# DEPARTMENT OF SCIENCE

## COURSE OUTLINE – WINTER 2012

## CS3120 – EXPERIMETNAL MOBILE ROBOTICS – 3 (3-0-3) 90 HOURS


**INSTRUCTOR:** Libero Ficocelli **PHONE:** 780 539 - 2825
**OFFICE:** C424 **E-MAIL:** LFicocelli@gprc.ab.ca


**OFFICE HOURS:** TBA

**PREREQUISITE(S)/COREQUISITE:** CS2290 or Permission of the instructor

**REQUIRED TEXT/RESOURCE MATERIALS:**

| | |
|---|---|
| The Robotics Primer | Robotics Explorations |
| Maja J Mataric | Fred Martin |
| MIT Press | Prentice Hall |
| (required) | (will be provided) |

**CALENDAR DESCRIPTION:**

This is a primarily a project-based course dealing with the design and implementation of behaviour-based robots to accomplish specific tasks. Students work in groups and are introduced to concepts in sensor technologies, sensor data processing, motion control, embedded system design, real-time programming and behaviour arbitration.

**CREDIT/CONTACT HOURS:** 3 (3-0-3) 90 Hours

**DELIVERY MODE(S):** In class lecture

**OBJECTIVES (OPTIONAL):**

**TRANSFERABILITY:** University of Alberta, University of Calgary, University of Lethbridge, Athabasca University

**GRADING CRITERIA:**

**** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability**

| GRANDE PRAIRIE REGIONAL COLLEGE | | | |
|---|---|---|---|
| **GRADING CONVERSION CHART** | | | |
| **Alpha Grade** | **4-point Equivalent** | **Percentage Guidelines** | **Designation** |
| **$A^+$** | **4.0** | **90 – 100** | **EXCELLENT** |
| **A** | **4.0** | **85 – 89** | |
| **$A^-$** | **3.7** | **80 – 84** | **FIRST CLASS STANDING** |
| **$B^+$** | **3.3** | **77 – 79** | |
| **B** | **3.0** | **73 – 76** | **GOOD** |
| **$B^-$** | **2.7** | **70 – 72** | |
| **$C^+$** | **2.3** | **67 – 69** | **SATISFACTORY** |
| **C** | **2.0** | **63 – 66** | |
| **$C^-$** | **1.7** | **60 – 62** | |
| **$D^+$** | **1.3** | **55 – 59** | **MINIMAL PASS** |
| **D** | **1.0** | **50 – 54** | |
| **F** | **0.0** | **0 – 49** | **FAIL** |
| **WF** | **0.0** | **0** | **FAIL, withdrawal after the deadline** |

**EVALUATIONS:**

35 % -- Lab Assignments/Mini-projects
18 % -- Final Project
7 % -- Final report
10 % -- Log book (may include oral presentations)
30 % -- Term Exam – near the end of semester

## STUDENT RESPONSIBILITIES:

CLASS and LAB attendance is **mandatory**. You must clear all absences with me; failure to comply will result in a failing grade for the course!

## STATEMENT ON PLAGIARISM AND CHEATING:

Refer to the Student Conduct section of the College Admission Guide at http://www.gprc.ab.ca/programs/calendar/ or the College Policy on Student Misconduct: Plagiarism and Cheating at www.gprc.ab.ca/about/administration/policies/**

**Note: all Academic and Administrative policies are available on the same page.

## COURSE SCHEDULE/TENTATIVE TIMELINE:

The course will provide students an opportunity to integrate knowledge of software and hardware design in the context of building an autonomous LEGO robot(s). Students will become extremely familiar with the difficulties of designing hardware and software which must work in the **real world**. Students will learn the basics of robot design techniques, terminology and concepts in the construction of working robotic systems.

Each student participates in a team of 2 students (special case group size of 1 or 3, if we have odd numbers) who will work together to assemble hardware, instrument sensors, write control software, and test their designs. The robot(s) will be constructed from off-the-shelf components: LEGO parts, assorted sensors (light, bumper, infrared), motors, and controlled by the *Handy board*. The Handy board is special purpose robotics board designed by Fred Martin at MIT, it houses a Motorola 68HC11A microprocessor, 32K RAM, a 2 line LCD screen as well as input and output circuitry. Robot control software will be written using Interactive C, a special purpose interactive programming language. We will also be making use of the Arduino controller board supported by the ADE (Arduino Development Environment).

For each lab assignment, robot performance will be tested using a variety of predetermined tasks and behaviors (line/wall following, obstacle avoidance, etc). Some of the labs will be graded based on performance relative to other robots in the class (competition based).

This course is inspired and modeled (roughly) after an MIT computer science/engineering course called 6.270 (LEGO Robot Design Competition).