COSC 355 Computer Graphics-CrsRvs-2016-03-04

- The workflow icon is no longer available. Please click on the Page Status after the orange circle icon near the page title. *

Form Information

The page you originally access is the global template version. To access the template document that progresses through the workflow, please complete the following steps:

First Step: **ONLY** change the text in the [brackets] so it looks like this: **CRIM 101 Intro to Criminology-CrsRvs-2015-08-10**

- ***If DUAL LISTED list BOTH courses in the page title***

Second Step: Click **"SAVE"** on bottom right

- ***DO NOT TYPE ANYTHING INTO THE FIRST PAGE OTHER THAN THE TEXT IN BRACKETS***
- ***Please be sure to remove the Brackets while renaming the page***

Third Step: Make sure the word ***DRAFT*** is in yellow at the top of the proposal

Fourth Step: Click on "**EDIT CONTENTS**" (not EDIT) and start completing the template. When exiting or when done, click **"SAVE"** on bottom right

When ready to submit click on the workflow icon and hit approve. It will then move to the chair as the next step in the workflow.

**Indicates a required field*

Proposer*	Terrence Fries	**Proposer Email***	t.fries@iup.edu
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Proposing Department/Unit*	Computer Science	**Contact Phone***	7-4492

Course Level*	undergraduate-level

Course Revisions **(Check all that apply;fill out categories below as specified; i.e. if only changing a course title, only complete Category A)**	
Category A:	Category B:
catalog_desc_change	course_revision ** Teacher Education: Please complete the Teacher Education section of this form (below)* ** Liberal Studies: Please complete the Liberal Studies section of this form (below)* ** Distance Education: Please complete the Distance Education section of this form (below)*

Rationale for Proposed Changes (All Categories)	
(A) Why is the course being revised/deleted:*	The course catalog description and student learning objectives are being updated to reflect the state-of-the-art in computer graphics. This will also help in assessment efforts. Additionally, a grade of C or better will be required for the prerequisite COSC 310 to ensure that students are prepared for the rigorous programming tasks required.
(B) University Senate Summary of Rationale*	*Please enter a single paragraph summary/rationale of changes or proposal for University Senate.* The course catalog description and student learning objectives are being updated to reflect the state-of-the-art in computer graphics. This will also help in assessment efforts. Additionally, a grade of C or better will be required for the prerequisite COSC 310 to ensure that students are prepared for the rigorous programming tasks required.

(C) Implications of the change on the program, other programs and the Students:*	None

Current Course Information*		**Proposed Changes**	
Category A			
(D) Current Prefix*		**Proposed Prefix**	
(E) Current Number*		**Proposed Number**	
(F) Current Course Title*		**Proposed Course Title**	
(G) Prerequisite(s)	COSC 310 and junior status	**Proposed Prerequisite(s)**	Grade of C or better in COSC 310 and junior status
(H) Current Catalog Description	The use of computer graphics hardware and software. An overview of current applications and experience with representative software will introduce current practice. Foundations in primitives, geometry, and algorithms of passive computer graphics are the principal focus. A brief introduction to interactive computer graphics is included.	**Proposed Catalog Description**	Introduces computer graphics hardware and software. Explores and implements 2-D and 3-D modeling and transformations, viewing transformations, projections, rendering techniques, lighting, and shading using a current cross-platform 3-D graphics API. Includes creation of complex, photorealistic images and animation principles.
If changing Category A, no further action required.			
Category B (if no change, leave blank)			
(I) Number of Credits	Class Hours: Lab Hours: Credits:	**Proposed Number of Credits**	Class Hours: Lab Hours: Credits:
(J) Current Course (Student Learning) Outcomes	1. Discuss computer graphics terminology, progress and issues. 2. Describe different kinds of graphics display system. 3. Write 2-D and 3-D computer graphics application. 4. Model geometric objects into computer graphics. 5. Create digital images using vector tools and parametric forms. 6. Create images using affine transformation in both 2-D and 3-D cases. 7. Develop tools for modeling, shaded objects and 2-D and 3-D viewing. 8. Model shapes with polygonal meshes, surfaces and Bezier curves. 9. Render texture and hidden surface removal. 10. Apply advanced techniques such as ray tracing, color theory, and fractals.	**Proposed Course (Student Learning) Outcomes**	Upon successful completion of this course, the students will be able to: 1. Explain hardware architecture for computer graphics including graphics pipeline, frame buffers, and graphic accelerators. 2. Describe and use a cross-platform 3D graphics API such as WebGL, OpenGL, or DirectX. 3. Create digital images using 2D and 3D affine transformations and projections. 4. Describe and employ mathematical concepts necessary for graphics such as normal vectors, matrix operations, and cross and dot products. 5. Design and implement models of surfaces, lights, sounds, and textures (with texture mapping) using a 3D graphics API. 6. Explain and be able to select among models for lighting/shading including color, ambient and distant light, Phong reflection model, ray tracing, and shading (flat, smooth, Gouraud, and Phong). 7. Describe and use surface modeling with polygonal meshes, splines, Bezier curves, and NURBS. 8. Explain the concepts of hierarchical modeling, hidden surface elimination, ray-tracing, anti-aliasing, texture mapping, and animation principles 9. Discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications. 10. Discuss future trends in computer graphics and quickly learn future computer graphics concepts and APIs

(K) Dual Listed Courses Only: **List Current Learning Outcomes for the Higher-Level Course**		**Dual Listed Courses Only:** **List Proposed Learning Outcomes for the Higher-Level Course**	
(L) Brief Course Outline *(It is acceptable to copy from old syllabus)*	*As outlined by the federal definition of a "credit hour", the following should be a consideration* *regarding student work - For every one hour of classroom or direct faculty instruction,* *there should be a minimum of two hours of out of class student work.* **A. Introduction** **3 hours** a. Where computer generated picture are used b. Primitives c. Input and output devices d. Graphics architectures **B. Drawing figures** **4 hours** a. Device independent programming b. Window based programming c. Graphics primitives d. Line drawing e. Interaction with input devices **C. Drawing tools** **3 hours** a. Viewports b. Figures based on regular polygons c. Drawing circles and arcs d. Parametric curves **D. Vector tools for graphics** **3 hours** a. vectors b. Dot product c. Cross product d. Representation of geometric objects	**Brief Course Outline** *(Give sufficient detail to communicate the content to faculty across campus. It is not necessary to include specific readings, calendar or assignments)*	*As outlined by the federal definition of a "credit hour", the following should be a consideration* *regarding student work - For every one hour of classroom or direct faculty instruction,* *there should be a minimum of two hours of out of class student work.* 1. Graphics Architectures a. Pixels and framebuffers b. CPU and GPU c. Pipelines 2. Graphics Programming a. Primitives b. 3D graphics API 3. Transformations a. Vectors and matrices b. Affine spaces c. Dot and cross products d. Coordinate systems e. Transformations in homogeneous coordinates f. Quaternions 4. Viewing a. Projection b. Perspective c. Meshes d. Shadows 5. Lighting and Shading a. Light sources b. Phong reflection c. Polygonal shading d. Lighting models e. Gouroud and Phong shading 6. Discrete Techniques a. Texture mapping b. Environment mapping c. Reflection mapping 7. Rendering a. Clipping b. Hidden surface removal c. Antialiasing d. Color models e. Ray tracing f. Radiosity 8. Modeling complex images a. Hierarchical models b. CSG and BSP trees c. Quadtrees d. Particle systems 9. Curves and Surfaces a. Polynomial curves b. Bezier curves and surfaces c. Cubic B-Splines d. NURBS

e. Tweening

f. Clipping

E. Transformation of objects **5 hours**

a. Introduction to transformation

b. 2-D , 3-D and inverse affine transformation

c. Changing coordinate systems

d. Drawing 3-D objects

e. Translation, scaling and rotation

f. Tiling

F. Modeling shapes with polygonal meshes **4 hours**

a. Polygonal meshes

b. Finding normal vectors

c. Properties of meshes

d. Polyhedra and Prism

e. Extruded shapes

f. Smooth objects

G. Three dimensional viewing **4 hours**

a. Positioning and pointing camera

b. Projection of 3-D objects point, line

c. Graphics pipeline

d. Taxonomy of projections

H. Rendering **5 hours**

a. Shading models

b. Flat and smooth shading

c. Texture

d. Shadows

I. Approaches to Infinity **3 hours**

a. Fractals, random fractals and self-similarity

b. String production

c. Peano curves

d. Creating images by iterated functions systems

e. Mandelbrot and Julia sets

J. Raster Display, curves and surface **3 hours**

a. Pixmaps

b. Aliasing

c. Polynomials

d. Bernstein polynomial

e. B-splines

f. Color theory

	K. Hidden surface removal and ray tracing **3 hours** a. Hidden surface removal methods b. Hidden line removal methods c. Overview of Ray-tracing process		

Distance Education Section

- Complete this section only if adding Distance Education to a New or Existing Course

If Completing this Section, **Check the Box to the Right:**	
Course Prefix/Number	
Course Title	
Type of Proposal	*See CBA, Art. 42.D.1 for Definition*
Brief Course Outline	*Give an outline of sufficient detail to communicate the course content to faculty across campus. It is not necessary to include specific readings, calendar or assignments* *As outlined by the federal definition of a "credit hour", the following should be a consideration regarding student work - For every one hour of classroom or* *direct faculty instruction, there should be a minimum of two hours of out of class student work.*
Rationale for Proposal (Required Questions from CBA)	
How is/are the instructor(s) qualified **in the Distance Education delivery** **method as well as the discipline?**	
For each outcome in the course, describe **how the outcome will be achieved using** **Distance Education technologies.**	
How will the instructor-student and **student-student interaction take place?** **(if applicable)**	
How will student achievement be evaluated?	
How will academic honesty for tests **and assignments be addressed?**	

Liberal Studies Section

- Complete this section only for a new Liberal Studies course or Liberal Studies course revision

If Completing this Section, **Check the Box to the Right:**	

Liberal Studies Course Designations (Check all that apply)	
Learning Skills:	
Knowledge Area:	
Liberal Studies Elective	*Please mark the designation(s) that apply - must meet at least one*
Expected Undergraduate Student **Learning Outcomes** **(EUSLOs)**	*Describe how each Student Learning Outcome in the course enables students to become Informed Learners, Empowered Learners and/or Responsible Learners* *See http://www.iup.edu/WorkArea/DownloadAsset.aspx?id=181694*
Description of the Required **Content for this Category**	*Narrative on how the course will address the Selected Category Content*
All Liberal Studies courses are required to include perspectives on cultures and have a supplemental reading. **Please answer the following questions.**	
Liberal Studies courses must include **the perspectives and contributions** **of ethnic and racial minorities and** **of women whenever appropriate to** **the subject matter. Please explain** **how this course will meet this** **criterion.**	

Liberal Studies courses require the reading and use by students of at least one non-textbook work of fiction or non-fiction or a collection of related articles. Please describe how your course will meet this criterion.	

Teacher Education Section

- Complete this section only for a new Teacher Education course or Teacher Education course revision

If Completing this Section, Check the Box to the Right:	
Course Designations:	
Key Assessments	
	For both new and revised courses, please attach (see the program education coordinator): • The Overall Program Assessment Matrix • The Key Assessment Guidelines • The Key Assessment Rubric **File** **Modified** No files shared here yet. • Drag and drop to upload or browse for files
Narrative Description of the Required Content	*How the proposal relates to the Education Major*

For Deans Review
Are Resources Available/Sufficient for this Course? Is the Proposal Congruent with the College Mission? Has the Proposer Attempted to Resolve Potential Conflicts with Other Academic Units? Comments:

Please scroll to the top and click the Page Status if you are ready to take action on the workflow.
Please submit an ihelp if you have any questions http://ihelp.iup.edu