COURSE CONTENT

Course Code	DM3008
Course Title	Generative Art
Pre-requisites	NIL
No of AUs	3
Contact Hours	39 hours studio contact

Course Aims

This course will introduce you to the creative realm of generative art, which is based on designing and exploring the interaction between predefined systems and different factors of unpredictability. The course focuses on artistic concepts, techniques and tools that you will be able to apply in the creation of digital or analogue generative art projects. This learning will set up the foundation for further studies of generativity, and for extending the expressive potential of more complex generative projects in art, design and media.

Intended Learning Outcomes (ILO)

By the end of the course, you should be able to:

1. Describe techniques and tools for creating generative artworks in various scenarios and media.
2. Develop a range of methodologies and techniques for making generative art.
3. Create generative art sketches and generative art projects using gained knowledge and skills.
4. Present, discuss, evaluate and reflect on the effectiveness and impact of generative art projects.
5. Identify, constructively discuss and critique various approaches to generativity in a broader context of contemporary art, culture and technology.

Course Content

Generative art unfolds in a range of creative methodologies for consciously interacting predefined systems with different factors of unpredictability throughout conceptualizing, producing and presenting the artwork. It appreciates and cultivates the artwork as a dynamic catalysing event or process, inspired by curiosity, susceptible to chance and open for change. This course is a platform for the creative exploration of generativity in making art, using analogue and/or digital tools. It will provide you with the grounding for an understanding of generativity as a powerful cognitive toolset and medium-independent framework which makes crucial contributions to media art and design. You will examine different aspects and factors of generativity, and apply them to develop strategies and techniques for creating your own generative artworks. You will learn about popular software tools and hardware devices for generative experimentation, sketching, testing and complex project development. You will be exposed to a full spectrum of contemporary exponents, practices and aesthetics relevant to the field, ranging from minimalist generativity to creative artificial intelligence and machine learning.

Generativity in the arts and analogue techniques

The course begins with an introduction to generative art. In a historical overview of generativity

in the arts, you will learn about various analogue techniques for turning chance and uncertainty into defining factors of an artwork. This will enable you to understand both the inherent generativity of any creative process, which is dictated by nature, and an explicit generative approach which appreciates and develops the artwork as a dynamic catalysing event or process, inspired by curiosity, susceptible to chance and open for change.

Algorithmic thinking and procedural literacy
We will examine the cognitive requirements for effective generative creativity. They comprise two modes of thinking: matching the algorithmic and the unpredictable elements into a coherent system, and the construction of algorithms as multi-purpose tools, which requires procedural literacy and programming skills for making digital generative projects. We will approach these modes systematically, focusing on the critical details of procedural literacy, and this will enable you to read and write processes, to engage procedural representation and aesthetics, independent of the technological environment you are working in.

Digital tools for generative art
An overview of artistically accessible coding environments and programming languages for generative experimentation, sketching, testing and complex project design. These include Processing, openFrameworks, P5.js, Pure Data, TouchDesigner, FFmpeg, Python and Godot. In addition, we will introduce online tools, platforms and cloud computing services for exploring and utilizing machine learning techniques in the development of generative artworks, such as ml5.js and Runway. We will address their advantages and trade-offs, learning resources and strategies. Using some of these tools, you will explore generative systems for processing various media and data types.

Hardware devices and physical computing
You will learn about popular hardware for generative art and design such as compact, open-source 2D and 3D printers, interactive input/tracking devices such as Leap Motion, Kinect and Intel RealSense, physical computing platforms such as Arduino and Intel Galileo, and systems on a chip such as Raspberry Pi. We will discuss their usage scopes, address their advantages and trade-offs, learning resources and strategies. You will be experimenting with some of these devices to facilitate generative processes and interaction.

Systems for surprise, discovery and learning
Over several lectures we will look at exemplar projects of contemporary generative art, distinguished by the artists' abilities to transcend the conceptual, productive and aesthetic limits of algorithmic thinking and code-based creativity. By leveraging generativity into the original structures, they command inspiring, emotionally and intellectually rich experiences with unique aesthetic and ethical values. You will be able to recognize and evaluate them as cognitive tools for comparison, abstraction, categorization, analogising and meaning making. This will empower you to synergize your inspiration, knowledge, skills, playfulness and curiosity into your own generative projects.

Thinking and designing generativity, the role of prototyping
Defining ideas and evolving conceptual and methodological frameworks for a generative art project. The importance of testing the ideas and developing a project prototype. You will sketch and prototype ideas in order to experience your generative designs before going to the production stage of the final project.

Developing and producing generative art projects

Identifying, profiling and developing generative art projects through the following stages: elaboration of the project demo (prototype), refinement and adjustment of the project goals and outcomes, production, postproduction and presentation.

Class assignments

Assignment 1: You will individually produce one generative sketch, using analogue, digital or combined tools.

Assignment 2: You will individually write a short critical essay (2 pages) on a modern generative artwork of your selection, using sources presented in classes, online, and/or the selected material from the course reading list.

Assignment 3: Working in a small team of 2 to 4 members, you will create an original generative artwork using analogue, digital or combined tools.

Classes will comprise lectures, demonstrations and activities that will be included in the assessment such as quick tutorials, presentations, class exercises, workshops, and peer/instructor feedback sessions.

Assessment (includes both continuous and summative assessment)

Component	**ILO Tested**	**Programme LO**	**Weighting**	**Team/ Individual**
Continuous Assessment Assignment 1: Creating a generative sketch using analogue and/or digital tools 20% Assignment 2: Writing about generative artwork 10%	1,2,3,4,5	N.A	30	Individual
Final Project: Assignment 3: Creating and an original generative art project in small team 50%: – Concept 10% *Team assessment* – Team contribution 20% *Individual assessment* – Project outcome 20% *Team assessment*	1,2,3,4,5	N.A	50	Team
Continuous Assessment: Participation 20%	5	N.A	20	Individual
Total			100%	

Reading and References

1. Banzi, Massimo. *Getting Started with Arduino*. Sebastopol: O'Reilly Media, 2011.
2. Boden, Margaret and Ernest Edmonds. "What is Generative Art." *Digital Creativity*, 20, No. 1-2, 2009: 21-46.
3. Bohnacker, Hartmut, Benedikt Gross and Julia Laub. *Generative Design: Visualize, Program, and Create with Processing*. Mainz: Verlag Hermann Schmidt, 2009. http://www.generative-gestaltung.de/.
4. Borenstein, Greg. *Making Things See: 3D vision with Kinect, Processing, Arduino and*

MakerBot. Sebastopol: O'Reilly Media, 2012.

5. Dorin, Alan, Jonathan McCabe, Jon McCormack, Gordon Monro and Mitchell Whitelaw. "A Framework for Understanding Generative Art." *Digital Creativity*, 23 (3-4) (2012): 239–259.
6. Galanter, Philip. "Generative Art Theory." *A Companion to Digital Art*, edited by Christiane Paul. Chichester: John Wiley & Sons, Inc., 2016: 146-180.
7. Grba, Dejan. "Avoid Setup: Insights and Implications of Generative Cinema." *Leonardo*, Vol. 50, Nr. 4, Aug (2017): 384-393. http://www.mitpressjournals.org/doi/abs/10.1162/LEON_a_01456.
8. Ihmels, Tjark and Julia Riedel. "The Methodology of Generative Art." Medien Kunst Net website. http://www.medienkunstnetz.de/themes/generative-tools/generative-art/1/.
9. Iversen, Margaret, ed. *Chance (Whitechapel: Documents of Contemporary Art)*. Cambridge: The MIT Press, 2010.
10. Johansen, Andrew. *Python: The Ultimate Beginner's Guide*. North Charleston: CreateSpace Independent Publishing Platform, 2016.
11. McCarthy, Lauren, Casey Reas and Ben Fry. *Getting Started with p5.js: Making Interactive Graphics in JavaScript and Processing*. Sebastopol: O'Reilly Media / Maker Media, 2015.
12. Nyhoff, Jeffrey L. and Larry R. Nyhoff. *Processing: An Introduction to Programming*. Boca Raton: CRC Press Taylor & Francis Group, 2017.
13. Pearson, Matt. *Generative Art*. Greenwich: Manning Publications, 2011.
14. Richardson, Matt and Shawn Wallace. *Getting Started with Raspberry Pi*. Sebastopol: O'Reilly Media, Inc., 2013.
15. Richardson, Matt. *Getting Started with Intel Galileo: Electronic Projects with the Quark-Powered Arduino-Compatible Board*. Sebastopol: Maker Media, Inc., 2014.
16. Todorović, Vladimir and Dejan Grba. "Wandering Machines: Narrativity in Generative Art." *CITAR Journal of Science and Technology of the Arts*, Special xCoAx Issue, Porto, 2019.
17. Whitelaw, Mitchell. "System Stories and Model Worlds: A Critical Approach to Generative Art." *Readme 100: Temporary Software Art Factory*. Norderstedt: BoD, 2006.

Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned readings, activities, assignments, attend all classes punctually and complete all scheduled assignments by due dates. You are expected to take responsibility to follow up with assignments and course related announcements. You are expected to participate in all project critiques, class discussions and activities.

(2) Punctuality

You are expected to be punctual for all classes. If you are more than 30 minutes late, you will be deemed as absent and will not be able to sign on the attendance register.

(3) Absenteeism

In-class activities make up a significant portion of your course grade. Absence from class without a valid reason will affect your participation grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for in-class activities.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Planned Weekly Schedule*

*Subject to adjustment by instructor according to the teaching situation, students' progress, public holidays and unforeseeable circumstances. A revised schedule will be issued to students at the start of the semester.

Week	Topic	Course LO	Readings/ Activities
1	**Generativity in the arts and analogue techniques** An introduction to generative art. A historical overview of generativity in the arts, and analogue techniques for working with chance and uncertainty. The differences between inherent generativity of a creative process, and the explicit generative approach.	1, 2, 3	**Introductory Lecture: Generativity in the arts** **In-class discussion** on personal favourites in generative art **Assigned Project 1:** Create one generative sketch (a system of smaller scale and complexity), using analogue, digital or combined tools.
2	**Algorithmic thinking and procedural literacy** The cognitive requirements for effective generative creativity. Modes of generative thinking. Procedural literacy and programming skills for digital generative projects.	1, 2, 3, 4	**Lecture: Algorithmic thinking and procedural literacy** **In-progress presentation of Project 1** Critique and feedback. **In-class exercise:** Use the critique and feedback to improve your generative sketch.
3	**Digital tools for generative art 1** An overview of coding tools for generative art and design: Processing, openFrameworks, P5.js, Pure Data, TouchDesigner, FFmpeg, Python and Godot. Their uses, advantages and trade-off. Learning resources and strategies.	1, 2, 3, 4	**Lecture: Digital tools for generative art 1** Informative exploration of software tools for generative art. **Final presentation of Project 1** Critique and feedback. **In-class exercise:** Use the critique and feedback to improve and

			extend your generative sketch.
4	**Digital tools for generative art 2** Introduction to online tools, platforms and cloud computing services for machine learning applicable for generative artworks: ml5.js and Runway. Their advantages and trade-offs, learning resources and strategies.	1, 2, 3, 4	**Lecture: Digital tools for generative art 2** **In-class exercise:** Practical exploration, testing and sketching with generative software tools, ML platforms and services presented in this and previous lecture. **Assigned Project 2: Writing about generative artwork** Write a short critical essay (2 pages) on a modern generative artwork of your selection, using examples presented in classes, online, and/or the material from the course reading list.
5	**Hardware devices and physical computing** Popular hardware devices for generative art and design: LeapMotion, Kinect and Intel RealSens. Physical computing platforms: Arduino and Intel Galileo. Standalone systems on a chip: Raspberry Pi. General usage scopes, advantages and trade-offs. Learning resources and strategies.	1, 2, 3, 4	**Lecture: Hardware devices and physical computing** **Assigned Project 3 – Final Project: Creating and an original generative artwork in small team** Team assembly, team member responsibilities, project ideation. Teams start developing 2 to 3 initial ideas for the final project.
6	**Systems for surprise, discovery and learning 1** A series of lectures for motivational learning. Comparison of exemplar generative art projects and approaches. Discussion of their poetic, expressive and cognitive values. These motivational lectures accompany the final project development until the end of semester.	1, 2, 3, 4	**Lecture: Systems for surprise, discovery and learning 1** **Project consultation** Final project ideation and concept development.
7	**Student Presentations**	1, 2, 3, 4	**In-class presentation:** Student teams present their final project ideas: motivation, concepts, methodologies and techniques, development timelines, documentation and media. Critique and feedback and further discussion. With the lecturer, each team selects one final project idea for further profiling, prototyping and

			production. Selected ideas will be posted, and their development documented online (OSS).
8	**Systems for surprise, discovery and learning 2** **Thinking and designing generativity, the role of prototyping** Defining ideas, evolving conceptual and methodological frameworks for a generative art project. The importance of sketching and developing project prototype for the better experience of generative designs before going to the production stage. **Developing final projects** Preparing the project demo as an integral phase of the final project production. Work will be based on the inputs from all previous classes, combined with the in-class consultations with the lecturer.	1, 2, 3, 4, 5	**Lecture: Systems for surprise, discovery and learning 2** **Project consultations** Developing the demo. **Continuous review of final assignment through various phases of completion** Throughout the last six weeks (8-13), the final project assignment will be subject to review in its various phases of completion. This will be carried out through class presentations by students and will allow for a peer-review-based examination of the work in progress. In this highly interactive process, you will learn through and from the work of your peers and the advice offered by the lecturer. These reviews will take all previously learned concepts into account and test the students in terms of their understanding of applying these to practice.
9	**Systems for surprise, discovery and learning 3** **Producing final projects** Continues from developing the project demo through production, postproduction and preparing for the presentation.	1, 2, 3, 4, 5	**Lecture: Systems for surprise, discovery and learning 3** **Project critique** Project demo and discussion. **Final project production**
10	**Systems for surprise, discovery and learning 4** **Producing final projects**	1, 2, 3, 4, 5	**Lecture: Systems for surprise, discovery and learning 4** **Project consultations** Project production. **Project critique** Project progress. **Final project production**
11	**Systems for surprise, discovery and learning 5** **Producing final projects**	1, 2, 3, 4, 5	**Lecture: Systems for surprise, discovery and learning 5** **Project consultations** Project production. **Project critique** Project progress. **Final project production**
12	**Producing final projects**	1, 2, 3, 4, 5	**Project consultations** Project production.

			Project critique Project progress **Final project production**
13	**Final presentation**	1, 2, 3, 4, 5	**Student Presentations** on final assignment with critique and feedback.