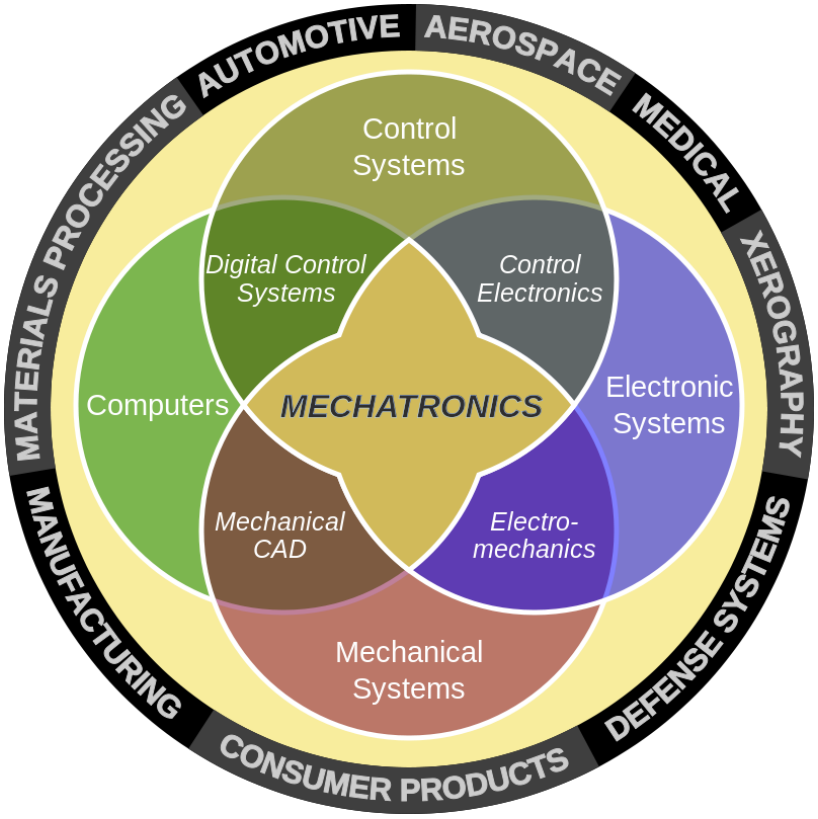
NICHOLS CAREER CENTER

Mechatronics I & II



Mechatronics Systems

A Mechatronics System integrates various technologies involving:

- **Sensors & Measurement systems,**
- **Drives & Actuation systems (Mechanical/Pneumatic/Hydraulics)**
- **Controlling system (microprocessor/microcontroller/PLC) and software engineering**

INSTRUCTOR CONTACT INFORMATION:

Matt Yeager
605 Union St.
Jefferson City, MO 65101
573-659-3108
Matthew.yeager@jcschools.us
Office hours: 7:30-3:30 M-F

GENERAL COURSE DESCRIPTION:

The focus of the Mechatronics is a multidisciplinary field of science that includes a combination of mechanical engineering, electronics, computer engineering, telecommunications engineering, systems engineering and control engineering. As technology advances, the subfields of engineering multiply and adapt. Mechatronics' aim is a design process that unifies these subfields. Originally, mechatronics just included the combination of mechanics and electronics, hence the word is a combination of mechanics and electronics; however, as technical systems have become more and more complex the definition has been broadened to include more technical areas. We also include robotics, 3D design in AutoCAD, 3D printing, Pneumatics design and control, Programmable logic controller, and much, much more. Prerequisites include Algebra I with a C or better and Computer Applications I. Opportunities in Dual Credit with State Fair Community College, Articulation agreement with State Technical College.

GOALS AND OBJECTIVES:

Goals: The primary goal of this class is to introduce the student to the Mechatronics. Mechatronics is a multidisciplinary field of science that includes a combination of mechanical engineering, electronics, computer engineering, telecommunications, systems engineering, and control engineering. As technology advances, the subfields of engineering multiply and adapt. Mechatronics' aim is a design process that unifies these subfields. Originally, mechatronics just included the combination of mechanics and electronics, therefore the word is a combination of mechanics and electronics; however as technical systems have become more and more complex the definition has been broadened to include more technical areas as seen by the emblem on the front of this syllabus. The goal of this course is that students will have a solid background in many different areas giving the student the ability to enter college or career adequately skilled.

ESSENTIAL SKILLS AQUIRED IN PROGRAM:

Fundamentals of:

1. Personal safety
2. Mechanical systems
3. Programmable Logic Controllers
4. Soldering and repair
5. A/C, D/C, Digital Electronics
6. Control systems
7. Digital Control systems
8. Computers
9. Software loading and Maintenance
10. Computer Server Maintenance
11. Wide variety of tool use
12. Telecommunications cabling
13. Car Audio
14. Alarm and Surveillance systems
15. Computer Aided Design
16. Electro-mechanical systems
17. Pneumatics
18. Leadership
19. Test Equipment
20. Troubleshooting

CURRICULUM/EQUIPMENT ENHANCEMENTS:

The Mechatronics Department has all computers and equipment required for this course. We have state of the art computers, 3D printer, and Mechatronics Lab equipment. All of this equipment is available to students during school hours and time permitting before and after school for 30 minutes.

Nichols Career Center has counselors available to aid students in career counseling, job opportunities and advanced educational opportunities. A Vocational Resource Educator is available to assist students with disabilities and/or special needs.

Dual credit is available with State Fair Community College as well as State Technical College. Offering 3 credit hrs. Per school year with a total of 6 college credit hours. Currently this dual credit is offered for free with the completion of the course.

TEXTBOOKS, RESOURCE MATERIALS, MEDIA SUPPORT:

*Electricity, Principles and Applications, 7th Edition; Fowler, 2008, McGraw-Hill; ISBN 978-0-07-310699-1
*Electronics, Principles and Applications, 6th Edition; Fowler, 2008, McGraw-Hill; ISBN 0-07-830981-6
*Digital Electronics, Principles and Applications, 6th Edition; Tokheim, 2003, McGraw-Hill; ISBN 0-07-830981-6
*LMS Learnmate Robotics online Curriculum
*Festo MecLab Training Course Materials
*Festo Pneumatic Training Course Materials

RESOURCES AVAILABLE TO STUDENTS:

All Instructional materials are available to the students on the google drive and they have links to the materials in google classroom. Each week on google classroom the daily lesson plans are provided with links directly to the materials needed for each day. All students have access to ALL materials ALL the time. The only materials students do not have remote access to, is the LearnMate Robotics server which can only be accessed on the Jefferson City Public internet Domain.

TEXT BOOKS/EQUIPMENT CARE RESPONSIBILITIES:

All Textbooks that are issued to students throughout the year are to be cared for responsibly. If while in the student's possession they are damaged the student is liable for the cost of the replacement of these items.

All equipment in the classroom including robotics equipment, electronics equipment, 3D printers, and other related items are to be used with caution. If these items are damaged by the students the cost of repair/replacement will be assumed by the student in charge of said equipment. If repeated dropping or hitting occurs to equipment the same replacement rules apply.

TECHNOLOGY EXPECTATIONS: CELL PHONES, IPADS, ETC...

All Technology will be provided by the instructor. There is no need for any other technology in the class than what is provided. Any use of personal Technology must be approved by the instructor as needed.

PROGRAM CERTIFICATION/TSA:

Electronics Technician Association EM1 D/C Basics Certification.

DRESS CODE:

Must follow Nichols Handbook and include not wearing open toed shoes, Long hair must be kept up when working with rotating tools and soldering or during test taking, no hats or hoods on in class. Safety glasses must be worn when instructor advises.

STUDENT YOUTH ORGANIZATIONS:

SkillsUSA-Please refer to student handbook.

Note: If a student receives a referral for discipline or falls below the attendance/grade average level during the term of contests they are eligible for removal from the contest.

LATE WORK POLICY:

Assignments turned in late up to two days will receive a 50%, after 2 days will receive 0%.

GRADE REPORTING:

GRADE REPORTING

Grade reports will be sent to students and parent(s)/guardian(s) of secondary students at the end of each nine week period. The following grading scale is used:

GRADE		GPA	PERCENTAGE	COMMENT
A	11.00	4.000	100-93	Excellent Work
A-	10.00	3.667	92-90	Excellent Work
B+	9.00	3.333	89-87	Superior Work
B	8.00	3.000	86-83	Superior Work
B-	7.00	2.667	82-80	Superior Work
C+	6.00	2.333	79-77	Average Work
C	5.00	2.000	76-73	Average Work
C-	4.00	1.667	72-70	Average Work
D+	3.00	1.333	69-67	Inferior Work
D	2.00	1.000	66-63	Inferior Work
D-	1.00	0.667	62-60	Inferior Work

F No Credit No Credit 59 & Below Failure

WF No Credit No Credit

IN....Incomplete work, no credit given until requirements are completed, which should occur within two weeks. Incomplete automatically becomes an “F” at the end of a semester, unless arrangements are made with the office.

W.....Withdrawn, passing work being done in a course dropped either by withdrawal from school or by permission of the director.

WF....Withdrawn failing, failing work being done at the time of withdrawal or course is dropped after the deadline for schedule changes (4 days after classes begin). A 3.00 (B) average or above must be attained in a given semester for a student to be listed on the honor roll.

GRADING CATEGORIES:

70% Summative Assessments
10% Term Final
10% Formative Assessments
10% Embedded English

ATTENDANCE/MAKE-UP POLICY:

Nichols Career Center

Regular attendance, coursework, and class participation is critical to the success of a student. As a training facility, the faculty of Nichols Career Center places a great deal of importance on daily attendance, coursework, and class participation. Many of the activities that occur within the programs offered at Nichols cannot be duplicated. To reflect the importance of regular daily attendance and class participation, the following grading procedure becomes effective on the first day of school.

- Students will be able to "make-up" the class participation grade for absences in the following manner. Within 2 school days from the absence, turn in a paper (one page per block period missed) relevant to the subject being taught on the day of the students absence.
- The paper must be legible and use correct grammar, spelling, and sentence structure.

- The cover page should include:

Name of student
Class missed and number of blocks
Date of absence

Parent/Guardian signature and daytime phone number

- A bibliography page must be included
- If the instructor deems the paper unacceptable based on the above conditions, the instructor has the discretion whether to allow the student the opportunity to revise the assignment.
- School activities are not considered an absence for the student.
- It is up to the student to seek out the instructor for make-up work. The instructor will not in any way be responsible for making sure the student is making up the work.
- The paper will be a standard size (8 ½ X 11). The type should be no larger than 12 point. The paper should be double spaced. If the paper is written by hand, each line of the page must be written on.
- As with all guidelines and procedures, there will be extenuating circumstances concerning make-up work. If the student finds themselves in this position they must have a conference with the instructor.

CLASSROOM RULES:

- No cell phones during class, unless discussed with the instructor!
- Wait at your desk until the bell rings.
- Comply with all safety rules.
- No traffic on computers to unauthorized sites.
- 2 Bathroom breaks per term.
- Food and Drinks at desks only, not in lab area.
- Raise your hand when you have a question, do not speak out of turn.
- Treat others with respect.
- Treat this environment as if it were a job, you can be fired at any time.
- Do not take tools or parts home.
- Do not go into my office.
- Do not make noise or run in hallways.
- Act like adults and do not make noise or get on cell phones during assemblies.
- During assemblies make sure you sit as a group and toward the front.
- Do not help others unless instructed.
- Treat the instructor and others with respect.

Mechatronics I Units

ESTIMATED ONE WEEK PER UNIT:

A-Safety Procedures
B-Soldering, Construction of Circuits
C-Basic Electronic Circuits and Devices
D-Test Equipment
E-Setting up the Boe-Bot Hardware and Software
F-Create a program to turn a LED on and off
G-Build and Test a push button switch circuit
H-Controlling Motion with a Servomotor
I-Using a Potentiometer to Measure rotation
J-7-Segment LED Displays
K-Using Phot-Resistors to Measure Light
L-Computer controlled Speakers
M-Amplifiers
N-Semiconductor Devices
O-Power Supplies
P-Fundamentals of building and programming the Clawbot
Q-Fundamentals of programming the Clawbot
R-Programming the Clawbot 90 Degree Turn
S- Create, analyze, and trouble-shoot a program that utilizes Line Trackers
T-Create a program that assesses the possibility of Line Trackers that go AWOL
U-Ultrasonic Range Finders
V-Ultrasonic Range Finders diverting path
W-Designing and Competing Robots
X-Construction of Circuits
Y-Designing a Chess Piece-Part A
Z1-Designing a Chess Piece-Part B
Z2-Makerware Software and Makerbot 3D Printer
Z3-Frequency Generation Equipment
Z4-Research, Development, and Build Robots
Z5-Designing and competing with robots using a mechanical collector system
Z6-Design and construct a robot that competes in a game of Tug of War
Z7-Design a robot that utilizes Mecanum Wheels
Z8-Leadership-Skills
Z9-Utilize electronic and-or robotic knowledge and skills to perform to competition specifications

Mechatronics II Units

ESTIMATED ONE WEEK PER UNIT:

2A-Safety Procedures
2B-Soldering, Construction of Circuits
2C-Digital Circuits
2D-Tower Crane
2E-Digital Logic System Components
2F-Basic Electronics Circuits and Devices
2G-Precision and Timing
2H-Logic Gates
2I-PID (Proportional-Integral-Derivative)
2J-Automatic Transmission
2K-Combination Logic Circuits
2L-Operation of Test and Measurement Equipment
2M-Flip-Flops, Counters, and Shift Registers
2N-Analyze Memory and AD, DA Converters
2O-Intro to Basic Level Pneumatics Trainer
2P-Construct, utilize, analyze, and troubleshoot Cylinders and valves
2Q-Construct, utilize, analyze, and troubleshoot Cylinders and 5-2-way valves
2R- Construct, utilize, analyze, and troubleshoot Signaling Elements, Control Elements, and Flow Control
2S- Construct, utilize, analyze, and troubleshoot logic operations, latching circuits, and combinational logic operations.
2T- Construct, utilize, analyze, and troubleshoot magnetic proximity switches, pressure sequence valves, and pressure-dependent control systems.
2U-Time Delay Valves, Oscillating Motion, and Multiple Cylinders
2V-Industrial Machines and Components
2W-Sequence of Operations, Pneumatic and Electrical Schematics
2X-Linear Actuators, Relays, Limit Switches, Cylinders
2Y-Constuction of Circuits
2Z1-Calculating Parameters, Actuation, Valves, and Circuits
2Z2-Pressure Measurement, Pressure Control Systems, Flow Control, and Latching Circuits
2Z3-SkillsUSA Competition
2Z4-Nothing but Net
2Z5-Leadership-Skills

STATEMENT OF OWNERSHIP

(To be signed by student and parent to verify that the syllabus has been read and that all policies and terms are understood by both parties. Please return this sheet to the program instructor.)

We have received a copy of the Nichols Career Center Mechatronics Syllabus. We have read and understand the rules and policies of the Nichols Career Center Mechatronics Syllabus. We also understand that this syllabus is not all inclusive and new policies may be developed at any time.

NCC Career Program: _____

Student Name (please print) _____

Student Signature _____

Parent/Guardian Name (please print) _____

Parent/Guardian Signature _____

Date: _____

Please sign and return to your Nichols Career Center program instructor. Due to safety and liability issues, failure to return a signed sheet could result in denial of program participation.