

M E 570X

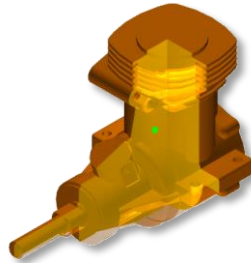
Solid Modeling and GPU Computing

Course Information

Course description This course covers the theory and applications of solid modeling and introduction to parallel computing using the graphic processing unit (GPU). Topics include solid modeling fundamentals, different representations of solid geometry, introduction to parallel programming using CUDA, and applications of GPU algorithms. Design and analysis software include SolidWorks and programming using C and NVIDIA CUDA.

Location & Meeting Times 1hr 20 minutes, twice per week

Prerequisites ME 160, ME 419 or Instructor Permission
It is the policy of the Department of Mechanical Engineering to expect that students enrolled in this course have satisfied all of the course's prerequisite requirements. If it is discovered that a student has not met these requirements, he/she will automatically receive a final course grade of 'F', regardless of course performance. In such cases, students are strongly encouraged to meet with advising staff to promptly drop the course and make alternative scheduling arrangements.



Instructor Information

Instructor: Adarsh Krishnamurthy

Email: adarsh@iastate.edu

Office Hours: Campus office (*walk-ins*) by appointment

Learning Outcomes:

Upon completion of the course, students will have the ability to:

1. Summarize the important concepts in solid modeling
2. Select the solid modeling representation best suited for a CAD application
3. Summarize the basics of GPU computing
4. Apply GPU computing to real-world applications to improve the performance of traditional algorithms

Required Textbooks

None

Optional Textbooks

1. Geometric and Solid Modeling, Christoph Hoffmann,
<https://www.cs.purdue.edu/homes/cmh/distribution/books/geo.html>

2. CUDA by Example, Jason Sanders and Edward Kandrot
<http://developer.download.nvidia.com/books/cuda-by-example/cuda-by-example-sample.pdf>

Online Resources

1. SolidWorks Online Instructor: www.onlineinstructor.org
2. Software <https://engineering.cypoint.iastate.edu/unit/it>
3. Licensed Software <http://www.it.iastate.edu/sldb>

Class Procedures:

Lectures

Your attendance is expected for the duration of every class period. Make ups for missed or late work, including scheduled exams (if), are not automatic but will be based on the conditions outlined by the instructor (also **you must contact the instructor ahead of time and documentation is required**). Each student is expected to sign the attendance sheet for credit.

Expectations

- Come to class prepared and ready to work.
- Be professional, respectful, and courteous with everyone in class.
- Complete your assignments on time. (Be ready to 'multi-task' efficiently.)
- Demonstrate your understanding of the material by concise and well-reasoned assignments and answers in/out of class, in labs, in office, etc.
- Learn from your own work, from your classmates, and from the instructors.
- Ask question/ seek help when you do not understand.

Homework

Homework is due at the beginning of class on the assigned date. No late work will be accepted without documentation. Contact your instructor as soon as possible if needed and before any given due dates as appropriate.

Attendance & Engagement

Regular attendance and participation in class discussion and activities are essential for success in this course. Therefore, you must prepare carefully for class by completing all readings in advance. As a reminder, unexcused absences, tardiness, or leaving class early will result in a lower course participation grade.

The following scale will be used to assess your engagement:

| | |
|----------|---|
| A | Volunteers frequently and is well prepared for class. Contributes ideas and opinions to class. Participates well in small group and partner work. Attends class regularly, is always on time, and never leaves early. Completes homework and always brings required texts and materials to class. |
| B | Volunteers occasionally and is not always prepared, sometimes contributes ideas to class, mostly participates in small group and partner work. Sometimes late for class or leaves early. Mostly completes homework and typically brings required texts and materials to class. |
| C | Speaks only when spoken to, listens passively. Does not generally volunteer. Contributes little to group or partner discussions/work. Does not attend class regularly. Often late to class or leaves early. May not complete homework and may not always bring required texts and materials to class. |
| D | Does not participate efficiently to general class discussion or small group or partner work, whether through lack of preparation, repeated absences, or other factors. Typically, does not complete homework or bring required texts and materials to class. |
| F | Unacceptable. Complete or near-total absences. |

Grading

Assignments will be graded by the instructor/ graders. If you believe an error has been made, write a statement making your case and turn it in to the instructor within one week of when the graded material was returned in class. Grades on the projects will be determined from written reports/ handouts, presentations, individual work/ participation, and peer evaluations. The table below shows the tentative distribution of course grades. It is subject to change based on course progress. Updated final grade distribution will be posted by week 6 of classes.

| | |
|---|-------------|
| Projects | 50% |
| • Reports | |
| Home Work | 20% |
| • Assignments + Online Quizzes | |
| Tests | 20% |
| • Quizzes + Midterm | |
| Class Engagement | 10% |
| • Attendance + Class Participation + Peer Evaluations | |
| TOTAL | 100% |

Grading Scale

Note: rounding up or down only to closest decimal place

| | | | | | |
|----|-------------|----|-------------|----|-------------|
| A | > 93.0 % | B- | 82.9-80.0 % | D+ | 69.9-68.0 % |
| A- | 92.9-90.0 % | C+ | 79.9-78.0 % | D | 67.9-63.0 % |
| B+ | 89.9-88.0 % | C | 77.9-73.0 % | D- | 62.9-60.0 % |
| B | 87.9-83.0 % | C- | 72.9-70.0 % | F | < 59.9 % |

Academic Integrity

As professionals, we must always strive to uphold standards of honesty and integrity. ASME, the Mechanical Engineering professional society, has adopted a code of ethics in order to define our commitments. The academic honesty policy of the University is a guideline for this course. Students are expected to adhere to this policy. Any student who violates this policy will be subject to disciplinary action, as specified in the ISU student handbook. Refer to the handbook for further information: <http://www.dso.iastate.edu/ja/academic/students.html>

Academic Dishonesty of any type (cheating, plagiarism, etc.) is grounds for receiving an F in this course.

Disability Accommodation

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

- Dead Week*** This class follows the Iowa State University Dead Week policy as noted in section 10.6.4 of the Faculty Handbook.
<http://www.provost.iastate.edu/resources/faculty-handbook>
- Harassment and Discrimination*** Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, [Student Assistance](#) at 515-294-1020 or email dso-sas@iastate.edu, or the [Office of Equal Opportunity and Compliance](#) at 515-294-7612.
- Religious Accommodation*** If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor or supervisor will review the request. You or your instructor may also seek assistance from the [Dean of Students Office](#) or the [Office of Equal Opportunity and Compliance](#).