



Part 1 Introduction to Sustainability and Finance Syllabus

PART 1 Introduction to Sustainability and Finance

The aim of Part 1 of the course is to bridge the gap between students with engineering background from LUT University (e.g. Industrial Engineering Management, Software Engineering, Energy), TUD (Energy Systems) and students from CBS and IPAG with major in Business and Finance. They will actively acquire basics from disciplines not included in their Master's programs and not directly related to their field of study. The knowledge gained will help them to build a bridge between Technology, Finance and Sustainability and prepare them for the main topics of the Sustainable Finance course presented in Part 2.

Part 1 of the course contains the following modules:

1. 21-day challenge for all students
2. Innovation and Technology for Sustainable Future (for finance students) / Principles of Finance (for engineering students)
3. Quantitative Analysis module for all students.

This part of the course is based on materials available on the learning platform.

ECTS	Each university defines the number of ECTS based on the university rules (9- 10 ECTS based on learning hours for the TRUST Finance course in total, 3 ECTS for Part 1 of the course)
Objectives	<p>The Part 1 Introduction to Sustainability and Finance has the main objectives:</p> <ol style="list-style-type: none"> 1. To gain knowledge on and refresh understanding of sustainability and sustainable development 2. To acquire knowledge on Innovation and Technology for Sustainability (for finance and business students) / Principles of Finance (for Engineering students) 3. Further understand fundamental sustainability concepts across technology, innovation and finance 4. To improve quantitative analysis skills 5. To develop and improve communication, collaboration and presentation skills
Content	Part 1 Introduction to Sustainability and Finance provides students with theoretical insights on sustainability in everyday life and how they can develop and



	<p>improve their sustainable habits. Engineering students learn key concepts of finance (e.g. financial market and its players and instruments, financial management, financial statements, financing and investing decision-making, risk etc.). Finance and business students learn about sustainability, climate change and its causes and consequences, fundamentals of technology and innovation, evaluation of technology maturity and investments in technologies, responsible innovation topics. Additionally, all participants refresh and improve their qualitative analysis skills.</p>
<p>21-day challenge</p>	<p>The 21-day challenge is the first step of the course. It represents an innovative teaching approach for getting familiar with the SDGs. Developed in frames of the Erasmus+ ISSUE project, it is adapted for the needs of the transdisciplinary course in Sustainable Finance. Students from all partner universities with different backgrounds learn about sustainable development, get familiar with sustainability in everyday life and develop their sustainable habits. Via solving various challenges and getting familiar with educational materials, students raise their awareness on sustainability-related topics. 17 SDGs are presented in 17 videos. It takes 21 days to develop habits, and students will have three weeks to change their habits and get more information on each SDG. Each week 5-6 SDGs pages will be opening. This helps students to explore them without rush. It takes at least 10 min per day to watch videos and do the tasks. Participants need to complete pre- and post-assessment quizzes to discover their levels of sustainability awareness.</p> <p>This part of the course is completed by the students independently, and instructor's support is provided.</p> <p>Learning Outcomes</p> <p>After completing the 21-day challenge students should:</p> <ol style="list-style-type: none"> 1. Understand UN Agenda 2030 and know 17 SDGs 2. Discuss and argument on various perspectives of sustainability-related issues 3. Analyze their own decision-making situations related to sustainability and develop more sustainable habits <p>In this module, the learning content is organized around 17 teams representing sustainable development goals: no poverty; zero hunger; good health and well-being; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice, and strong institutions; and partnerships for the goals.</p>
<p>Innovation and Technol-</p>	<p>The Innovation and Technology for Sustainable future for business and finance students presents the learning themes and educational material the course will</p>



ogy for Sustainable future: for business and finance students

rely on to instruct students on climate change causes and consequences, innovation and technologies for sustainable future, focusing on clean energy, responsible innovation; technological maturity models and investments in technology aspects are included. These materials will help students from business and finance programs to understand the importance of technology and innovation, understand the main differences between application of various technologies in the field, better understand climate change, nature and human contributions and clean and renewable energy offering a bright future for investors.

The course materials provide students with an overview of climate change's causes and consequences, its risks for human beings and life on Earth, define technology and sustainability and provide an overview on the role of technology and innovation and highlight how they can lead to and support a sustainable future. Various technologies and their effect on climate change are covered. Materials define responsible innovation considering the role new products, processes or business models have in society, and the importance of creating change that has positive impacts on society and the environment.

Learning outcomes

Once Innovation and Technology for Sustainable Future module is completed by business students, they should:

1. Describe the climate change causes and consequences
2. Discuss and argument role of technology and innovation in development of new products, processes and business models and how it impacts the global carbon footprint
3. Outline clean energy, renewable energy, carbon-capture technologies
4. Discuss how technological innovation is driving a sustainable future, emerging technologies and green technologies
5. Know the concept of technology life cycle and understand how investment into technologies and innovations are made
6. Recognize responsible innovation, define its significance

Key themes:

Technology and Sustainability; Role of Technology and Innovation, Innovation Potential; Responsible Innovation; Technology Maturity; Investment in Technologies; Climate change; Sustainability and Financial System

Reading materials:

- Mikhaylov, A., Moiseev, N., Aleshin, K., & Burkhardt, T. (2020). Global climate change and greenhouse effect. *Entrepreneurship and Sustainability Issues*, 7(4), 2897.
- Consequences of climate change. https://climate.ec.europa.eu/climate-change/consequences-climate-change_en
- United Nations What is climate change? <https://www.un.org/en/climatechange/what-is-climate-change>



- United Nations, Causes and effects of climate change. <https://www.un.org/en/climatechange/science/causes-effects-climate-change>
- Agovino, M., Casaccia, M., Ciommi, M., Ferrara, M., & Marchesano, K. (2019). Agriculture, climate change and sustainability: The case of EU-28. *Ecological Indicators*, 105, 525-543.
- Xin, D., Ahmad, M., & Khattak, S. I. (2022). Impact of innovation in climate change mitigation technologies related to chemical industry on carbon dioxide emissions in the United States. *Journal of Cleaner Production*, 379, 134746.
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- UNCTAD 2022. Technology and Innovation Report 2021. <https://unctad.org/page/technology-and-innovation-report-2021>
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- Olabi, A. G., & Abdelkareem, M. A. (2022). Renewable energy and climate change. *Renewable and Sustainable Energy Reviews*, 158, 112111.
- Qazi, A., Hussain, F., Rahim, N. A., Hardaker, G., Alghazzawi, D., Shaban, K., & Haruna, K. (2019). Towards sustainable energy: a systematic review of renewable energy sources, technologies, and public opinions. *IEEE access*, 7, 63837-63851.
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- Güney, T. (2019). Renewable energy, non-renewable energy and sustainable development. *International Journal of Sustainable Development & World Ecology*, 26(5), 389-397.
- Wiedmann, T., & Minx, J. (2008). A definition of 'carbon footprint'. *Ecological economics research trends*, 1(2008), 1-11.
- Wilberforce, T., Olabi, A. G., Sayed, E. T., Elsaid, K., & Abdelkareem, M. A. (2021). Progress in carbon capture technologies. *Science of The Total Environment*, 761, 143203.
- Wilberforce, T., Baroutaji, A., Soudan, B., Al-Alami, A. H., & Olabi, A. G. (2019). Outlook of carbon capture technology and challenges. *Science of the total environment*, 657, 56-72.
- Zhang, Y., Sun, J., Yang, Z., & Wang, Y. (2020). Critical success factors of green innovation: Technology, organization and environment readiness. *Journal of Cleaner Production*, 264, 121701.
- Qing, L., Chun, D., Ock, Y. S., Dagestani, A. A., & Ma, X. (2022). What myths about green technology innovation and financial performance's relationship? A bibliometric analysis review. *Economies*, 10(4), 92.
- Umar, M., Khan, S. A. R., Zia-ul-haq, H. M., Yusliza, M. Y., &



	<p>Farooq, K. (2022). The role of emerging technologies in implementing green practices to achieve sustainable operations. <i>The TQM Journal</i>, 34(2), 232-249.</p> <ul style="list-style-type: none"> ○ Rosário, A. T., & Dias, J. C. (2022). Sustainability and the Digital transition: A literature review. <i>Sustainability</i>, 14(7), 4072. ○ Christensen, C. M. (1992). Exploring the limits of the technology S-curve. Part I: component technologies. <i>Production and operations management</i>, 1(4), 334-357. ○ Christensen, C. M. (1992). Exploring the limits of the technology S-curve. Part II: Architectural technologies. <i>Production and Operations Management</i>, 1(4), 358-366 ○ Stilgoe, J., Owen, R., & Macnaghten, P. (2020). Developing a framework for responsible innovation. In <i>The ethics of nanotechnology, geoengineering and clean energy</i> (pp. 347-359). Routledge. ○ Startups & Society Initiative (N.d.). The State of Responsible Innovation and Startups. https://static1.squarespace.com/static/60f582748e70050f6b2c615e/t/6346b5a037365b23a23637e8/1665578414282/The-State-of-Responsible-Innovation-and-Startups-092022.pdf ○ Responsible Innovation Future Science Platform (2023). Responsible innovation inspires public trust in new technologies. https://research.csiro.au/ri/responsible-innovation-inspires-public-trust-in-new-technologies/ ○ Schönherr, N., Martinuzzi, A., & Jarmai, K. (2020). Towards a business case for responsible innovation. <i>Katharina Jarmai Editor</i>, 85. ○ Grinbaum, A., & Groves, C. (2013). What is “responsible” about responsible innovation? Understanding the ethical issues. <i>Responsible innovation: Managing the responsible emergence of science and innovation in society</i>, 119-142. ○ Von Schomberg, R. (2019). Why responsible innovation?. In <i>International handbook on responsible innovation</i> (pp. 12-32). Edward Elgar Publishing.
<p>Principles of Finance for Engineering Students</p>	<p>This module of Part 1 of the course is designed for engineering students. It will familiarize them with the main concepts of finance, the role of financial institutions, budgeting and risks in managing industrial projects. The Principles of Finance module covers the fundamentals of finance including financial market participants and corporate activities and performance, capital and financial markets, the role and importance of financial statements and valuation techniques. Students will gain knowledge of capital markets and capital allocation, risks and risk management, financial management and financing and investment decision making.</p> <p>Learning Outcomes</p> <p>After the completion of this module, engineering students will:</p> <ol style="list-style-type: none"> 1. Define key concepts of finance 2. Be aware of financing, budgeting and investing, and financial decision-



	<p>making</p> <ol style="list-style-type: none"> 3. Appraise time value of money, understand and evaluate risk and return 4. Identify and explain the role of valuation and apply valuation ratios techniques <p>Key themes:</p> <p>Fundamentals of Finance; Financial Statements; Valuation & Ratio Analysis; Risks, Opportunities, and Time Value of Money; Financial Management and Value Creation Overview; Financing Decisions, Financing and Investment</p> <p>Reading Materials:</p> <ul style="list-style-type: none"> • Brealey R., Myers S and Allen F., 2019, Principles of Corporate Finance, McGraw-Hill Education, 13ed, 2019 • Financial Times • The Economist • Business section of reputed News journal
<p>Quantitative analysis</p>	<p>Quantitative analysis module is developed for both students' cohorts and aims to present and refresh quantitative analysis skills, applied to sustainable finance. The module is developed with a focus on machine learning techniques.</p> <p>Key themes: Regression techniques, linear and non-linear; Data labelling; Classifiers and Regressors; From linear regression to Machine Learning; Selected Machine Learning Methods</p> <p>Reading materials:</p> <ul style="list-style-type: none"> • Mazzone T., A First Course in Quantitative Finance, 2018, Cambridge University Press • Lopez de Prado, Advances in Financial Machine Learning, 2018, Wiley • Chan E. P., Quantitative Trading, 2021, Wiley.
<p>Modes of study</p>	<p>In total h: 76,5h:</p> <p>21-day challenge (25,5h), lectures and assignments Principles of Finance (for engineering students) / Innovation and Technology for Sustainability and Quantitative Analysis (51 h).</p> <p>All teaching materials and assignments are available on the learning platform.</p>
<p>Evaluation</p>	<p>21-day challenge - Pass/Fail</p> <p>Principles of Finance / Innovation and Technology for Sustainability module is evaluated based on level of participation, individual and group assignments (including Learning Portfolio and Peer teaching).</p>



Study materials	Provided by course instructors via the learning platform (e.g. Moodle).
Prerequisites	Part 1 is developed for engineering and business/finance students pursuing their master's studies.
PART 1 Assignments	
21-day challenge	<p>The 21-day challenge starts with the pre-assessment quiz to determine the level of sustainability awareness (multiple attempts allowed). After watching and reading materials on the SDGs (5-6 per week), several challenges per week chosen according to personal interest should be completed (minimum requirements 8 points/week and 24 points in total for the challenge required). After the completion of a challenge, Comments (minimum eight) on other students' are required. After the completion of the 21-day challenge, results should be posted on the respective forum. At the end of the 21-day challenge, the post-assessment quiz should be taken.</p> <p>All requirements should be met to pass the 21-day challenge.</p> <p>After completing the 21-day challenge students should:</p> <ol style="list-style-type: none"> 1. Understand UN Agenda 2030 and know 17 SDGs 2. Discuss and argument on various perspectives of sustainability-related issues 3. Analyze their own decision-making situations related to sustainability and develop more sustainable habits
Forum Discussions	<p>After watching the lectures, students are supposed either to work with the interactive video content or open a discussion and comment on at least two other posts in a predefined forum(s). Deadlines will be available on the platform.</p> <p>The posts in forums and work with materials are formative elements of assessment and thus have no grade associated with same. These will prepare participants for the next parts of the course.</p>
Peer-teaching assignment	<p>At the start of the course, students are divided into groups of 4-10 students (depending on the number of participants). Course teachers provide students with the list of topics for the Peer-teaching assignment.</p> <p>Every group needs to deliver more than one teaching package video on topics given in accordance with the Peer-teaching guidelines provided.</p> <p>Teaching package should include a 5-7 min video on the topic, reading materials</p>



	<p>list and questions to test knowledge. The video should include an introduction explaining why you have chosen this topic, description of the technology/case or an institution, its key features, application, use potential, relation with sustainability (detailed guidelines available on the platform), discussion (reflect how you did the work) and brief summary.</p> <p>At least 10 sources should be used when preparing the teaching package (including minimum 5 scientific papers). Reading materials should include 5-10 interesting reliable works / articles. Finally, 6 questions (3 open and 3 close) for testing peers' knowledge should be submitted to the platform together with the video and reading list.</p> <p>Learning Objectives</p> <p>After participation in peer-teaching activities, student will:</p> <ol style="list-style-type: none"> 1. strengthen learning experience 2. be able to prepare teaching materials and explain for people with lack of knowledge in their study field 3. develop pedagogical skills 4. improve analytical, communication and presentation skills <p>Evaluation criteria:</p> <ul style="list-style-type: none"> ● Following guidelines (max 2 points) ● Video production (max 4 points) ● Script and Delivery (max 4 points) ● Relevance of the Content (2 points) ● Clarity of explanation (9 points) ● Quality of additional teaching materials (4 points)
<p>Learning Portfolio for Part 1</p>	<p>A portfolio is a “purposeful collection” of student work that demonstrates effort, progress and achievements. After module completion, it is necessary to demonstrate the learning outcome and the main reflection you have on same. It should be submitted on the platform. Based on the teachers' instructions, at least one journal entry is required (based on Part 1 of the course). The aim of this assignment is to demonstrate the progress of your learning:</p> <p>LO1: Apply and reflect on the UN SDGs in everyday decision-making process</p> <p>LO2: Define concepts of finance, innovation and technologies with respect to climate change and its consequences.</p> <p>Discussion of, reflection on and evidence of task completion to be included into the portfolio.</p>



	<p>Learning Objectives:</p> <ul style="list-style-type: none"> • Learning to Learn: improve assessing and developing one's own learning • Reflect on understanding of concepts encountered <p>Evaluation criteria:</p> <p>Sources of Learning: Experiences relevant to learning outcomes (max 3 points)</p> <p>Demonstration of Learning: Artifacts (max 3 points)</p> <p>Reflection of Learning: Aligned with course learning outcomes (max 3 points)</p> <p>Presentation: Completeness and quality of the portfolio presentation (max 3 points)</p> <p>Mastering Knowledge & Skill LO1: Apply and reflect on the United Nations' Sustainable Development Goals (SDGs) in everyday decision making processes (max 3 points)</p> <p>Mastering Knowledge & Skill LO2: Define concepts of finance, innovation and technologies with respect to climate change and its consequences (max 3 points)</p>
<p>Part 1 Program</p>	
<p>Steps, materials, assignments</p>	<p>1. 21-day challenge</p> <p>The challenge is available on the platform during the first three weeks of the course.</p> <p>Completion: by the 21st day of the course. Requirement: Minimum 8 points/week and min 24 points in total.</p> <p>2. Principles of Finance / Innovation and Technology</p> <p>Videos are available on the platform.</p> <p>Forums open on the platform</p> <p>Instruction on the peer-teaching assignment on the platform, same as for learning portfolio task.</p>



3. Quantitative analysis

Lectures are delivered online or recorded.

All deadlines are on the platform.

