Description of the specialization

I. DESIGN

1. Design development

   Development of products, services, visual communication, interfaces, with the following considerations:

- Form - design works on complete novelty in shape, modernization of shape - thorough or superficial.
- Function - utility notions arising from functional and ergonomic analyses, observation of users’ needs and preferences, as well as new usage and operational concepts.
- Technology - resulting from emergence of new technical capabilities, in the field of construction as well as
  material and production technologies.
- Creation of new consumer and social needs.
- Setting up information structures.
- Setting up functional structures.
- Design of interactions.
- User experience (UX).

2. Tools supporting the design development process

- Innovative design methods improving the effectiveness of design works.
- Innovative design methods employing advanced IT systems.
- Methods of testing design concepts leading to creation of new tools supporting a design process, employing IT technologies among others.
- Methods of development of operational models used in a design process in particular those based on IT technologies.
- Innovative tools for recording, communicating and presenting effects of design works aimed at improving decision-making process in designing, in particular those based on IT technologies.
- Innovative tools for managing work and communication of an interdisciplinary design team, including those based on IT technologies.
- Innovative tools for testing design concepts in pre-prototype phase.
- Innovative tools for prototyping of design concepts, in works which final results are material and non-material solutions (system, process, organization, service), including those within UX and IT field.

II. GAMES

1. Development and design of video games

Works within this area pertain to the whole process of game production and relate to prototyping, designing,
and development of game components, including:

- Innovative concepts of games addressed to current demand and expectations of the market and players.
- Base gameplay model, a set of main and side elements of game's functionality and their connections and relations.
- Model of communication with a player, visual code and visual style, including a unique artistic layer intended to have an anticipated effect on the player.
- Sets of animations, models and textures, behavioral models of living creatures and mechanical devices.
- Sound systems for games based on real-time analysis of game situations.
- Levels, interfaces, communities, characters, icons, objects, vehicles, special effects, plants and vegetation models, weather conditions with simulation of weather conditions impact, day and night cycles.
- Innovative and more efficient production methods, production tools and business models.

2. Platforms, engines, and processing techniques

This point covers technologies on which the game production process and operation

of any video game are based, i.e. mainly the processing techniques and middleware (the, so-called, engines):

- Devising and development of innovative engines for game graphics and physics and their adaptation to requirements of various platforms and devices (mobile, consoles, etc.).
- Motion and performance capture techniques.
- Innovative techniques of image and 3D object digitalization.
- New and improved techniques and tools for data optimisation.

3. Application of artificial intelligence to:

- improve algorithms solving basic problems related to artificial intelligence and methods of their implementation in games;
- develop algorithms and simulation models of credible behaviour of characters, groups of characters and environment;
- mechanisms for automatic generation of content;
- create systems for collecting, storing and processing data resources of high complexity, variability and size (the, so-called, „Big data").

4. New tools and mechanisms of interaction

Interaction between user and video game is a key aspect of game playability and operation, and at the same time significantly affects the user's interest in a particular product and user's engagement
in a game. That is why research in the following fields is crucial for sector development:

- modern tools for using innovative interfaces and mechanisms of interaction with the game and environment, their adaptation to new hardware platforms and adjustment to the needs
of persons with disabilities;
- application of data coming from controllers and sensors in modern mechanisms of interaction with a game or in game mechanics;
- methods and solutions which allow to create and apply new models of narration and games with non-linear plot.

5. Digital distribution and multiplayer online games

Development of modern methods of sales and distribution of games, and provision of support for the development of technologies
and infrastructure necessary for the multiplayer online games, including:

- solutions, technologies and infrastructure for sharing and servicing of games in a cloud, including digital distribution, real-time data streaming, handling of external distribution systems, unification of message display;
- creation of platforms and functionalities for advanced multiplayer games and interactions between users inside and outside the games with the use of various platforms and networks (e.g. Internet, LAN) and anti-fraud protection technologies and systems;
- development of distributed infrastructure facilitating multiplayer games and creation of the persistent state world for such games;
- development of innovative economic models for digital distribution and online games;
- development of platforms providing content related to mobile and network games.

6. Tools and knowledge supporting the game creation process.

- Tools and methods employing advanced methods of assessment of reaction and psychological and emotional condition of a player.
- Tools for automation and facilitation of game testing and error detection processes,
  including tests of elements created in a procedural (automatic) manner
- Tools supporting communication and data exchange within a game developing team.
- Tools supporting the process of development of video games for various platforms and devices.

7. Application of video games in other areas

- Development of simulation, creation of virtual models of real systems and processes, simulation studies on performance, capacity and behaviour of systems.
- Creation of games for therapeutic and medical purposes.
- Creation of games for research and educational purposes.

III. MULTIMEDIA

1. Support to and optimisation of processes

- Developing innovative methods and models of supporting, optimisation, and controlling the content production and dissemination processes.
- Tools and methods employing advanced methods of assessment of response and psychological and emotional state of content recipients.

- Tools for automation and facilitation of error detection, tests generated with the use of algorithms and procedures of content production processes.
- Tools supporting communication, data exchange and transmission within teams creating content.

2. Shaping the market of creators and consumers.

- Models and tools for remote and direct measurements, analysis and evaluation of recipients' preferences aimed at improving effectiveness of creative projects fulfilling the high-ranking needs of citizens: measurements employing the subjective and objective indicators.
- Models and tools used to personalize the audio-visual communication based on preferences and behaviour of recipients.
- Development of innovative business models enabling co-financing and engagement of recipients in the process of creation and implementation of audiovisual content and interactive solutions.
- Tools and applications for creation of innovative educational and presentational models employing multimedia and interaction.
- Technologies and solutions supporting innovative forms of dissemination of content among various social groups.

3. Knowledge and tools supporting production and revitalization.

- Models, technologies, devices, design applications, management and production of visual, audial and audio-visual content, including: network technologies, mobile hardware embedded systems, stationary systems for automation of production and post-production processes, innovative interfaces, interactive systems, and multimedia engines generated in real-time or automatically, systems employing image and sound analysis and processing in multidimensional modelling.
- Technologies, devices, applications and algorithms for processing and digital reconstruction of copies recorded on analog or digital media, including: technologies aimed at improving and automating the processes of digitalization, revitalization, and adaptation of content to modern distribution channels
- Technologies and solutions supporting the processes of modelling, prototyping, and testing the functionality and usability of content, products, and audio-visual and interactive services, including the creation and application of new narration models and content of non-linear stories.
- All creation technologies for the development and automation of pre-production, production and post-production processes of image and sound, image and sound

sharing and storage, including the techniques of digitization and processing of images and multi-dimensional objects, and the motion and performance capture techniques, and visual code, visual style, animations, models and textures, simulations, special effects, behavioral models of living organisms, and mechanical devices.

4. Distribution and management of content

- Creation of innovative distribution channels of content dedicated to various social groups (including the groups excluded due to health, economic, geographical, social condition), including: intelligent streaming of content, real-time delivery of content.
- Models, tools, technologies, applications, interfaces for intelligent dissemination and distribution, among others by ensuring permanent identification and effective protection of copies against illegal access or dissemination.
- Tools, methods and technologies for measuring and control the maintaining of correct content distribution parameters.
- Data management systems for data of considerable complexity, variability, or size.
- Solutions facilitating inter-system exchange of multi-element digital data.
- Creation of platforms and functionalities for multiplayer and interactive participation of users in content communication with the use of various distribution channels.
- Development of platforms related to content distribution via mobile means or networks.

5. Archiving and smart access to content

- Models, technologies, devices and applications for secure long-term storage of content recorded in analog or digital format.
- Technologies of searching and accessing content, including semantic analyzers of image
  and sound, and systems of smart indexation of multimedia content.
- Complex digital data management systems and solutions compliant with international standards allowing data exchange between systems.