Ministry of Science and Higher Education of the Russian Federation
NATIONAL RESEARCH
TOMSK STATE UNIVERSITY (NR TSU)

Institute of Applied Mathematics and Computer Science

APPROVE:
Director

_____ A. V. Zamyatin

Work program of the discipline

Data Science & VR/AR technologies

in the major of training

01.04.02 Applied mathematics and informatics

Orientation (profile) of training:

Big Data and Data Science

Form of study
full-time

Qualification
Master

Y ear of admission
2025

AGREED:
Head of EP
_____ A.V. Zamyatin

Chairman of the EMC
_____ S.P. Sushchenko

Tomsk – 2025

1 Planned results of the practice

The results of the internship are the following indicators of achievement of competencies:

IPK-1.2 Applies existing mathematical methods, algorithms and software to solve problems in the field of professional activity

2. Tasks of mastering the discipline

– Master the apparatus of the theory of creating virtual reality applications using modern software. – Learn to apply the conceptual apparatus of the theory of virtual reality to solve practical problems of professional activity.

4. Semester of mastering and form of intermediate certification in the disciplin

Third semester, credit

5. Entrance requirements for mastering the discipline

To successfully master the discipline, learning outcomes in the following disciplines are required: "Fundamentals of Programming", "Algorithms and Data Structures", "Object-Oriented Programming".

6. Язык реализации

English.

7. Scope of discipline

The total labor intensity of the discipline is 4 credits, 144 hours, of which:

- lectures: 16 hours
- laboratory: 32 hours
  including practical
  training: 0 h.

The volume of independent work of the student is determined by the curriculum.

8. The content of the discipline, structured by topics темам

Topic 1. Design document. Topic summary. Design document: tips for creating a design document. Information to include in a design document. Features of creating VR. Application development plan. Topic 2. Basics of working in Unreal Engine (UE). Topic summary. Getting to know the UE interface. Visual programming (blueprints, BPs). Project structuring. Materials in UE. Animation in UE. BPs types. Widgets. HUD, UMG – UI. Event Dispatchers, Interfaces. Particle system. Prototyping and debugging. Topic 3. Creating virtual reality (VR). Topic summary. Review of possible engines, VR tools. Connecting work with VR tools in UE. Character creation and control in VR. Interaction with objects. Navigation – main components of the engine. Movement: movement area, teleportation. User interface: tooltips; object outline selection. Topic 4. Optimization. Topic summary. Post-processing. Profiling. Optimization.

99. Ongoing evaluation

The current control of the discipline is carried out taking into account the specifics of the implementation of the discipline.

The discipline is implemented in a mixed format using the Plario online adaptive learning platform, which is integrated with TSU Moodle. It is a pull-up (leveling) course intended for students, undergraduates, graduate students, teachers of TSU, who need knowledge of basic mathematics in their educational or professional activities.

The student enters Plario through a personal Moodle account. In the Moodle system, the course teacher has the ability to track individual trajectories for each section, the degree of mastery of skills, control the amount of time spent in the system, the amount of material covered for each section. Once a week, the teacher conducts consultations in person, and there is also the possibility of online consultations in the Moodle system.

The form of attestation is a test. The offset is given if

1) for each section, the student showed mastery of skills at least 80 percent. The Plario system records the mastery of skills for each section automatically.

2) The test is written with at least "good"

10. The procedure for conducting and criteria for evaluating the intermediate certification

The form of attestation is a test. The offset is given if

1) for each section, the student showed mastery of skills at least 80 percent. The Plario system records the development of skills for each section in automatic mode - the formation of IOTC 1.1

2) The test is written with at least "good"

Typical control tasks or other materials necessary for assessing learning outcomes that characterize the stages of competency formation, and methodological materials that determine the procedures for assessing learning outcomes, are given in the Evaluation Tools for the discipline.

Typical control tasks or other materials necessary for the current certification, and methodological materials that determine the procedures for evaluating the results of the current certification, are given in the Evaluation Tools for the discipline.

11. Educational and methodological support

a) An electronic training course in the discipline at the electronic university "Moodle"

b) Evaluation materials of the current control and intermediate certification for the

discipline are in the Evaluation tools of the discipline.

c) Plan of seminars / practical classes according to the curriculum.

e) To master the educational results of the discipline, it is necessary to complete 6 sections of the adaptive course. The mixed format of the discipline and adaptive technology (algorithmic), which is the basis of the course, allows you to pass the discipline at a pace convenient for the student using any device. It is necessary to follow the sequence of sections recommended by the teacher.

For the successful mastering of the discipline, regular classes in each section are necessary. Before studying each section, it is necessary to pass an input diagnostic test in the system, according to the results of which a digital twin (profile) of the student is formed and the level of proficiency in each skill is determined. The time spent in the system will depend on the results of the entrance test. Further, the system itself offers training exercises and theoretical material, forms an individual trajectory in real time, which is available to the student and the teacher. Lessons in the system are recommended as asynchronous lessons in remote mode (controlled by the SIW).

Practical classroom lessons can take place both in the classical form and in the format of consultations. 1.

12. List of educational literature and Internet resources
a) Main literature: – Unreal Engine VR for developers / Mitch McAffrey ; [translated from English by N.I. Veselko, O.V. Maksimenkova, A.A. Neznanova]. – M.: Eksmo, 2019. – 256 p. – Developing games on Unreal Engine 4 in 24 hours / Aram Cookson, Ryan Dowlingsoka, Clinton Crumpler ; [translated from English by M.A. Reitman]. – M.: Eksmo, 2019. – 528 p. b) Internet resources: – Official website of Unreal Engine with documentation, useful materials for self-study - https://www.unrealengine.com/en-US. – Open online courses.

13. List of information technologies
a) licensed and freely distributed software: – Unreal Engine game engine – https://www.unrealengine.com/en-US. – Publicly available cloud technologies (Google Docs, Yandex disk, etc.). b) information reference systems: – Electronic catalog of the TSU Scientific Library – http://chamo.lib.tsu.ru/search/query?locale=ru&theme=system – Electronic library (repository) of TSU – http://vital.lib.tsu.ru/vital/access/manager/Index

14. Logistics
Audiences for conducting lecture-type classes (for an introductory lecture and conducting tests).

Виртуальные аудитории для проведения занятий лекционного и семинарского типа, индивидуальных и групповых консультаций, текущего контроля и промежуточной аттестации в смешенном формате («Moodle»).

15. Authors information
Pristupa Andrey Viktorovich – PhD in Engineering, Associate Professor of the Department of Theoretical Foundations of Computer Science at TSU. Prokudina Yulia Andreevna – Assistant of the Department of Software Engineering at TSU.