



15th Global Conference on Sustainable Manufacturing

- Decoupling Growth from Resource Use -

Workshop

Monday 25/9/17 - Wednesday 27/09/17

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Technion Student Activities
ME Graduate & Undergraduate R&D

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Environment, Industry and Science

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Prof. Dr.-Ing. Henrique Rozenfeld, M.Sc. Omar Chaim and Dipl.-Ing. Bernd Muschard
Learning for the Fourth Industrial Revolution
A Virtual Factory Learnstrument

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Student Presentations on Learnstruments and Learning Factories
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M.Sc. Rodrigo Pastl Pontes
Sustainability in Additive Manufacturing

Prof. Anath Fischer and M.Sc. Ronit Schneor
Technion – Israel Institute of Technology

Tuesday: 25 Sep 2017
11:00 - 13:00



A Self-Controlled Gait Balance Mechanism

MSc Student: Ariel Bar Yehuda

Supervisor: Prof. Alon Wolf, Technion

Designing a new type of mechanism, that fits inside APOS shoe soles, in order to self-adjust the coefficient of pressure (COP) during gait cycle, using shoe sole pressure distribution as a feedback.



Design for Metal Additive Manufacturing of a Bicycle Truss

Student: Omer Vikinski

Supervisor: Prof. Anath Fischer, Technion

The project illustrates a design approach of a bicycle truss that is optimized for additive manufacturing. It alleviates some of this manufacturing technology disadvantages for the sake of broader usage and applications.



AFT - Aviation-Fastener Tester

Students: Elyashiv Zion Bokovza, Dafna Libis, Dudi Epstein

Supervisor: Mr. Kfir Cohen, Technion

Our machine is designed to address the specific needs of the aviation industry. According to industry special requirements and standards, a test device was designed to test the quality of the fastener and it's resistance to vibration over time.



Low Cost 3D Printed Bionic Hands for Children

MSc Student: Yair Herbs

Supervisor: Prof. Alon Wolf, Technion



The Enable community is a distributed, collaborative volunteer effort to design and fabricate upper-limb assistive technology devices for anyone who needs it. The designs created by the community are open-source and the fabrication is done locally using consumer 3D printers. While most the devices offered by the organization are body powered and have 1 degree of freedom (DOF) and thus limited in their capabilities, our group is currently attempting to create more advanced devices that include sensory feedback and several DOF motorized fingers.

Prof. Anath Fischer and M.Sc. Ronit Schneor

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An Interactive Simulation of a Guided Articulated Needle in a Porous Structure

Student: Ehud Vardimon

Supervisor: Prof. Anath Fischer, Technion

In this work, a practical method has been proposed for guiding an articulated needle in a porous structure, based on a pre analysis of the structure.

Several algorithms were used in order to make the analysis, and to create a path which avoids the damaging of the structure or at least bring it to the minimum. Since porous structures may contain a lot of data, the used algorithms were also selected for their ability to reduce the complexity.



Graphic Tactile Display Device

Students: Majd Nasser, Steven Miari

Supervisor: Mr. Kfir Cohen, Technion

Tactile graphic display is a device which helps blind and visually impaired people to recognize shapes and figures through sensing. The main goal of the team was to design a simple and cheap electro-mechanical system that will have the ability to display 2D figures.

Agenda

Time	Content
11:00 – 11:15	A Self-Controlled Gait Balance Mechanism
11:15 – 11:30	Design for Metal Additive Manufacturing of a Bicycle Truss
11:30 – 11:45	AFT - Aviation-Fastener Tester
11:45 – 12:00	Low Cost 3D Printed Bionic Hands for Children
12:00 – 12:15	An Interactive Simulation of a Guided Articulated Needle in a Porous Structure
12:15 – 12:30	Graphic Tactile Display Device

Dr. Sinaia Netanyahu,
Chief Scientist Ministry of Environmental Protection, State of Israel

Moderator

Monday: 25 Sep 2017
11:00 - 13:00



Industry is crucial for economic growth. Industry consumes natural resources and leaves footprints on our environmental and ecological systems. Working with the industry as part of a global effort in decoupling economic growth from degradation of environmental and natural resources is a challenge for most countries. In addition, in order to remain competitive, industry seeks to become more efficient and innovative. This workshop on environment, technology and science shares a selection of government actions in these fields.

The workshop briefly introduces the state of the environment in Israel and the progress made by the Ministry of Environmental Protection in recent years in regulating environmental issues related to achievements, and also progress made by the industry. In particular, we will demonstrate the implementation of Integrated Environmental Licensing and Emission Reporting as adopted from the EU Regulation. We will demonstrate a significant measure led by the Ministry on a Haifa Bay National Plan in order to reduce pollution and environmental risks. This will be followed by presenting the Ministry's effort in going beyond regulation as part of government action in promoting voluntary sustainable manufacturing. We then show an innovative dimension related to a cross-ministerial effort in searching for alternative fuels for transportation as part of a National Program dedicated to this issue. The Ministry of Science and Technology will introduce its mission in promoting science and innovation in various fields, this time emphasizing the areas of engineering and robotics.

Agenda

Time	Content
11:00 – 11:15	The State of the Environment in Israel, Sinaia Netanyahu, The Chief Scientist, Ministry of Environmental Protection
11:15 – 11:35	Environmental issues - implementation of OECD recommendations, Ayelet Ben-Ami, Head of Unit, Integrated Treatment of Industry, Ministry of Environmental Protection
11:35 – 11:55	Haifa Bay National Plan to Reduce Pollution and Environmental Risks, Reut Rabi, Head of Energy Department, Air and Climate Change Division, Ministry of Environmental Protection
11:55 – 12:15	Beyond Regulation: Government Part in Promoting Voluntary Sustainable Manufacturing, Ohad Carny, Head of Regulatory Policy Domain, Ministry of Environmental Protection
12:15 – 12:30	The National Program of Fuel Alternatives for Transportation: the role of the Ministry of Environmental Protection, Orna Matzner, Senior Manager (Science and Research), Ministry of Environmental Protection
12:30 – 12:50	Driving sustainability as part of a business strategy at HP Indigo, Mrs. Noa Falk Yogev, HP Indigo
12:50 – 13:00	The mission of the Ministry of Science and Technology, Andrey Broisman, Director of Applied Science and Engineering, Ministry of Science and Technology

Learning for the Fourth Industrial Revolution:



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A Virtual Factory Learnstrument

Prof. Dr.-Ing. Henrique Rozenfeld, M.Sc. Omar Chaim

Moderators

Universidade de Sao Paulo and

Dipl.-Ing. Bernd Muschard, Technische Universität Berlin



Monday: 25 Sep 2017
14:00 - 15:30

The innovations towards an Industry 4.0 are having a disruptive influence on the manufacturing industry by establishing an interplay of smart factories, smart products and smart services embedded in an internet of things and services also called industrial internet. Meeting the future needs for learning and in-work training requires the development of new learning conducive technologies, materials and methods.



Through the usage of a new developed Learnstrument and guided discussions, this workshop aims to clarify some of the significant changes that follow the transition towards Industry 4.0 in an interactive manner. Participants will be challenged in a virtual environment where they have to solve industrial issues using tools and practices of Industry 4.0. After each challenge, a short discussion will follow regarding the applied approaches and their relation to the fourth industrial revolution. To close the workshop, a discussion on the learning method itself will be held.



Agenda

Time	Content
14:00 – 14:15	Introduction and Learnstrument Presentation
14:15 – 14:30	Tutorial Challenge
14:30 – 15:15	Using the Learnstrument and Activity Discussion
15:15 – 15:30	Final Remarks

M.Sc. Jan Philipp Menn, Dipl.-Ing. Bernd Muschard and
M.Sc. Felix Sieckmann
Technische Universität Berlin

Tuesday: 26 Sep 2017
11:00 - 13:00



Each semester about 120 TU-Berlin students take the course **Project Assembly technology and Factory Planning (PMF)**. The students work for four months in interdisciplinary teams of 3 to 6 students on actual research topics, guided by a research engineer. Out of these student groups seven students have been selected to present their findings to the topics of *Learnstruments* and *Learning Factories* at the GCSM to foster the participation of the academic youth.

Learnstruments are objects which automatically demonstrate their functionality to the learner. They use existing and new information and communication technology (ICT), aim at increasing the learning and teaching productivity, provide adequate learning goals to the user and support the user in achieving the learning goals

Learning Factories are learning environments that resemble value chains with realistic industrial processes, products and technologies. Learning takes places predominately through experiential and problem-based learning. Due to a high degree of realism, the acquired knowledge can be transferred more easily to the industrial practice.

Henry Angerstein, Hannah Lickert,
 Andrea Ketherija Lorenz and Felix Waitschies
 Technische Universität Berlin

Tuesday: 26 Sep 2017
 11:00 - 12:15

Students



Cube Factory 2.0

The CubeFactory is a learning-conductive instrument with an experience-based approach for the mediation of a closed loop material cycle and a self-sustaining mini-factory for the production of 3D printed objects. To operate, the CubeFactory requires only sunlight and thermoplastic waste.

Recycler for 3D-prints

The Recycle Bin transforms plastic waste into 3D printer filament. It returns obsolete products back into the value creation process. Comparing the cost of 100 kg of sorted plastic waste (\$50.00) with 1 kg of 3D printer Filament (\$25), an up-lift ratio of 50:1 can be realized.

Plastic recycling for Gaza waste management system

Development of a cost-effective recycling unit for plastic waste to be rebuilt in regions with poorly supported infrastructure.

Augmented Reality App for turbomachinery model assembly

Integrally geared compressors are complex machines with more than 3000 parts to be assembled. To give new employees a first impression, a 3D-printed small compressor model is used together with an AR-App.

Supervisors



Agenda

Time	Content
11:00 – 11:15	Introduction to the topic
11:15 – 11:30	Cube Factory 2.0
11:30 – 11:45	Recycler for 3D-prints
11:45 – 12:00	Plastic recycling for Gaza waste management system
12:00 – 12:15	Augmented Reality App for turbomachinery model assembly

Yunus Nissen and Natalie Petrusch

Technische Universität Berlin

Tuesday: 26 Sep 2017
12:15 - 13:00

Students



Learning Factory for special machinery assembly

Learning factories are established for mass and batch production. In a new approach the concept was transferred to one-of-a-kind special machinery assembly by focusing rather on the product than the process.

Integration of API production into a pharmaceutical Lean Learning Factory

In an existing Learning Factory for the pharmaceutical industry, Lean Management topics are so far trained on formulation and packaging processes only. In order to convey the special characteristics of Lean Management in the context of the production of the active pharmaceutical ingredient (API), the Learning Factory was expanded by an additional module.

Supervisors



Agenda

Time	Content
12:15 – 12:30	Learning Factory for special machinery assembly
12:30 – 12:45	Integration of API production into a pharmaceutical Lean Learning Factory
12:45 – 13:00	Discussion

Prof. Dr. Gideon Levy, TTA Technology Turn Around
Dipl.-Ing. André Bergmann, Fraunhofer IPK
Dipl.-Ing. Bernd Muschard, Technische Universität Berlin
M.Sc. Rodrigo Pastl Pontes, Fraunhofer IPK

Wednesday: 27 Sep 2017
14:00 - 16:00



Companies that want to stay competitive in the future need flexible and highly efficient production systems – systems that take account of ecological aspects and the scarcity of resources, but can respond to increasing differentiation in customer demand as well. This leads to a higher number of variations with smaller batch lots for each variant. The consequences of adopting this novel production technology on industrial sustainability are not yet well understood. Benefits can be found across the product and material life cycles, through product and process redesign, improvements to material input processing, make-to-order component and product manufacturing or a closed loop material cycle.

This workshop gives a short insight into the state of the art research for the industrial as well as prosumer-oriented sustainable application of additive manufacturing. Within the framework of a round table (World Café), sustainability-oriented advantages, disadvantages and new approaches will be recorded and discussed in small individual groups.

Agenda

Time	Content
14:00 – 14:20	Impulse Speech
14:20 – 15:30	World Café
15:30 – 16:00	Discussion
	Coffee Break
16:00 – 17:30	Visit Additive Manufacturing Laboratory at Materials Center