GE-009-145, ARC 111, An Introduction to the Theory and Practice of Descriptive Geometry (GE Sub-area C2)
ECO ATTACHMENT – 10-21-15

GE COURSE EXPANDED COURSE OUTLINE

Subject Area:	**ARC**
Course Number:	**111**
Course Title:	**Introduction to the Theory and Practice of Descriptive Geometry**
Units:	**3**
C/S Classification #:	**C-1**
Component:	**Lecture**
Grading Basis: (graded only, CR/NC only, student's choice)	**Graded**
Repeat Basis: (may be taken once, taken multiple times, taken multiple times only with different topics)	**Once**
Cross Listed Course: (if offered with another department)	**No**
Dual Listed Course: (if offered as lower/upper division or undergraduate/graduate)	**No**
Major course/Service course/GE Course: (pick all that apply)	**Major course / GE Course**
General Education Area/Subarea: (as appropriate)	**C-2**
Date Prepared:	**May 20, 2015**
Prepared by:	**Alexander Ortenberg**

I. Catalog Description

The course focuses on the role of visual explanation in Western European civilization. It analyzes the rules of representational conventions in the context of the rich cultural history that produced them. The course introduces several of 20th century's schools of thought that have questioned the Western-European civilization's trajectory of increasingly privileging vision-centric practices.

II. Required Coursework and Background

Open to students from all departments. No prerequisite required. Concurrent enrollment in ARC111A required

III. Expected Outcomes

A: List the knowledge, skills, or abilities which students should possess upon completing the course. If this is a course for the major, describe how these outcomes relate to the mission, goals and objectives of the major program.

Upon completion of this course the students will

1. Develop the basic understanding of the history of representation (proto-orthographic representation in Ancient Egypt, examples of early map-making around the world, the late-medieval architectural drawings, the Renaissance "invention" of perspective and of orthographic representation, the evolution of representation in the early Modern and Modern world) (GE SLO Id, IIb)
2. Understand the relationship between culture and the ways in which we visualize the world, and understand contemporary technical drawing and drafting as an embodiment of modern culture (GE SLO Id, IIb, IIIb)

3. Understand the concept of Western European ocular-centrism, and understand the Renaissance "invention" of parallel and perspectival projection in the context of a paradigmatic shift that produced fundamental impact on art, science, and technology (GE SLO Id, IIb)
4. Develop research skills (GE SLO Ic)
5. Improve their written communication skills (GE SLO Ia)
6. Improve their understanding of architectural graphic representation conventions (GE SLO IIIb)

A.a: The course also meets the following Criteria of NAAB (National Architecture Accrediting Board)
Critical Thinking and Representation (Professional Communication Skills): Ability to write and speak effectively and use appropriate representational media with peers and with the general public (GE SLO Ia, Ib, Ic)

B: As a General Education sub-area C2 course, it meets the following criteria:
Courses in this area will provide students with an understanding of the values that make a civilized and humane society possible. Courses will enable students to examine critically the philosophical ideas and theories around which different civilizations have been organized, and to explore complex developments of those civilizations. In the study of philosophy, students should come to understand and appreciate the principles, methodologies, and thought processes employed in human inquiry. Courses should promote the capacity to make informed and responsible moral choices. Moreover, they should encourage broad historical understanding enabling students to see the past in the present and the present in the past.

The course emphasizes the central role that visual culture and visual literacy play in our civilization. It follows its history from the Renaissance revolution until the early-twentieth-century avant-guard's challenge to perspectival modes of representation. It introduces students to schools of philosophic thought that has critically analyzed the relationship between our vision-centric culture and power, as well as the role that the visual regime of Modernity has played in Western-European colonial expansion and domination of non-western cultures. See Section VII for more details.

As a General Education sub-area C2 course, also discuss how the course address the following associated GE Student Learning Outcomes:
Ia: Write effectively to various audiences

Aligned with SLO 5, and achieved through writing assignments, including summaries of the readings and a term research paper. Students will be required to explain in writing the representational techniques while also discussing the history of representation and its role in the evolution of our civilization

Ic: Find, evaluate, use and share information effectively and ethically

Aligned with SLO 4. Library and various databases research to get access to academic articles and image resources. Students will be required to identify academic resources and to properly cite them.

Id: Construct arguments based on sound evidence and reasoning to support an opinion or conclusion.

Aligned with SLOs 1,2, and 3. Summaries of readings and term paper adhere to the "good essay format." Students will be required to identify a) the author's main thesis; b) the structure of the author's argument (e.g., hypothetical, counterfactual etc.); c) the nature of evidence that the author uses; d) the terminology and the audience to which the author addresses his / her argument; and to state their opinion of the effectiveness of the argument. Class discussions of readings to reinforce the standards of well-structured argument.

IIb: Analyze major literary, philosophical, historical, or artistic works and describe their aesthetic, historical, and cultural significance in society

Aligned with SLO 1, 2, and 3. Lectures and readings will introduce the concept of graphic representation as a major factor that has determined the development of the Western European arts, architecture, theatre, and technology

IIIb: Analyze principles, methods, value systems, and ethics of social issues confronting local and global communities

Aligned with SLOs 2and 6. Students will understand the role of visual explanations in our civilization in the context of comparison with non-Western-European traditions. They will be required to critically assess the benefits of our vision-centric culture as well as its problematic aspects such as its role in the continuous compartmentalization of knowledge, its contribution to the increasing panoticism of our society, and the privileging of the male-chauvinist gaze.

IV. Instructional Materials-
Texts and Readings

Khaled Azzam, editor (Ririko Suzuki, educational coordinator), *Arts and Crafts of the Islamic Lands: Principles, Materials, Practice*, London: Thames and Hudson, 2013

Yves-Alain Bois, "Metamorphosis of Axonometry," in *Daidalos*, no. 1 (1981)

Mario Carpo, *The Alphabet and the Algorithm*, Cambridge, Mass.: The MIT Press, 2011

Mario Carpo, *Architecture in the Age of Printing: Orality, Writing, Typography, and the Printed Images in the History of Architectural Theory*, (Translated by Sarah Benson) Cambridge, Mass.: The MIT Press, 2001

Mario Carpo and Frédérique Lemerie, *Perspective, Projection, and Design: Technologies of Architectural Representation*, London and New York: Routledge, 2008

Frank Ching, *Drawing: A Creative Process*, New York: Van Nostrand Reinhold, 1990

Jonathan Crary, *Suspension of Percieption: Attention, Spectacle, and Modern Culture,* Cambridge, Mass.: The MIT Press, 1999

Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century,* Cambridge, Mass.: The MIT Press, 1990

Samuel Y. Edgerton, *The Heritage of Giotto's Geometry: Art and Science on the Eve of the Scientific Revolution,* Cheshire, Connecticut: Graphic Press, 1997

Robin Evans, *Translations from Drawings to Buildings*, Cambridge, Massachusetts: The MIT Press, 1997

Robin Evans, *The Projective Cast: Architecture and its Three Geometries*, Cambridge, Massachusetts: The MIT Press, 1995

Marco Frascari, *Eleven Exercises in the Art of Architectural Drawing: Slow Food for Architect's Imagination,* Abington and New York: Routledge, 2011

Marco Frascari, Jonathan Hale and Bradley Starkey, editors, *From Models to Drawings: Imagination and Representation in Architecture,* London and New York: Routledge, 2007

Hiram Grant, *Practical Descriptive Geometry,* New York: McGraw Hill, 1956

Martin Kemp, *Visualizations: The Nature Book of Art and Science*, Berkeley: University of California Press, 2000

Martin Kemp, *Geometrical Perspective from Brunelleschi to Desargues: A Pictorial Means or an Intellectual End,* Oxford (England): Oxford University Press, 1985

Alberto Pérez-Goméz and Louise Pelletier, *Architectural Representation and Perspective Hinge*, Cambridge: Massachusetts, 1997

Helmut Pottmann and Johannes Wallner, *Computational Line Geometry (Mathematics and Visualization* series), Berlin: Springer, 2001

D'Arcy Wentworth Tompson, *On Growth and Form,* Cambridge: University Press, 1963 (1913)

Edward Tufte, *Visual Explanations: Images and Quantities, Evidence and Narrative*, Cheshire, Connecticut: Graphics Press, 1997

Additional Instructional Materials

Additional instructional materials (tutorials and illustrations) will consist of the lecture slides and notes, tutorials, and additional readings. They will be developed for each lecture and a number of laboratory sessions and placed on the Blackboard

V. Minimum Student Materials

In order to complete course-work students will be required to purchase drafting and drawing equipment and soft-ware not to exceed $200.00

VI. Minimum College Facilities

Large lecture hall with blackboard / whiteboard, overhead projector, video / audio equipment and Internet connection. Regular classroom (labs) with blackboard / whiteboard, overhead projector, video / audio equipment and Internet connection

VII. Course Outline

As many contemporary philosophers have argued, one of the most distinctive features of the Western-European civilization is its ocular-centric essence. The proposed course addresses this feature by following the rich cultural history that produced the contemporary conventions of architectural and technical drawing. The basic technics of representing depth in two-dimensional media—such as perspective, axonometric, and orthographic types of images—are explained in the context of paradigm shifts, during which each of these technique emerged and / or gained the status of the privileged tool of design and communication. The survey mentions some ancient and non-western examples; however its main focus is directed towards the six-centuries-old tradition that starts with the Renaissance "invention" of projective drawings—when the understanding of the laws of geometry and its representation was considered as an art form and a production device, but also as a spiritual pursuit—to the normalization of these techniques in the end of the 18thcentury—when they became devoid of any mystical or philosophical overtone. They have been considered since then neutral and objective instruments to solve practical problems. This view effectively obscures their political implications such as the roles they played in establishing the Western-European domination over non-western world, and in privileging male chauvinist gaze.

The course emphasizes the essential role that the means of visual explanation have played in the shaping of our civilization, a major device of post-Renaissance artistic practices—which, at the same time, made the Western-European technological project possible. It also introduces the 20th century intellectual tradition that draws from thinkers such as Martin Heidegger, Maurice Merleau-Ponty, Michel Foucault, Jacques Derrida, and Gilles Deleuze, all of whom expressed deep concerns about the Western-European vision-centered interpretation of knowledge, beauty, and truth.

The readings for the course and the explanation of the descriptive geometry rules will be based on the texts by architectural theorists such as Yves-Alain Bois, Mario Carpa, Jonathan Crary,

Robin Evans, Alberto Pérez-Gómez, and others whose interpretation of architectural representation was influenced by the works of the above philosophers.

Additional discussions of the readings, as well as practical drawing exercises that will help to understand the philosophic concepts will be conducted in ARC 111A (activity) component of the course.

I. Course Plan

Segment 1 (*weeks 1-2****)***

Lectures and Discussion:

1. Introduction.
    - Visual representation and the philosophical tradition of vision critique.
    - Sacred geometry in pre-modern societies
    - Medieval architectural design techniques: Christian Neo-Platonist interpretation of geometric proportions as a revelation of divine design
2. Renaissance and the search for the means to representing depth in 2-dimensional media
    - Luca Pacioli and the Christian mysticism
    - Sebastiano Serlio's treatise. Architecture becomes perceived as a spectacle, with one-point perspective as a major design device that informs both architecture and theatre alike

Readings:
Excerpts from Robin Evans, *Translations from Drawings ….*
Excerpts from Pérez-Gómez, Alberto and Louise Pelletier, *Architectural Representation*

Segment 2 (*weeks 3-4****)***

Lectures and discussion:
The Baroque and the Oblique.

- Counterreformation and the exploration of the "true" and the "distorted" image
- Projection on a curvilinear surface
- The Jesuit interpretation of shades and shadows from the sun and from artificial sources of light as a revelation of the Divine perfect vision versus human distorted vision

Readings:
Excerpts from Alberto Perez-Gomez and Louise Pelletier, *Architectural Representation ….*
Excerpts from D'Arcy Wentworth Tompson, *On Growth and Form …*

Segment 3 (*weeks 5-6****)***

Lectures and Discussion:
Visual representation in the16th and the 17th centuries and the beginning of the Scientific and the Industrial Revolution

- Two point perspective
- Illustrated books of machines and the Jesuit missions in the Far East and beyond

Readings:
Excerpts from Samuel Edgerton, *The Heritage of Giotto's Geometry …*
Excerpts from D'Arcy Wentworth Tompson, *On Growth and Form …*

Segment 4 (*weeks 7-8****):***

Lectures and Discussion:
The twentieth century and the critique of perspectival representation by the artistic avant-garde and by contemporary philosophers

- The rules of descriptive geometry are finalized in the 18th century as a product of the Age of Reason and the compartmentalization of knowledge. Drawings of the machines in the *Encyclopedie.*

- Dissemination of visual literacy after the French Revolution (1789), the normalization of vision, and the emergence of distinctively modern types of representation
- Axonometric drawing and the early avant-garde's revolt against gravity

Readings:
Yves-Alain Bois, "Metamorphosis of Axonometry,"

Segment 5 (*weeks 9-10****):*** **Hand-Drawing vs. the Computer**

Lectures and discussion:
Conclusion: Constructing the visual regime of Modernity. Conclusion

VIII. Instructional Methods

Face to face with an online (Blackboard) component.

IX. Evaluation of Outcomes

Students' learning will be evaluated according to the following assignments and activities:

- Summaries of the readings:
  Students will post summaries of the readings (minimum 6 summary per student, graded) online.
- Discussions:
  Portions of class sessions (30-40 minutes per week) will be dedicated to the discussion of the readings, with some additional discussions taking place in ARC 111A
- Final paper (meaningful writing assignment, graded):
  Students will select form the list of the topic on week 5 of the class. On week 8 they will be required to turn-in an extended outline of the paper, with instructor's feedback due on week 10. The final paper (5-7 pages) will be due on the finals week
- Pop-up quizzes (minimum of 4, graded) will assure that students' acquisition of knowledge is consistent throughout the class.

Evaluation Chart

Assignment	Develop the basic understanding of the history of representation	Understand the relationship between culture and the ways in which we visualize the world	Understand the concept of Western European ocular-centrism, and understand the Renaissance "invention" of parallel and perspectival projection in the context of a paradigmatic shift that produced fundamental impact on art, science, and technology	Develop research skills	Improve their written communicati on skills	Improve their understanding of architectural graphic representation conventions
summaries of the reading	**X**	**X**	**X**		**X**	**X**
In class discussions	**X**	**X**	**X**	**X**		**X**
Pop-up Quizzes	**X**	**X**				**X**
Term paper	**X**	**X**	**X**		**X**	

Evaluation Chart specific of GE area C2 SLO

Assignment	**Ia** Write effectively to various audiences	**Ic** Locate, evaluate, and responsibly use and share data employing information and communication technologies	**Id:** Construct arguments based on sound evidence and reasoning to support an opinion or conclusion.	**IIb** Analyze major literary, philosophical historical or artistic works and explain their significance in society	**IIIa** Analyze the historical development of diverse cultures and the role they play in shaping core institutions and practices of individuals and societies
Summaries of the reading	**X**		**X**	**X**	**X**
In class			**X**	**X**	**X**

discussions and participation					
Pop-up quizzes				**X**	**X**
Term paper	**X**	**X**	**X**	**X**	**X**

Evaluations will be **conducted by:** instructor

Course Assessment

1. Department of Architecture course evaluations are distributed to students at the end of each term.
2. The Architecture program is periodically evaluated for accreditation by NAAB-National Architecture Accrediting Board. Course is assessed to meet NAAB Accreditation Criteria.

General Education Outcome Assessment

The course will be evaluated in an ongoing manner. Students will be requested to provide feedback several times per term to determine the appropriateness of the pace, the adequacy of tasks, efficiency of the instructional materials and media. There will also be a survey of students evaluations of the course two and three years past its completion in order to determine the usefulness of the course for their future education.