UNITY3D COURSE PROGRAM

(BASIC LEVEL)

Olena Chebanyuk

This program is aimed to define (i) topics (course points); (ii) knowledge (sub points), (iii) level of skills (practical tasks); for achievement of ITHEA® ISS certificate. Course graduators prepare Uinty3D project and game concept document for certification.

Prepared Unity3D projects and game concept documents have to be uploaded to ITHEA® ISS software engineering forum for the further reviewing. Successfully reviewed projects are awarded with corresponded certificate.

Requirements to Unity3D projects:

- *contain 2D and 3D game scenes;*
- *2D scenes should be adopted for different sizes and resolutions of mobile screen;*
- *project should reuse at least one asset from Asset Store;*
- *at least eight points of topic "Scriping" should be presented in your scripts.*

1. Getting and installing Unity

1.1 Creating Unity accounts

1.2 Install Unity configuration

Practical task: *Creating Unity account, installing and launching Unity.*

2. Representation of 2D and 3D objects on game scene

2.1 Flat objects representing

2.2 Unity3D coordinate systems

2.3 Using Vectors for manipulating of objects.

2.4 Principle of 3D objects representation. 3D objects meshes. Triangulation and polygonalization.

- ✓ rendering pipeline;
- ✓ sequence of operations in rendering pipeline;
- ✓ rendering matrices (world matrix, projection matrix, and view matrix);
- ✓ affine transformation for proceeding 2D and 3D objects.

2.5 Setting build configuration (defining build scenes, setting target operating system for building, setting screen orientation). Build optimization.

Practical task: *Setting meshes and rendering game scenes, setting build configuration in Unity3D, getting skills in soling simple tasks in analytical geometry based in vector processing.*

3. Preparing game documentation

3.1. Game genres.

3.2. Defining limited possibilities of standard tools for describing game features and scenario.

3.3. Concept document structure.

3.4. Approaches to represent game scenarios.

3.5. Peculiarities of concept documents designing for different game genres.

Practical task: *Designing game document, getting practical skills in describing game scenarios.*

4. Approach to game scene designing and rapid game prototyping

4.1. Concept of GameObject in Unity3D.

4.2. Aggregation of components for creating complex GameObjects.

4.3. Hierarchy window. Principle of complex GameObjects creation.

4.4. Particle system components.

4.5. Principles of game scenes designing.

4.6. Setting scene view (cameras projection modes, lights types, and background)..

4.7. Decorating a game scene by different assets (materials, textures, audio, sanders, particle systems, 3D models combining). Principles of these assets creating and reusing..

4.8. Downloading assets from asset store and importing them to projects.

4.9. Systematizing of asset storage assets for effective reusing.

Practical lesson: *Company 3D logo designing.*

5. Uniy3D environment

5.1. Search tools in unity environment.

5.2. Gismoz.

5.3. Dynamically changing GameObjects' component configuration.

5.4. Debug and animation windows.

5.5. Scene layers.

Practical lesson: *Simple platformer game creation, simple labyrinth game creation*

6. Game scenes prototyping

6.1. Setting camera and layouts.

6.2. Transform component (changing transform properties and resetting them).

6.3. Using several cameras on the same scene.

6.4. User Interface scenes designing (canvas, UI containers, RectTransform, layout groups):

- ✓ setting camera view;
- ✓ creating and reusing package for user interface scenes designing;
- ✓ anchoring Canvas elements adopting their representation for different sizes of mobile devices screens.

6.5. Peculiarities of designing 2.5D scenes.

6.6. Using documenting and reusing prefabs.

Practical lessons: *Game menu designing, 2.5D scene designing, updating UI scene for different resolutions of mobile devices screens, switching between different cameras in run time, preparing Unity packages, documenting Unity packages.*

7. Game physics

7.1. Mathematical principles of defining collisions for two bodies (bound object, bound sphere, mesh filter).

7.2. Components providing game physics. Rigidbody and colliders. Setting collider properties.

7.3. Triggers and colliders events.

7.4. Setting physical materials properties.

Practical lessons: *Creating Gameobjects as physical bodies, collision processing*

8. Scripting

8.1. Game lifecycle (Awake, Start, Update, FixedUpdate, and Destroy).

8.2. Hierarchy of classes for development games in Unity3D.

8.3. User input processing. Processing events from mouse and keyboard.

8.4. Activating and deactivating GameObjects.

8.5. Resources loading by their types.

8.6. Vectors and basic operations for 3DModels processing

8.7. Peculiarities of debugging in Unity. Interactive debugging. Tools for connecting Unity and Visual Studio environment.

8.8. GameObjects interaction in scripting.

8.9. Using common variables in several scripts.

8.10. Principles of transmitting data between scenes.

8.11. Saving game state between sessions.

8.12. Interacting in UI components

8.13. Means to organize Game Timer (InvokeRepeating, Colourtines, and Deltatime),

8.14. Unity3D UI events. Delegates

8.15. Design pattern prototype. GameObjects cloning.

8.16. Processing of GameObjects arrays. Using tags for manipulating with similar objects.

Practical tasks: Collision processing, using timing, preparing mini 2D game

9. Resulting project

Preparation of resulting project: creating memory 2D game, creating quiz game.

10.Acknowledgement

Author of the course thanks to ITHEA ISS for hosting ITHEA ISS software engineering forum. http://idr.ithea.org/tiki-view_forum.php?forumId=1

11.Authors' Information

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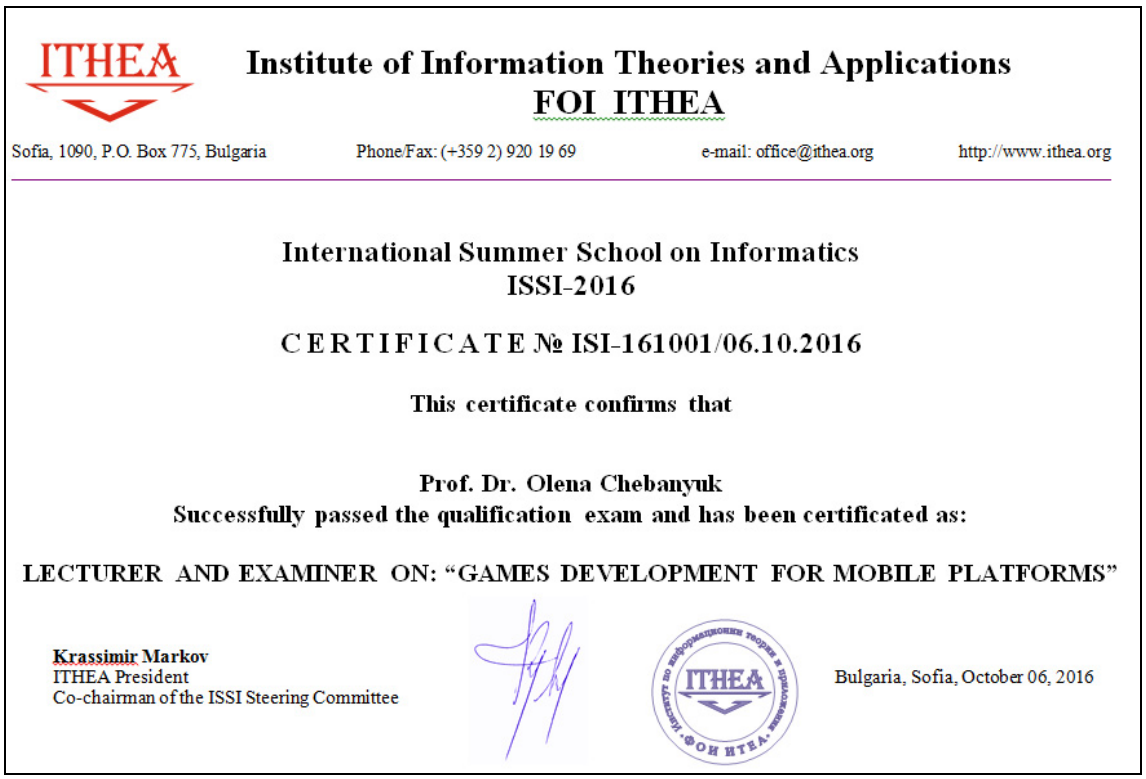
- Co-chair of International Summer School of Informatics
  http://www.ithea.org/conferences/ITA2017/2017issi.htm;
- Lecturer of software engineering department in National aviation university, Kyiv, Ukraine.

Certificate of lecturer and examiner on "games development for mobile platforms"



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International Summer School on Informatics
ISSI-2016

CERTIFICATE № ISI-161001/06.10.2016

This certificate confirms that

Prof. Dr. Olena Chebanyuk
Successfully passed the qualification exam and has been certificated as:

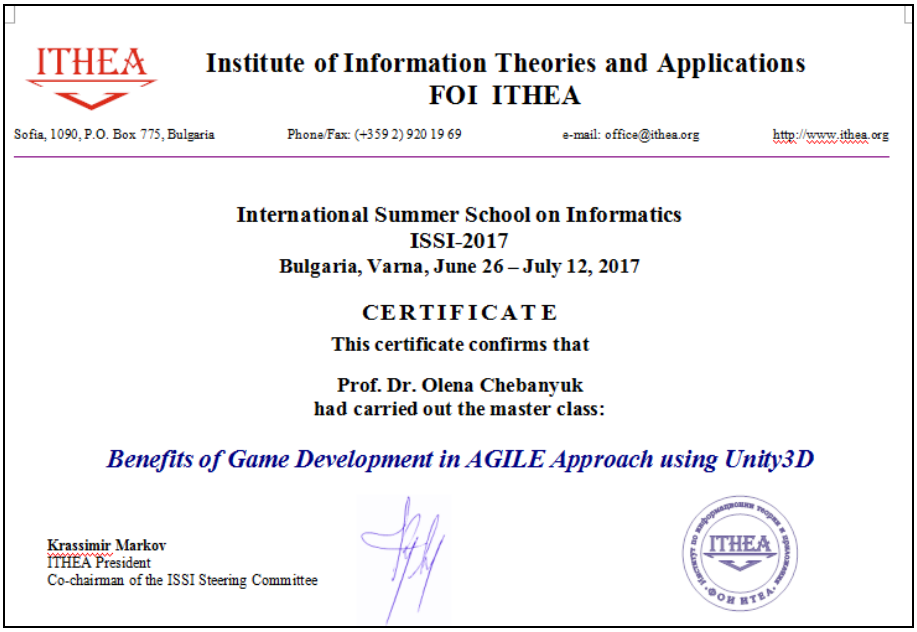
LECTURER AND EXAMINER ON: "GAMES DEVELOPMENT FOR MOBILE PLATFORMS"

Krassimir Markov
ITHEA President
Co-chairman of the ISSI Steering Committee

ITHEA

Bulgaria, Sofia, October 06, 2016

Unity certificates archived providing ISSI master-classes and lectures



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International Summer School on Informatics
ISSI-2017
Bulgaria, Varna, June 26 – July 12, 2017

CERTIFICATE

This certificate confirms that

Prof. Dr. Olena Chebanyuk
had carried out the master class:

Benefits of Game Development in AGILE Approach using Unity3D

Krassimir Markov
ITHEA President
Co-chairman of the ISSI Steering Committee

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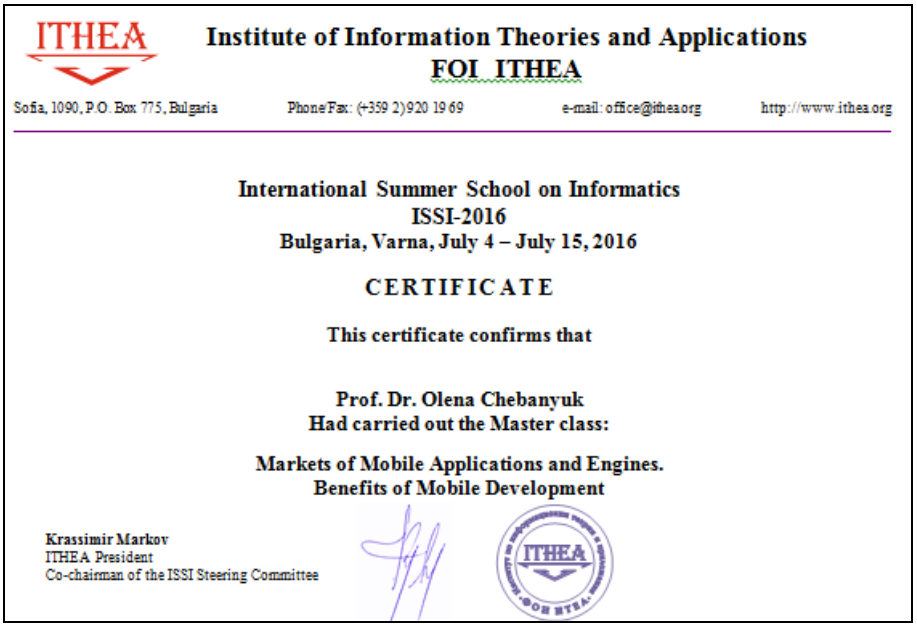

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Had carried out the Master class:

Markets of Mobile Applications and Engines.
Benefits of Mobile Development

Krassimir Markov
ITHEA President
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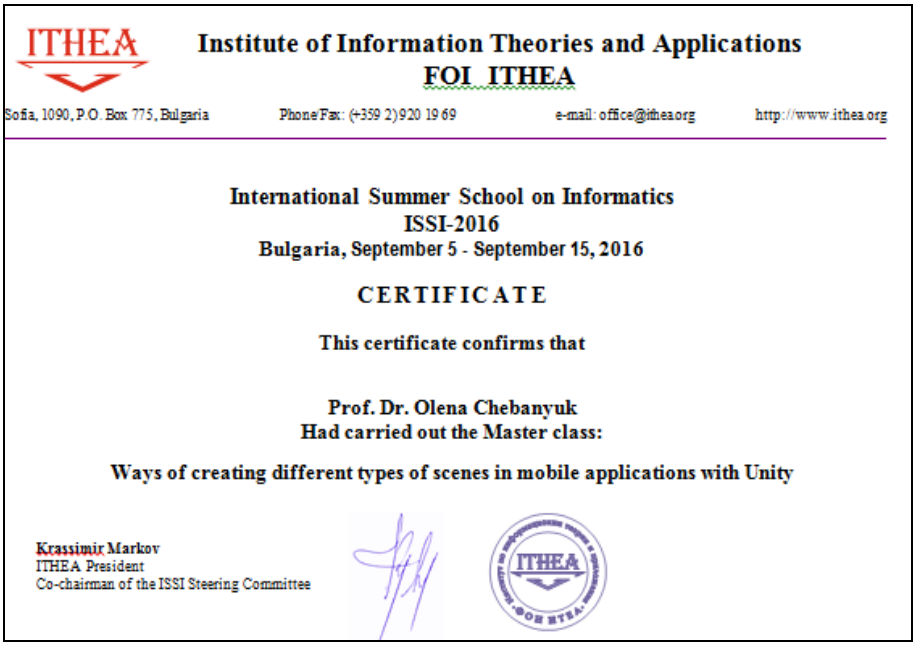

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International Summer School on Informatics
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Bulgaria, September 5 - September 15, 2016

CERTIFICATE

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Prof. Dr. Olena Chebanyuk
Had carried out the Master class:

Ways of creating different types of scenes in mobile applications with Unity

Krassimir Markov
ITHEA President
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ISSI 2016 X International Summer School on Informatics, September 5 - 15, 2016, Varna (Bulgaria)
Lecture: Ways of creating different types of scenes in mobile applications with Unity