Contextualized Learning Activities (CLAs)

For the "other required credits" in the bundle of credits, students in a Specialist High Skills Major program must complete learning activities that are contextualized to the knowledge and skills relevant to the economic sector of the SHSM. Contextualized learning activities (CLAs) address curriculum expectations in these courses.

This CLA has been created by teachers for teachers.
It has not undergone an approval process by the Ministry of Education.

Contact Information	
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Development date	June 2008
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Specialist High Skills Major	Manufacturing, and Transportation
Course code and course title	**SPH3U, Physics**
Name of contextualized learning activity/activities	Motion
Brief description of contextualized learning activity/activities	The focus of the activities includes the analysis of motion using gear ratios, and the application of encoders in the feedback of information. Students will learn about gears and gear ratios and apply them to a manufacturing setting with a robotics focus. Students will learn how to design a basic gear train and add feedback with an encoder.
Duration	6 hours

Overall expectations	**SIS.04** · locate, select, analyse, and integrate information on topics under study, working independently and as part of a team, and using appropriate library and electronic research tools, including Internet sites; **SIS.06** · use appropriate scientific models (theories, laws, explanatory devices) to explain and predict the behaviour of natural phenomena (e.g., use the kinetic molecular theory of matter to explain thermal energy and its transfer [heat]); use ray diagrams to predict the location and nature of images created by lenses); **FMV.01** · demonstrate an understanding of the relationship between forces and the acceleration of an object in linear motion; These codes can be obtained from the course profiles, which are available on the Curriculum Services Canada website.
	What do we want students to learn? The students will learn about the relationship between speed and torque and the ability to convert the speed of a motor to a desired speed of a machine.
Specific expectations	**FM1.01** – define and describe concepts and units related to force and motion (e.g., vectors, scalars, displacement, uniform motion, instantaneous and average velocity, uniform acceleration, instantaneous and average acceleration, applied force, net force, static friction, kinetic friction, coefficients of friction); **FM1.02** – describe and explain different kinds of motion, and apply quantitatively the relationships among displacement, velocity, and acceleration in specific contexts; **FM3.02** – evaluate the design of technological solutions to transportation needs and, using scientific principles, explain the way they function (e.g., evaluate the design, and explain the operation of, airbags in cars, tread patterns on car tires, or braking systems);
	What do we want students to learn*?* ▪ Students will learn how gear trains convert speed and torque to desired values. ▪ Students will learn about the relationship between speed and torque in an ideal situation. ▪ Students will learn about different applications of gear trains. ▪ Students will learn about the ability to receive feedback regarding angular velocity using encoders and gear tooth sensors and how to size them.

Essential Skills and work habits	Reading Text Measurement and Calculation Data Analysis Numerical Estimation Job Task Planning and Organizing Decision Making Problem Solving Finding Information Organization Initiative
Catholic graduate expectations (if applicable)	***A REFLECTIVE AND CREATIVE THINKER WHO:*** (b) Creates, adapts, evaluates new ideas in light of the common good. (c) Thinks reflectively and creatively to evaluate situations and solve problems. (e) Adopts a holistic approach to life by integrating learning from various subject areasand experience. (f) Examines, evaluates and applies knowledge of interdependent systems (physical,political, ethical, socio-economic and ecological) for the development of a just and compassionate society. ***A SELF-DIRECTED, RESPONSIBLE, LIFE LONG LEARNER WHO:*** (a) Demonstrates a confident and positive sense of self and respect for the dignity and welfare of others. (b) Demonstrates flexibility and adaptability. (e) Sets appropriate goals and priorities in school, work and personal life. (f) Applies effective communication, decision-making, problem-solving, time and resource management skills. (g) Examines and reflects on one's personal values, abilities and aspirations influencing life's choices and opportunities. ***A COLLABORATIVE CONTRIBUTOR WHO:*** (a) Works effectively as an interdependent team member. (b) Thinks critically about the meaning and purpose of work. (e) Respects the rights, responsibilities and contributions of self and others. (g) Achieves excellence, originality, and integrity in one's own work and supports these qualities in the work of others.

Instructional/Assessment Strategies

Teacher's notes Review basic motion concepts and formulas Describe force and torque Allow students to read material and do exercises. Give formative assessment when each section is complete. Summative assessment when entire CLA is complete. Use Professional judgement based on students for summative verses formative evaluation throughout CLA
Context Manufacturing facilities, robotics team or robotics environment, automated machines.
Instructional/Assessment Strategies Students are to read the information, work through the examples and complete the exercises and assignment. Exercises can be used for formative evaluation or summative. The assignments will be used for summative evaluation. Assignments to be handed in for marking. The provided rubric can be used for formative evaluation. Students who complete the exercises and assignments will show there level of understanding and application of the information. The student's communication skills can be evaluated from their rational for design decisions.

Additional Notes/Comments/Explanations

Take students to a machine shop where equipment with gear trains can be seen, Metal lath, wood lath, drill press etc. Bring a bicycle and demonstrate the torque, speed relationship. Plan a trip to a local manufacturing facility where some of the example equipment might be found.

Resources

Websites *www.digikey.com*
Other

Accommodations

What adjustments must be made to the instructional and assessment strategies for those students who are not progressing?
Bring in a bicycle and use it to develop questions and about gear ratios, torque and speed.

List of Attachments

1. Motion
2. Gear Trains
3. Planetary Gears
4. Torque
5. Encoders
6. Gear Tooth Sensors
7. Application

Appendix

A. Gear Sizes & Ratios
B. Rubrics
C. Solutions