**Programa de Asignatura**

**How can we face the Environmental Problems of Today?**

**A. Antecedentes Generales**

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| 1. **Unidad Académica** | Facultad de Ingeniería | | | | | | |
| 1. **Carrera** | Ingeniería Civil Industrial | | | | | | |
| 1. **Código** | IEL460A | | | | | | |
| 1. **Ubicación en la malla** | 5 año, I semestre y II semestre | | | | | | |
| 1. **Créditos** | 10 | | | | | | |
| 1. **Tipo de asignatura** | Obligatorio |  | Electivo | X | Optativo | |  |
| 1. **Duración** | Bimestral |  | Semestral | X | Anual | |  |
| 1. **Módulos semanales** | Clases Teóricas | 1 | Clases Prácticas | 1 | Ayudantía | |  |
| 1. **Horas académicas** | Clases | 68 | Ayudantía | | |  | |
| 1. **Pre-requisito** | Sin pre-requisitos | | | | | | |

**B. Aporte al Perfil de Egreso**

The course **How can we face the Environmental Problems of Today?,** part of the ​​ electives of the Sustainability Management group, located in the professional cycle of the Engineering degree study plan.

This course will cover a variety of current environmental issues on a global and regional scale. We will look at the impact of humans on various environmental systems and analyse whether there are alternatives. We cover the topics of food and agriculture, industry, energy, transport, air, water and land pollution and analyze these themes with case studies and by reading recent papers, articles and watching videos. We will analyze how society can improve current problems, talking about social movements, legislation, activism and citizen science. During each class you will prepare presentations or carry out role-plays with the rest of the class. During the final month each student will work on a personalised case study or pilot project on an environmental issue and present this both orally and in a written report.

This course pays tribute to the generic competence of Global Vision and to the specific competences of Innovation, Adaptation to change in a complex and dynamic context and Critical Thinking, declared in the graduation profile of the degree.

**C. Objetivos de Aprendizajes Generales de la asignatura**

The main objective of the course is to identify and characterize the world´s main environmental challenges and the main initiatives leading to tackle them. The course focus on environmental pollution and the societal and technological tools that we can build to challenge it.

**D. Unidades de Contenido y Objetivos de Aprendizaje**

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| **Unidades de Contenidos** | **Objetivos de Aprendizaje** |
| **UNIT 1. Current Challenges** | * Learn about today´s more important environmental challenges and their causes * Identify health and environmental impacts derived from food, energy and industrial production * Characterize soil, water and air pollution |
| **UNIT 2. Political and social perspectives** | * Learn about national and international regulatory frameworks * Identify social movements and the potential impact of citizen science * Identify technological advancement for environmental mitigation |
| **UNIT 3. Project development** | * Research on environmental topics and behavioural/technological tools * Develop experimental design to study a specific phenomenon * Increase the deepness of analysis of complex problems * Implement and communicate a project |

**E. Estrategias de Enseñanza**

The methodology of this course is based on b-learning approaches. This course will use digital content that will be design to be used prior to the lectures, these videos contain most of the information and concept needed to understand phenomenon, the class will be mostly used for debate and discussion on this content. The class will have guest speakers, report reading and video displays that will be commented online by participants. The course will involve a hands-on approach by recent case studiesrelated to the diverse issues and a practical group project to be implemented and communicated.

**F. Estrategias de Evaluación**

* Continuous Evaluation (36%): 4 “homework” that count for 8 % each, 2 are individual and 2 are in groups
* Participation in class (8%): Speaking in English, presenting tasks and being present in most of the clases
* Certamen 1 (10 %): Short test based on unit 1 content
* Certamen 2 (10 %): Personal “homework” that involves designing an environmental business plan
* Final Project (40%): 40 % of which is oral presentation, 40 % written presentation10 % preliminary report and 10 % peer evaluation of oral presentation

**Attitudinal Evaluation**

As part of the evaluation of Continuous Work, there will be a percentage of the grade that corresponds to attitude, this includes initiative during the course, level of interest and participation and group work commitment.

**G. Recursos de Aprendizaje**

**Scientific papers**

* Andrews, G., Taylor, L.L. (2019). Combating Climate Change Through Enhanced Weathering of Agricultural Soils, Elements 15(4):253-258, DOI:[10.2138/gselements.15.4.253](https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.2138%2Fgselements.15.4.253?_sg%5B0%5D=SP9M8HiWL9bX3bOex-dERS1o_NYqVPBdsr10l-anOzgz-jgMY8HoU4J8Xjx4uxLpvoPObmSiS1S4ACmfOQQ3KFATVw.H76bKeTFrLLgeUKV14nXNNywD12RoFIiF19e5D3XYv1Lsg2vk_QxQFiPQIv9HeTpL-RjaqP4LSMRyDOyrVzNRQ)
* Butler, S. J., Vickery, J. A., & Norris, K. (2007). Farmland Biodiversity and the Footprint of Agriculture. Science, 315(5810), 381-384. doi:10.1126/science.1136607
* Characterization of Baker Fjord region through its heavy metal content on sediments (Central Chilean Patagonia). Lat. Am. J. Aquat. Res. [online]. 2015, vol.43, n.3, pp.581-587. ISSN 0718-560X. DOI: 10.3856/vol43-issue3-fulltext-20
* Castro, S. H., & Sánchez, M. (2003). Environmental viewpoint on small-scale copper, gold and silver mining in Chile. Journal of Cleaner Production, 11(2), 207-213. doi:10.1016/s0959-6526(02)00040-9
* Egerton, F. N. (2018). History of Ecological Sciences, Part 60: American Great Lakes before 2000. The Bulletin of the Ecological Society of America, 99(1), 77-136. doi:10.1002/bes2.1372
* Gallardo, L., Barraza, F., Ceballos, A., Galleguillos, M., Huneeus, N., Lambert, F. Véliz, K. D. (2018). Evolution of air quality in Santiago: The role of mobility and lessons from the science-policy interface. Elem Sci Anth,6(1), 38. doi:10.1525/elementa.293
* Hammond, G. P. (2006), ‘People, planet and prosperity’: The determinants of humanity's environmental footprint. Natural Resources Forum, 30: 27-36. doi:[10.1111/j.1477-8947.2006.00155.x](https://doi.org/10.1111/j.1477-8947.2006.00155.x)
* Kabir, E., Kumar, P., Kumar, S., Adelodun, A. A., & Kim, K. (2018). Solar energy: Potential and future prospects. Renewable and Sustainable Energy Reviews, 82, 894-900. doi:10.1016/j.rser.2017.09.094
* Lagos, G., Peters, D., Videla, A., & Jara, J. J. (2018). The effect of mine aging on the evolution of environmental footprint indicators in the Chilean copper mining industry 2001–2015. Journal of Cleaner Production, 174, 389-400. doi:10.1016/j.jclepro.2017.10.290
* Panwar, N., Kaushik, S., & Kothari, S. (2011). Role of renewable energy sources in environmental protection: A review. Renewable and Sustainable Energy Reviews, 15(3), 1513-1524. doi:10.1016/j.rser.2010.11.037
* Pizarro, J., Vergara, P. M., Rodríguez, J. A., & Valenzuela, A. M. (2010). Heavy metals in northern Chilean rivers: Spatial variation and temporal trends. Journal of Hazardous Materials, 181(1-3), 747-754. doi:10.1016/j.jhazmat.2010.05.076
* Rockström J, Steffen W, Noone K, Persson Å, Stuart Chapin F, Lambin EF, Lenton TM, Scheffer M, Folke C, Schellnhuber HJ, Nykvist B, de Wit CA, Hughes T, van der Leeuw S, Rodhe H, Sörlin S, Snyder PK, Costanza R, Svedin U, Falkenmark M, Karlberg L, Corell RW, Fabry VJ, Hansen J, Walker B, Liverman D, Richardson K, Crutzen P and Foley JA. (2009). A safe operating space for humanity. Nature 461, 472–475.
* Schwarzenbach, R. P., Egli, T., Hofstetter, T. B., Gunten, U. V., & Wehrli, B. (2010). Global Water Pollution and Human Health. Annual Review of Environment and Resources, 35(1), 109-136. doi:10.1146/annurev-environ-100809-125342
* Sorrell, S. (2015). Reducing energy demand: A review of issues, challenges and approaches. Renewable and Sustainable Energy Reviews, 47, 74-82. doi:10.1016/j.rser.2015.03.002
* Springmann, M., Clark, M., Mason-D’Croz, D., Wiebe, K., Bodirsky, B. L., Lassaletta, L., Willett, W. (2018). Options for keeping the food system within environmental limits. Nature, 562(7728), 519-525. doi:10.1038/s41586-018-0594-0
* Urkidi, L. (2010). A glocal environmental movement against gold mining: Pascua–Lama in Chile. Ecological Economics, 70(2), 219-227. doi:10.1016/j.ecolecon.2010.05.004
* Vega-Coloma, M., & Zaror, C. A. (2018). Environmental impact profile of electricity generation in Chile: A baseline study over two decades. Renewable and Sustainable Energy Reviews, 94, 154-167. doi:10.1016/j.rser.2018.05.058