General Studies Gold Request Form

Consult the General Studies Request FAQ for more information and quick answers.

New permanent numbered courses must be submitted to the workflow in Kuali CM before a General Studies request is submitted here. The General Studies Council will not review requests ahead of a new course proposal being sent to the Senate.

Submission Information

College/School	Department/School
Herberger Institute for Design and the Arts (CHI)	The Design School (CARCH)

Submission Type

Mandatory Review

ASU Request

Is this request for a permanent course or a topic?

Permanent Course

Subject Code	Course Number	Units/Credit Hours
DSC	236	3

Course Information

Enter the course catalog information, found in the web course catalog or Kuali CM.

Course Title

Introduction to Computer Modeling

Course Catalog Description

Computers in design, including software concepts, specific packages, and problem solving, illustration, typography, modeling and animation.

Enrollment Requirements (Prerequisites, Corequisites, and/or Antirequisites)

Prerequisite(s): Industrial Design BSD major; DSC 101 with C or better; IND 120 with C or better; IND 121 with C or better; IND 122 with C or better; minimum 3.00 GPA OR Visiting University Student

Is this a crosslisted course?

No

Is this course offered by (shared with) another academic unit?

No

If this course or topic already carries a different General Studies Gold (not Maroon) designation than the one being requested, please check this box.

General Studies Gold Designation Request

Requested Designation

Quantitative Reasoning (QTRS)

Attach a representative syllabus for the course, including course learning outcomes and descriptions of assignments and assessments.

DSC 236 Syllabi SP25.docx

Quantitative Reasoning (QTRS)
Quantitative and computational reasoning is essential for success in 21st-century careers, for critically evaluating information in the age of "big data," for assessing the quality of arguments conveyed through digital media, for informed participation in community and social life, and for contributing to the formulation of effective solutions for achieving a sustainable and just future. Quantitative reasoning enables students to apply relevant mathematical, statistical, computational, and visualization methods in academic, social and personal settings.

In a quantitative reasoning course, students learn about data, data management, data summaries, data visualization, and the use of computational tools with data. Data can take many forms, including numerical data, textual data, images, and others. Students also learn about how quantitative reasoning can be used to make arguments clear, precise and verifiable. Finally, they learn to build quantitative models, make predictions, and communicate their findings based on available data. This may include some combination of mathematical, statistical, computational or network models, or visualizations.

Instructions: In the fields below, state the assignment, project, or assessment that will measure each learning outcome, and provide a description. The description should provide enough detail to show how it measures the learning outcome. If needed, more than one can be identified.

The proposal does not need to include all course assessments that measure a given learning outcome. The provided assessment should include sufficient detail to allow the subcommittee to make their evaluation. When appropriate, the same assessment can be listed for more than one learning outcome (e.g., a culminating project).

You may provide links to a document (Google Drive or Dropbox) that includes the relevant details for the assessment. Do not provide links to Canvas shells.

QTRS Learning Outcome 1: Understand variables, measurement and data, including how they can be used to pose and answer questions about society and nature, and to manipulate, organize, classify and visualize quantitative data.

Assignment: Parametric Product Design and Data-Driven Decision Making for Societal Impact

Program: SolidWorks, Keyshot

Description:
This assignment emphasizes understanding variables, measurement, and data by engaging students in tasks that pose and answer questions relevant to both society and nature. Through SolidWorks and KeyShot, students will manipulate, organize, classify, and visualize quantitative data to inform product design decisions.

Students will design a consumer product using parametric modeling techniques in SolidWorks and render concept images in KeyShot. Throughout the assignment, they will define and adjust key design variables, such as dimensions, material properties, and tolerances, to optimize product performance. The product design will need to address a societal or environmental need, encouraging the development of sustainable, functional, and user-centered solutions.

Quantitative reasoning will be applied through data collection and performance analysis. Students will modify design parameters to meet specific objectives and use 3D renderings to communicate their findings. This iterative process ensures that students make informed decisions based on measurable data while developing critical design thinking skills regarding the broader societal and environmental impact of their designs.

Process:
1. Problem Identification (Research & Data Collection)
1. Identify a societal or environmental need that the product addresses.
2. Conduct background research and gather relevant data (e.g., material properties, ergonomics measurements, environmental impact metrics).

2. Define Design Variables & Parameters
1. Set key design variables (dimensions, materials, and tolerances) using parametric modeling tools in SolidWorks.
2. Ensure that each variable can be adjusted easily for optimization.

3. Visualization and Iteration
1. Apply quantitative reasoning to interpret analysis results and refine the design.
2. Use KeyShot to create 3D renderings that visualize design iterations and improvements.

4. Final Product Design
1. Create a final CAD model and render visualizations showcasing how the design responds to performance data.

Deliverables:

1. SolidWorks CAD model: A parametric product design with adjustable features.
2. KeyShot renderings: Visualizations of the final product design and key iterations.

Learning Outcome Measurement

1. Understanding Variables and Data: Students will define key variables related to their product's design and performance. They will use parametric modeling to adjust these variables and observe the effects on the product, thereby gaining an understanding of how variables influence outcomes.

2. Data Visualization: Students will organize and classify the data they collect during the modeling process, presenting their findings through visualizations in SolidWorks and KeyShot. These visualizations will include technical drawings, orthographic views, exploded views, and photorealistic renderings that communicate the impact of their design choices on the final product.

QTRS Learning Outcome 2: Evaluate arguments from everyday life or academic fields of study that are represented mathematically, statistically, computationally, or in visualizations.

Assignment: Sustainable Product Redesign

Program: SolidWorks, Keyshot

Description:

In this assignment, students will design a sustainable product using SolidWorks for 3D modeling and KeyShot for rendering and visual analysis. The project challenges students to critically evaluate design decisions by integrating mathematical, and computational representations throughout the product development process.

Students will start by selecting a real-world problem with societal or environmental significance, such as reducing material waste, enhancing product ergonomics, or improving energy efficiency. Using parametric modeling techniques in SolidWorks, they will explore and manipulate variables like dimensions, material choices, and tolerances. KeyShot will be used to create visualizations that highlight these design changes and illustrate their potential impact.

Process:

1. Product Selection and Analysis
1. Choose an existing product such as remote controls, eyewear, or household items.
2. Conduct research to understand the product's current environmental impact, materials used, manufacturing processes, and user experience (durability, repairability, functionality).

2. Identify Areas for Improvement
1. Consider design changes that align with sustainable practices, such as materials, manufacturing process, disassembly, etc.

3. Redesign and Conceptualization
1. Model redesigned concepts in SolidWorks to address the identified sustainability issues.

4. Visualization

1. Render visualizations showcasing how the design responds to performance data.

Deliverables:

1. SolidWorks CAD model: A parametric product design with adjustable features.
2. KeyShot renderings: Visualizations of the final product design and key iterations.

Learning Outcome Measurement:

1. Computational Analysis: Through the use of SolidWorks simulations and KeyShot animation, students can computationally analyze their design's structural integrity, material efficiency, and overall performance, ensuring that their redesign is not only sustainable but also functional.

2. Visualization: By using KeyShot to create detailed visualizations, students will translate complex computational and statistical data into clear, visually compelling arguments that support their redesign decisions. This will help them effectively communicate their evaluation of the design improvements.

QTRS Learning Outcome 3: Formulate hypotheses, mathematical models or narratives that are consistent with quantitative data.

Project: Houseware Product Innovation: Hypothesis-Driven Design

Program: SolidWorks, Keyshot

Description:

Students will design a functional and aesthetically pleasing houseware product, such as a lamp, kitchen utensil, or storage container, using SolidWorks for parametric modeling and KeyShot for rendering. The assignment requires students to formulate design hypotheses about product performance and aesthetics that can be evaluated through quantitative data.

For example, a student designing a lamp may hypothesize: "Using aluminum instead of plastic will enhance heat dissipation without significantly increasing weight or cost." Students will build mathematical models in SolidWorks to simulate the impact of these variables, such as material strength, thermal conductivity, and production cost on the overall product.

Once their initial hypotheses are defined, students will perform computational simulations and measurements in SolidWorks, testing aspects like weight distribution, durability, or surface smoothness. They will gather this data, compare it to their original hypotheses, and adjust their models as needed.

In KeyShot, students will develop visual narratives through photorealistic renderings to communicate their design's evolution based on performance data. The renderings should emphasize key elements, such as improved functionality, user comfort, and align with their tested hypotheses.

Process:

1. Select a houseware product (e.g., a kitchen utensil, chair, desk lamp, or handheld tool).

2. Analyze the product's existing ergonomic performance by conducting usability studies, observing user interaction, and gathering qualitative feedback from users.

3. Redesign the product based on ergonomic principles, aiming to improve comfort, usability, and functionality.

4. 3D modeling redesigned concepts in SolidWorks to justify the design decisions

5. Visualize how the redesigned product improves upon the original through KeyShot rendering and animation.

Learning Outcome Measurement:

1. Formulation of Hypotheses: Students will develop a clear hypothesis on how specific design changes will improve ergonomic outcomes, directly informed by quantitative data on human factors.

2. Mathematical Modeling: The assignment requires the creation of mathematical models to predict the impact of design changes on user comfort and ergonomics. These models guide the 3D modeling process in SolidWorks.

3. Visual Narratives: Students will use KeyShot to create visual representations that effectively communicate how the product design addresses the ergonomic issues identified, reinforcing the connection between their initial hypothesis and the quantitative data.

QTRS Learning Outcome 4: Communicate how quantitative data, interpretations, or models are connected to outcomes, predictions, decisions, explanations, or future states.

Project: Predictive Design Analysis and Communication for a Houseware Product Using SolidWorks and KeyShot

Program: SolidWorks, Keyshot

Description:

In this assignment, students will design a houseware product using SolidWorks for parametric modeling and KeyShot for visual storytelling. The goal of the assignment is for students to communicate how the quantitative data they gather through simulations and models connect to design decisions, outcomes, and predictions for the product's performance or market viability.

Students will begin by constructing a detailed 3D model in SolidWorks, focusing on design variables such as material type, weight, cost, and structural strength. They will perform computational simulations to analyze performance metrics such as durability under stress or thermal resistance. These simulations will generate data, which students will interpret to make informed design decisions. For example, after running a stress analysis, a student may decide to increase the thickness of a handle to improve durability.

Next, students will use KeyShot to create photorealistic renderings and product visualizations that highlight key outcomes from their computational analyses. They will explain how the results of their quantitative assessments informed changes to the design and how these adjustments contribute to the product's future performance, functionality, or user experience.

Process:

1. Select a Houseware Product:

1. Choose a houseware product to develop and analyze quantitative data gathered from market research, including user demographics and competitor analysis.

2. Performance and Functionality Analysis:

1. Assess the product's performance and functionality by collecting quantitative data through observations, user interactions, and usability testing.

3. Redesign for Improvement:

1. Utilize the insights gained from quantitative analysis to redesign the product with a focus on enhancing comfort, usability, and functionality. Clearly articulate how data-driven insights inform design changes and their expected impact on user experience.

4. 3D Modeling:

1. Create detailed 3D models of the new product concepts using SolidWorks. Justify your design decisions by linking them to quantitative data, predictions about performance improvements, and expected user outcomes.

5. Visualization and Communication:

1. Visualize the redesigned product through KeyShot rendering and animation. Prepare a presentation that effectively communicates how the quantitative data and models used throughout the project connect to the outcomes and predictions regarding the product's performance and market viability.

Learning Outcome Measurement:

1. Connecting Quantitative Data to Outcomes: The assignment ensures that students demonstrate how the quantitative data they gather directly influences their design decisions, resulting in specific, measurable outcomes in the product's performance.

2. Interpretation and Communication: By interpreting simulation results and using them to refine their design, students show their ability to connect models to outcomes and predictions. This is further communicated through detailed presentations and visualizations.

3. Predicting Future States: Students are required to predict the future performance of their product and discuss how future data might impact subsequent designs, demonstrating their understanding of the ongoing relationship between quantitative data and design evolution.

4. Comprehensive Documentation: The final presentation provides a clear narrative that links every stage of the design process—from data collection to model creation, interpretation, and visualization—to the final product outcome and future predictions.

QTRS Learning Outcome 5: Effectively employ one or more digital tools to demonstrate quantitative reasoning, interpretations of calculations, or the creation and evaluation of visualizations.

Project: Digital Design Workflow for a New Product Development

Program: SolidWorks, Keyshot, Photoshop, Adobe Premier

Description:

In this assignment, students will create a fully developed new product, such as a modular storage system, reusable water bottle, or desk lamp, using SolidWorks for CAD modeling and KeyShot for rendering and visual communication. The focus of the assignment is to ensure that students effectively employ multiple digital tools to achieve design, analysis, and presentation outcomes within an integrated workflow.

The assignment begins with students developing an initial 3D model of the product in SolidWorks, incorporating precise dimensions, parametric constraints, and essential features such as part assemblies and mechanical joints.

Once the design is finalized, students will export the SolidWorks files into KeyShot to produce photorealistic renderings and visual assets. They will explore lighting, textures, and material finishes in KeyShot to create compelling visuals that accurately represent the product's aesthetic and functional aspects. Additionally, students will use KeyShot's animation tools to demonstrate the product in action, such as a folding mechanism or assembly process, providing dynamic insights into its use and design intent. Students are highly encouraged to manipulate their KeyShot rendering images in Photoshop and edit their animation video using Adobe Premier.

Learning Outcome Measurement:

1. Effective Use of SolidWorks: The assignment assesses the student's ability to employ SolidWorks as a digital tool for 3D modeling, simulation, and iterative design refinement. Their proficiency in using the software to create functional and aesthetically pleasing models directly measures this aspect of the learning outcome.

2. Effective Use of KeyShot: The project also evaluates how students utilize KeyShot to create compelling visual representations of their designs. Their ability to produce high-quality, photorealistic renderings that accurately reflect their design intentions demonstrates effective use of this digital tool.

3. Integration of Digital Tools: The assignment measures how well students integrate SolidWorks, KeyShot, Photoshop, and Adobe Premier to accomplish the overall design and presentation goals. Their ability to move seamlessly between modeling, rendering and animation, using each tool to its fullest potential, is a key indicator of meeting this learning outcome.

4. Outcome Achievement: The final presentation and submission provide concrete evidence of how effectively students used these digital tools to achieve the desired design outcomes, such as a functional 3D model with simulations and visually impactful renderings and animation.

List all course-specific learning outcomes. Where appropriate, identify the associated QTRS learning outcome(s) in brackets (see below for example). Note: It is expected that a majority of course-specific learning outcomes will be associated with a QTRS learning outcome.

1. Understand the concepts of variables, measurement, and data, and explore their applications in manipulating, classifying, and visualizing quantitative information through 3D data representations. [QTRS LO1]

2. Create mathematical models in SolidWorks and produce visualizations and animations in KeyShot that effectively represent quantitative data to support decision-making. [QTRS LO3, LO4]

3. Understand the differences and similarities among the various types of digital tools to demonstrate quantitative reasoning, interpretations of calculations, and the creation and evaluation of visualizations. [QTRS LO5]

4. Explore product development with considerations for sustainability, manufacturing processes, and data analysis using mathematical modeling, computational methods, and visualizations. [QTRS LO2, LO3]

5. Gain proficiency in using various digital tools to visually communicate product concepts. [QTRS LO5]

Provost Use Only

Backmapped Maroon Approval

No Response

Form Submission - Proposer

Submitted for Approval | Proposer

Keith Smith - August 29, 2024 at 9:40 AM (America/Phoenix)

Department Approval

Approved

Al Sanft

John Takamura

Samantha Perkins

Keith Smith - August 29, 2024 at 9:41 AM (America/Phoenix)

GSC Coordinator Review

Sent Back

Alicia Alfonso - August 30, 2024 at 6:42 PM (America/Phoenix)

The syllabus is missing the course catalog description.
GS syllabus statements must be presented exactly as on
the syllabus statement document: https://docs.google.com/document/d/
1JrFD2qKryUpvc0wvj4C2N8i0lqoQKY4XRmFOgkNnyF0/edit?usp=sharing. Please correct GS
statement 5 on the syllabus.

April Randall

Form Submission - Proposer

Submitted for Approval | Proposer

Keith Smith - September 3, 2024 at 12:30 PM (America/Phoenix)

Department Approval

Approved

Al Sanft

John Takamura

Keith Smith - September 3, 2024 at 12:31 PM (America/Phoenix)

Updates made to the syllabus.

GSC Coordinator Review

Approved

Alicia Alfonso - September 4, 2024 at 3:41 PM (America/Phoenix)

April Randall

Assistant Vice Provost Review

Approved

Tamiko Azuma - September 4, 2024 at 4:30 PM (America/Phoenix)

All required components confirmed

Pre-GSC Meeting

Approved

Alicia Alfonso

April Randall - September 9, 2024 at 3:50 PM (America/Phoenix)

Quantitative Reasoning (QTRS) Subcommittee

Acknowledge Cancelled

Abhishek Singharoy - September 19, 2024 at 10:43 AM (America/Phoenix)

Jason Nichols

Terri Kurz - September 27, 2024 at 4:58 PM (America/Phoenix)

Revise and Resubmit: The course objectives and course student learning outcomes listed on the syllabus do not align with the QTRS paperwork. The course content (description, objectives and so on) need to align throughout, not just on the QTRS paperwork. The actual assignments need to be turned in with the QTRS paperwork, not just descriptions of assignments. For example, this is an assignment description: “In this assignment, students will select an existing consumer product (remote, sunglasses, houseware, etc.) and redesign it with a focus on sustainability and efficiency. The goal is to improve the product’s environmental impact through changes in material selection, manufacturing processes, and overall design.” Learning outcomes follow. As a student, I would not know what you expected from this assignment. The learning outcomes should not be listed, but content provided to students to describe the assignment should be included. The quoted assignment, above, also has nothing to do with QTRS objectives. The assignments are really hard to follow and do not make sense. Their alignment with QTRS learning outcomes are listed but not contextualized through meaningful curriculum descriptions. Soldworks is spelled incorrectly.

Michelle Mancenido

Elizabeth Kizer

General Studies Council Meeting

Sent Back

TJ Robedeau - October 7, 2024 at 3:05 PM (America/Phoenix)

Your request was not approved. The HUAD subcommittee invites you to revise and resubmit this request. They provided the following rationale:

The course objectives and course student learning outcomes listed on the syllabus do not align with the QTRS paperwork. The course content (description, objectives and so on) need to align throughout, not just on the QTRS paperwork. The actual assignments need to be turned in with the QTRS paperwork, not just descriptions of assignments. For example, this is an assignment description: “In this assignment, students will select an existing consumer product (remote, sunglasses, houseware, etc.) and redesign it with a focus on sustainability and efficiency. The goal is to improve the product’s environmental impact through changes in material selection, manufacturing processes, and overall design.” Learning outcomes follow. As a student, I would not know what you expected from this assignment. The learning outcomes should not be listed, but content provided to students to describe the assignment should be included. The quoted assignment, above, also has nothing to do with QTRS objectives. The assignments are really hard to follow and do not make sense. Their alignment with QTRS learning outcomes are listed but not contextualized through meaningful curriculum descriptions. Soldworks is spelled incorrectly.

If you have questions regarding this, please reach out to Tamiko Azuma (tazuma@asu.edu).

April Randall

Form Submission - Proposer

Submitted for Approval | Proposer

Keith Smith - November 7, 2024 at 9:54 AM (America/Phoenix)

Department Approval

Approved

Amanda Osman

Al Sanft

John Takamura

Keith Smith - November 7, 2024 at 9:56 AM (America/Phoenix)

Updates made, resubmitting.

GSC Coordinator Review

Approved

TJ Robedeau - November 7, 2024 at 10:33 AM (America/Phoenix)

April Randall

Assistant Vice Provost Review

Approved

Tamiko Azuma - November 8, 2024 at 12:35 PM (America/Phoenix)

All required components confirmed.

Pre-GSC Meeting

Approved

TJ Robedeau - November 8, 2024 at 1:47 PM (America/Phoenix)

April Randall

Quantitative Reasoning (QTRS) Subcommittee

Acknowledgement Requested

Abhishek Singharoy

Jason Nichols

Terri Kurz - December 1, 2024 at 10:44 AM (America/Phoenix)

Revise and Resubmit: In relation to LO2, the committee would like to more clarification regarding the arguments are being evaluated. Please provide more information about the statistical data being examined (this is mentioned in the description of how assessments will be evaluated). Regarding LO3 "usability" studies needs to be defined and clarified. Are these all computer-based simulations or will they be collecting data from potential users? If so, then maybe these ergonomic models should be mentioned under LO2 for clarity.

Michelle Mancenido

Elizabeth Kizer

General Studies Council Meeting

Waiting for Approval

TJ Robedeau

April Randall

Proposer Notification

Notification

Keith Smith

College Notification

Notification

Stephani Etheridge Woodson
