Canvas Course Curriculum:

Introduction to Robotics

## Class Topics

| **Class #** | **Hours** | **Topics** |
| --- | --- | --- |
| 1 | 1.5 | Introduce engineering and engineering design process, Robotics and applications |
| 2 | 1.5 | Build the Drivetrain of the VEX Clawbot Robot |
| 3 | 1.5 | Write simple programs to drive DC motors: Robots go forward/backward, turn left/ right at different speeds. |
| 4 | 1.5 | Introduce relational and logic operators and programming structure: Running motors in an infinite loop |
| 5 | 1.5 | Program bump sensor and optical shaft encoders: Robots go straight and travel the required distance. |
| 6 | 1.5 | Program bump sensor and optical shaft encoders: Robots go straight and travel the required distance. Part II |
| 7 | 1.5 | Introduce the robotic arm and claw, potentiometer and limit switch:  Building a robotic arm on the chassis and program the arm/claw to grasp an object and move it to another location. |
| 8 | 1.5 | Programming the robot to perform a simple autonomous task of moving an object from one location to another utilizing sensors. |

| **Week #** | **Hours** | **Projects and Tasks** |
| --- | --- | --- |
| 1 | 3 | 1. Introducing the VEX Easy C programming environment. 2. Building the VEX Clawbot Drivetrain |
| 2 | 3 | 1. Programming Simple movement commands. 2. Using simple conditional loops and logic operations to control robot movement |
| 3 | 3 | 1. Using the bump sensor and optical shaft encoders to control the robot movements and create accurate movements. |
| 4 | 3 | 1. Attaching the robot arm and claw to the VEX Clawbot Robot. 2. Programming the robot to actuate the robot arm and claw. 3. Combining drivetrain commands with robot arm and claw. |

***Competency****: What are the key critical pieces that I think my students should have as a result of the* ***process*** *they’ve been engaged in? → these are the things that would become badges*

***Benchmarks****: The steps within each competency*

***Evidence****: Student demonstration of the competency*

# Competency-Based Assessment Tool

# Intro to Robotics

| **Competency** | **Benchmarks** | **Evidence**  *Portfolio, Project-Based, Evaluation, Summative, Formative, Observation* | **Rating**  0-*Not Yet Demonstrated*  *1 - Emerging*  *2 - Competent*  *3 -Highly Competent* | **Narrative Feedback for Student**  *Faculty, Mentor, Peer, Self* |
| --- | --- | --- | --- | --- |
| *Fluency in understanding the five major components of robots and how they correlate to each other.* | *Be able to identify the different subsystems of robots and accurately explain their importance.*  *Build and construct the Vex Robotics Clawbot* | *Student Work from Weeks 1 and 2* |  | *Checklist, Rubric* |
| *Demonstrate ability in basic motor control using RobotC Programming Language* | *Be able to understand how to control motors to spin for a set time period allowing the robot to move.* | *Project 1*  *(Weeks 1 and 2)* |  | *Checklist, Rubric* |
| *Demonstrate ability to understand AND/ OR operations with use of bump sensor* | *Be able to program conditional loops with the use of And/OR operations.* | *Project 2*  *(Week 3)* |  | *Checklist, Rubric* |
| *Demonstrate ability to incorporate the use of multiple sensors in creating conditional loops* | *Be able to identify how multiple sensors work and implement them together to generate robot logic branching in code.* | *Project 3*  *(Week 4)* |  | *Checklist, Rubric* |
| *Successfully communicates and collaborates with others* | *-Communicates needs, wants, information, negotiates, resolves conflict, and asks for help when needed*  *-Understands giving and receiving feedback and constructive criticism*  *-Develops positive relationships with supportive peers and adults*  *-Participates in group/team activities using teamwork and* [*collaborative problem-solving*](https://www.mediate.com/articles/BernsteinS1.cfm) | *Weeks 1 -4*  *All projects and assignments.* |  |  |

# Competency-Based Assessment Tool

# SAMPLE: SIPP Summer Curriculum

| **Competency** | **Benchmarks** | **Evidence**  *Portfolio, Project-Based, Evaluation, Summative, Formative, Observation* | **Rating**  0-*Not Yet Demonstrated*  *1 - Emerging*  *2 - Competent*  *3 -Highly Competent* | **Narrative Feedback for Student**  *Faculty, Mentor, Peer, Self* |
| --- | --- | --- | --- | --- |
| *Fluency using CAD software to develop working prototypes of assigned projects* | *Develop CAD models of moderate complexity using a variety of sketch and modeling tools in novel ways*  *Develop assemblies and sub-assembly using to defined tolerance*  *Develop engineering drawings to workplace standard*  *Refine model, integrating feedback from multiple sources.* | *Student Work from Week 1 Project* |  |  |
| *Demonstrate ability to program microcontrollers to interact with the physical world* | *Attain fundamental concepts of programming: syntax,, language, conditional statements, variables,*    *Develop strategies for Debugging and troubleshooting* | *Series of projects completed using*  *CPX*  *and*  *Arduino* |  | *Checklist /rubric* |
| *Demonstrate ability to build working prototypes in conjunction with physical computing devices* | *Devise plans*  *Use tools and materials for construction*  *Test*  *Iterate on design / troubleshoot* | *Series of projects completed using*  *CPX*  *and*  *Arduino* |  |  |
| *Consistently demonstrating a growth mindset during assigned projects and activities* | *Embrace challenges*  *Persist through setbacks*  *View failures as opportunity for growth*  *Maintain effort & strong work ethic*  *Learn when to ask for help*  *Take inspiration from the setbacks of others* | *Week 1: end of week check-in, reflection*  *Continually evaluated at end of week check-ins* |  | *Checklist/rubric* |
| *Successfully communicates and collaborates with others* | *-Communicates needs, wants, information, negotiates, resolves conflict, and asks for help when needed*  *-Understands giving and receiving feedback and constructive criticism*  *-Develops positive relationships with supportive peers and adults*  *-Participates in group/team activities using teamwork and* [*collaborative problem-solving*](https://www.mediate.com/articles/BernsteinS1.cfm) | *Week 6: end of week check-in*  *Continually evaluated during any group/team activities* |  |  |