

## Rubric for Assessment of CSE Capstone Design Projects (for use by capstone course instructors) (pdf)

**Background:** This rubric is intended to help assess key aspects of the outcomes that the capstone design courses contribute to. The instructor of each section of each CSE capstone design course should complete *one* of these rubrics for *each project team* in the class and give a copy of the completed rubric to Neelam at the end of the semester, note that it is one rubric per *team*, not per student. Please *do not* modify this rubric in any manner. An ideal time to complete this rubric, for any given team, would be during or immediately following the final (in-class) presentation/demo of the project by the team.

The rubric includes seven dimensions. Each dimension is assigned a score of 1 through 4, these values representing increasing degrees of achievement as described below. The instructor should assign, in the rightmost column, a value between 1 and 4 --fractional values okay-- for each dimension. Additional comments may be noted at the bottom.

Course number, semester, instructor name: \_\_\_\_\_

Title of capstone project being evaluated: \_\_\_\_\_

Students in the team: \_\_\_\_\_

	1	2	3	4	Points assigned
<b>Problem formulation</b>	Unclear formulation; Relation to original requirements not mentioned, nor changes in scope.	Mostly clear but relation to original requirements and/or rationale for changes in scope not clear.	Satisfactory formulation; Relation to client's original requirements, changes in scope and rationale thereof mostly clear with some gaps.	Excellent problem formulation; Relation to client's original requirements and changes in the scope, if any, explained and justified.	
<b>Design approach</b>	Poor design; No exploration of alternative approaches; No attention to effective use of resources.	Some attention to alternative design approaches but not a careful analysis of their advantages/disadvantages; Team picked an approach based on superficial comparisons.	Careful consideration of alternative design approaches and their resource requirements; Not all trade-offs fully analyzed.	Thorough consideration and evaluation of a good set of design approaches; Careful analysis of resource requirements of each and the resulting trade-offs; Where appropriate, client's input sought before making final choice.	
<b>Implementation</b> (including resource considerations, testing approach, adherence to standards, etc.) If implementation is incomplete, assess based on current state.	Not even basic consideration of memory and other resource requirements; System is very buggy. No systematic testing, nor use of standard approaches/processes such as agile.	Limited amount of attention to memory and other resource usage; Team has followed a standard (agile/waterfall/...) process but not consistently. Team has put some effort into systematic testing but some bugs remain.	Careful attention to memory and other resource usage and how system might scale with increased demand for services; The team adopted and mostly followed a standard process in its work; The team used a systematic approach to testing and the system seems bug-free.	Meticulous attention to resource usage and to user interface factors; Has ensured that system can evolve to deal with increased demand for services. Team has consistently followed a standard process in its work; Adopted a suitable testing approach, and thoroughly tested the system. Client involved at all appropriate points.	
<b>Other factors</b> such as use of professional tools, security considerations, ethical issues.	Little attention paid to factors beyond minimal functional requirements; No systematic use of professional tools; Ethical issues related to	Some use of common tools seen in earlier courses; Modest effort to ensure basic reliability and security properties; Mostly ignored ethical issues and potential impact on society of	Good use of professional tools going beyond ones previously seen; System designed to be reliable/secure under normal operation and under stress; Some consideration of impact of	Excellent use of professional tools and systems, identified by careful research; Detailed analysis of security holes with implementation designed to deal with ones that can be reasonably handled and documentation of rest;	

	system and impact on society not considered.	systems of this kind.	system on society including potential harm system may cause in some situations.	Analysis of ethical issues related to system and its impact on society including implications of ACM/IEEE Code as it applies to the system, in consultation with client.
<b>Effectiveness as a project team</b>	Dysfunctional team; Members blamed each other for problems in project; Team spirit completely lacking.	Team functioned at minimal level of effectiveness; Members concentrated on distinct parts of system without concern for impact on other members' work. In presentations, individual members did not make any attempt to help other members address audience questions.	Generally effective team; Members interested in presenting a positive picture of the team's work; Members helped each other during team presentations. Team members had a general idea of other members' work.	Very effective team; Team members went out of the way to describe how each member contributed to various aspects of project. Team worked as a cohesive unit during presentations, with members seamlessly handing over the conversation from one to another to answer questions, etc.
<b>Effectiveness of written communication</b>	Documentation consisted of little more than (poorly commented) system code; Hardly any mention of system's scope, design rationale, implementation choices, etc.	Documentation mostly effective at conveying main aspects of project including scope and design/implementation choices (but not the rationale behind the choices); Skippy user manual; Information future teams may need to evolve system lacking.	Team's documentation clearly presented all important aspects of project: original scope, changes made, implementation choices, processes used etc. Test scripts and important parts of code explained; Lessons learned were summarized; Well-written user manual.	Excellent documentation; Project's original scope, design choices, relevant code details, processes and tools used, and test scripts all described in a structured and integrated manner; Information to enable future designers to evolve system included; Well-designed user manual provided all necessary information; Illustrations, graphics, and layout executed to excellent effect.
<b>Effectiveness of oral communication</b>	Presentations not effective; Failed to present information about some essential aspects of project; Team members ineffective in responding to even simple questions.	Presentations adequate at conveying main ideas behind project including design choices, etc., but not engaging or inspiring. Team responded appropriately to specific questions about specific aspects of project but some responses were unclear.	Presentations were well done and presented all important aspects of project; Team explained rationale behind its choices and summarized important lessons learned; Responses to questions were reasonable although some went into too much technical detail, compromising their effectiveness.	Team's presentations were polished, informative and engaging. In answering questions, the team provided the right level and type of detail for questions ranging from implementation detail to test methodology to future evolution of project.

Comments:

(2)



**Assessment of Poster Presentations in CSE Capstone Design Courses**

**Code of capstone project being evaluated:**

**Information about person completing this rubric (check all that apply):**

- CSE/CIS student  non-CSE/CIS student  CSE faculty member  non-CSE faculty member
- IT professional  other ( \_\_\_\_\_ )

This rubric and the assessments it provides are an important part of our continuous improvement process designed to help us identify ways to improve our BS program. The rubric includes six dimensions, these being Problem formulation, Design approach, Implementation approach, Other factors, Effectiveness as a team, and Communication effectiveness, along which the capstone project should be evaluated. For each dimension, there is a description of the corresponding characteristics that are expected of the ideal capstone team and its work. The visitor to the poster session is asked to consider the following statement for each dimension: "Based on what I saw and heard at the poster session, this project team exhibited, in an exemplary manner, all or most of the characteristics corresponding to this dimension"; and then choose one of "Strongly Agree", "Agree", "Disagree", or "Strongly Disagree" (or "Not Applicable" if the item is not relevant to the particular project). Additional comments related to any of the six dimensions or about other aspects of the project may be entered in the box at the bottom of the rubric.

<b>Problem Formulation</b>	Team has come up with a clear formulation of the problem based on sponsor's goals; any changes in the project scope were clearly explained and justified. <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Not Applicable
<b>Design Approach</b>	The team has produced a high-quality design that, for the most part, meets the sponsor's goals; in doing so, the team has gone through a suitable iterative process considering various alternatives, including resource (memory, bandwidth, etc.) implications. <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Not Applicable
<b>Implementation Approach</b>	The team has paid careful attention to all key performance factors that may affect the system. The team has also considered scalability issues as well as possible evolution of the system to meet changing needs. The team has, in its implementation (or plans for it), applied important lessons from key courses in the curriculum; and it has adopted and consistently followed a standard process. **Note: If the team has not fully completed an implementation of the project because of midstream changes in its scope or other reasons, please complete this dimension on the basis of briefly discussing, with the team, its implementation plans and ideas. <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Not Applicable
<b>Other factors</b>	The team has effectively used appropriate professional tools and systems. It has carefully analyzed its design and implementation to identify potential security holes and documented them. The team has considered the implications of various aspects of the ACM/IEEE Code as it applies to this system and appropriately discussed the relevant questions with the project sponsor. <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Not Applicable
<b>Effectiveness as a Project Team</b>	The students in this team seem to have worked together very effectively on various aspects of the project from initial formulation based on the sponsor's goals/ requirements, through exploring design alternatives, working on the implementation details, the documentation of the project, through the preparation of the poster. The students also worked effectively as a team in responding to questions and comments from visitors to the poster session. <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Not Applicable
<b>Communication Effectiveness</b>	The team has produced a well-designed poster that pays careful attention to the items included and the level of detail presented. The poster effectively integrates elements related to basic background of the project with key technical factors. Responses to questions perfectly complemented the poster with the team providing the right level of detail. <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Not Applicable

**Comments:**

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## Rubric for Use in Phil 1338 and CSE 2501 for the Assessment of Program Outcomes

**Note: This rubric is under development!**

**Background:** One of the requirements of the BS-CSE (and BS-CIS) curriculum is that students take either CSE 2501 or Phil 1338. The main topic of these courses concerns ethical and social issues related to computing systems and applications. The ethical issues are addressed on the basis of appropriate ethical theories but, given that Phil 1338 is a 4-credit hour course and CSE 2501 is a 1-credit hour course, naturally the depth to which ethical theories are discussed in Phil 1338 is much greater than in CSE 2501; nevertheless, both courses provide sufficient background in ethical theories as well as discussion of the ACM/IEEE Code of Conduct, to enable students to analyze typical cases that may raise ethical dilemmas related to computing concepts and practices.

Both courses require students to write papers analyzing topics involving ethical and social issues related to computing systems and practices; students are also required to make oral presentations on these topics. This is natural, given the nature of these topics. Indeed, these topics also present excellent opportunities for formal debates among students. Although neither course requires students to engage in formal debates, the oral presentations in each course and the *q/a* period following each presentation offer natural opportunities for students at the presentation to engage actively with each other. Thus these courses make important contributions toward helping students achieve (CAC) outcomes (e), (f), and (g) [respectively, understanding of ethical, social issues, etc.; effective communication; and local and global impact of computing]; as well as EAC outcome (j) [contemporary issues]. The rubric below is designed to assess the extent to which the two courses contribute to these outcomes.

Phil 1338, by the manner in which the oral presentations are organized, also helps contribute, to a small extent, toward achieving effective team skills. Briefly, the one-hour weekly "recitation" periods are reserved for presentations by students. The class of 40 students is grouped into 4 *groups* of 10 students each. Further, each team of 10 students is split into four *teams*, two with 3 students each, the other two with 2 students each. Each recitation is devoted to presentations from a 4-person team and a 2-person team from one of the four groups. All students in the group are required to attend the entire recitation periods during which students from the group are presenting and they are expected to participate by asking suitable questions, etc. Each *team* of students (triple or pair) works as a team during a presentation. In other words, each presentation on a particular topic is by the students in a particular team and all students in the team take turns speaking (and answering questions from the other students in the group and the instructor). The evaluation (by the instructor for grading purposes) of any given student's presentation is determined, in part, by the feedback from the other students in the group. This seems to work well since the group size is small enough to ensure participation by all students and large enough to generate interesting discussions. Because of this, the rubric also includes a dimension related to team skills; this dimension is intended to be used only for Phil 1338.

**Details:** The rubric includes ten dimensions. The first four have to do with the quality of the oral presentation, specifically having to do respectively with the organization of the presentation, the mechanics (mainly quality of slides), effectiveness of delivery, and how well the speaker relates to the audience. The next two have to do with the quality of written communication, specifically the organization of the paper(s) and the style of presentation. The next three dimensions have to do with understanding of ethical & professional issues; recognition of the local and global impact of the topic under discussion and, more generally, on society at large; and awareness of relevant political, cultural and other contemporary issues. The last dimension, for use only in Phil 1338, deals with the effectiveness of the student's team work during presentations. Each of these dimensions is assigned a score of 1 through 4, these values representing increasing degrees of achievement in the particular dimension, as described in the table below in the rows corresponding to the various dimensions. The last column are the actual scores assigned to this particular student's presentation along the four dimensions.

This rubric is not specifically intended to be used by course instructors to assess individual students in their sections of Phil 1338 or CSE 2501 for purposes of providing formative feedback to the students during the course of the semester and/or for assigning final course grades. Individual instructors will likely use other rubrics, possibly based to a greater or lesser extent on this one, for these purposes. The main purpose of the current rubric is for assessment and continuous improvement of the BS-CSE program. It is expected to be used in *one* section per year of each of Phil 1338 and CSE 2501. In each case, the section in question should have been taught by an instructor with some experience with the course (rather than a first-time instructor) so that he/she has had a chance to work out any kinks in the specific way he/she approaches the course. The results from one section of each of the two courses will be presented at a regular meeting of the CSE Undergraduate Studies Committee as an important part of the continuous improvement process of the BS-CSE program. The discussion in the committee is expected to assess the extent to which students in the program are enabled by these two courses to achieve the particular outcomes noted above and to identify possible improvements in the program. Of course, other courses, in particular the capstone design courses, contribute to several of the same outcomes and the discussion, in the committee, of the results from the rubrics used to assess the effectiveness of those courses to the relevant outcomes is also a key part of the continuous improvement process.

Name/(code?) of student being evaluated: \_\_\_\_\_  
 Course and semester: \_\_\_\_\_

	1	2	3	4	Points assigned
<b>Oral Communication Skills</b>					
<b>Organization</b>	Audience cannot understand presentation because of poor organization; introduction is undeveloped or irrelevant; main points and conclusion are unclear;	Audience has difficulty following presentation because of some abrupt jumps; some of the main points are unclear or not sufficiently stressed;	Satisfactory organization; clear introduction; main points are well stated, even if some transitions are somewhat sudden; clear conclusion;	Superb organization; clear introduction; main points well stated and argued, with each leading to the next point of the talk; clear summary and conclusion.	
<b>Mechanics</b>	Slides seem to have been cut-and-pasted together haphazardly at the last minute; numerous mistakes; speaker not always sure what is coming next;	Boring slides; no glaring mistakes but no real effort made into creating truly effective slides;	Generally good set of slides; conveys the main points well;	Very creative slides; carefully thought out to bring out both the main points as well as the subtle issues while keeping the audience interested.	
<b>Delivery</b>	Mumbles the words, audience members in the back can't hear anything; too many filler words; distracting gestures;	Low voice, occasionally inaudible; some distracting filler words and gestures; articulation mostly, but not always, clear;	Clear voice, generally effective delivery; minimal distracting gestures, etc., but somewhat monotone;	Natural, confident delivery that does not just convey the message but enhances it; excellent use of volume, pace etc.	
<b>Relating to audience</b>	Reads most of the presentation from the slides or notes with no eye contact with audience members; seems unaware of audience reactions;	Occasional eye contact with audience but mostly reads the presentation; some awareness of at least a portion of the audience; only brief responses to audience questions;	Generally aware of the audience reactions; maintains good eye contact when speaking and when answering questions;	Keeps the audience engaged throughout the presentation; modifies material on-the-fly based on audience questions and comments; keenly aware of audience reactions.	
<b>Written Communication Skills</b>					
<b>Presentation of ideas and organization of the paper</b>	Bland presentation; sequencing and pace of topics seems random; doesn't lead up to any clear conclusions;	Some of the ideas are presented well; others are lacking; offers plausible conclusion(s);	Ideas are well organized and help the reader move along; the key points are presented but does not demonstrate in-depth understanding; leads up to convincing conclusion(s);	The paper is clear and focused; relevant, quality details give the reader important information; helps the reader develop <i>insight</i> into the topic.	
<b>Style</b>	Occasional problems with word choices and sentence structure, leaving the reader unsure of the meaning; often resorts to jargon/cliches;	Words and sentences are adequate in general but lack energy; reader has to struggle to keep reading to the end;	Good writing style; sentences flow smoothly and evenly;	Compelling writing style; connects strongly with the reader and keeps him or her engaged right to the end.	
<b>Ethical/professional issues, local/global impact, contemporary issues***</b>					
***Note: While a student's abilities related to the other dimensions in this rubric will be evidenced primarily during that student's oral presentation(s) and/or paper(s), the student's abilities with respect to the dimensions in this category are likely to be reflected also and, possibly to a greater extent, in the types of questions that he/she raises during presentations by other students and the types of discussions he/she engages in. For example, if there is a presentation that raises questions related to the security of electronic voting machines, that should present an opportunity, for all students at that session, to engage in a serious discussion about the impact on society of real or perceived insecurity of those machines; similarly					

(5)

for presentations that are related to cyber-espionage; etc. This should be kept in mind when arriving at the assessment of student's abilities with respect to the dimensions in this category.

<p><b>Understanding of ethical and professional issues</b></p>	<p>Little or no understanding of professional/ethical issues even where there are serious questions involved;</p>	<p>Some consideration of professional, ethical issues raised directly by the topic under discussion;</p>	<p>Good understanding of and reasonable analysis of all the essential relevant issues.</p>	<p>Deep understanding of the professional issues involved and the ethical implications of the topic under discussion; careful, convincing analysis of all relevant factors.</p>
<p><b>Awareness of implications to society at large</b></p>	<p>Little or no understanding of (or interest in?) implications to society related to the topic under discussion;</p>	<p>Moderate understanding of the implications to society related to the topic under discussion;</p>	<p>Good understanding of the implications to society of the topic, as well as its relation to general societal issues;</p>	<p>Deep understanding of the immediate and longterm implications to society of the topic under discussion, and the related potential benefits and risks to society.</p>
<p><b>Awareness of contemporary issues (political, cultural, ...)</b></p>	<p>Little or no understanding of (or interest in?) contemporary issues directly related to the item under discussion;</p>	<p>Moderate understanding of the main relevant contemporary issues directly related to the item;</p>	<p>Good understanding of all the relevant contemporary issues directly related to the topic;</p>	<p>Deep understanding of all the relevant issues, whether political, cultural or other, related to the topic, as well as of issues that may be only tangentially related; good analysis of the issues and possible impacts on various aspects of society.</p>
<p><b>Team skills (applies only to Phil 1338)</b></p>				
<p><b>Contribution as a team member</b></p>	<p>Seems to have no interest in the presentations by the other member(s) of the team; occasionally gets into arguments with the other member(s) during the presentation.</p>	<p>Mainly focused on his/her portion of the presentation; responds when another team member asks him/her a direct question but otherwise does not attempt to help other team member(s) address audience questions.</p>	<p>Good team player. Is interested in the presentations by the other team member(s); makes a definite effort to ensure success of the <i>entire</i> presentation by occasionally helping the other member(s) respond to audience questions.</p>	<p>Excellent team player. Goes out of the way to help the other member(s) in any way possible to address audience questions, get over glitches during their presentations, etc.</p>
				<p><b>Total:</b></p>
<p>*** Note: While a student's abilities related to the other dimensions in this rubric will be evidenced primarily during that student's oral presentation(s) and/or paper(s), the student's abilities with respect to the dimensions in this category are likely to be reflected also and, possibly to a greater extent, in the types of questions that he/she raises during presentations by other students and the types of discussions he engages in. For example, if there is a presentation that raises questions related to the security of electronic voting machines, that should present an opportunity, not just for the student making the presentation, but also the ones attending it to engage in serious discussion about the impact on society of real or perceived insecurity of those machines; similarly for presentations that are related to cyber-espionage; etc. This should be kept in mind when arriving at the assessment of the dimensions in this category.</p>				

Evaluator's name: \_\_\_\_\_  
 Date of evaluation: \_\_\_\_\_

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