

## Research – Development – Innovation Syllabus

1 · G e n e r a l i n f o r m a t i o n s	Course title: 3D Printing with (Food-)Waste				
	Course coordinator(s) / lecturer(s): Kovács-Nagy Ferenc, Malu Lücking Contact details: <a href="mailto:kovacs.nagy.ferenc@mome.hu">kovacs.nagy.ferenc@mome.hu</a> ; <a href="mailto:lucking@mome.hu">lucking@mome.hu</a>				
	Level and Code: M-KF-301-IK-242501-01	Position in the Curriculum:	Recommended semester:	Credits: 5	Teaching hours: 48 Student workload: 60
	Related codes: M-KF-E-101-IK-242501-01	Type: lecture/ seminar/practice <b>/combined</b>	Is it open to sign-up as an elective? -	Specific pre-conditions to sign-up as an elective:	
Interlinkages / prerequisites, parallel units:					
2 · T a r g e t i n g	Aims and principles of the course: (in accordance with the subject description)				
	<p>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.</p> <p>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.</p> <p><b>This course will be bilingual, but knowledge of the English language is required.</b></p>				

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.

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**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

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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

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**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