



# HALTON CATHOLIC DISTRICT SCHOOL BOARD

## COURSE OVERVIEW

**SCHOOL:** Thomas Merton Centre for Continuing Education

**DEPARTMENT:** Technological Education/Computer Science Department

**MINISTRY DOCUMENT:** The Ontario Curriculum, Grades 11 and 12, Interdisciplinary Studies (Model A), 2002 and The Ontario Curriculum, Grades 11 and 12, Technological Education, 2009 Revised

**Course Title:** Interdisciplinary Studies, Grade 11      **Course Type:** Open

**Grade:** 11                              **Course Code:** IDC3OR                              **Credit:** 1  
**Prerequisite:** None

**Recommended:** Membership on Holy Trinity's FIRST Robotics Team

**Teacher(s):** C. Woods, J. Monson, A. Montanari and R. Balech

**Date:** September 2012

### Course Description:

This course explores several disciplines within the FIRST (For Inspiration and Recognition of Science and Technology: [www.usfirst.org](http://www.usfirst.org)) organization. This includes manufacturing, computer aided design (CAD), computer technology, and business.

This course will help students acquire knowledge and skills in the areas of mechanical engineering, electronics, business administration, computer-aided manufacturing and design, industrial maintenance, precision machining, and sheet metal.

Using CAD drawings and other communication methods to present their design ideas students will research, design, build, and assess solutions and material requirements and resources that meet the specific school's extra-curricular robotics team needs.

Students will use a broad range of tools and equipment while acquiring engineering, fabrication, business, and problem-solving skills culminating in the design and fabrication of a competition robot.

The course is designed for students heading to university or college, an apprenticeship or directly to the workplace in their pursuit of careers such as engineer, business administrator, technician, technologist, tradesperson or any of the skilled entry positions.

This course will help students develop and consolidate the skills required for and knowledge of different subjects and disciplines to solve problems, make decisions, create personal meaning, and present findings beyond the scope of a single subject or discipline. Students will apply the principles and processes of inquiry and research to effectively use a range of print, electronic, and mass media resources; to analyze historical innovations and exemplary research; and to investigate real-life situations and career opportunities in interdisciplinary endeavours. They will also assess their own cognitive and affective



# HALTON CATHOLIC DISTRICT SCHOOL BOARD

## COURSE OVERVIEW

strategies, apply general skills in both familiar and next contexts, create innovative products, and communicate new knowledge.

### How This Course Supports Expectations for the Catholic School Graduate:

This course enables students to develop a confident and positive sense of self. Within the setting of a supportive and caring classroom community, the dignity and value of each student is respected and affirmed. Through their personal growth in reason, critical thinking and communication, students come to appreciate their mathematical ability as a God given gift. By sharing their abilities, students contribute to the good of others, in service to the classroom and school community.

### Units: Titles and Time

<b>Unit 1</b>	<b>FIRST Robotics From a CAD (Computer Aided Design) Perspective</b>
<b>Unit 2</b>	<b>FIRST Robotics From a Manufacturing Technology Perspective</b>
<b>Unit 3</b>	<b>FIRST Robotics From a Team Operations/Organization Perspective</b>
<b>Unit 4</b>	<b>Culminating Performance Task</b>

### Course Grade Weighting:

<b>Term Work: 70%</b>		<b>Final Evaluation: 30%</b>	
<i>Category</i>	<i>Weight</i>	<i>Task</i>	<i>Weight</i>
Knowledge and Understanding	17.5%	<i>Course Culminating Activity</i>	30%
Thinking and Investigation	17.5%		
Communication	17.5%		
Application	17.5%		



# HALTON CATHOLIC DISTRICT SCHOOL BOARD

## COURSE OVERVIEW

### **Overall Course Expectations:**

#### **Theory and Foundation**

##### *Overall Expectations*

*By the end of this course, students will:*

- *demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;*
- *demonstrate an understanding of the different structures and organization of each of the subjects or disciplines studied;*
- *demonstrate an understanding of the different perspectives and approaches used in each of the subjects or disciplines studied;*
- *demonstrate the skills and strategies used to develop interdisciplinary products and activities.*

#### **Processes and Methods of Research**

##### *Overall Expectations*

*By the end of this course, students will:*

- *be able to plan for research, using a variety of strategies and technologies;*
- *be able to access appropriate resources, using a variety of research strategies and technologies;*
- *be able to process information, using a variety of research strategies and technologies;*
- *be able to assess and extend their research skills to present their findings and solve problems.*

#### **Implementation, Evaluation, Impacts, and Consequences**

##### *Overall Expectations*

*By the end of this course, students will:*

- *implement and communicate information about interdisciplinary endeavours, using a variety of methods and strategies;*
- *evaluate the quality of interdisciplinary endeavours, using a variety of strategies;*
- *analyse and describe the impact on society of interdisciplinary approaches and solutions to real-life situations;*
- *analyse and describe ways in which interdisciplinary skills relate to personal development and careers.*

#### **MANUFACTURING TECHNOLOGY FUNDAMENTALS**

##### *Overall Expectations*

*By the end of this course, students will:*

- *demonstrate an understanding of how a design process is used in the planning and development of a manufacturing project;*
- *demonstrate an understanding of material conversion processes;*
- *demonstrate an understanding of various types of control systems used in manufacturing;*
- *apply relevant mathematical and scientific concepts and use appropriate forms of technical communication in the study of manufacturing technology.*

#### **MANUFACTURING TECHNOLOGY SKILLS**

##### *Overall Expectations*

*By the end of this course, students will:*

- B1. demonstrate the ability to interpret and prepare technical drawings and develop process plans;*
- B2. demonstrate a working knowledge of the characteristics of various materials and the proper selection of materials for the manufacture of a product;*
- B3. demonstrate a working knowledge of various metrology tools used to measure, lay out, and inspect products;*



# HALTON CATHOLIC DISTRICT SCHOOL BOARD

## COURSE OVERVIEW

*B4. use tools, equipment, and machine processes safely and correctly in the manufacture of a product.*

### **Unit 1 FIRST Robotics from a CAD (Computer Aided Design) Perspective**

**Skills:** Draw orthographic views of robotic and machine parts dimensioned with tolerances in metric and imperial.

**Assessment:** Detailed CAD model and drawing of robot chassis.

**Specific Expectations:**

A3. Demonstrate an understanding of drafting standards, conventions, and guidelines for various types of drawings used to represent designs.

A3.2 demonstrate an understanding of drawing types (e.g., pictorial drawings, floor plans, elevations, sections, detail drawings, rendered drawings) and of drafting standards and conventions (e.g., standards: Canadian Standards Association [CSA]; conventions: symbols, abbreviations, shading, dimension labels, geometries), with an emphasis on working drawings.

A3.3 accurately interprets technical drawings and specifications.

A5.1 use technical terminology correctly when documenting, reporting on, and presenting design projects (e.g., vernier caliper, orthographic, fillet, bisect, construction lines, shears).

B2.1 use freehand sketches to help brainstorm initial design concepts for a project.

B2.3 differentiate between artistic and technical criteria for a design.

B2.4 produce hand-drafted and/or computer-based working drawings and other technical drawings of design solutions, using industry-recognized drafting standards and conventions.

### **Unit 2 FIRST Robotics From a Manufacturing Technology Perspective**

**Skills:**

**Unit 1:** Safety training in the shop, and obtaining safety passports. Training to use hand and power tools. Machine training on the bandsaw, bender brake, metal shear, lathe, drill press, bench grinder, and the hydraulic press.

**Unit 2:** Use various measuring devices, micrometer, Vernier readings. Use fasteners: bolts, nuts, rivets, machine screws, and locking devices. Use tap and die sets, and fabricating tap drill charts to create threads on parts.

**Assessment:** Robot chassis built to specifications from previous unit.

**Specific Expectations:**

A2.1 describe and demonstrate the correct use of a variety of processes for joining materials (e.g., bonding and fastening);

A2.2 describe and demonstrate the correct use of a variety of processes for cutting materials (e.g., using saws, shears, an engine lathe, a milling machine);

A2.3 describe and demonstrate the correct use of a variety of processes for forming materials, using various tools and equipment (e.g., hammers; brake press; rollers);

A4.2 apply mathematical concepts (e.g., linear systems; integers; decimals and fractions; order of operations) and skills in performing a variety of tasks required within the context of manufacturing design and production (e.g., angle calculations; calculation of perimeter, volume, and area; percent/decimal/fraction conversions; US customary/British imperial and metric unit conversions);

B2.3 use the proper procedures to prepare materials for production (e.g., measuring, marking, cutting to rough length, grinding, cleaning, deburring).

B4.1 demonstrate the use of appropriate bench work techniques to lay out, fit, and assemble work pieces;

B4.2 use appropriate procedures (e.g., correct machine set-up, operational safety procedures) when setting up, maintaining, using, and storing tools and equipment used in manufacturing and production processes;

B4.3 demonstrate the correct selection and use of appropriate tools and equipment (e.g., wrenches, electric drills, grinders, engine lathe, milling machine) for specific manufacturing tasks;

D1.2 demonstrate good housekeeping practices in the work environment (e.g., cleaning up spills and leaks, keeping areas clean and clear of obstructions, properly organizing tools and equipment);

D1.4 demonstrate an understanding of procedures to ensure safe and productive work practices in the manufacturing workplace (e.g., perform safety inspections and audits that include ergonomic considerations related to workshop layout and set-up, material handling, ease of movement, lighting, workstation set-up);



# HALTON CATHOLIC DISTRICT SCHOOL BOARD

## COURSE OVERVIEW

D1.5 demonstrate the safe use of tools and equipment in compliance with safety manuals, instructions, and institutional requirements;

### **Unit 3 FIRST Robotics From a Business Studies Perspective**

#### **Part I – Getting Ready For Start-Up**

##### **Overall Expectations**

By the end of this course students will:

- Demonstrate an understanding of the components of an effective Marketing Plan for the FIRST Organization.
- Demonstrate an understanding of the components of an effective Operating Strategy for the FIRST Organization.
- Analyze the resources that are required to start-up and operate the FIRST Organization.

##### **Specific Expectations**

By the end of this course students will:

- Determine the possible human resource needs (e.g., student membership, professional mentors, partners, suppliers, donors, etc.) of the FIRST Organization
- Specify the consumable (e.g., raw materials, supplies, etc.), fixed (e.g., equipment, tools, etc.), technological (e.g., computers, software, etc.), and financial (e.g., corporate and other donors, fundraising, etc.) resources required for the FIRST Organization.
- Describe the services and infrastructure (e.g., brick and mortar location for build season, light, heat, electricity, communication technology, etc.) required for the FIRST Organization.
- Summarize and document the process involved in building a robot.
- Determine the possible roles and responsibilities of student members, mentors and other partners in the build process using an Organizational Chart to document the organization from a human resource perspective.
- Analyze the factors involved in acquiring the necessary goods for the building process (e.g., finding sources of supply, fundraising for start-up and operations of the building process).
- Describe and identify the potential target markets (e.g. corporate sponsors and donors, future student membership, professional mentors, etc.) for the marketing of the FIRST Organization.
- Compare ways of advertising and promoting the FIRST Organization to potential corporate sponsors, donors, student members, and to the community at large.
- Develop a promotional strategy to help establish and maintain an identity for the FIRST Organization including a promotional brochure created with the use of PUBLISHER productivity software.

#### **Part II – The Financial Plan**

##### **Overall Expectations**

By the end of this course students will:

- Determine and compare the possible sources of fundraising for the FIRST Organization.
- Demonstrate the purpose and structure of a cashflow projection.

##### **Specific Expectations**

By the end of this course students will:

- Calculate the amount of fundraising required to start-up and operate a successful build season for the FIRST Organization.
- Identify the advantages and disadvantages of various sources of fundraising.
- Propose an effective strategy for fundraising.
- Compile a cashflow projection for the current build season using EXCEL Productivity Software.



# HALTON CATHOLIC DISTRICT SCHOOL BOARD

## COURSE OVERVIEW

### **Part III – The Business Plan**

#### **Overall Expectations**

By the end of this course students will:

- Analyze and identify the components of a Business Plan.
- Incorporate the Marketing Plan, the Resource Analysis, Operating Strategy, and the Financial Plan into an overall Business Plan for the FIRST Organization.

#### **Specific Expectations**

By the end of this course students will:

- Analyze and compile the components of the business plan (e.g., executive summary, marketing plan, resource analysis, operating strategy, financial plan)
- Prepare a business plan for the FIRST Organization using WORD Productivity Software.
- Prepare a presentation for the business plan using POWERPOINT Productivity Software.

#### **List of Skills**

By the end of this course the student will have gained or augmented the following skills:

- Problem-solving skills
- Organization skills
- Planning skills
- Business writing / speaking skills, and business skills in general will be enhanced
- Networking skills
- Idea generation skills (Creativity)
- Student's ability to Think-Outside-the-Box will definitely be enhanced.
- Use of productivity softwares such as EXCEL, WORD, POWERPOINT, PUBLISHER.

### **Assessment & Evaluation**

For this unit the students will produce a Business Plan for the FIRST Organization. The Business Plan will be presented to the instructor via a Power Point Presentation (Communication-Oral) and a hardcopy will be submitted to the instructor for evaluation (Knowledge, Thinking, Communication-Written, and Application). An evaluation rubric will be used to derive the final mark for this unit.

#### **Unit 4 Culminating Performance Task**

**ROBOT BUILD:** Task presented by the FIRST organization in early January of each year. Students will work along with teachers as well as industry mentors to design, budget, and build a robot to compete in the regional competitions.