prácltica. México D.F.: Limusa (621.381I/S61).* - *Creus Solé, Antonio (2006) Instrumentación industrial. México D.F.: Alfaomega. (621.381I/C85/7).* - *Festo Didactic (1980) Introducción a la neumática. Esslengen: Festo (621.5/F/I)* - *Festo Didactic (1976) Iniciación al personal de montaje y mantenimiento. Berkheim: Festo (621.5/F/I-P)* - *Festo Didactic (1995) Simples circuitos de memoria y circuitos lógicos. Esslengen: Festo (621.5/F-S)* - *Herion (1979) Equipo didáctico hidráulico. Sttugart: Herion (621.2/H)* - *Exner, H. (1981) Fundamentos y componentes de la oleohidráulica. Mannesmann: Rexsoth. (621.2/T/1)*

Electronic Circuits Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Electronic Circuit</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA9</td></tr>
<tr><td rowspan="5">Courses and Semester(s) in which the module is taugh.</td><td colspan="2">Courses</td><td>ID</td><td colspan="2">Semester</td></tr>
<tr><td colspan="2">- Electronics</td><td>AG2010</td><td colspan="2">2</td></tr>
<tr><td colspan="2">- Electronic Devices and Circuits I</td><td>AA3030</td><td colspan="2">3</td></tr>
<tr><td colspan="2">- Electronic Devices and Circuits II</td><td>AA4010</td><td colspan="2">4</td></tr>
<tr><td colspan="2">- Digital Circuits</td><td>AA3010</td><td colspan="2">3</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Francisco Camacho</td></tr>
<tr><td>Lecturers</td><td colspan="2">- Francisco Camacho
- Dennis Izquierdo</td><td colspan="3">- Manuel Márquez
- Carlos Mendiola</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="10">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">AG2010</td><td>2</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AA3030</td><td>3</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">AA4010</td><td>3</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">AA3010</td><td>3</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</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.</td></tr>
<tr><td colspan="5"><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>AG2010</td><td>4</td><td>3.5</td><td>126</td><td>5</td></tr>
<tr><td>2</td><td>AA3030</td><td>6</td><td>2</td><td>140</td><td>4</td></tr>
<tr><td>3</td><td>AA4010</td><td>6</td><td>3</td><td>160</td><td>4</td></tr>
<tr><td>4</td><td>AA3010</td><td>6</td><td>3</td><td>148</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 the areas of application of discrete semiconductors.
- Identify the most important configurations of operational amplifiers.
- Identify and design combinational and sequential systems.
Skills:
- Perform semiconductor device functioning tests.
- Perform tests to circuits with operational amplifiers.
- Use technical information from manuals to replace or modify electronic circuits.
- Perform control applications with digital devices and circuits.
Competences:
- Implement basic circuits for electronic control.</td></tr>
</table>

Content	***Electronics**: Semiconductor diodes. DC voltage sources. Basic calculations in a DC voltage source. The bipolar transistor. Basic calculations in the BJT transistor. Thyristors. Optoelectronics. Applications of optoelectronic devices. Integrated circuits. Digital Logics. Digital Circuits. Industrial Digital Systems* ***Electronic Devices and Circuits I** : Semiconductor diode. Applications with diodes Rectifier circuit, analysis in DC and AC. Zener-diode regulated power supply. BJT transistor. Transistor polarization. Diode-regulated power supply and transistor regulated power supply. Techniques to prepare electronic schematic drawings. Printed circuit boards and mounting of electronic components. Voltage regulators in I.C. Power supplies regulated by integrated circuits and protection circuits. Field Effect Transistor (FET). MOSFET and IGBT. Control and power circuits with thyristors; applications. Project about electronic circuits.* ***Electronic Devices and Circuits II**: The operational amplifier. Basic configurations Comparator circuits. Circuits to be applied to measurement and control. Differentiator and integrator circuits. Oscillator circuits. Active filters. PWM circuits Multiplier circuit. Technology of programmed logic devices. Graphic edition and simulation. Text edition and simulation. Sequential systems with programmed logic Morey and Mely state machines. Use of macrofunctions.* ***Digital Circuits**: Simplification of logic functions. Logic families. Combinational systems with logic gates. Combinational systems in I. C. Bistables. Counters and dividers. Shift registers. State machines. Multivibrators. Semiconductor memories. Expansion of semiconductor memories. D/A converters. Unwired logic.*
Study and examination requirements and forms of examinations	- *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. México D.F.: Prentice Hall. (621.381/B78/2003.)* - *Floyd, Thomas (1996). Fundamentos de electrónica digital. México D.F.: Limusa (621.381D/F59)* - *Lilen, Henri (1991) Tristores y triacs. Barcelona: Marcombo S.A. (621.381S/L63)* - *Malvino, Albert Paul (2000) Principios de electrónica. Madrid: Mc Graw-Hill (621.381/M19/2000)* - *Pretence Junior, Antonio (1993) Amplificadores operacionales y filtros activos. Madrid: Mc Graw-Hill. (621.395/P43)* - *Couglin, Robert (1999) Amplificadores operacionales y circuitos integrados lineales. México D.F.: Prentice Hall. (621.381AO/C82/5).* - *Rede S.A. (1989) Teoría y práctica de las fuentes de alimentación. Barcelona: Rede S.A. (621.381/RE).* - *Angulo Uzategui, José María (1986) Electrónica digital moderna. Madrid: Paraninfo (621.381D/A61E)* - *Blanco Flores, Fernando (2003) Electrónica digital y microprogramable. Madrid: Paraninfo. (621.381D/B61)* - *Floyd, Thomas (1996) Fundamentos de electrónica digital. México D.F.: Limusa (621.381D/F59)* - *Mandado, Enrique (1996) Sistemas electrónicos digitales. México D.F.: Alfaomega. (621.381D/M22/1996)* - *Morris Mano, M. (1986) Lógica digital y diseño de computadoras. México D.F.: Prentice Hall (621.381D/M86L)* - *Tocci, Ronald (2003) Sistemas digitales: Principios y aplicaciones. México D.F.: Pretince Hall. (621.381D/T65/2003)*

Electrical Instalations and Machines Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Electrical Installations and Machines</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA12</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Electrical Machines</td><td>EA4010</td><td>4</td></tr>
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<tr><td>Person responsible for the Module</td><td colspan="5">- Carlos Cuba</td></tr>
<tr><td>Lecturer</td><td colspan="5">- Carlos Cuba</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>EA4010</td><td>2
2</td><td>Lecture
Laboratory</td><td>40 students
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>EA4010</td><td>4</td><td>1.5</td><td>113</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: Basic Electricity</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 functioning and operating principle of DC motors and three-phase induction motors.
- Recognize the functioning and operating principle of a synchronous alternator and motor.
Skills:
- Perform functioning tests to three-phase transformer, AC and DC motors.
- Use software for calculation of transport phenomena.
Competences:
- Select AC and DC motors based in defined characteristics of a specific application.</td></tr>
<tr><td>Content</td><td colspan="5">Single-phase transformer. Behaviour of single-phase transformer with load. Three-phase transformer. The autotransformer. Motor performance. Synchronous alternator. Generator synchronization. Synchronous motor. DC machine. DC motor.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td colspan="5">- Practical / laboratory: preparations with review, functional projects, lab reports
- Lecture: partial quizzes 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">- Kosow, Irving. (1993) Máquinas eléctricas y transformadores. México D.F.: Prentice Hall. (621.3MO/K77/1993)
- Chapman, Stephen (2004) Máquinas eléctricas. México D.F.: Mc Graw-Hill. (621.3MO/CH523/2005)
- Richardson, Donald (1997) Máquinas eléctricas rotativas y transformadores. México D.F.: Prentice Hall. (621.3MO/R54)
- Enríquez Harper, Gilberto (2006) El ABC de las máquinas eléctricas I. Transformadores. México D.F.: Limusa (621.3MO/E64E/2007)</td></tr>
</table>

Automatic Control Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Automatic Control</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA13</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Automatic Control I</td><td>AA4030</td><td>4</td></tr>
<tr><td>- Automatic Control II</td><td>AA5030</td><td>5</td></tr>
<tr><td>- Automation Projects</td><td>AA6030</td><td>6</td></tr>
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</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Ernesto Godinez</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Ernesto Godinez
- Armando Sarco
- Manuel Alvarado</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">AA4030</td><td>3</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AA5030</td><td>3</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">AA6030</td><td>1</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2.5</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>AA4030</td><td>6</td><td>2</td><td>150</td><td>4</td></tr>
<tr><td>2</td><td>AA5030</td><td>6</td><td>4</td><td>163</td><td>4</td></tr>
<tr><td>3</td><td>AA6030</td><td>3.5</td><td>2.5</td><td>111</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 and Industrial Automation</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 measure the characteristic parameters of a process.
- Control processes with different strategies and controllers.
- Plan, execute and control an automation project.
Skills:
- Determine and adjust control parameters for common processes.
- Represent measurements and control instruments and loops using ISA symbols.
- Configure digital controllers.
- Document an automation project.
Competences:
- Select the adequate type of control for a given processes.
- Select the adequate controller for different processes.
- Specify instruments to be used in an automation project</td></tr>
<tr><td>Content</td><td colspan="5">Automatic Control I: Automatic control concepts. Characteristics of processes. Process modeling. Control of two positions. Control modes. Proportional control. PI, PD and PID controls. Controller tuning. Characteristics of common loops. Control type selection. Instrumentation symbols. Instrumentation diagrams. Industrial control loops

Automatic Control II: Controller tuning. Modifications to the standard PID control. Stability in control systems. Fundamentals of the design of a feedback control system.</td></tr>
</table>

	Adaptive tuning. Models with Laplace. Control strategies. Feed forward control. Batch-type processes. Batch process control. Smart control. Control with Fuzzy Logic. Expert systems. Applications of Industrial control ***Automation Projects**: Fundamentals. Activities and documents. Instrument specifications, control room and terminals room. Technical standards. Hazard and operability analysis (HAZOP). Commissioning and starting up. Technical and economic assessment.*
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	- *Creus Sole, Antonio (2006) Instrumentación industrial. México D.F.: Alfaomega (621.381I/C85/7).* - *Roca Cusidó, Alfred (2002) Control de procesos, México D.F.: Alfaomega (621.381I/R7).* - *Smith, Carlos A. (1991) Control automático de procesos.Teoría y práctica. México D.F.: Limusa (621.381I/S61).* - *Whitt, Michael (2004) Successful instrumentation and control systems design. New York: ISA (621.381I/W4)* - *Coggan, Donald (1996) Fundamentals of industrial control. New York: ISA. (621.381I/A34).* - *Project Management Institute, Inc. (2004) Guía de los fundamentos de la dirección de proyectos (Guía del PMBOK) Newtown Square PA: PMI. (658.404/P87).* - *Mulley, Raymond (1994) Control system documentation: Applied instrumentation symbols and identification. North Carolina: Instrument Society of America. (621.381I/M74).* - *Mulley, Raymond (1994) Control system documentation: Applied instrumentation symbols and identification. North Carolina: Instrument Society of America. (621.381I/M74).*

Applied Programming Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Applied Programming</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA14</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Applied Programming I</td><td>IA4010</td><td>4</td></tr>
<tr><td>- Applied Programming II</td><td>AA5050</td><td>5</td></tr>
<tr><td>- Microcontrollers</td><td>AA5010</td><td>5</td></tr>
<tr><td>- Programmable Logic Controllers</td><td>AA5070</td><td>5</td></tr>
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</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Miguel Chávez</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Miguel Chávez
- Jaime Farfán
- Carlos Mendiola</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">IA4010</td><td>1</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AA5050</td><td>1</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">AA5010</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">AA5070</td><td>1</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>3</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>IA4010</td><td>4</td><td>3</td><td>122</td><td>6</td></tr>
<tr><td>2</td><td>AA5050</td><td>4</td><td>2</td><td>109</td><td>4</td></tr>
<tr><td>3</td><td>AA5010</td><td>3</td><td>2.5</td><td>105</td><td>4</td></tr>
<tr><td>4</td><td>AA5070</td><td>4</td><td>4</td><td>130</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: Applied Informatics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Develop applications using structured programming.
- Use Data Acquisition Systems in control applications.
- Use microcontroller in electronic control applications.
- Use PLC for discrete control of industrial processes.
Skills:
- Organize work areas and procedures for industrial maintenance.
- Configure Data Acquisition Cards.
- Develop and execute programs in a PIC microcontroller
- Develop programs using binary and word-level instructions
Competences:
- Use PC to implement computer-based control loops.
- Develop PIC programs and interfaces applicable to industrial control.
- Develop a discrete PLC-based control project.</td></tr>
<tr><td>Content</td><td colspan="5">Applied Programming I: Algorithms, pseudo codes, and flow charts. Variables an types of data. Selective structures: if statement and if-else statement. Switch and case statements. Repetitive structures. Methods. Arrangements – matrixes. Object-</td></tr>
</table>

	oriented programming: classes, methods, constructors and objects. Elements of the object-oriented programming. ***Applied Programming II**: PC-based data acquisition. PC-based data analysis. Monitoring and control software. PC-based process control. Various applications. Project .(Completion).* ***Microcontrollers**: Architecture of a microcontroller. Programming of a microcontroller. PIC input ports. PIC output ports. Timers. Interruptions. A/D conversion. Serial Communication. Capture / Compare Modules. PWM module. Project* ***Programmable Logic Controllers**: Introduction. Basic operations. Timers. Counters. PLC-based discrete control. PLC-based continuous control. Applications with PLC. Installation and maintenance.*
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	- *Joyanes, Luis (1993) Problemas de metodología de la programación. Madrid: Mc Graw-Hill (005.13/J79)* - *Cherre A, Rafael (2002) Lenguaje de Programación C++. Net. Lima: s.n. (005.13/CH54)* - *Ceballos Sierra, Francisco (2002) El lenguaje de Programación C. México D.F.: Alfaomega (005.13VC/C3)* - *Amy, Laurence (1992) Automation systems for control and data acqusition. North Caroline: ISA (621.381I/A51).* - *Szklanny, Sergio (1995) Sistemas digitales de control de procesos. Buenos Aires: s.n. (621.381I/S9).* - *Marin, Francisco (2007) Diseño basado en microcontroladores. Málaga: Universidad de Málaga. (004.16/M2)* - *Pereira, Fabio (2007) Microcontroladores PIC. Sao Paulo:s.n. (005.13/P43).* - *Ramírez Quiroz, Elmer (1997) Controladores lógicos programables. Lima: Concytec (629.8PLC/R2)* - *Porras, Alejandro. Autómatas programables. Madrid: Mc Graw-Hill .(629.8PLC/P78)* - *Ackermann, R.(1991) Controladores lógicos programables. Nivel avanzado. Esslingen: Festo (629.8PLC/A1).*

Power Electronics and Maintenance Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Power Electronics and Maintenance</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA17</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">- Electronics Maintenance</td><td>AA5020</td><td colspan="2">5</td></tr>
<tr><td colspan="2">- Power Electronics</td><td>AA6010</td><td colspan="2">6</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- José Lazarte</td></tr>
<tr><td>Lecturer</td><td colspan="5">- José Lazarte
- Roberto Delgado</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.</td></tr>
<tr><td></td><td>Nr</td><td>Courses ID</td><td>Contact hours per week</td><td>Teaching Method</td><td>Class Size</td></tr>
<tr><td></td><td rowspan="2">1</td><td rowspan="2">AA5020</td><td></td><td></td><td></td></tr>
<tr><td></td><td>3</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td></td><td rowspan="2">2</td><td rowspan="2">AA6010</td><td>4</td><td>Lecture</td><td>40 students</td></tr>
<tr><td></td><td>2.5</td><td>Laboratory</td><td>20 students</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.</td></tr>
<tr><td></td><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></td><td>1</td><td>AA5020</td><td>3</td><td>2</td><td>99</td><td>4</td></tr>
<tr><td></td><td>2</td><td>AA6010</td><td>6.5</td><td>3</td><td>177</td><td>5</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, Electronic Devices and Circuits I and II, Digital Circuits.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Apply a methodology for detection and correction of electronic faults.
- Install, calibrate, put into operation and give maintenance to power control equipment.
- Configure and program a Programmable Logic Controller to control a manufacturing system.
Skills:
- Use maintenance instruments and tools adequately.
- Use software tools to design printed circuit boards.
- Configure AC and DC motor drives.
Competences:
- Diagnose failures and propose solutions in electronic equipment.
- Select, install and configure AC and DC motor drives.</td></tr>
<tr><td>Content</td><td colspan="5">Electronics Maintenance: Schematic diagrams. Design simulation software. Schematic capture. Design and edition of printed circuits boards. Post-processing. Printed circuits boards. Manufacture of printed circuit board by means of thermal transfer and micromilling. Electronic maintenance concepts. Theoretical analysis of faults. Detection and registry of failures. Electronic welding. Prototype construction.

Power Electronics: Application of passive components in power electronics - R, L and C Selection of power devices. Harmonics, causes and effects. Single-phase rectifier circuits. Three-phase uncontrolled rectifier. Integrated circuits of power control. PWM signals. DC/DC converters. PWM control I integrated circuit. Inverter circuits. Speed control of motors. Speed variators of AC/DC motors. Variators according to NEMA codes. Networks with speed variators. Motion control.</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	- *Thompson, D.L. (1987) Proyectos en microelectrónica. Madrid: Paraninfo. (621.381/T48).* - *Cannon, Don (1988) Mantenimiento de sistemas digitales. Madrid: Anaya multimedia. (621.381D/C23).* - *Rashid, Muhammad (2004) Electrónica de potencia. México D.F.: Pearson Educación. (621.381/R26)* - *Mohan, Ned (1992) Power electronic. Computer simulation, analysis and education using PSpice. (621.381I/M5P).* - *Martínez García, Salvador (2006) Electrónica de potencia. Madrid: Paraninfo. (621.381/M2E).* - *Hart, Daniel (2001) Electrónica de potencia. Madrid: Pearson Educación. (621.381/H2).*

Industrial Systems Module

<table>
<tr><td>Degree Program</td><td colspan="5">Industrial Automation and Electronics</td></tr>
<tr><td>Module designation</td><td colspan="5">Industrial Systems</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5"></td></tr>
<tr><td>Code, if applicable</td><td colspan="5">EA19</td></tr>
<tr><td>Courses and Semester(s) in which the module is taught</td><td colspan="5">
<table>
<tr><th>Courses</th><th>ID</th><th>Semester</th></tr>
<tr><td>- Industrial Processes and Operation</td><td>QA6010</td><td>6</td></tr>
<tr><td>- Industrial Processes Supervision and Control</td><td>AA6050</td><td>6</td></tr>
<tr><td>- Industrial Data Communications</td><td>AA6070</td><td>6</td></tr>
</table>
</td></tr>
<tr><td>Person responsible for the Module</td><td colspan="5">- Miguel Chávez</td></tr>
<tr><td>Lecturers</td><td colspan="5">- Miguel Chávez
- Gerard Franklin
- Fidel Matos</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>QA6010</td><td>2</td><td>Lecture</td><td>40 students</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AA6050</td><td>1</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2.5</td><td>Laboratory</td><td>20 students</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">AA6070</td><td>2</td><td>Lecture</td><td>40 students</td></tr>
<tr><td>2.5</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>QA6010</td><td>2</td><td>3</td><td>100</td><td>4</td></tr>
<tr><td>2</td><td>AA6050</td><td>3.5</td><td>1</td><td>102</td><td>4</td></tr>
<tr><td>3</td><td>AA6070</td><td>4.5</td><td>3</td><td>133</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 and Industrial Automation</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">After having finished the module, students are able to:
Knowledge:
- Differentiate the characteristics of the most important processes and operations performed at industrial plants.
- Use computed-based control systems in industrial applications.
- Use different systems of communications to transfer data in reliable form.
Skills:
- Determine of tank capacity.
- Configure HMI
- Implement a media transmission using radio modems.
Competences:
- Describe processes that involve gas handling equipment, water treatment, heat transfer, steam generation and air conditioning.
- Use control systems like SCADA, DCS and PLC-based.
- Select equipment and technology to transmit information.</td></tr>
<tr><td>Content</td><td colspan="5">Industrial Processes and Operation: Introduction to the process plant. Pipes – accessories. Description of hydraulic pumps. Description of gas equipment handling. Water in industry. Steam boilers. Combustion and fuels. Equipment in the process industry. Operation and application of steam. Industrial refrigeration and applications Industrial air conditioning.</td></tr>
</table>

	***Industrial Processes Supervision and Control**: OSI model. Error checking. Network topology. Communication protocols. Field buses. SCADA systems. Parts in a SCADA system. Classification of the SCADA Systems. Distributed control systems. Systems with PLC. Programming languages. Selection of a PLC. Input/output systems. Communications. Real-time data exchange. OPC.* ***Industrial Data Communications**: Signals. Modulation and demodulation. Digital Communication. Pulse modulation. Transmission media. Antennas. Fiber optic communications. Satellite communications. The telephone system. Mobile telephony. Modems and Radio Modems. Wireless communications. Interfaces and communication protocols. Field buses.*
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	- *Austin, George (1990) Manual de procesos químicos en la industria. México D.F.: MC Graw-Hill. (661/A88/t.1) - (661/A88/t.2) - (661/A88/t.3).* - *Kent, James A. (1984) Manual de riegel de química industrial. México D.F.: Continental S.A. (660/K3).* - *Szklanny, Sergio (1995) Sistemas digitales de control de procesos. Buenos Aires: s.n. (621.381I/S9).* - *Laurence, Amy (1992) Automation systems for central and data acquisition. North california: ISA. (621.381I/A51).* - *Considine, Douglas (1993) Process industrial instruments and controls handbook. New York: Mc Graw-Hill. (621.381I/C74).* - *Creus Sole, Antonio (2007) Simulación y control de procesos por ordenador. Madrid: Marcombo. (621.381I/C88)* - *Berge, Jonas (2005) Software for automation. Architecture, integration, and security. Research Triangle Park NC: ISA (670.4275/B45).* - *Rodríguez Penin, Aquilino (2007) Sistemas SCADA. Barcelona: Marcombo (621.381I/R76).* - *Tomasi, Wayne (2003) Sistemas de comunicaciones electrónicas. México D.F.: Prentice Hall (621.382/T69/4)* - *Mariño, Perfecto (1995) Las comunicaciones en la empresa. Madrid: RAMA (004.67R/M26).* - *Roldán Martínez, David (2005) Comunicaciones inalámbricas. México D.F.: Alfaomega 2005 (004.67R/R79).*