Lecture 0 of 41:
Part A – Course Organization

Introduction to Computer Graphics:
Course Organization and Survey

William H. Hsu
Department of Computing and Information Sciences, KSU

Course web site: http://www.kddresearch.org/Courses/CIS636
Instructor home page: http://www.cis.ksu.edu/~bhsu

Reading for Next Class:
Syllabus and Introductory Handouts
CIS 536 & CIS 636 students: CG Basics 1 slides
Chapter 1, Eberly (2006) 3D Game Engine Design, 2e

Course Administration

- Class Web Page: www.kddresearch.org/Courses/CIS636
- Instructional E-Mail Addresses – Best Way to Reach Instructor
  * CIS736TA-L@listserv.ksu.edu (always use this to reach instructor and TA)
  * CIS636-L@listserv.ksu.edu (everyone; substitute “736” for Advanced CG)
- Instructor: William Hsu, Nichols 324C
  * Google Voice (cell/office/home): +1 785 236 8247; office: +1 785 532 7905
  * IM: AIM/MSN/YIM hsuwh/rizanabsith, ICQ 28651394/191317559, Google banazir
  * Office hours: after class Mon/Wed/Fri; Tue AM; other times by appointment
- Graduate Teaching Assistant: To Be Announced
  * Office location: Nichols 124 (CIS Visualization Lab) & Nichols 218
  * Office hours: to be announced on class web board
- Grading Policy: Overview
  * Exams: 45%
  * Homework: 23% (5 written, 5 programming, drop lowest 2; 7 labs)
  * Term project: 20%
  * Paper/peer reviews and class participation: 12% (Q&A)
Course Policies

- **Letter Grades**
  - 15% graduations (85+%: A, 70+%: B, etc.)
  - Cutoffs may be more lenient, but a) never higher and b) seldom much lower

- **Grading Policy**
  - Hour exams: 10% each (in-class, with notes); final (open-book): 25%
  - Machine problems, problem sets (8 of 10): 16%; labs: 7%; term project: 20%
  - Reviews: paper critiques (2): 4%; peer review: 2%
  - Class participation: 6% (HW, Q&A)

- **Late Homework Policy**
  - Allowed only in case of medical excusal
  - All other late homework: see drop policy

- **Attendance Policy**
  - Absence due to travel or personal reasons: e-mail CIS736TA-L in advance
  - See instructor, Office of the Dean of Student Life as needed

- **Honor System Policy**: [http://www.ksu.edu/honor/](http://www.ksu.edu/honor/)
  - On plagiarism: cite sources, use quotes if verbatim, includes textbooks
  - OK to discuss work, but turn in your own work only
  - When in doubt, ask instructor

Class Resources

- **Course Content Management System (CMS): K-State Online (KSOL)**
  - Mirror: [http://www.kddresearch.org/Courses/CIS636](http://www.kddresearch.org/Courses/CIS636)
  - Lecture notes (MS PowerPoint 97-2010, PDF)
  - Homeworks (MS Word 97-2010, PDF)
  - Exam and homework solutions (MS PowerPoint 97-2010, PDF)
  - Class announcements (students’ responsibility) and grade postings

- **Course Notes On KSOL and Public Mirror**
  - Mailing List (Automatic): CIS636-L@listserv.ksu.edu
  - Homework/exams (before uploading to CMS, KSOL), sample data, solutions
  - Use KSOL “File Dropbox”
  - Class participation
  - Project info, course calendar reminders
  - Dated research announcements (seminars, conferences, calls for papers)

- **LISTSERV Web Archive**
  - Stores e-mails to class mailing list as browseable/searchable posts
**Textbook and Recommended References**

**Required Textbook**


**Recommended References**


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**Background Expected**

- **Both Courses**
  - Proficiency in C/C++ or strong proficiency in Java and ability to learn
  - Strongly recommended: matrix theory or linear algebra (e.g., Math 551)
  - At least 120 hours for semester (up to 150 depending on term project)
  - Angel’s *OpenGL: A Primer* recommended

- **CIS 636 Introduction to Computer Graphics**
  - Fresh background in precalculus: Algebra 1-2, Analytic Geometry
  - Linear algebra basics: matrices, linear bases, vector spaces
  - Watch background lectures

- **CIS 736 Computer Graphics**
  - Recommended: first course in graphics (background lectures as needed)
  - OpenGL experience helps
  - Read up on shaders and shading languages
  - Watch advanced topics lectures; see list before choosing project topic
Online Recorded Lectures for CIS 536/636 (Intro to CG)

- Project Topics for CIS 536/636
  - Computer Graphics Basics (10)
    - 2. OpenGL Primer 1 of 3: Basic Primitives and 3-D – Weeks 2-3
    - 3. Detailed Introduction to Projections and 3-D Viewing – Week 3
    - 4. Fixed-Function Graphics Pipeline – Weeks 3-4
    - 5. Rasterizing (Lines, Polygons, Circles, Ellipses) and Clipping – Week 4
    - 6. Lighting and Shading – Week 5
    - 7. OpenGL Primer 2 of 3: Boundaries (Meshes), Transformations – Weeks 5-6
    - 8. Texture Mapping – Week 6
    - 9. OpenGL Primer 3 of 3: Shading and Texturing, VBOs – Weeks 6-7
    - 10. Visible Surface Determination – Week 8

- Recommended Background Reading for CIS 636
  - Shared Lectures with CIS 736 (Computer Graphics)
    - Regular in-class lectures (30) and labs (7)
    - Guidelines for paper reviews – Week 6
    - Preparing term project presentations, CG demos – Weeks 11-12

Online Recorded Lectures for CIS 736 (Computer Graphics)

- Project Topics for CIS 736
  - Advanced Topics in Computer Graphics (10)
    - 1. Filters for Texturing – Week 2
    - 2. Level-of-Detail Algorithms and Terrain – Week 3
    - 3. More Mappings – Week 6
    - 4. More on Animation – Week 8
    - 5. Character Modeling and IK – Week 9
    - 6. Global Illumination: Photon Maps (Radiosity) – Week 10
    - 7. Advanced Lighting Models – Week 11
    - 8. Advanced Ray-Tracing – Week 12
    - 9. More on Scientific, Data, Info Visualization – Week 13
    - 10. Fractals and L-Systems – Week 14

- Recommended Background Reading for CIS 736
  - Shared Lectures with CIS 536/636 (Introduction to Computer Graphics)
    - Regular in-class lectures (30) and labs (7)
    - Guidelines for paper reviews – Week 6
    - Preparing term project presentations, CG demos – Weeks 11-12
### Syllabus [1]: First Half of Course

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<td>Viewing 1: Overview, Projections</td>
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<td>§ 2.3 esp. 2.3, 2.4 ±</td>
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<td>Scene Graphs: Rendering; Lab 3b: Shader</td>
<td>§ 4.4 – 4.7</td>
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<td>Demos 3: Surfaces, B-rays/Volume Graphics</td>
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</tr>
</tbody>
</table>

Lightly-shaded entries denote the due date of a written problem set; heavily-shaded entries, that of a machine problem programming assignment; blue-shaded entries, that of a paper review, and the green-shaded entry, that of the term project.

Lab exercises are always due on the day before the next lab.

Green, blue and red letters denote exam review, exam, and exam solution review dates.

### Syllabus [2]: Second Half of Course

<table>
<thead>
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<th>Topic</th>
<th>Primary Source(s)</th>
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<td>Chapter 10, 13, 517.3 – 17.5</td>
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<td>§ 2.4.3, 8.1, OGL handout</td>
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<td>§ 8.3 – 8.4, 4.2, 5.0, 5.8, 9.1</td>
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<td>Collisions 2: Dynamic, Particle Systems</td>
<td>§ 9.1, particle system handout</td>
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<td>Visualization 1: Data (Quantities &amp; Evidence)</td>
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<td>Fractals/Terrain generation</td>
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<td>Tuff handout (3)</td>
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<td>Project presentations 1; Final Review 2</td>
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<td>Project presentations 2</td>
<td>–</td>
</tr>
</tbody>
</table>

Final Exam

Ch. 1 – 8, 10 – 15, 17, 20

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Math Review for CIS 536 / 636

- Overview: First Month (Weeks 2-5 of Course)
  - Review of mathematical foundations of CG: analytic geometry, linear algebra
  - Line and polygon rendering
  - Matrix transformations
  - Graphical interfaces

- Line and Polygon Rendering (Week 3)
  - Basic line drawing and 2-D clipping
  - Bresenham’s algorithm
  - Follow-up: 3-D clipping, z-buffering (painter’s algorithm)

- Matrix Transformations (Week 4)
  - Application of linear transformations to rendering
  - Basic operations: translation, rotation, scaling, shearing
  - Follow-up: review of standard graphics libraries (starting with OpenGL)

- Weeks 5 – 6: More OpenGL and Direct3D

- Graphical Interfaces
  - Brief overview
  - Survey of windowing environments (SDL in OpenGL, DirectX)

References and Outside Reading

- OpenGL Tutorials (GameDev aka Nehe): http://nehe.gamedev.net
- Andy vanDam’s Lectures @ Brown: http://bit.ly/cWUxBz