Department of Computer Science and Software Engineering

Model-Based Software Engineering

CSSE 490 Spring Term 2010-11

Class Times: 7th Period in Olin 167

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Wednesdays: (Most times accept when Senior projects are meeting)
Or by Appointment

Course Description: This advanced topics course explores Model-Based Engineering (MBE) disciplines and principles for software production. Key tenants of modeling, component development, assembly, transformation, refinement, and generation are examined along with relevant case studies on popular approaches such as Model-Driven Architecture, Domain Specific Languages, Software Factories, and Automatic Programming.

Overview: Despite advances in software engineering process, methods, and tools, productivity of organizations producing large, long-lived software products is not keeping pace with the advancements in hardware capabilities or the demand for software; hence, there is a "productivity gap." Software systems are complex and the sophistication is often beyond the capabilities of most software engineers. An emerging approach that addresses these challenges is Model-Based Engineering (MBE). MBE has been applied successfully in other engineering disciplines, and we examine how it applies to producing software.

Key software productivity advancements have come as a result of increasing abstraction, exploiting reuse, process improvements, and automation. These are addressed in MBE for software for the next level of productivity. Dating back to the 1980s, the promise of automatic programming and software factories has stayed just out of reach for software development. Problems with formalism, repositories, and delayed payback have all hampered adoption of these approaches. However, with improved interoperability, transformational technologies, and software architecture representations, MBE is taking hold in software.

In this course we explore fundamentals of MBE for software and examine how MBE can be used in today's organizations. Through a series of directed readings and interrogatory class sessions, students will be exposed to the state of the practice and the art to grasp a fundamental understanding of key principles. Topics to be covered include:

1. Fundamental principles of modeling
2. Model-based engineering principles
3. Software and knowledge reuse
4. Fundamentals of Architecture Description Languages (ADL)
5. Overview of Model-Based Software Engineering Approaches
6. Model-Driven Architecture (MDA)/ Model-Driven Development (MDD)
7. Model-Driven Software Development
8. Transformation systems and automatic programming
9. Metamodels and transformation rules
10. Software Factories.

Learning Outcomes: Upon successfully completing this course, a student should be able to.

1. Explain the fundamental principles of modeling
2. Apply modeling principles to software
3. Relate Model-Based Engineering as an engineering discipline
4. Demonstrate the fundamentals of Architecture Description Languages (ADL)
5. Define transformation rules for abstraction and refinement
6. Design a metamodel for a model-based software system
7. Evaluate model-based software engineering principles and strategies
8. Conduct the Model-Driven Architecture (MDA) approach on a software example

Prerequisites: CSSE 374 (or permission of the instructor). Some software development experience, and an ability write and communicate effectively will make this course more meaningful.

Textbooks: "Model-Driven Software Development: Technology, Engineering, Management," by Thomas Stahl, Markus Voelter; Wiley (2006). ISBN 10: 0470025700 Weekly readings may also be assigned from relevant papers / tutorials.

Course Evaluation and Feedback: Please feel free to provide feedback about the course at any time. If you feel uncomfortable talking with me directly, there is an anonymous feedback box under the ANGEL account for this course where you can provide feedback throughout the term; I typically check it once a day and will try to respond to feedback in a reasonable time. There will also be two anonymous plus-delta evaluations of the course where you can offer suggestions on how to improve the course and its delivery.

Grading:

Examination	20%	Quizzes and Class Discussion	10%
Homework/Case Studies	15%	Team Project Deliverables	35%
Term Paper and presentation	20%		

Expectations: Students will be expected to attend and participate in class. Students will be required to use the CSSE490 course website on Angel to obtain relevant information, and interact with instructor and other students. Announcements and assignments will be conveyed via Rose-Hulman email addresses and/or posted on the course website. Students will be expected to work on some assignments with other team members.

Assignments: Homework and project assignments will be assigned regularly. Unless otherwise requested, please post these on Angel in the associated drop boxes. Homework and projects are necessary instruments for tracking progress of students. A typical student will work approximately 9 hours outside of lectures each week on this course (depending on background). This is a demanding course covering a great deal of material -- please avoid falling behind on the assignments. While this course is demanding, it is also rewarding for those that want strong understanding of software engineering as a discipline.

Case Studies: We may be doing case studies in class. You should prepare (and submit) a brief write-up of your understanding and opinion of the case study. The write-up should be no more than 1/2 page in length and will be collected in class. If you have an excused absence from class, this can be sent to me via email the day of the class.

Late Submissions: Please note that homework and project deliverables will be due at the specified time on the specified day. Late quizzes will not be accepted. Homework assignments, and project deliverables will also not be accepted late, with the following exception: You have two "late day" credits. You may use one of them on any homework or project assignment, which will allow you to submit that assignment up to 24 hours after the due time. Homework's or project assignments, which are more than 24 hours late, will receive a deduction of at least 10% per late day (or not be accepted at all), depending on the circumstances and the degree of lateness. You may earn a maximum of one additional "late day" by submitting an assignment or a project deliverable 24 hours before the due date. Please use the Angel Early/Late Day Declaration Box alerting me to the same to obtain the "late day" credit. If you submit something late for which late day credits are allowed, I will assume that you want to use one of your credits unless you tell me otherwise.

Academic Integrity: CSSE Honesty Policy (see http://www.cs.rose-hulman.edu/index.php/courses-mainmenu-28/82-honesty-policy.html) governs class and performance. Joint study is allowed (even encouraged) on some items as expressed by the instructor; however, each student must produce his or her solutions individually. Students must not collaborate on tests or homework that is passed in unless directed by the instructor.

Attendance Policy: Attendance is mandatory (unless with a legitimate excused absence such as illness). If you cannot make it to class or lab, you are still responsible for all materials covered in class as well as all announcements. Up to 2 unexcused absences are permitted. In accordance with the Rose-Hulman attendance policy, additional unexcused absences may result in you receiving a failing grade for the course.

Laptop Policy: You may need to use your laptops during some portion of the class period. Please be sure to bring your laptop, a power brick, and a network cable to class. During class discussion, please do not use your laptops. Laptop use during discussions can be distracting to your classmates, the instructor, and may also keep you from focusing on the material. If you typically use your laptop for note taking, please get permission from the instructor in advance so arrangements can be made.