

Career & Technical Education | Information Technology

Hard Surface Modeling

Subject Code: 145140

Outcome & Competency Descriptions

Course Description:

Students will use current industry standard commercial and open-source programming software to create 3D visual elements in a web or standalone environment. Students will learn how to create static objects using polygonal modeling for applications like environmental design and level building. Students will learn standard techniques for preparing, smoothing, sculpting, and surfacing 3D objects.

Strand 1. Business Operations/21st Century Skills

Learners apply principles of economics, business management, marketing, and employability in an entrepreneur, manager, and employee role to the leadership, planning, developing, and analyzing of business enterprises related to the career field.

Outcome: 1.1. Employability Skills

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competencies

- 1.1.6. Explain the importance of work ethic, accountability and, responsibility and demonstrate associated behaviors in fulfilling personal, community, and workplace roles.

Outcome: 1.3. Business Ethics and Law

Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

Competencies

- 1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).

Outcome: 1.6. Business Literacy

Apply digital information security principles to keep information secure.

Competencies

- 1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.
- 1.6.6. Identify the target market served by the organization, the niche that the organization fills and an outlook of the industry.
- 1.6.8. Identify the features and benefits that make an organization's product or service competitive.
- 1.6.11. Describe how all business activities of an organization work within the parameters of a budget.

Outcome: 1.7. Entrepreneurship / Entrepreneurs

Analyze the environment in which a business operates, and the economic factors and opportunities associated with self-employment.

Competencies

- 1.7.13. Protect intellectual property and knowledge (e.g., copyright, patent, trademark, trade secrets, processes).

Strand 2. IT Fundamentals

Learners apply fundamental principles of IT, including the history of IT and its impact on society, common industry terms, systems theory, information storage and retrieval, database management, and computer hardware, software, and peripheral device configuration and installation. This base of knowledge and skills may be applied across the career field.

Outcome 2.3. Data Encoding

Explain and describe data encoding basics.

Competencies

- 2.3.2. Convert between numbering systems (e.g., binary, hexadecimal, decimal).

Outcome 2.4. Emerging Technologies

Identify trending technologies, their fundamental architecture, and their value in the marketplace.

Competencies

- 2.4.1. Identify emerging technologies that are applicable to the marketplace.
- 2.4.2. Describe the fundamental architectures of emerging technologies and how they are integrating into the existing systems of information technology.
- 2.4.3. Research the value of emerging technologies on the marketplace.
- 2.4.4. Describe emerging technologies (e.g., Bring your Own Device [BYOD], Services Virtualization, Mixed Reality [MR], SMART Devices, Additive Manufacturing [3D Printing], Internet of Things, Large Language Models, Machine Learning, and Artificial Intelligence).

Outcome: 2.9. Project Concept Proposal

Develop a project concept proposal.

Competencies

- 2.9.1. Identify the scope and purpose of branding.
- 2.9.2. Determine the scope and purpose of the project.
- 2.9.3. Determine the target audience, client needs, expected outcomes, objectives, and budget.
- 2.9.4. Develop a conceptual model and design brief for the project.

- 2.9.5. Develop a timeline, a communication plan, a task breakdown, costs (e.g., equipment, labor), deliverables, and responsibilities for completion.
- 2.9.6. Develop and present a comprehensive proposal to stakeholders.

Outcome: 2.11. Troubleshooting

Select and apply troubleshooting methodologies for problem solving.

Competencies

- 2.11.1. Identify the problem.
- 2.11.2. Select troubleshooting methodology (e.g., top down, bottom up, follow the path, spot the differences).
- 2.11.3. Investigate symptoms based on the selected methodology.
- 2.11.4. Gather and analyze data about the problem.
- 2.11.5. Design a solution.
- 2.11.6. Test a solution.
- 2.11.7. Implement a solution.
- 2.11.8. Document the problem and the verified solution.

Outcome: 2.12. Performance Tests and Acceptance

Develop performance tests and acceptance plans.

Competencies

- 2.12.1. Create a written procedure agreed by the stakeholders and project team for determining the acceptability of the project deliverables.
- 2.12.3. Develop test cases that are realistic, compare with expected performance, and include targeted platforms and device types.
- 2.12.4. Develop, perform, and document usability and testing integration.
- 2.12.5. Make corrections indicated by test results.
- 2.12.6. Seek stakeholder acceptance upon successful completion of the test plan.

Outcome: 2.13. Rollout and Handoff

Plan rollout and facilitate handoff to customers.

Competencies

- 2.13.1. Include overall project goals and timelines in the rollout plan.
- 2.13.2. Communicate rollout plans to key stakeholders in a timely manner.
- 2.13.3. Conduct final review and approvals according to company standards.

- 2.13.4. Identify support staff, training needs, and contingency plans in the rollout plan.
- 2.13.5. Test delivered application to assure that it is fully functional for the customer or user and meets all requirements.
- 2.13.6. Deliver support and training materials.

Outcome: 2.14. Artificial Intelligence

Understand and apply prescribed methods of using Artificial Intelligence.

Competencies

- 2.14.2. Analyze how artificial intelligence technology impacts society and the ethical implications of its usage.
- 2.14.3. Write and revise a prompt to generate the desired response from an AI.
- 2.14.4. Evaluate the result of an AI query on a variety of parameters (e.g. validity, relevance, authenticity, potential bias and hallucinations).
- 2.14.5. Identify and analyze opportunities to apply AI across business, industry and society.
- 2.14.6. Critically analyze scenarios involving AI usage.

Strand 7. Digital Media

Learners apply principles of digital media to produce interactive media; develop and produce multimedia applications; integrate typography into media; create 3D models and 2D and 3D animation; and create digital video, audio, and photographs.

Outcome: 7.1. Interactive Media

Describe and explain interactive media and interactive media production.

Competencies

- 7.1.1. Identify the types and uses of interactive media environments (e.g., web-based, kiosks, games, mobile devices, video, print).
- 7.1.2. Describe the components of interactive media.
- 7.1.3. Identify the major characteristics of interactive media presentations.
- 7.1.4. Identify important historical developments and future trends in interactive media.
- 7.1.5. Identify the major interactive media genres.
- 7.1.6. Perform critical review of interactive media products in different genres.
- 7.1.7. Identify the intellectual property rights, responsibilities, and controls related to interactive media.
- 7.1.8. Analyze the social and cultural implications of interactive media.
- 7.1.9. Identify major applications for interactive media (e.g., sales and marketing, interactive advertising, education, online learning, corporate training, corporate communications, news, entertainment).

7.1.10. Identify specific uses for interactive media in potential markets.

Outcome: 7.2. Multimedia Tools

Develop navigational structures, scripts, storyboards, and flowcharts for multimedia applications.

Competencies

- 7.2.7. Select colors based on color theory and psychology.
- 7.2.8. Describe music, video, and special effects to be used.
- 7.2.10. Select and create visual design elements appropriate for the intended audience and use.
- 7.2.11. Develop client personas and narratives for intended project outcomes.

Outcome: 7.3. Production

Produce interactive media.

Competencies

- 7.3.1. Select the media elements to be used (e.g., sound, video, graphics, text, animation).
- 7.3.2. Generate text for multi-image presentations (e.g., title graphics, charts, graphs).
- 7.3.3. Incorporate graphics (e.g., digital, hand-drawn, photographic).
- 7.3.4. Incorporate computer animation.
- 7.3.5. Prepare and integrate photographic images and special effects with graphic images.
- 7.3.7. Edit video footage.
- 7.3.9. Integrate sound with visuals.
- 7.3.11. Apply accessibility guidelines to the selection and production of interactive media.

Outcome: 7.4. Graphics

Construct and manipulate digital graphics.

Competencies

- 7.4.2. Select color, shape, size, and texture of objects.
- 7.4.3. Create or acquire graphics.
- 7.4.4. Manipulate and layer objects.
- 7.4.5. Differentiate between vector and raster images.

- 7.4.6. Select graphic software applications based on budget, technical capabilities and hardware specifications to meet intended project outcome.
- 7.4.8. Compress and decompress graphic files.
- 7.4.9. Describe and select color profiles (e.g., Red Green Blue [RGB], Cyan Magenta Yellow Key [CMYK], Pantone).

Outcome: 7.6. Animation

Create 2D and 3D animation.

Competencies

- 7.6.1. Develop a plan and storyboard for an animation.
- 7.6.2. Create and import 2D assets and environments.
- 7.6.3. Create key frames and apply tweens and paths.
- 7.6.4. Create special effects and virtual navigation.
- 7.6.5. Create and import 3D assets and environments.
- 7.6.6. Render and export animations.
- 7.6.7. Create and import virtual assets and environments.
- 7.6.8. Create and render materials in a 3D environment.
- 7.6.9. Create 3D shapes through box modeling.
- 7.6.10. Create 3d shapes through NURBS.
- 7.6.11. Describe voxels and its uses.

Strand 9. Cybersecurity

Learners apply principles of Cybersecurity to secure and defend information technology systems, selection and implementation of methods and tools to secure physical and digital assets, manage threats, deploy countermeasures, and establish strategies to protect business information using risk and incident management.

Outcome: 9.6. Cybersecurity Law

Adhere to Cybersecurity laws.

Competencies

- 9.6.1. Adhere to licensing and intellectual property laws (e.g., copyright, trademark, digital-rights management).