Research – Development – Innovation Syllabus

<table>
<tr><td rowspan="5">1. General Information</td><td colspan="5">Course title: 3D Printing with (Food-)Waste</td></tr>
<tr><td colspan="5">Course coordinator(s) / lecturer(s): Kovács-Nagy Ferenc, Malu Lücking
Contact details: kovacs.nagy.ferenc@mome.hu; lucking@mome.hu</td></tr>
<tr><td>Level and Code: M-KF-E-101-IK-242501-01</td><td>Position in the Curriculum:</td><td>Recommended semester:</td><td>Credits: 5</td><td>Teaching hours: 48
Student workload: 60</td></tr>
<tr><td>Related codes:</td><td>Type: lecture/ seminar/practice /combined</td><td>Is it open to sign-up as an elective?
-</td><td colspan="2">Specific pre-conditions to sign-up as an elective:</td></tr>
<tr><td colspan="5">Interlinkages / prerequisites, parallel units:</td></tr>
<tr><td>2. Targeting</td><td colspan="5">Aims and principles of the course:
(in accordance with the subject description)

This course aims to equip students with the knowledge and skills to transform food waste into valuable resources through innovative design and sustainable practices. Emphasizing the potential of waste as a raw material, the course seeks to reimagine discarded materials as assets for creating a sustainable future. Students will explore various waste streams, from agricultural residues to post-consumer food waste and beyond, gaining a comprehensive understanding of the diversity of materials available for sustainable design. Through an in-depth exploration of circular design principles, students will engage in hands-on experiences that bridge theory and practice, utilizing cutting-edge technologies like 3D paste printing with ceramic printers.

The course promotes interdisciplinary collaboration and encourages students to think critically and creatively about organic waste management. With a strong focus on real-world applications and hands-on prototyping, the course also includes lectures, workshops, and guest speakers to deepen students' understanding of sustainable material design. By the end, students will be well-prepared to apply their knowledge and skills in innovative ways, driving positive change in the field of sustainable design.

This course will be bilingual, but knowledge of the English language is required.</td></tr>
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Intended learning outcomes / professional and transitive competencies:
(in accordance with the subject description)

Knowledge:

- Understand the principles of circular design and sustainable material utilization.
- Gain insights into various waste streams and their potential for resource recovery.
- Familiarity with cutting-edge technologies like 3D paste printing in the context of waste repurposing.

Skills:

- Ability to identify and assess opportunities for transforming waste into valuable resources.
- Proficiency in applying sustainable design principles to real-world projects.
- Competence in using digital tools, including 3D modeling software, to conceptualize and prototype innovative designs.
- Collaboration and communication skills in interdisciplinary teams, working effectively in both English and Hungarian.

Attitudes/attributes:

- Develop a proactive mindset toward sustainable design and waste management.
- Cultivate an appreciation for the value of waste as a resource rather than a byproduct.
- Encourage innovative thinking and creativity in addressing environmental challenges.
- Commitment to continuous learning and staying informed on advancements in sustainability and design.

Autonomy and Responsibility:

- Demonstrate the ability to independently research and apply knowledge in sustainable design projects.
- Take responsibility for the environmental impact of design choices, aiming for sustainable outcomes.
- Show initiative in leading or contributing to projects that promote circular economy principles.
- Maintain ethical standards in all aspects of design, recognizing the broader implications of waste management decisions.

3. Itinerary

Course content (topics and themes):

- Biodesign methods, research techniques
- Biomaterial recipes
- Digital fabrication tools
- Introduction to Circular Design and Sustainable Material Utilization
- Exploration of Waste Streams: Agricultural Residues, Post-Consumer Food Waste, and Other Organic Materials
- Material Properties and Testing: Understanding the Potential of Organic Waste
- Hands-On Prototyping Techniques: 3D Paste Printing and Handcrafted Approaches
- Life-Cycle Analysis of Sustainable Products
- Case Studies in Circular Economy and Waste Management
- Design Thinking and Innovation in Sustainable Material Design

RDI methods and tools used in the course:

- Data collection, analysis and evaluation methods
- Artistic and design cognition and creative methods
- Methods for developing ideas and concepts
- Product development methods
- Testing and validation methods
- Research collaboration methods
- Documentation and communication methods
- Comparative critique and evaluation of RDI elements, processes and methods
- Self-reflection on the performance of RDI processes and tasks

Specificity of the learning process:

Teaching method:

Schedule:

Week 1-2: Introduction to Circular Design and Food Waste

- Overview of circular design principles and their relevance to sustainable design
- Introduction to food waste sources, types, and global impact
- Guest lecture

Week 3-4: Waste Stream Analysis and Material Selection

- Analysis of specific waste streams in production, retail, and consumption sectors and nature
- Identification of valuable components within waste for material transformation
- Hands-on experiments and demonstrations on waste processing techniques

Week 5-6: 3D Paste Printing and Additive Manufacturing

- Introduction to 3D paste printing technology and its applications in waste transformation
- Hands-on workshops on using 3D printers to create prototypes from waste-derived materials

Week 7-8: Material Transformation Techniques

- Exploration of various methods for transforming food waste into usable materials (e.g., bioplastics, textiles, bio-composites)
- Case studies and discussions on successful waste-to-material conversion projects

Week 9-10: Designing with Waste Materials

- Design thinking workshops focusing on creating functional and aesthetically pleasing designs using waste-derived materials
- Prototyping sessions to iterate and refine design concepts
- Guest critiques and feedback sessions

Week 11-14: Collaborative Projects and Presentations

- Collaborate in teams to develop and prototype innovative products or design solutions using waste materials
- Final presentations showcasing design concepts, prototypes, and sustainability metrics
- Peer review and feedback sessions for continuous improvement

Tasks and assignments (with student notional workload):

Learning environment:
Lab & Classroom

4. Evaluation

Assessment:
The course is completed through active participation in lectures, workshops, individual teamwork, consultations and presentations.

Assignments:
Individually or in groups, use 3D printing or handcrafted techniques to create a series of prototypes and a final product from a local organic waste resource, testing material qualities and designing a circular life-cycle to demonstrate sustainable transformation and circularity.

Assessment method:
Based on class attendance, interim outcome presentation, group work and final process.

Assessment criteria:
As result of this course is a team project, the grade will be calculated based on the activity and participation of the students, according to their role and responsibility in the project.

Calculation of grade:
(weights of the achievements, assignments; ranges of rates or points)

Attendance: 40%
Group work: 40%
Interim presentation: 10%
Final presentation: 10%

Prior learning recognition (based on application):
Basic knowledge on Digital fabrication is useful

Recommended readings:

Further readings, documents, sources:

Additional information:

Schedule and venue for personal consultation:
To be announced