# SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

## SAULT STE. MARIE, ONTARIO

## SAULT COLLEGE

### COURSE OUTLINE

| | |
|---|---|
| **COURSE TITLE:** | Data Com 2 (Industrial Networking) |
| **CODE NO. :** | ELR 325    SEMESTER:    FIVE |
| **PROGRAM:** | Electrical Engineering Technology – Process Automation |
| **AUTHOR:** | Ron Chartrand |
| **DATE:** | September 2016   **PREVIOUS OUTLINE DATED:**   September 2015 |
| **APPROVED:** | June/16 |
| | **CHAIR**                                          **DATE** |
| **TOTAL CREDITS:** | SEVEN |
| **PREREQUISITE(S):** | ELR223 and  ELR251 |
| **CO-REQUISITE(S):** | ELR320 |
| **HOURS/WEEK:** | 4 hours per week |

Industrial Networking  Data Com 2                                                    ELR325

**I.     COURSE DESCRIPTION:**

The Fundamentals of Industrial Networks as presented in this course is for those who need a basic working knowledge and an overview of today's data communications industrial networking systems and device control networking technologies. Data communications is commonly used in the world of Industrial Automation Control. Whether it is transmission of manufacturing control information from a central computer to automated machines or processes or the selection of a data and collection of information. Data communications has become an integral part of Industries daily activities.

The objective of this course is to outline the best practice in designing, installing, commissioning and troubleshooting industrial Networks. In any given plant, factory or installation, there are a number of different industrial networks and communications standards use and the key to successful implementation is the degree to which the entire system integrates and works together. With so many different standards on the market today, the debate is not about what is best, be it, Foundation Fieldbus, Profibus, DeviceNet< or Industrial Ethernet, but rather about selecting the most appropriate technologies and standards for a given application and then ensuring that the best practice is followed in designing, installing and commissioning the data communications links to ensure they run fault-free.

The industrial networking communications system in a plant has become the foundation of the entire operation. It is critical that the best practice be used in designing, installing, and fixing any problem that may occur. The important point to make is that with today's wide range of protocols available to an industry, the student will develop an understanding of how to select, install and maintain industrial network protocols in the most cost-effective manner for an industrial plant environment and therefore this course will concentrate on a systems approach.

This course will focus on introducing common Allen Bradley automation networks such as Data Hwy. Ethernet I/P ControlNet, Devicenet and other commonly used industrial networks such as Profibus, Modbus, and other industrial EtherNet etc.as time permits.

## II.    LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1.    ***Understand various Basic Terminology, Concepts of a Computer Network and related networking certifications.***

   **Potential Elements of the Performance:**

- List the advantages of  industrial networked computing relative to islands of automation

- Identify the elements of an industrial network

- Explain Basic Industrial Network Terminology and Concepts

- Describe several specific uses for Industrial networks

- Identify some of the certifications available to industrial networking professionals

- Identify the kinds of non-technical, or "soft," skills that will help you succeed as an industrial networking professional

- Identify  and Distinguish between different  Data communications standards such as,  RS-232 interface standard, RS-485 interface standard

- Understand the importance of the ISO OSI model and how it applies to the Industrial Networks discussed in this course

2. ***Understand the  characteristics of Peer to Peer,sever based networks and the OSI model***

**Potential Elements of the Performance:**

- Understand the basics of Industrial EtherNet

- State the application advantages and limitations of Industrial Ethernet in today's modern industries

- Understand the role of TCP/IP and its associate protocols have in the Industrial Ethernet plant application

- Describe how industrial Ethernet systems operate

- Compare wired to wireless industrial networking

- List the Advantages and Disadvantages of Wireless technology

- List and Describe Communication medias used in Industrial Networking systems discussed in this course

- Identify Industrial Ethernet Network cable types and uses

- Identify Industrial Ethernet Network  troubleshooting

- Describe the terms Electrical Coupling Grounding and Shielding as they applies to Industrial

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*3.*     ***Analyze OSI Model commutation and addressing***

      <u>**Potential Elements of the Performance**</u>**:**

- Understand and Identify ControlNet Applications and place in in a typical plant **Hierarchy**

- Identify Frame Format and Network Characteristics

- Understand ControlNet Configuration and Network Components

- Explain ControlNet Addressing  and Topology

- Discuss Installation ,commissioning and troubleshooting

- Identify the Types & Media characteristics

- Identify the core protocols of each protocol suite and its functions

*4.*     ***Analyze the operation of various types Network transport systems.***

      <u>**Potential Elements of the Performance**</u>**:**

- Understand and Identify Devicenet Applications and place in in a typical plant Hierarchy

- Identify Frame Format and Network Characteristics

- Understand Devicenet Configuration and Network Components

- Explain Devicenet Addressing  and Topology

- Discuss Installation ,commissioning and troubleshooting

- Identify the Types & Media characteristics

5.    *Analyze the operation of various types Network components.*

   **Potential Elements of the Performance:**

   - Understand and Identify different types of Profibus networks and their Applications and place in in a typical plant Hierarchy

   - Identify Frame Format and Network Characteristics

   - Understand Profibus networks Configuration and Network Components

   - Explain Profibus Networks Addressing  and Topology

   - Discuss Installation ,commissioning and troubleshooting

   - Identify the Types & Media characteristics

6.    *Understand the basics of common Industrial Networks.*

   **Potential Elements of the Performance:**

   - Identify different Industrial Networks such as Modbus, ASI, and Hart etc.

   - Identify basic Industrial Networks addressing methods

   - Understanding the differences between industrial network types

   - Discuss Installation ,commissioning and troubleshooting

   - Identify the Types & Media characteristics

   - Demonstrate the ability to communicate peer to peer information from two or more industrial computerized lab equipment over several AB  industrial networks such as Ethernet I/P, ControlNet, Devicenet, Data Hwy. etc

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**III.    TOPICS:**

  1.    Induction to Industrial Networks
  2.    Overview of Serial Communication Standards and the OSI Model
  3.    Overview of Industrial Ethernet
  4.    Overview of Ethernet IP Installation, Commissioning, and
        Troubleshooting
  5.    Overview of ControlNet
  6.    Overview of ControlNet Installation, Commissioning, and
        Troubleshooting
  7     Overview of Devicenet.
  8     Overview of Devicenet Installation, Commissioning, and
        Troubleshooting
  9     Introduction to Profibus, Modbus, Hart  Fieldbus, ASI., and others


**IV.    REQUIRED RESOURCES/TEXTS/MATERIALS:**
        To be announced
        AB and other Company  manuals and documentation information on the
        internet

## V.     EVALUATION PROCESS/GRADING SYSTEM:

| | | |
|---|---|---|
| **Test 1** | **10 marks** | **10% overall** |
| **Test 2** | **20 marks** | **20% overall** |
| **Test 3** | **25 marks** | **25% overall** |
| **Assigned** | **0 marks** | **0% overall** |
| from Text or /and handouts | | |
| **Lab Demonstration** | **15 marks** | **15% overall** |
| **Lab Write-ups** | **15marks** | **15% overall** |
| **Class Participation/attendance 15 marks** | | **10% overall** |
| | **Total 100 marks** | **100 %** |

The following semester grades will be assigned to students:

| Grade | Definition | Grade Point Equivalent |
|---|---|---|
| A+ | 90 – 100% | 4.00 |
| A | 80 – 89% | |
| B | 70 - 79% | 3.00 |
| C | 60 - 69% | 2.00 |
| D | 50 – 59% | 1.00 |
| F (Fail) | 49% and below | 0.00 |

| | |
|---|---|
| CR (Credit) | Credit for diploma requirements has been awarded. |
| S | Satisfactory achievement in field /clinical placement or non-graded subject area. |
| U | Unsatisfactory achievement in field/clinical placement or non-graded subject area. |
| X | A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. |
| NR | Grade not reported to Registrar's office. |
| W | Student has withdrawn from the course without academic penalty. |

If a faculty member determines that a student is at risk of not being academically successful, the faculty member may confidentially provide that student's name to Student Services in an effort to help with the student's success. Students wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member

## VI.    SPECIAL NOTES:

**<u>Attendance:</u>**
Sault College is committed to student success.  There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

It is the departmental policy that once the classroom door has been closed, the learning process has begun.  Late arrivers will not be granted admission to the room.

## VII.    COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located in D2L and on the portal form part of this course outline.

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## COURSE OUTLINE ADDENDUM

1.   Course Outline Amendments:
     The faculty member reserves the right to change the information contained in this course
     outline depending on the needs of the learner and the availability of resources.

2.   Retention of Course Outlines:
     It is the responsibility of the student to retain all course outlines for possible future use in
     acquiring advanced standing at other postsecondary institutions.

3.   Prior Learning Assessment:
     Students who wish to apply for advance credit transfer (advanced standing) should
     obtain an Application for Advance Credit from the program coordinator (or the course
     coordinator regarding a general education transfer request) or academic assistant.
     Students will be required to provide an unofficial transcript and course outline related to
     the course in question.  Please refer to the Student Key Dates Calendar for the deadline date
     by which application must be made for advance standing.

     Credit for prior learning will also be given upon successful completion of a challenge
     exam or portfolio. Student Services can provide information regarding the Prior Learning
     Assessment and Recognition policy or it can be viewed on the student portal.

     Substitute course information is available in the Registrar's office.

4.   Student Portal:
     The Sault College portal allows you to view all your student information in one place.
     **my.saultcollege.ca** gives you personalized access to online resources seven days a
     week from your home or school computer.  Single log-in access allows you to see your
     personal and financial information, timetable, grades, records of achievement, unofficial
     transcript, and outstanding obligations, in addition to announcements, news, academic
     calendar of events, class cancellations, your learning management system (LMS), and
     much more.  Go to https://my.saultcollege.ca.

5.   Communication:
     The College considers *Desire2Learn (D2L)* as the primary channel of communication for
     each course.  Regularly checking this software platform is critical as it will keep you
     directly connected with faculty and current course information.  Success in this course
     may be directly related to your willingness to take advantage of this Learning
     Management System (LMS) communication tool.

6.    Accessibility Services:
      If you are a student with a disability (e.g. physical limitations, visual impairments, hearing
      impairments, or learning disabilities), you are encouraged to discuss required
      accommodations with the Accessibility Services office.  Call Ext. 2703 or email
      studentsupport@saultcollege.ca so that support services can be arranged for you.

7.    Audio and Video Recording Devices in the Classroom:
      Students who wish to use electronic devices in the classroom will seek permission of the
      faculty member before proceeding to record instruction. Students with disabilities who
      require audio or visual recording devices in the classroom as an accommodation will receive
      approval from their counsellor once the Audio and Video Recording Devices in the Classroom
      Policy has been reviewed by the student. Recorded classroom instruction will be used only for
      individual academic use and will not be used for any other purpose. Recordings may only be
      used for individual study of materials presented during class and may not be published or
      distributed.  Intentional misuse of audio and video recordings or intentional
      misrepresentation when requesting the use of a device for recording shall constitute a
      violation of this policy and laws protecting intellectual property.

8.    Academic Dishonesty:
      Students should refer to the definition of "academic dishonesty" in the *Student Code of
      Conduct*.  Students who engage in academic dishonesty will be issued a sanction under
      the Student Code of Conduct which could lead to and include expulsion from the
      course/program. In order to protect students from inadvertent plagiarism, to protect the
      copyright of the material referenced, and to credit the author of the material, students
      must use a documentation format for referencing source material.

9.    Tuition Default:
      Students who have defaulted on the payment of tuition) as of the first week of November
      (fall semester courses), first week of March (winter semester courses) or first week of
      June (summer semester courses) will be removed from placement and clinical activities
      due to liability issues. This may result in loss of mandatory hours or incomplete course
      work.  Sault College will not be responsible for incomplete hours or outcomes that are
      not achieved or any other academic requirement not met as of the result of tuition
      default. Students are encouraged to communicate with Financial Services with regard to
      the status of their tuition prior to this deadline to ensure that their financial status does
      not interfere with academic progress.

## Course outline important points:

In order to maintain a passing grade the student must obtain a **minimum 50% average in all subject sections listed here**, such as, **the theory Tests section, Practical Tests section, & Lab Write-ups.**
**ALL Labs must be 100% completed and demonstrated** to the satisfaction of the Instructor in order to maintain a passing grade in this section. Failure to demonstrate the completed and safely functioning Labs of any of the listed labs in this section of the course will result in a final grade of F for this course.

If a student misses a test he/she must have a valid reason (e.g. medical or family emergency). A Doctors Slip may be requested by the instructor it a test or deadline is missed due to a medical emergency. In addition, the school must be notified before the scheduled test sitting.

The student should contact the instructor involved. If the instructor cannot be reached leave a message with the Dean's office or the College switchboard. If this procedure is not followed the student will receive a mark of zero on the test with no rewrite option.

The Instructor, if time permits, will summarize the main points of this course outline in the first Lecture. Student's questions related to the course outline will be addressed at that time. The Instructor throughout the course may also expand on particular items related to the course outline and the course requirements.

It is the responsibility of the student to read the course outlines and be aware of the course requirements.

## Sault College email account:

Students are expected to maintain an active Sault College email account. They are further required to check this email account daily. The instructor may announce details of lab and test requirements and scheduling through the Sault College email system (as well as sharing other important information).

# General Information:

### Classroom Etiquette:

Pagers and cell phones should be either turned off or set to vibrate mode during class. Please show courtesy to the class by restricting conversation to in-class topics, and raise your hand to gain attention when asking a question or raising a point of discussion.

### Class Room Safety:

Safety is the most important aspect in this course and any compromise in student safety by any other student will not be tolerated. Students that observe any unsafe lab condition and/or act must report it to the instructor immediately. Student safety in the Labs is the number one priority. Students are not to work any on energized equipment without first informing the instructor. The Student is not to work on any live equipment that they are not familiar with or have not been instructed in the safety procedures and operation of that particular equipment.

### Turning in Work :

Be sure to include your name and the course name and section on all work to be turned in.

### Late Coursework :

All assignments are to be turned in on the due date. Students may be allowed to make up any late work at the instructor's discretion.

### Term tests/quizzes

With the expectation that the student will attend all classes, there will be no make up tests for missed tests.  There will be no rewrites for low-test scores.

### Attendance

Students' attendance and participation are required in all activities.  If a student is absent from class, it is her/his responsibility to find out what was missed prior to the next class and complete any assigned work **before** the next class.  Absence does not constitute a reason for missed work or late assignments.

# Cell phones/PDAs etc.

Use of cell phones/PDAs for any form of communication (voice, text…) during class or lab time is strictly prohibited. Cell phones/PDAs must be silenced during regular class and lab times and *must be turned off and kept out of sight during test sittings. Failure to follow the latter requirement during a test sitting will result in a grade of 0 being assigned.*

Students may not wear earphones of any kind (i.e. for play back of recorded music/voice) during lab activities or test sittings. This does not include hearing aids required for hearing impaired.

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## ADDITIONAL:

Since all work must be performed on a special network server located at the college, there will be little opportunity to work on the projects at home. The reading, review questions, and planning must be done outside of class time.

All student assignment materials that are not picked up by the student will be held for a maximum of two weeks after grading. After this time materials may be discarded or used at the professor's discretion.  Attendance may be monitored.  Regular absentia may be reported to OSAP at the college's discretion.

### POLICIES AND EXPECTATIONS FOR LEARNING ENVIRONMENT:

## Assignments:

 Any Chapter review questions (written in a Text) are designed to help the student review and consolidate the theory presented in each of the chapters.  The chapters in an assigned text, computer programs demos, computer text files and the hand out material that the instructor may provide to the student, are designed as walk-through learning tools and must be read for understanding **before the class topic lecture**. The hands-on projects are designed to allow the student to apply and practice the concepts introduced in ELR 325 while providing an opportunity to reinforce skills learned previously.

All assignments including Student Assignments, Lab Exercises, and Lab demonstrations are due on or before the due date specified in class. Assignments handed in on the due date must be in the instructor's hands **before** the specified time.  **Late assignments will not be graded or checked.**  Students **must** complete all assignment in the required time, no extensions will be permitted, therefore, the due date will be strictly enforced to provide time for the instructor to mark the lab write-up material and return it to the student.   No photocopies or mass produced documents will be accepted.

## Homework Policy:

Homework includes all written Lab work, assignments, assigned questions, and any other work that the instructor may assign through out the duration of the course.

All homework should have either a cover sheet or a header with the course number and name, the assignment number, the due date, and the submitter clearly written.

All homework is to be turned in at the start of class. They are to be legible and neat, with all relevant work shown.

While you are encouraged to discuss this class and problem-solving methods with each other, you are not to share your actual homework papers with one another.

## <u>Additional Requirements Assignments:</u>
## Homework/ Assignment Requirements/Policy

- ✓ All homework/assignments should have either a cover sheet or a header with the course number and name, the assignment number, the due date, and the submitter clearly written.
- ✓ All homework/assignments are to be turned in at the start of class. They are to be legible and neat, with all relevant work shown.
- ✓ While you are encouraged to discuss this class and problem-solving methods with each other, you are not to share your actual homework papers with one another.
- ✓ They must be typed in word and any diagram will be done in AutoCAD.
- ✓ When they are turned in, they will be in a hard copy.
- ✓ Any material or equipment required for the completion of these projects is the responsibility of the student. The student must obtain the necessary equipment/manuals and or supplies to complete the projects. The instructor will advise students were they may obtain necessary equipment/manuals e.g. internet for manuals and info.

Demonstration requirements of Lab Projects will be outlined in class and in a student handout located online that the student can download.

Write-Up requirements of Lab Projects will be outlined in class and in a student handout located online that the student can download.

# All projects/ assignments/homework must be submitted by the deadline outlined in the course weekly schedule.

## Lab Write-ups Requirements:

Lab requires write-ups and demonstration as outlined below.

1) All lab assignments must be turned in on hard copy and in digital format before or no later than the last lab class of the semester. The media will contain all program drawings, word-processor write-ups HMI files and PLC programs files
2) Labs that require tables shall be done in a spreadsheet or a word processor the can produce a table.
3) Each lab may have specific requirements which the instructor will inform the students during the lab period. These requirements may include changes to the equipment, procedure, write-ups, demonstrations or any other requirement that the instructor deem as necessary. So all students must attend the labs to obtain any of the specific requirements. These will only be given out on the day of the particular lab is scheduled
4) If the student is not clear on any of the lab requirements, it is his/her's responsibility to ask the instructor for clarification
5) **READ and follow** Demonstration and Write-up guideline sheets. Instructor will hand out these sheets in the first lab class

# See Instructor for ELR325 Write-up Guidelines
# See Instructor for ELR325 Demonstration Guidelines

**NOTE:**

Each student must demonstrate the lab to the instructor and turn in a write-up as outline. The student must obtain a passing mark (grade) in each area of the course sections as described below.

- Written Tests, and Practical test student must obtain 50%
- Write-up, student must obtain 50% and turn in a write-up for all  compulsory labs to obtain a grade in this portion of the course
- Demonstration, student must obtain 50% marks and the student must have demonstrated all compulsory labs, to obtain a grade in this portion of the course. Each student must demonstrate the assigned projects.

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# REMEMBER:

Read all Projects completely and any additional material that is included or handed out by the instructor that pertains to the labs. The student is responsible to make sure that he / she have read all martial pertaining to a lab before starting the lab.

**ALL students** must **demonstrate all labs** to the instructor and have the instructor sign your sheet that each lab was completed successfully. The sheet will be given to you by the instructor during the first lab period.

**Note:** the sheet discussed above must be turned in with the lab write ups during the last lab class of the semester with all labs signed on the sheet and demonstrated to the instructor**.** If the sheet is not with the lab write-ups, the write-ups will not be accepted for marking until the student re-demonstrates selected labs which the instructor will select as proof that the student has successfully completed the practical parts of the labs. The student will have to make arrangements with the instructor for a time to demonstrate his/her practical skill. If the student is successful in the practical demonstration his/her labs will be evacuated as if the student had turned in their signed sheet.

## YOU ARE RESPONSIBLE FOR YOUR LAB SIGNOFF SHEET! NO EXCUSES WILL BE ACCEPTED

You must pass all sections of the course, theory, the demonstration part of the course and the write up portion of the course to obtain a passing grade in this course. If the student passes all sections the final mark will be the mark as state for each section added together for the final mark. That is the theory mark, and demonstration marks will be added with the write up marks to arrive at a final student average for this course. If the student fails any one section of this course he/she will receive an F grade (failing grade).

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## STUDENT   COURSE   AGREEMENT

**I, _____ student ID # _____**

(Please print)

**with regards to the course known as Networking (ELR 325), have read and understand the course content, outline and expectations which clearly state the following:**

1-    Absolutely no make up tests or exams will be administered with the exceptions of personal illness or death of an immediate family member both requiring written verification.

2-    All Assignments / labs must be complete and handed in by the due date or a grade of 0 will be awarded. All Labs assigned must be completed by the last lab class and signed off by the instructor to or the student will receive an F grade for the lab portion of this course.

3-    Attendance for all class activities is compulsory. Any lecture notes, lab assignments etc. missed will become the student's responsibility to retrieve from another student.

4-    Quizzes can be presented at anytime without prior notification.

5-    Students must be able to demonstrate labs that are assigned by the instructor after the due date if requested by the instructor. Each student must be sure that he / she can duplicate the lab that they turned in. If the student cannot duplicate the lab to the satisfaction of the instructor, a grade of 0% will be assessed to that particular lab. Demonstration request will be at the discretion of the instructor.

6-    **In order to maintain a passing grade the student must obtain a   minimum 50% average in ALL subject sections that the course may have, such as, the theory Tests section, / Lab section etc.**

7-    **If the student is not clear with any requirement state in the course outline, or in additional handouts, or stated by the instructor during class room activities, it is the responsibility of the student to see the instructor immediately or as soon as possible during the class.**

8-    Most important you understand all safety requirements that are required of you to function safely at all times in the automation networking labs, B1050. These requirements were explained to you by the instructor as outlined below in Lab 0 during your first Lab class.

Print Name _____

_____
(Signature)                                              (Date)

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## Student Lab Evaluation Sheet ELR325

Student's Name_____ Mark _____

**NOTE**: Each student must turn in his/her own sheet with each lab demonstration verified by the instructor signature. If the student does not turn the sheet with all labs signed by the instructor the write-up will not be accepted and the student will be assessed a mark of 0% resulting in an overall F (fail) grade for ELR325.

| Lab # | Description    NOTE: All labs are compulsory unless state other wise | Demo Mark | Instructor's Signature | Write-up Mark |
|---|---|---|---|---|
| 0 | ***Safety in the labs and related equipment.*** | No mark | | No mark |
| **1A** | **Demonstrate** the use of and Map out B1050 Ethernet IP Network using RSNetworx for Ethernet-IP | 5% | | 5% |
| **1B** | **Install And Set Up Ethernet IP** Communication Nic Card In The AB 5000 Also Test and Verify Using RSLinx& RSNetworx Software. | 10% | | 10% |
| **1C** | **Peer To Peer Communication** Using Message Blocks For AB 5000 To 5000 Ethernet IP | 10% | | 5% |
| **2A** | **Install And Set Up DH**+ Communication NIC Card In The AB 5000 Also Test Using RSLinx Software | 5% | | 5% |
| **2B** | **Peer To Peer Communication** Using Message Blocks For AB 5 To 5 Dh+ | 5% | | 5% |
| **2C** | **Peer To Peer Communication** Using Message Blocks For AB 5 To 500 Dh+ | 5% | | 5% |
| **2D** | **Peer To Peer Communication** Using Message Blocks For AB 5 To 5000 Dh+ | 5% | | 5% |
| **3A** | **Master/Slave Communications** Plc-5 Scanner To Plc. 5 Adapter Communications Using Block Transfers With Simple Start / Stop  Send & Receive 1 word | 10% | | 10% |
| **4A** | **Demonstrate** the use of and Map out B1050 ControlNet Network using RSNetworx for ControlNet | 10% | | 10% |
| **4B** | **Install And Set Up ControlNet** Communication Nic Card In The  AB 5000 Also Test Using RSLinx & RSNetworx Software | 10% | | 10% |
| **4C** | **Peer To Peer Communication** Using Message Blocks For AB 5000 To 5000 ControlNet | 10% | | 10% |
| **5A** | **Demonstrate** the use of and Map out B1050 DeviceNet Network using RSNetworx for DeviceNet | 10% | | 10% |
| **5B** | **Install And Set Up DeviceNet** Communication Nic  Card In The  AB 5000 Also Test Using **R**SLinx Software | 5% | | 10% |
| **6A** | Ab-5 Scanner To Slc. 504 Remote Plc.  Extra or Instructor    Assign Project with ABB robots | 5% bonus | | 5% bonus |
| | | 100% | | 100% |

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# <u>Assignments:</u>

## Homework/ Assignment Requirements/Policy

- ✓ All homework/assignments should have either a cover sheet or a header with the course number and name, the assignment number, the due date, and the submitter clearly written.

- ✓ All homework/assignments are to be turned in at the start of class. They are to be legible and neat, with all relevant work shown.

- ✓ While you are encouraged to discuss this class and problem-solving methods with each other, you are not to share your actual homework papers with one another.

- ✓ They must be typed in word and any diagram will be done in AutoCAD.

- ✓ When they are turned in, they will be in a hard copy.

- ✓ Any material or equipment required for the completion of these projects is the responsibility of the student. The student must obtain the necessary equipment/manuals and or supplies to complete the projects. The instructor will advise students were they may obtain necessary equipment/manuals e.g. internet for manuals and info.

Demonstration requirements of Lab Projects will be outlined in class and in a student handout located online that the student can download.

Write-Up requirements of Lab Projects will be outlined in class and in a student handout located online that the student can download.

# <u>All projects/ assignments/homework must be submitted by the deadline outlined in the course weekly schedule.</u>