Yavapai COLLEGE **S Y L L A B U S** *Your Course Learning Plan*	**COURSE: ELT 130: Introduction to Robotics** **INSTRUCTOR: Rick Peters** **TIME & DAY/ TIME FRAME: August 18, 2014 to December 6, 2014; class runs from 1:15 PM to 3 PM on Mondays and Wednesdays**

A. Instructor Contact & Communications

Classroom Location:	**CTEC Room 161**
YC Email Address:	**Rick.Peters@yc.edu Phone: (928) 771-6114**
Office/Campus Location:	**CTEC room 161**
Office/Lab Hours:	**3-4PM, Monday, Wednesday and Thursday; open lab on Thursdays from 11AM-7PM**
Separate Web Address: (if available)	**N/A**

B. General Course Information, Content, & Learning Outcomes

Course Purpose & Credit Hours:	Multi-disciplinary course for applied pre-engineering degree. This course covers the basics of robotics and will provide students with one of the six industry certifications they can earn in the applied pre-engineering degree. (Certification through GE FANUC; world leader in robotics).
General Education:	☐ This course is on a General Education list X This course is not on a General Education list ** S/U grading is not an option for courses applied to the Arizona General Education Curriculum (AGEC).
Course Description:	This course introduces the fundamental concepts of robotics. Topics include how robots move, sense, and interact with the world around them. Students will operate and program FANUC industrial robots in laboratory sessions.
Prerequisite/Co-requisite:	None
Course Content:	1) Robotic terms and definitions 2) Robotic design 3) Robot programming 4) Work cell design
Learning Outcomes:	Upon successful completion of this course, the learner will be able to: 1) Describe the interdisciplinary field of robotics, including sensing and movement (1). 2) Describe the parts of a robot including number of axis (2).

	3) Utilize a computer language to communicate and program a robot (3). 4) Describe widely used robotic programming structures in a variety of settings, including structures such as assignment, looping, conditional statements, and the use of variables (3). 5) Create a robotic based work cell capable of performing a simple repetitive task (4). 6) Utilize appropriate criteria to evaluate reasoning and to recognize different patterns of logic and reasoning, including faulty patterns (4)
Assessment Measures	Unit review questions Unit exams FANUC online training/quizzes FANUC HandlingTool labs FANUC Robot Operations Master Quiz FANUC certification exam Work cell design team project Final exam

Grading (credit) criteria:	Unit review questions: 11 @ 20 points each; 20 points for 70% correct; 0 points for less than 70% correct.
	 Unit exams: 12 @ 50 points possible each; percentage score equals number correct divided by total possible.
	 FANUC online units/quiz: 13 @ 20 points each; 10 points for 80% correct; 0 points for less than 80% correct.
	 FANUC labs: 16 @ 20 points each.
	 FANUC Robot Operations Master Quiz: (20 questions; you must achieve an 80% or higher to pass on to HandlingTool Operations; 50 points for 80% or higher, 0 points if below 80%).
	 FANUC certification exam: (47 questions; you must achieve an 80% or higher to be certified; 100 points for certification, 0 points if not certified)
	 Work cell design (team project): 150 points possible graded via work cell design rubric
	 Final exam: 175 points possible: percentage score equals number correct divided by total possible
	
	 Unit review questions: 220 points possible
	 Unit exams: 600 points possible
	 FANUC online training/quiz: 260 points possible
	 FANUC labs: 320 points possible
	 FANUC Robot Operations master quiz: 50 points possible
	 FANUC Mater Quiz: 100 points possible
	 Work cell design team project: 150 points possible
	 Final exam: 175 points possible (weighted as 10% of your grade)
	 Total points possible: 1,875
	 Grading: A = 1,687-1,875 points (90%)
	          B = 1,500-1,686 points (80%)
	          C = 1,312-1,499 points (70%)
	          D = 1,125-1,311 points (60%)
	          F = 1,124 or less
	 I will do my best to respond to email, voice mail within 24 hours during the week. I will return graded assignments within 7 days after the scheduled due date. If you have questions regarding an assignment, contact me prior to the due date so your question can be answered in a timely manner.)

C. Textbooks, software, supplies, equipment and/or tools	Robotics: Theory and Industrial Applications, 2nd ed; Larry Ross, Stephen Fardo; Goodheart-Willcox (2011). FANUC Training Manuals: Basic Robot Operations, HandlingTool Operations with Shapes, and Introduction to Programming, Motion Instructions and File Backup; FANUC Robotics America Corporation (2012). Safety glasses Scientific calculator

Student Resources (as applicable)

Campus Resources:	Campus Resources available through Student Services (http://www.yc.edu/v4content/student-services/default.htm).
myYC Portal:	All Yavapai College students will be required to use the *myYC* Portal to register, add, or drop classes online at http://my.yc.edu/. First-time students will create a log-on username and password. The *myYC* Portal includes: • Links to your College email • Your degree audit system – *DegreeWorks* – to track your progress • Registration information - also your schedule • View transcripts, update information, and more! For assistance with the Portal, go to http://portalinfo.yc.edu/support.asp
Student Email Accounts:	Yavapai College requires enrolled students to have an e-mail address to which official College communications can be sent called 'Scholar', accessed by clicking on the email icon in your *myYC* portal. Students are expected to check their Yavapai College Scholar account for college-related information and for class information and announcements, as directed by the instructor. For assistance, go to http://www.yc.edu/content/myyc/emailinfo.htm Students may elect to forward their e-mail to an address different from their official Yavapai College account (see instructions on website), but assume full responsibility for reading e-mail at the forwarded location.
Library Services:	Library services are available at the Prescott and Verde Valley Campuses. Both are members of a countywide library network, which provides access to a wide range of information and resources at libraries throughout Yavapai County. Both libraries also include public computer access.
Learning Centers & Tutoring:	Learning Centers are available on both the Prescott and Verde Valley Campuses. These centers provide a variety of learning support for students including tutoring, adaptive computer and learning equipment for students with disabilities, and a networked general computer lab for registered students. Please call for details: Prescott - 776-2085, or Verde Valley – 634-6562. Web link: http://www.yc.edu/v4content/learning-center/
Online resources and services:	Online writing tutoring for any academic subject is available at http://www.yc.edu/v4content/learning-center/
Open Computer Labs:	Most campuses have open computer lab hours for currently-enrolled students. Please check your campus site for availability and schedules.

Holidays & Closures:	**Monday, September 1st – Labor day (no class)** **Tuesday, November 11, 2013 – Veteran's Day (no class)** **Fall break for high schools (October 6-10) no classes** **Wednesday through Friday, November 26th – 28th – Thangsgiving Break**
<u>**Important Dates:**</u>	Instruction Begins – **August 18, 2014** Last Day to Add/Drop Regular class –**August 24, 2104** Last Day for 100% refund – **August 24, 2014** Last Day of Student-initiated Withdrawals (no refunds,15 week classes only) – **October 13, 2013** Last Day of class – **December 3, 2014**

Institutional Policies and Instructor Procedures

Attendance:	Students are expected to attend and participate in all class meetings, laboratories, and field trips. A student who expects to be absent due to another school-sponsored activity or compelling personal reason must make prior arrangements with the instructor. All course work must be made up as directed by the instructor. A student who does not adhere to instructor and College attendance requirements may be dropped from the course as defined in the Yavapai College General Catalog.
Course Withdrawal:	A student-initiated drop date is established by the College. For Fall semester 2014, this date is **Sunday, August 24, 2014.** <u>Students are responsible to drop</u> a class through the Self-Service option on the *myYC* Portal. If you have not withdrawn from a class by the student-initiated drop date, you will receive the letter grade earned in the course at the end of the semester. An instructor may withdraw students from class after the student-initiated date. If a student does not follow official procedures for withdrawing from a course, failing grades may be posted on your student permanent record.
Satisfactory (S) Unsatisfactory (U) Grades	An "S" grade is defined as equivalent to a grade of "C" or better on the conventional grading scale of A-F. A course completed with an "S" grade indicates appropriate subject area knowledge to satisfy the prerequisite requirement of a related higher-level course. Specified courses are graded only S/U. Students who prefer the S/U grading option must notify the class instructor. Conditions of Satisfactory/Unsatisfactory (S/U) grading: • Since some college and universities limit the number of credits completed with S/U grading that will transfer, or restrict the way that such credits may be applied to degree requirements, it is recommended that students preparing to transfer select the S/U grading option only for elective courses. • A maximum of twelve (12) hours of "S" credit from 100- and 200-level courses may be applied toward Yavapai College graduation requirements. • S/U grading is not an option for courses applied to the Arizona General Education Curriculum (AGEC). • S/U grades are not computed in the student's Yavapai College grade point average.

Academic Integrity:	Honesty in academic work is a central element of the learning environment. It will be assumed that you will present your own work. The presentation of another individual's work as one's own or the act of seeking unfair academic advantage through cheating, plagiarism or other dishonest means are violations of the College's Student Code of Conduct. Definitions of plagiarism, cheating, and violation of copyright and penalties for violation are available in the Yavapai College Student Code of Conduct (http://www.yc.edu/v4content/student-services/code-conduct.htm)
Student Code of Conduct:	Respect for the rights of others and for the College and its property are fundamental expectations for every student. The "Code of Conduct" outlines behavioral expectations, and explains the process for responding to allegations of student misconduct. Students are expected to respond and write in a professional and appropriate manner when activities are assigned to create scenarios, discuss opinions, present on a selected subject, or post to the web discussion board. Inappropriate language or objectionable material will not be tolerated and could result in disciplinary measures and/or a failing grade for the class. Web link for the Student Code of Conduct – http://www.yc.edu/v4content/student-services/code-conduct.htm
Internet Downloading:	Yavapai College technological equipment and resources must be used in accordance with the Copyright Guidelines. Use of Yavapai College equipment and resources to illegally copy, download, access, print or store copyrighted material or download pornographic material is strictly prohibited. For example, file swapping of copyrighted material such as music or movies is strictly prohibited. Users found to violate this policy will have their privileges to use Yavapai College technological equipment and resources revoked.
Disability Resources:	Yavapai College is committed to providing educational support services to students with documented disabilities. Accommodations for a student must be arranged by the student through the Disability Resources Coordinator (Prescott Campus: 928-776-2079 or Verde Valley Campus: 928-634-6563).

Cell Phone, Pages & Texting:	Yavapai College is committed to providing a quality learning environment. All cell phones and pagers must be placed in a non-audible mode while in classrooms, computer labs, the library, the learning center, and testing areas. Cell phones and pagers need to be used outside these facilities. **Cell phones** must be turned off in the lab**. Please turn them off and take them with you to prevent theft. Do not leave them on your desk.**
Tobacco Use:	Yavapai College is committed to limiting exposure to the harmful effects of primary and secondary smoke to campus students, visitors, and employees. If you use the facilities at Yavapai College, we comply with ASRS 36-301.01, Smoke Free AZ. Smoking is prohibited indoors and 25 feet from all doors, windows and vents. **At CTEC the smoking area is designated outside the exterior door nearest the student lounge. NO other areas are permitted for smoking.** In order to reduce the harmful effects of tobacco use and maintain a healthful working and learning environment, the district prohibits the use of tobacco except in specific areas. Tobacco use on college property is defined as lighted pipes, cigars, cigarettes, and the use of snuff and smokeless tobacco in any form.
Drug & Alcohol Free Environment:	Yavapai College's policy is to provide an environment free of drugs and alcohol. The use of illegal drugs and abuse of alcohol pose significant threats to health and can be detrimental to the physical, psychological, and social well-being of the user and the entire Yavapai College community, and is prohibited.
Additional Instructor Information & Procedures:	**LATE WORK:** Assigned work (worksheets, labs, review questions and exams) will be accepted after the due date defined in the calendar **only if prior notice is given** of an absence to the instructor **in advance of the class meeting** (via e-mail or phone). In other words, if you miss class and don't let me know about it in advance you will not be allowed to make up any work that you missed. **Note: All assignments including labs and worksheets are due the next class meeting.**
Online System & Assignment Requirements	**All course materials are available 24/7 at the course shell in Blackboard.**

COURSE CALENDAR

Date	Activity	Assessment
8/18/2014	Introduction/syllabus **Chapter 1: Introduction to Industrial Robotics** (pp. 11-19) • Evolution of industrial robots • Types of automation **For 8/20:** Read **FANUC:** LRMate Education Training Cart document in the Course materials section on blackboard. **NOTE: All assignments are due the next class after they are assigned.**	
8/20/2014	**FANUC: CERT Training** **For 8/25:** Read Chapter 2 (pp. 20-58) and answer review questions 1-11 on p. 58 (20 points for 70% correct; 0 for less the 70% correct).	**Pre-test** (not part of your grade)
8/25/2014	**Chapter 2: Fundamentals of Robotics** (pp. 20-58) • Parts of a robot • Degrees of freedom **For 8/27**: Read sections 1-5 of FANUC Basic Robot Operations	**Chapter 1 exam (50 points possible)**
8/27/2014	**FANUC: CERT Training** **For 9/3:** Read Chapter 3 (pp. 59-80) and answer review questions 1-10 on p. 80 (20 points for 70% correct; 0 for less the 70% correct).	ONLINE: FANUC Robot Operations Safety and cycle power unit (26 slides) *FANUC Basic Robot Operations labs 1 and 2: Power up and jog the robot and Set axis limits: pp. 62 & 63 (20 points possible each).*
9/1/2014	**No Class – Labor Day**	
9/3/2014	**Chapter 3: Programming the Robot** (pp. 59-80) • The evolution of programming • Motion control • Programming methods and language • Types of programming **For 9/8**: Read FANUC Basic Robot Operations section 6. Read Chapter 4 (pp. 81-113) and answer review questions 1-13 on p. 113 (20 points for 70% correct; 0 for less the 70% correct).	**Chapter 2 exam (50 points possible)** ONLINE: FANUC Robot Operations Moving a Robot in JOINT/WORLD modes (85 slides) *FANUC Basic Robot Operations lab 3: Jog the robot in World mode: p. 82 (20 points possible).*

9/8/2014	**Chapter 4: Industrial Applications** (pp. 81-13) • Integrating robots into manufacturing process • Using robots in industry **For 9/10:** Read FANUC HandlingTool Operations with shapes, sections 1-5.	**Chapter 3 exam (50 points possible)**
9/10/2014	**FANUC: CERT Training** **For 9/15:** Read Chapter 5 (pp. 115-138) and answer review questions 1-18 on p. 138 (40 points for 70% correct; 0 for less the 70% correct).	ONLINE: FANUC Robot Operations Create and change Teach Pendant programs (48 slides) *FANUC Handling Tool Operations with Shapes labs 1 & 2: Tool frame set-up (p. 17)* and *Create a User and Jog frame: (p 32) (20 points each).*
9/15/2014	**Chapter 5: Electromechanical Systems** (pp. 115-138) • Automated systems and subsystems • Mechanical and electrical systems	**Chapter 4 exam (50 points possible)**
9/17/2014	**FANUC: CERT Training** **For 9/22:** Read Chapter 6 (pp. 139-169) and answer review questions 1-12 on p. 169 (20 points for 70% correct; 0 for less the 70% correct).	ONLINE: FANUC Robot Operations Abort, access, test and run programs (14 slides) **FANUC Robot Operations Master Quiz** *(20 questions; must score an 80% or higher to pass onto HandlingTool Operations)*
9/22/2014	**Chapter 6: Fluid Power Systems** (pp. 139-169) Fluid power system models • Characteristics and principles of fluid flow • Fluid power system components • Hybrid systems **For 9/24 :**Read FANUC HandlingTool Operations with shapes, sections 6-9.	**Chapter 5 exam (50 points possible)**
9/24/2014	**FANUC: CERT Training** **For 9/29:** Read Chapter 7 (pp. 171-194) and answer review questions 1-13 on p. 194 (20 points for 70% correct; 0 for less the 70% correct).	ONLINE: FANUC Handling Tool Operations & Programming: Frames: WORLD, TOOL and USER (35 slides) *FANUC Handling Tool Operations with Shapes lab 4: Create a shape program (pp . 37-38)(20 points).*
9/29/2014	**Chapter 7: Sensors** (pp. 171-194) • Types of sensors • Sensor applications **For 10/1:** Read FANUC HandlingTool Operations with shapes, section 10.	**Chapter 6 exam (50 possible points)**

10/1/2014	**FANUC: CERT Training** **For 10/13:** Read Chapter 8 (pp. 195-209) and answer review questions 1-11 on p. 209 (20 points for 70% correct; 0 for less the 70% correct).	ONLINE: FANUC Handling Tool Operations & Programming: Input/Output (23 slides) *FANUC Handling Tool Operations with Shapes lab 11: Input/Output: pp. 102-103 (20 points possible).*
10/6/2014	**<u>Fall Break – no class</u>**	
10/8/2014	**<u>Fall break – no class</u>**	
10/13/2014	**Chapter 8: End Effectors** (pp. 195-209) • End effector movement • Types of end effectors • Changeable end effectors **For 10/15:** Read FANUC Introduction to programming, motion instructions and file backup: section 4	**Chapter 7 exam (50 points possible)**
10/15/2014	**FANUC: CERT Training** **For 10/20:** Read FANUC Introduction to programming, motion instructions and file backup section 3 and FANUC Handling Tool Operations with Shapes section 9.	ONLINE: FANUC Handling Tool Operations & Programming: Program Instructions (26 slides) *FANUC: Introduction to programming, motion instructions and file backup lab 2 (p. 50) lab 3: (p. 51) 20 points possible each).*
10/20/2014	**FANUC: CERT Training** **For 10/22:** Read Chapter 10 (pp. 241-252) and answer review questions 1-7 on p. 252 (20 points for 70% correct; 0 for less the 70% correct).	*FANUC: Introduction to programming, motion instructions and file backup lab 4 (p. 53) (20 points possible).* *FANUC Handling Tool Operations with Shapes lab 9: Register instructions, p. 63 (20 points possible).* *FANUC Handling Tool Operations with Shapes lab 10: Position register offset, p. 75 (20 points possible).*
10/22/2014	**Chapter 10: Interfacing & Vision Systems** (pp. 241-252) • Interfacing • Machine vision **For 10/27:** Review FANUC Handling Tool Operations with Shapes section 7.	**Chapter 8 exam (50 points possible)**

10/27/2014	**FANUC: CERT Training** **For 10/29:** Read Chapter 11 (pp. 253-264) and answer review questions 1-16 on p. 264 (20 points for 70% correct; 0 for less the 70% correct).	ONLINE: FANUC Handling Tool Operations & Programming: Modifying a Program (29 slides) *FANUC Handling Tool Operations with Shapes lab 5, p. 45: Select/modify and execute a program* (20 points possible).
10/29/2014	**Chapter 11: Maintaining Robotic Systems** (pp. 253-264) • Troubleshooting • General servicing techniques • Preventative maintenance **For 11/3:** Read FANUC Handling Tool Operations with Shapes section 12.	**Chapter 10 exam (50 points possible)**
11/3/2014	**FANUC: CERT Training** **For 11/5** Read Chapter 12 (pp. 265-280) and answer review questions 1-9 on p. 280 (20 points for 70% correct; 0 for less the 70% correct).	ONLINE: FANUC Handling Tool Operations & Programming: Macro Commands (10 slides) *FANUC Handling Tool Operations with Shapes 1ab 14: Macros, p. 119* (20 points possible).
11/5/2014	**Chapter 12: Robots in Modern Manufacturing (**pp. 265-280) • Evaluating potential uses for robots • Preparing an implementation plan	**Chapter 11 exam (50 points possible)**
11/10/2014	**FANUC: CERT Training** **For 11/12:** Read Chapter 13 (pp. 281-290) and answer review questions 1-8 on p. 290 (20 points for 70% correct; 0 for less the 70% correct). **For 11/17:** Read FANUC Handling Tool Operations with Shapes section 13.	ONLINE: FANUC Handling Tool Operations & Programming: Robot Setup for Production (11 slides)
11/12/2014	**CH 13: Future of Robotics** (pp. 281- 290) • Fully automated factories • Robots outside the factory • Artificial intelligence	**Chapter 12 exam (50 points possible)** *FANUC Handling Tool Operations with Shapes lab 15: Program adjust, pp. 132-133* (20 points possible).
11/17/2014	**FANUC: CERT Training**	ONLINE: FANUC Handling Tool Operations & Programming: File Management (17 slides) *FANUC: Introduction to programming, motion instructions and file backup lab 6: Program and file manipulation: p. 72* (20 points possible).

11/19/2014	**FANUC: CERT Training**	**Chapter 13 exam (50 points possible)** ONLINE: FANUC HandlingPRO (75 slides)
11/24/2014	**FANUC: CERT Training**	*Lab make-ups*
11/26/2014	<u>Thanksgiving Break – no class</u>	
12/1/2014		**FANUC Master Text (100 points possible)** *(47 questions; must achieve an 80% or higher to certify; 100 points for above 80%, 0 points for below 80%)* **Work cell team projects due (150 points possible; graded via work cell rubric)**
12/3/2014		**Final Exam (175 points possible)**

*** end of ELT 130: Introduction to Robotics syllabus ***