

## Computer-Aided Design and Computer Numerical Control

### Mechanical and Transportation Technology

<b>Course Number:</b> CAD9101	<b>Contribution to Program:</b> Vocational	<b>Normative Hours:</b> 60
<b>Applicable Program(s):</b> 0550X01FWO EME Technician - Robotics	<b>AAL:</b> 3	<b>Core/Elective:</b> Core
<b>Prepared by:</b> Stephen Ryan Coordinator		<b>Approval Date:</b> 21/06/2013
<b>Co-Requisites</b> N/A		<b>Approved by:</b> Misheck Mwaba, PhD., P.Eng. Chair, Mechanical and Transportation Technology
<b>Pre-Requisites</b> MAC9200		<b>Approved for Academic Year:</b> 2013-2014

### COURSE DESCRIPTION

Students use Computer-Aided Design and Computer Numerical Control equipment to produce prototype parts. Students produce drawings on a CAD system and program a CNC machining centre to produce the desired design. Innovative design is encouraged.

### RELATIONSHIP TO VOCATIONAL LEARNING OUTCOMES

This course contributes to your program by helping you achieve the following Vocational Learning Outcomes:

#### EME Technician - Robotics 0550X01FWO

- 1 Fabricate mechanical components and assemblies, and assemble electrical components and electronic assemblies by applying workshop skills and knowledge of basic shop practices in accordance with applicable codes and safety practices.(T,A,CP)
- 2 Interpret and produce electrical, electronic, and mechanical drawings and other related documents and graphics to appropriate engineering standards.(T,A,CP)
- 5 Apply the principles of engineering, mathematics, and science to analyze and solve routine technical problems and to complete work related to electromechanical engineering.(T,A)
- 6 Assist in the specification of manufacturing materials, processes, and operations to support the design and production of mechanical components.(T,A,CP)
- 9 Install and troubleshoot basic computer hardware and programming to support the electromechanical engineering environment.(T,A)

T: Teach A: Assess CP: Culminating Performance

### ESSENTIAL EMPLOYABILITY SKILLS

The course contributes to your program by helping you achieve the following Essential Employability Skills:

- 1 Communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience.(T,A)
- 2 Respond to written, spoken or visual messages in a manner that ensures effective communication.(T)
- 4 Apply a systematic approach to solve problems.(T,A)
- 5 Use a variety of thinking skills to anticipate and solve problems.(A)
- 9 Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. (A)
- 10 Manage the use of time and other resources to complete projects.(T,A,CP)
- 11 Take responsibility for one's own actions, decisions and consequences.(T,CP)

T: Teach A: Assess CP: Culminating Performance

### COURSE LEARNING REQUIREMENTS/EMBEDDED KNOWLEDGE AND SKILLS

COURSE LEARNING REQUIREMENTS When you have earned credit for this course, you will have demonstrated the ability to:	EMBEDDED KNOWLEDGE AND SKILLS

1. Produce working drawings, using AutoCad software, of a mechanical or electrical nature.	<ul style="list-style-type: none"> <li>1 Set-up drawing protocols.</li> <li>1 Display, snap and erase</li> <li>1 Units and entity commands</li> <li>1 Object selection and editing</li> </ul>
2. Design a project to be fabricated using a CNC machine.	<ul style="list-style-type: none"> <li>1 Produce a complete set of drawings and supporting documentation for a self-designed part for manufacture on CNC equipment.</li> </ul>
3. Program a CNC machine from completed drawings and produce the product to specifications.	<ul style="list-style-type: none"> <li>1 Use and be familiar with various G and M function codes to control a CNC machining center.</li> <li>1 Familiarization with, and awareness of the differences between, "Absolute &amp; Incremental" programming methods.</li> <li>1 Preparation of material, and selection of tooling, used for manufacture of project.</li> </ul>

## LEARNING RESOURCES

Teacher supplied CNC manual on BlackBoard (Bb)

Other AutoCAD reference books may be used but ask teacher if suitable before purchasing.

## LEARNING ACTIVITIES

**During this course, you are likely to experience the following learning activities:**

As this course is delivered in a "Hybrid" method some of the learning you will experience will be in class as well as electronically via Email and Bb (BlackBoard). Classroom portions of instruction will feature demonstrations using AutoCAD software and CNC programming examples. Careful "step by step work-through" of CNC Tutorial will provide the necessary skills needed to complete the project. Familiarization with and operation of the CNC machining center will occur in the CNC lab area including "hands on" training on the machining center. Peer discussion and collaborative learning is encouraged.

## EVALUATION/EARNING CREDIT

The following will provide evidence of your learning achievements:	This activity validates the following Course Learning Requirements and/or Essential Employability Skills:
<b>Drawings:</b> Ten Drawings 3% each for 30%	<ul style="list-style-type: none"> <li>1 Produce working drawings, using AutoCad software, of a mechanical or electrical nature. - [CLR 1]</li> <li>1 Communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience. - [EES 1]</li> <li>1 Respond to written, spoken or visual messages in a manner that ensures effective communication. - [EES 2]</li> <li>1 Manage the use of time and other resources to complete projects. - [EES 10]</li> </ul>
<b>CNC Project</b> Project Drawings incl. supporting docs. 10%. Project Program 5%. Project 10%.	<ul style="list-style-type: none"> <li>1 Design a project to be fabricated using a CNC machine. - [CLR 2]</li> <li>1 Produce working drawings, using AutoCad software, of a mechanical or electrical nature. - [CLR 1]</li> <li>1 Program a CNC machine from completed drawings and produce the product to specifications. - [CLR 3]</li> <li>1 Apply a systematic approach to solve problems. - [EES 4]</li> <li>1 Manage the use of time and other resources to complete projects. - [EES 10]</li> <li>1 Take responsibility for one's own actions, decisions and consequences. - [EES 11]</li> <li>1 Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. - [EES 9]</li> </ul>
<b>Tests &amp; Quizzes:</b> One Practical drawing test 20% .	<ul style="list-style-type: none"> <li>1 Produce working drawings, using AutoCad software, of a mechanical or electrical nature. - [CLR 1]</li> </ul>

<p>CAD 5%, Safety 5%, Basic CNC operation 5%.</p>	<ul style="list-style-type: none"> <li>1 Respond to written, spoken or visual messages in a manner that ensures effective communication. - [EES 2]</li> <li>1 Manage the use of time and other resources to complete projects. - [EES 10]</li> <li>1 Take responsibility for one's own actions, decisions and consequences. - [EES 11]</li> <li>1 Apply a systematic approach to solve problems. - [EES 4]</li> </ul>
<p><b>LABS:</b> Completed lab piece: Square Triangle and Happy Face 10%</p>	<ul style="list-style-type: none"> <li>1 Program a CNC machine from completed drawings and produce the product to specifications. - [CLR 3]</li> <li>1 Use a variety of thinking skills to anticipate and solve problems. - [EES 5]</li> <li>1 Manage the use of time and other resources to complete projects. - [EES 10]</li> <li>1 Take responsibility for one's own actions, decisions and consequences. - [EES 11]</li> </ul>
<p><b>Notes Regarding Evaluation:</b></p> <p>There is sufficient time allotted to complete all requirements for this course provided that you use your time wisely. All drawings must be submitted for grading by the appropriate time/date via Algonquin College's email system. All student submissions are time sensitive, therefore, the professor will use the College's email system only as it will validate all time/date information. It is the students responsibility to know the due dates. They are posted on Bb in the "Weekly Planner". Late or untimely submissions will be graded ZERO. Students are <b><u>strongly advised</u></b> to keep back-up files of emails and all submissions.</p>	

**COLLEGE GRADING NUMERICAL EQUIVALENT TABLE**

Final Grade	Mark Equivalent	Numeric Value	Final Grade	Mark Equivalent	Numeric Value
A+	90-100%	4.0	C+	67-69%	2.3
A	85-89%	3.8	C	63-66%	2.0
A-	80-84%	3.6	C-	60-62%	1.7
B+	77-79%	3.3	D+	57-59%	1.4
B	73-76%	3.0	D	53-56%	1.2
B-	70-72%	2.7	D-	50-52%	1.0
			F	0-49%	0
			FSP	0	0

## OTHER COURSE INFORMATION

Students are required to respect the confidentiality of employer, client and/or patient information, interactions, and practices that occur either on Algonquin College premises, or at an affiliated clinical/field/co-op placement site. Concerns regarding clients, patients, and/or employer practices are to be brought to the attention of the program coordinator, or designated field/clinical/co-op placement supervisor so that they may be resolved collaboratively. Such concerns are not to be raised publicly either verbally, in writing, or in electronic forums. These matters are to be addressed through established program communication pathways.

## PRIOR LEARNING ASSESSMENT AND RECOGNITION

Students who wish to apply for prior learning assessment and recognition (PLAR) need to demonstrate competency at a post-secondary level in all of the course learning requirements outlined above. Evidence of learning achievement for PLAR candidates includes:

- 1 Portfolio
- 1 Challenge Exam
- 1 Performance Test
- 1 Project/Assignment

## RELATED INFORMATION

**The following information is course-specific:**

Required Equipment:

Safety Glasses  
Closed-toed shoes

Refer to the CSI under Course Information on Blackboard for an updated Lab and Testing Policy

Respect for Confidentiality

Students are required to respect the confidentiality of employer, client and/or patient information, interactions, and practices that occur either on AlgonquinCollege premises, or at an affiliated clinical/field/co-op placement site. Concerns regarding clients, patients, and/or employer practices are to be brought to the attention of the program coordinator, or designated field/clinical/co-op placement supervisor so that they may be resolved collaboratively. Such concerns are not to be raised publically either verbally, in writing, or in electronic forums. These matters are to be addressed through established program communication pathways.

**The following information is school/department-specific:****GENERAL CLAUSES - School of Advanced Technology**

**Harassment/Discrimination/Violence will not be tolerated.** Any form of harassment (sexual, racial, gender or disability-related), discrimination (direct or indirect), or violence, whether towards a professor or amongst students, will not be tolerated on the college premises. Action taken will start with a formal warning and proceed to the full disciplinary actions as outlined in Algonquin College Policy - HR22.

Harassment means one or a series of vexatious comment(s) or conduct related to one or more of the prohibited grounds that is known or ought reasonably to be known to be unwelcome/ unwanted, offensive, intimidating, derogatory or hostile.

This may include, but is not limited to: gestures, remarks, jokes, taunting, innuendo, display of offensive materials, offensive graffiti, threats, verbal or physical assault, academic penalties, stalking, slurs, shunning or exclusion related to the prohibited grounds.

For further information, a copy of the official policy statement can be obtained from the Student Association.

**The Use of Electronic Devices** , with the sound turned on, during classes is strictly prohibited. In particular, cell phones are not to be used to communicate during a class. The use of any electronic devices during exams and mid-term tests, other than those sanctioned by the faculty in charge of the examination, is strictly prohibited.

Anyone caught using a prohibited device will be considered to have plagiarized, and will be treated as such in accordance with College Plagiarism Policy. For further details on this directive, consult the Algonquin College Policy AA32 on the use of Electronic Devices in Class and Exams.

**The School of Advanced Technology' s Standard Operating Procedure on Plagiarism and Academic Honesty** defines plagiarism as an attempt to use or pass off as one's own idea or product, work of another without giving credit. Plagiarism has occurred in instances where a student either directly copies another person's work without acknowledgement; or, closely paraphrases the equivalent of a short paragraph or more without acknowledgement; or, borrows, without acknowledgement, any ideas in a clear and recognizable form in such a way as to present them as one's own thought, where such ideas, if they were the student's own would contribute to the merit of his or her own work.

Plagiarism is one of the most serious academic offenses a student can commit. Anyone found guilty will, on the first offense, be given a written warning and an F on the plagiarized work. If the student commits a second offense, an F will be given for the course along with a written warning. A third offense will result in suspension from the program and/or the college.

For further details on this directive, consult the Algonquin College Policy - AA20 and the School of Advanced Technology' s Standard Operating Procedure on Plagiarism and Academic Dishonesty.

**Respect for Confidentiality**

Students are required to respect the confidentiality of employer, client and/or patient information, interactions, and practices that occur either on AlgonquinCollege premises, or at an affiliated clinical/field/co-op placement site. Concerns regarding clients, patients, and/or employer practices are to be brought to the attention of the program coordinator, or designated field/clinical/co-op placement supervisor so that they may be resolved collaboratively. Such concerns are not to be raised publically either verbally, in writing, or in electronic forums. These matters are to be addressed through established program communication pathways

**Disruptive Behaviour** is any conduct, or threatened conduct, that is disruptive to the learning process or that interferes with the well-being of other members of the College community. It will not be tolerated.

Members of the College community, both students and staff, have the right to learn and work in a secure and productive environment. The College will make very effort to protect that right.

Incidents of disruptive behaviour must be reported in writing to the departmental Chair as quickly as possible. The Chair will hold hearings to review available information and determine any sanctions that will be imposed. Disciplinary hearings can result in penalties ranging from a written warning to expulsion.

For further details consult the Algonquin College Policy - SA07.

June 15, 2012

**The following information is College-wide:**

**Email**

Algonquin College provides all full-time students with an e-mail account. This is the address that will be used when the College, your professors, or your fellow students communicate important information about your program or course events. It is your responsibility to ensure that you know how to send and receive e-mail using your Algonquin account and to check it regularly.

**Centre for Students with Disabilities (CSD)**

If you are a student with a disability, it is strongly recommended that you identify your needs to the professor and the Centre for Students with Disabilities (CSD) by the end of the first month of the semester in order that any necessary support services can be arranged for you.

**Academic Integrity\* & Plagiarism\***

Adherence to acceptable standards of academic honesty is an important aspect of the learning process at Algonquin College. Academic work submitted by a student is evaluated on the assumption that the work presented by the student is his or her own, unless designated otherwise. For further details consult Algonquin College Policies AA18 <http://www2.algonquincollege.com/directives/files/2012/04/AA18.pdf> and AA20 <http://www2.algonquincollege.com/directives/files/2011/08/AA20.pdf>

**Student Course Feedback\***

It is Algonquin College's policy to give students the opportunity to complete a course assessment survey in each course that they take which solicits their views regarding the curriculum, the professor and the facilities. For further details consult Algonquin College Policy AA25 <http://www2.algonquincollege.com/directives/files/2011/10/AA25.pdf>

**Use of Electronic Devices in Class\***

With the proliferation of small, personal electronic devices used for communications and data storage, Algonquin College believes there is a need to address their use during classes and examinations. During classes, the use of such devices is disruptive and disrespectful to others. During examinations, the use of such devices may facilitate cheating. For further details consult Algonquin College Policy AA32 <http://www2.algonquincollege.com/directives/files/2011/11/AA32.pdf>

**Transfer of Credit**

Students, it is your responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.

\* College policies (previously called directives) are under review and redesign. The term *directives* is being retired. As such, the policy classification nomenclature is in transition. Students, it is your responsibility to refer to the Algonquin College Directives/Policies website for the most current information available at: (<http://www2.algonquincollege.com/directives/>)