

# Lesson Plan – ME101: Kinetics of a Particle

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**Lesson:** Kinetics of a Particle

**Timeframe:** 10 class periods of 75 minutes each

**Materials needed:** Review videos, reading materials (via McGraw Hill Connect), iCloud App, Power point slides, problem handouts

**Objectives:** After these lectures, students will be able to

***Basic:***

***B1.*** understand the relationship between external forces being applied and acceleration

***B2.*** Draw free body and inertia body diagrams for problems

***B3.*** Identify the most suitable method to solve problems (Newton's Law, energy method, impact-momentum method)

***B4.*** Calculate unknown forces, acceleration or other missing parameters in given problems

***Advanced:***

***A1.*** Solve problems that need the combined use of multiple kinetics methods

***A2.*** Solve problems where kinetics and kinematics concepts are applied together

**Background:** “Kinetics of a particle” follows the concept of “kinematics” in ME101 – Dynamics class offered by the mechanical engineering department at San Jose State University. ME 101 is considered to be a gateway course for the department which is also a course with the highest failure rate in the department (on average, 30% of the enrolled students fail this course). Multiple sections of this course are offered each semester and all of them are taught in the traditional classroom lecture format. This lesson part is a part of an effort to flip part of this course and will be implemented in one section (taught by Dr. Viswanathan) in Fall 2018.

**Introduction to Lesson:**

- Provide an overview of the lesson to be covered on that day
- Begin the Power Point presentation
- Review the concepts learned in the previous class
- Show the concept map of the course and show the students where they stand on the map



**Procedure [Time needed, include additional steps if needed]:**

***Pre-Class Individual Space Activities and Resources:***

<b>Steps</b>	<b>Purpose</b>	<b>Estimated Time</b>	<b>Learning Objective</b>
<b>Step 1:</b> Students watch a pre-recorded video (video will specify the reading assignment to be completed)	To provide an overview of the concept of the day, including the review of the required Physics and Mathematics concepts	10 min	B1, B2, B3, B4, A1
<b>Step 2:</b> Students complete a reading assignment on McGraw Hill Connect	This reading will take them through additional materials and examples in the textbook	30 min	B1, B2, B3, B4, A1, A2
<b>Step 3:</b> Students complete a reading quiz	Makes sure that students read the material before they come to the class (multiple attempts will be allowed so that students can review and complete)	10 min	B1, B2, B3, B4

***In-Class Group Space Activities and Resources:***

<b>Steps</b>	<b>Purpose</b>	<b>Estimated Time</b>	<b>Learning Objective</b>
<b>Step 1:</b> Introduction to the topic, review of some of the needed concepts, concept map (One concept is taught per class)	Revision of the material learned in individual space, communicate where they stand in the progress of the course	10 min	B1, B2, B3, B4
<b>Step 2:</b> Completion of a concept quiz (on iClickers)	to make sure students complete their reading and preparation, see if they have any misconceptions	5 min	B1, B2, B3, B4
<b>Step 3:</b> Assign a problem – students solve this in groups of 3-4 (groups will be selected by the instructor)	Peer learning	10 min	B1, B2, B3, B4, A1, A2
<b>Step 4:</b> Two groups are invited to solve the problem on the white board – one member from each group solves the problem with the support from his/her group members. This will be followed by a discussion between the students and instructor. Groups will be awarded points based on the correctness of their solution	Peer learning, group discussion	5 min + 5 min	B1, B2, B3, B4, A1, A2
<b>Step 5:</b> Present a realistic situation that uses the concept learned. Assign a more complex problem related to the situation that targets the advanced objectives – students are again instructed to solve this in groups	Relate the concept to practical situations, peer learning	15 min	A1, A2 (needs B1-B4 as well)

<p><b>Step 6:</b> Two teams are invited to present their solutions, followed by discussions</p>	<p>Peer learning, problem-based learning</p>	<p>15 min</p>	<p>A1, A2 (needs B1-B4 as well)</p>
<p><b>Step 7:</b> Introduce a challenging problem and provide some food for thought for the students. Assign the homework and the challenging problem as a bonus question. (additional practice problems will be posted on the learning management system)</p>	<p>Diverse thinking, understanding of the practical aspects of the concept</p>	<p>5 min</p>	<p>A1, A2, B1, B2, B3, B4</p>
<p><b>Step 8:</b> Muddiest point: use iClickers to collect the muddiest point of the day</p>	<p>Feedback on learning/instruction</p>	<p>3 - 5 min</p>	<p>-</p>

**Closure/Evaluation:**

**Analysis:**

1. *Performance of student groups in the class problems*
2. *Review of the muddiest point survey*
3. *Performance of individual students in their homework*
4. *Performance of individual students in their exams*

***Post-Class Individual Space Activities:***

<b>Step 1:</b> Students complete one or two problems as homework. They can also attempt a bonus question that uses in-depth understanding of the concept.	Additional practice	30 min	B1, B2, B3, B4, A1, A2
<b>Step 2:</b> Students can work on additional practice problems (optional –solutions provided) on the learning management system	Additional practice	30 – 45 min	B1, B2, B3, B4, A1, A2