

## Assessment Methods and Creating Assignments for Assessments

The learning domains in education include

- 1 Cognitive: mental skills (Knowledge)
- 2 Affective: growth in feelings or emotional areas (Attitude or self)
- 3 Psychomotor: manual or physical skills (Skills)

The cognitive domain involves knowledge and the development of intellectual skills. The cognitive domain has been categorised into Knowledge, Understanding, Application, Analysis, Synthesis and Evaluation. Learning in cognitive domain can be assessed using many methods. The following table describes various methods that are used for assessment.

Method of Assessment	Value	Limitations
Practical/Laboratory Classes Computer Simulations Tutorial Sessions Self-Test	<ul style="list-style-type: none"> <li>• Keeps students 'on task'</li> <li>• Encourages students early rather than later</li> <li>• Formative in nature as there are opportunities for students and teachers to make adjustments</li> <li>• Can encourage application, translation and interpretation of concepts learnt</li> </ul>	<ul style="list-style-type: none"> <li>• Can be time consuming for teachers.</li> <li>• 'Hoop jumping' exercise if not used formatively.</li> </ul>
Examination	<ul style="list-style-type: none"> <li>• Assurance that students have attained the appropriate knowledge, skills and dispositions.</li> </ul>	<ul style="list-style-type: none"> <li>• Merely summative</li> <li>• A measure of "poise" i.e. a capacity to recall information under stress</li> <li>• Often reproduction rather than transformation of information</li> </ul>
Assignments	<ul style="list-style-type: none"> <li>• <b>Opportunity to develop an extended argument</b></li> <li>• <b>Can achieve depth rather than breadth of learning</b></li> <li>• <b>Opportunity to develop capacity to interpret, translate, apply, critique and evaluate.</b></li> <li>• <b>Opportunity to problem pose and conduct inquiry</b></li> <li>• <b>Opportunity to explore the boundaries of what is known</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Time consuming to assess</b></li> <li>• <b>Highly subjective</b></li> <li>• <b>Often occurs at the end and leaves no opportunity for students to make use of the feedback</b></li> <li>• <b>Often one-off and fails to require students to make note of, and utilise, feedback (value added)</b></li> </ul>

Field reports	<ul style="list-style-type: none"> <li>• Authentic form of assessment</li> <li>• Develops observation and recording skills</li> <li>• Requires organisation skill</li> </ul>	<ul style="list-style-type: none"> <li>• Costly to supervise</li> <li>• Difficult to timetable</li> <li>• Need to consider ethical and safety issues</li> </ul>
Group Work	<ul style="list-style-type: none"> <li>• Communication of ideas</li> <li>• Encourages independence</li> <li>• Collaboration and co-operation</li> <li>• Opportunity for authentic skill development</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to assess individual input</li> <li>• Time consuming for students to organise</li> <li>• Students don't know how to work successfully in groups</li> </ul>
Portfolios - a collection of student work with inclusions carefully selected and justified	<ul style="list-style-type: none"> <li>• Can be used to demonstrate progress towards, and achievement of, topic or course objectives</li> <li>• understanding of complexity of professional roles</li> <li>• synthesis of what students have learnt in a number of topics</li> <li>• capacity to use new understandings in novel ways in unpredictable work contexts</li> <li>• Valid and authentic assessment as they can include real world tasks</li> <li>• Focus on higher order thinking</li> <li>• Students have to accept a high degree of responsibility so it encourages engagement with learning intentions</li> </ul>	<ul style="list-style-type: none"> <li>• Low stakes</li> <li>• Consistency between students is low</li> <li>• Time consuming for students and teachers</li> </ul>
Performances & Presentations	<ul style="list-style-type: none"> <li>• Provides alternate modes of assessment</li> <li>• Authentic</li> <li>• Develops skills</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to 'capture' and reflect on in order to assess</li> </ul>
Projects	<ul style="list-style-type: none"> <li>• Authentic, real world tasks</li> <li>• Capture students' interests</li> </ul>	<ul style="list-style-type: none"> <li>• Time consuming to set up</li> </ul>
Independent study	<ul style="list-style-type: none"> <li>• Encourages engagement with material</li> <li>• Captures students' interests</li> </ul>	<ul style="list-style-type: none"> <li>• Consistency is low</li> </ul>

Learning Contracts	<ul style="list-style-type: none"> <li>• Focuses on individual learning needs</li> </ul>	<ul style="list-style-type: none"> <li>• Consistency is low</li> </ul>
Using concept maps	<ul style="list-style-type: none"> <li>• Employ a hierarchical structure that distinguishes concepts and facts at different levels of specificity</li> <li>• Draw multiple connections, or cross-links, that illustrate how ideas in different domains are related</li> <li>• Include specific examples of events and objects that clarify the meaning of a given concept</li> </ul>	<ul style="list-style-type: none"> <li>• Concept maps evolve as they become more detailed and may require rethinking and reconfiguring.</li> </ul>
Concept tests	<ul style="list-style-type: none"> <li>• Concept test questions often describe a problem, event, or situation. Examples of appropriate types of questions include:</li> <li>• Asking students to predict the outcome of an event (e.g., What would happen in this experiment? How would changing one variable affect others?)</li> <li>• Asking students to apply rules or principles to new situations (e.g., Which concept is relevant here? How would you apply it?)</li> <li>• Asking students to solve a problem using a known equation or select a procedure to complete a new task (e.g., What procedure would be appropriate to solve this problem?)</li> </ul>	<ul style="list-style-type: none"> <li>• Concept tests are usually ungraded or very low-stakes</li> </ul>
Reproduced from: <a href="https://www.ucl.ac.uk/teaching-learning/downloads/assessment-methods.pdf">https://www.ucl.ac.uk/teaching-learning/downloads/assessment-methods.pdf</a> <a href="http://www.cmu.edu/teaching/assessment/assesslearning/">http://www.cmu.edu/teaching/assessment/assesslearning/</a>		

Thus assessments can be Formative and summative.

### **Formative assessment**

The goal of formative assessment is to monitor student learning to provide ongoing feedback that can be used by instructors to improve their teaching and by students to improve their learning. More specifically, formative assessments:

- help students identify their strengths and weaknesses and target areas that need work
- help faculty recognize where students are struggling and address problems immediately

Formative assessments are generally low stakes, which means that they have low or no point value. Examples of formative assessments include asking students to:

- draw a concept map in class to represent their understanding of a topic
- submit one or two sentences identifying the main point of a lecture
- turn in a research proposal for early feedback

### **Summative assessment**

The goal of summative assessment is to evaluate student learning at the end of an instructional unit by comparing it against some standard or benchmark.

Summative assessments are often high stakes, which means that they have a high point value.

Examples of summative assessments include:

- a midterm exam
- a final project
- a paper
- a senior recital

Information from summative assessments can be used formatively when students or faculty use it to guide their efforts and activities in subsequent courses.

### **Assignments and Essays-An Assessment Method**

Assignments and essays play a major role in assessing students pursuing higher education. The main advantages of assignments and essays as mentioned in the table are

- Opportunity to develop an extended argument
- Can achieve depth rather than breadth of learning
- Opportunity to develop capacity to interpret, translate, apply, critique and evaluate.
- Opportunity to problem pose and conduct inquiry
- Opportunity to explore the boundaries of what is known

An essay can be an assignment question.

The limitations of Assignments and essays are:

- Time consuming to assess
- Highly subjective
- Often occurs at the end and leaves no opportunity for students to make use of the feedback
- Often one-off and fails to require students to make note of, and utilise, feedback (value added)

One of the difficulties that we face with assignments is plagiarism and collusion. Assignments must be designed to be more open ended and each assignment must reflect individual's effort. Tutors have to develop strategies to avoid plagiarism and collusion while designing the assignments.

**Creating Assignments (Reproduced from  
<http://www.cmu.edu/teaching/assessment/assesslearning/>)**

Here are some general suggestions and questions to consider when creating assignments. There are also many other resources in print and on the web that provide examples of interesting, discipline-specific assignment ideas.

***Consider your learning objectives.***

What do you want students to learn in your course? What could they do that would show you that they have learned it? To determine assignments that truly serve your course objectives, it is useful to write out your objectives in this form: I want my students to be able to \_\_\_\_\_. Use active, measurable verbs as you complete that sentence (e.g., compare theories, discuss ramifications, recommend strategies), and your learning objectives will point you towards suitable assignments.

***Design assignments that are interesting and challenging.***

This is the fun side of assignment design. Consider how to focus students' thinking in ways that are creative, challenging, and motivating. Think beyond the conventional assignment type! For example, one American historian requires students to write diary entries for a hypothetical Nebraska farmwoman in the 1890s. By specifying that students' diary entries must demonstrate the breadth of their historical knowledge (e.g., gender, economics, technology, diet, family structure), the instructor gets students to exercise their imaginations while also accomplishing the learning objectives of the course (Walvoord & Anderson, 1989, p. 25).

***Double-check alignment.***

After creating your assignments, go back to your learning objectives and make sure there is still a good match between what you want students to learn and what you are asking them to do. If you find a mismatch, you will need to adjust either the assignments or the learning objectives. For instance, if your goal is for students to be able to analyze and evaluate texts, but your assignments only ask them to summarize texts, you would need to add an analytical and evaluative dimension to some assignments or rethink your learning objectives.

***Name assignments accurately.***

Students can be misled by assignments that are named inappropriately. For example, if you want students to analyze a product's strengths and weaknesses but you call the assignment a "product description," students may focus all their energies on the descriptive, not the critical, elements of the task. Thus, it is important to ensure that the titles of your assignments communicate their intention accurately to students.

***Consider sequencing.***

Think about how to order your assignments so that they build skills in a logical sequence. Ideally, assignments that require the most synthesis of skills and knowledge should come later in the semester, preceded by smaller assignments that build these skills incrementally. For example, if an instructor's final assignment is a research project that requires students to evaluate a technological solution to an environmental problem, earlier assignments should reinforce component skills,

including the ability to identify and discuss key environmental issues, apply evaluative criteria, and find appropriate research sources.

***Think about scheduling.***

Consider your intended assignments in relation to the academic calendar and decide how they can be reasonably spaced throughout the semester, taking into account holidays and key campus events. Consider how long it will take students to complete all parts of the assignment (e.g., planning, library research, reading, coordinating groups, writing, integrating the contributions of team members, developing a presentation), and be sure to allow sufficient time between assignments.

***Check feasibility.***

Is the workload you have in mind reasonable for your students? Is the grading burden manageable for you? Sometimes there are ways to reduce workload (whether for you or for students) without compromising learning objectives. For example, if a primary objective in assigning a project is for students to identify an interesting engineering problem and do some preliminary research on it, it might be reasonable to require students to submit a project proposal and annotated bibliography rather than a fully developed report. If your learning objectives are clear, you will see where corners can be cut without sacrificing educational quality.

***Articulate the task description clearly.***

If an assignment is vague, students may interpret it any number of ways – and not necessarily how you intended. Thus, it is critical to clearly and unambiguously identify the task students are to do (e.g., design a website to help high school students locate environmental resources, create an annotated bibliography of readings on apartheid). It can be helpful to differentiate the central task (what students are supposed to produce) from other advice and information you provide in your assignment description.

***Establish clear performance criteria.***

Different instructors apply different criteria when grading student work, so it's important that you clearly articulate to students what your criteria are. To do so, think about the best student work you have seen on similar tasks and try to identify the specific characteristics that made it excellent, such as clarity of thought, originality, logical organization, or use of a wide range of sources. Then identify the characteristics of the worst student work you have seen, such as shaky evidence, weak organizational structure, or lack of focus. Identifying these characteristics can help you consciously articulate the criteria you already apply. It is important to communicate these criteria to students, whether in your assignment description or as a separate rubric or scoring guide. Clearly articulated performance criteria can prevent unnecessary confusion about your expectations while also setting a high standard for students to meet.

***Specify the intended audience.***

Students make assumptions about the audience they are addressing in papers and presentations, which influences how they pitch their message. For example, students may assume that, since the instructor is their primary audience, they do not need to define discipline-specific terms or concepts. These assumptions may not match the instructor's expectations. Thus, it is important on assignments to specify the intended audience <http://wac.colostate.edu/intro/pop10e.cfm> (e.g., undergraduates with no biology background, a potential funder who does not know engineering).

***Specify the purpose of the assignment.***

If students are unclear about the goals or purpose of the assignment, they may make unnecessary mistakes. For example, if students believe an assignment is focused on summarizing research as opposed to evaluating it, they may seriously miscalculate the task and put their energies in the wrong place. The same is true they think the goal of an economics problem set is to find the correct answer, rather than demonstrate a clear chain of economic reasoning. Consequently, it is important to make your objectives for the assignment clear to students.

### ***Specify the parameters.***

If you have specific parameters in mind for the assignment (e.g., length, size, formatting, citation conventions) you should be sure to specify them in your assignment description. Otherwise, students may misapply conventions and formats they learned in other courses that are not appropriate for yours.

### ***A Checklist for Designing Assignments***

Here is a set of questions you can ask yourself when creating an assignment.

Have I...

- Provided a written description of the assignment (in the syllabus or in a separate document)?
- Specified the purpose of the assignment?
- Indicated the intended audience?
- Articulated the instructions in precise and unambiguous language?
- Provided information about the appropriate format and presentation (e.g., page length, typed, cover sheet, bibliography)?
- Indicated special instructions, such as a particular citation style or headings?
- Specified the due date and the consequences for missing it?
- Articulated performance criteria clearly?
- Indicated the assignment's point value or percentage of the course grade?
- Provided students (where appropriate) with models or samples?

### **Assignment Examples**

1. "Control engineering has an essential role in the design and development of control systems. Control systems are used right from a simple household washing machine to a complex high performance F-16 fighter aircraft. While designing a control system, the control system to be built is represented schematically and its mathematical model developed using appropriate physical laws. The mathematical models are simulated and analysed in time and frequency domains; and the control system design parameters are arrived at. Physical control systems are built as per the control system design parameters. The physical control system design parameters are further tuned to meet the desired performance.

The civilised world is overly dependent on mobility. For the last 4-5 decades, the technologists and engineers are tirelessly working on improving the safety systems in automobiles. To control longitudinal and lateral dynamics of a car modern control

systems like TCS, ABS and Yaw Control are being used and these control systems have made the cars safer.

Discuss various vehicle dynamic control systems (with Schematic and block diagrams, microcontrollers and sensors, plant models, control law, control system response with appropriate modelling equations) and the safety benefits they have brought in to the automobile users.

Your essay should not exceed 3 A4 pages, use appropriate control engineering terms, and represent data with appropriate graphs and diagrams.

2.

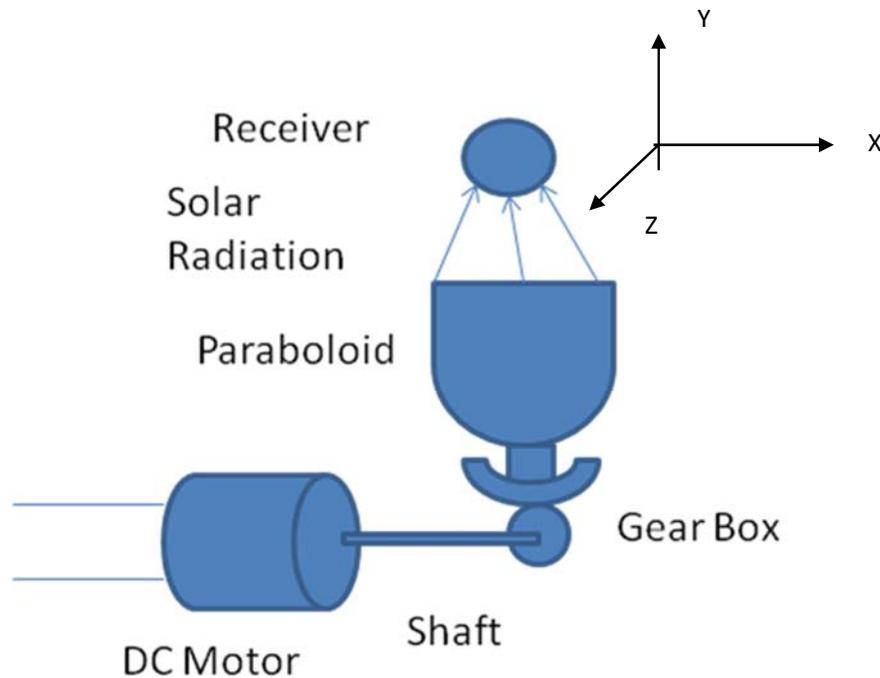


Fig. 1

A feedback control system is required to be designed for a parabolic solar collector to continuously track the Sun (about Z-Axis) so that the solar radiations are concentrated at the receiver. The schematic diagram of the plant (Paraboloid and Receiver) and Actuator (Armature Controlled DC servo motor) is shown in Fig.1. You are required to

1. Model the System using standard notations and obtain its transfer function
  2. Obtain the state model representation of the system
  3. Based on judgment, assign suitable values for mass moment of inertia, damping coefficient, stiffness, motor torque, motor constant, back emf constant and any other values required for analysis- given that the diameter of the collector is 1 m and rotates about Z axis and weighs 700 N including the receiver
  4. Simulate time response behaviour using Simulink
  5. Design a PID controller so that the overshoot is not more than 5%, settling time is 2s and steady state error is not more than 2%
  6. Every morning the Solar collector should begin tracking Sun from the same point, to facilitate this, make required changes in your micro-controller
3. It is required to study bounce vibration behaviour of a sprung mass in a car. The quarter car model of the Car is as shown in Fig. 2 you are required to
- a. Write the equations of motion
  - b. Determine transfer functions of the model
  - c. Write state model of the system
  - d. Determine the time response specifications of the system for a unit step input
  - e. Prove the system stability
  - f. Determine the resonance magnitude and resonance frequency, Gain Margin and Phase Margin using Bode Plots
  - g. Determine the displacement, velocity, accelerations and frequency of the sprung mass and unsprung mass, when the vehicle runs on a sinusoidal road of amplitude 0.1 m and wavelength of 1 m at speeds of 10 kmph to 80 kmph in steps of 10 kmph
  - h. Explain the wheel – road contact using the results obtained above. How do you improve the road grip of the tyre and also reduce the accelerations of the sprung mass, knowing the bounce frequency should be within 1-1.2 Hz.

The parameters for the analysis are

Sprung mass ( $m_b$ ) = 250kg

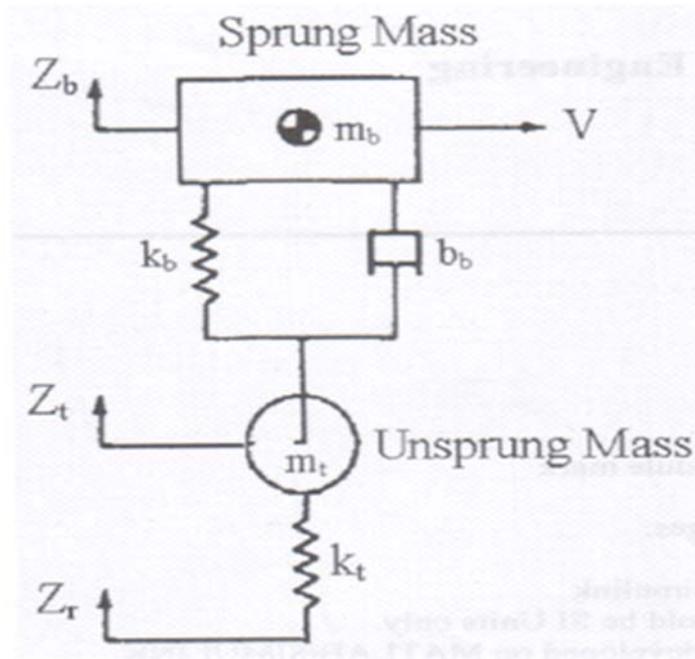
Suspension damping coefficient ( $b_b$ )= 2000 Ns/m

Suspension spring stiffness ( $k_b$ )= 28000 N/m

Unsprung mass ( $m_t$ ); 40kg

Tire stiffness ( $k_t$ ): 125000 N/m

Matlab/Simulink tool may be used to do the simulations



Prof. S.R. Shankapal