

School of Engineering, Computer Science and Mathematics

# Syllabus

## CS 3387 Artificial Intelligence

## Dusan Ramljak

## Fall 2019

RevisedSep 4, 2019at06:10

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### *Contact Information and Office Hours –*

**Instructor**: Dusan Ramljak

**Email/Messaging**: originate from within WTClass

**Office**: Engineering and Computer Science TBD

**Office Phone**: (806) 651-5248

**School of ECSM Phone:** (806) 651-5257 or 651-5258

**Office Hours**: Mondays 10am – 12 noon

**Grader:** TBA

**Course Supplemental Instructor** TBA

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### *Texts and Other Materials –*

**Required Texts:**

***Artificial Intelligence, Third Edition*** by Russell **ISBN-13** 978-0-13-604259-4. – You should already have this book.

**Other Required Materials:**

* **High speed internet access**. This is provided for you if you work in the ECS 142 lab using the computers provided to support your work. If working on your own computer, you definitely will need high speed access to the Internet. All assignments, etc. will be posted on WTClass. You will be completing some assignments via remote SSH access. High speed access is defined as a speed of 25 Mbps or greater.
* **Oracle’s VirtualBox**. Download version 6.0 (or later version) for free from [https://www.virtualbox.org](https://www.virtualbox.org/). Be sure to download and install the version for your computer’s operating system and be sure to also download and **install the extension pack**. This software is available for Linux, MAC, and Windows.
* **A single (for all CS courses) 64 Gbyte (or bigger) USB 3.0 flash drive or external hard drive**. Don't fall for the Generation 3 trap. Ensure that it really is USB 3.0 or 3.1 This flash drive will be used to hold a copy of a pre-configured Ubuntu Linux VM (virtual machine) that will be provided to all students as an appliance that can be imported using Oracle’s VirtualBox Manager. This will be used for all CS courses. The flash drive should be formatted using Windows. The file system format should be the Windows NTFS file system in order to be able to hold files larger than 4 Gbyte. NOTE: Kingston HyperX is one of the best performing and most reliable flash drives available. Please check out <https://www.amazon.com/Kingston-HyperX-Savage128GB-HXS3-128GB/dp/B017TZBE7Q/refh=sr_1_11?ie=UTF8&qid=1515183131&sr=8-11&keywords=Kingston%2BHyperX&th=1>
* For those who wish to work on programming assignments on their own computers, the computer should be no more than three years old with at least two cores with at least 60 Gbyte free disk space and should be running Windows 10 or later, MAC OS/X El Capitan or later, or a Linux distribution – ( Ubuntu 16.04 LTS recommended). NOTE that the CS program is heavily committed to use of Linux.
* Three ring binder to hold your notes and revised notes.

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### *Course Description and Purpose –*

The course assumes students have completed the data structures and algorithms course CS 3305. As such, it is assumed that students have developed significant skills at algorithmic thinking and skills in implementation of algorithms in Python and Java. It is assumed that students have some experience in C and C++.

Course is supposed to introduce students to the fundamental concepts and techniques of artificial intelligence.

In particular we will cover basic concepts and methods of artificial intelligence; Heuristic search procedures for general graphs; game playing strategies; resolution and rule based deduction systems; knowledge representation; reasoning with uncertainty.

The course is a broad survey that will require a significant amount of reading with hands-on exploration of existing AI programs and languages- including Python, PROLOG and Lisp. It will provide an understanding of the state of the practice of AI and set the foundation for further study in agency, machine learning, data science, neural networks, robotics, uncertainty, and computer vision.

By the end of the semester, the student should have a firm foundation in the organization and practical implementation of software for artificial intelligence:

• Have an understanding of the breadth of AI

• Apply the basic techniques for creating intelligent programs

• Apply the right programming language or technique to the right problem

• Be able to evaluate a proposed AI application for likelihood of success

• Be able to discern sensationalism from science on the possible impact of AI on society

***Prerequisite* – CS 3305**

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### *Objectives/Student Learning Outcomes –*

Upon successful completion of this course, the student will be able to complete all the listed learning objectives with a minimum of 68 percent competency level based on required exams and faculty evaluation. The student will demonstrate the following competencies by designing, implementing, and testing numerous data driven models.

The successful student will be able to demonstrate:

* enhanced problem solving skills as compared with those developed in previous courses;
* At the end of our course, students understand the artificial intelligence principles. They know how to use the basic models and how to implement them in several ways. They know the practical effects of the different implementation choices. The students can reason about efficiency with a big-O analysis and can argue for the correctness of their implementations by referring to the invariant of the ADT.
* One of the lasting effects of the course is the specification, design, and implementation experience. The improved ability to reason about artificial intelligence is also important. But perhaps most important of all is the exposure to data driven models that are easily used in many situations. The students no longer have to write everything from scratch. We tell our students that someday they will be thinking about a problem, and they will suddenly realize that a large chunk of the work can be done with any of the learned models. And this large chunk of work is work that they won’t have to do. Instead, they will pull out the model that they developed this semester—using it with almost no modifications. Or, more likely, they will use the familiar model from a library of standard AI models. In fact, the behavior of almost all models in this course is a simplified version of what could be found in real world applications.
* When students take the step to the real class libraries from any of the AI models, they will be on familiar ground—from the standpoint of how to use the model and also will have a knowledge of the considerations that went into building the class.

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### *Program Learning Outcomes –*

**Computer Science Program Outcomes**:

Students completing the CS curriculum will be able to demonstrate:

1. **A system-level perspective**
2. **An appreciation of the interplay between theory and practice**
3. **Familiarity with common themes of computer science such as abstraction, complexity and evolutionary change; and**
4. **Adaptability to the enormous pace of change in computing.**

Items 1through 4 above are addressed by this course.

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### *Student Learning Outcomes as required by ABET (Accreditation Board for Engineering and Technology, Inc.) –*

The WTAMU CS program requires that students must, by the time of graduation, have an ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

2. **Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.**

3. **Communicate effectively in a variety of professional contexts.**

4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

5. **Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline.**

6. **Apply computer science theory and software development fundamentals to produce computing-based solutions.**

Those items emboldened (2, 3,  5, and 6) are emphasized in this course.

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### *Course Requirements and Evaluation –*

**Explanation of Assignments and Requirements**

The final course grade will be determined as follows (percentages may change):

| **Description** | **% of Grade** |
| --- | --- |
| Participation, contributions, notebook, professional development, etc. | 15 % |
| Labs | 30 % |
| Major Exams (3 @ 10% each) | 30 % |
| Final Exam | 25 % |
|  | 100 % |

Standards:

A: 90%+ **and on-time submission of ALL work**

B: 78% to < 90%

C: 68% to < 78%

D: 58% to < 68%

F: < 58%

**NOTE: Failure to take the final results in an automatic F for the course.**

**Policy for Submission of Assignments:** All work for this course will be submitted electronically. Requirements for all assignments will include a precise date and time after which work will NOT be accepted. It is your responsibility to make your submissions prior to the deadline. Ensure that you begin your submission early enough to make the deadline. NOTE: the precise time for closing submissions is maintained by the server to which the submissions are made. These servers' clocks are set precisely by use of network time servers.

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### Policies and Responsibilities –

**No Food or Drink in Classroom:** Classes are conducted in a computer lab with some better than average computers. Grease and liquids are NOT compatible with this equipment. Thus, consume your food and beverage before coming into the classroom. If you have been eating, it is preferred that you wash your hands before beginning to use the computers.

**Assumed Engagement in Course**: It is assumed you CAN and WILL read the textbook and all supporting materials including this syllabus as well as take and revise notes throughout the semester.

**Additional expectations are that you**:

* dress as an aspiring professional, particularly dress in such a way that your dress, or lack thereof, does not disrupt work of the class – this means removing caps/hats and hoods so that you demonstrate courtesy to your classmates. Also, no cracks front or back.
* regularly check (at least three times a day) your “official” University email box for messages from your professors, the business office, the registrar’s office, etc. Create an e-mail filter for **Artificial Intelligence** in the subject line and have course mail placed in a separate folder.
* push monitors all the way down and turn them off except during those times when work with computer is a part of the class session
* attend ALL the class sessions ON time, and stay until the end of the class meeting (unless you let Prof. Ramljak know that you will need to leave early in which case seat yourself so that you may exit quietly) . . . **repeated late arrival is inexcusable and inconsiderate and WILL have a negative impact on your grade.**
* (while in class sessions) be attentive to discussion at hand and NOT surfing the Web, working on an assignment in another class, or engaged in sidebar discussions with other classmates . . . such behavior demonstrates a lack of common civility and courtesy to your classmates and to Prof. Ramljak
* (while in class sessions) turn off all cell phones, PDAs, beepers, etc. unless you have informed Prof. Ramljak that you are, for example, an EMT or a firefighter on call, or that you are waiting for a personal emergency call
* submit ALL work by the date and time specified – failure to do so will result in the grade of 0 for the submission in question
* be committed to daily work for this class – chances for success are greatly enhanced by sticking to this
* be committed to completing all homework assignments, all quizzes, all exams and any other work during the time(s) allotted for such
* be interested in learning rather than just finishing a given assignment, the course, or your degree
* arrange your schedule so that you have ample time for the work in this course -- an average of **10 - 15 hours a week** outside of class, including some more time to allow for unexpected problems
* read assigned material thoroughly, including tracing examples and working through exercises (whether assigned or not)
* regularly generate questions, and ask them, on material you don't understand
* participate in any forums in an informed, professional manner
* devote regular time to studying NOT to just doing assignments
* start and finish assignments promptly
* follow assignment specifications carefully
* take pride in the work you turn in, including doing a final careful check for completeness and correctness
* identify your academic weaknesses and work on them and/or come for help
* abide by the rules of the course, the ECSM School, and the University
* scrupulously follow academic integrity standards, including doing individual work when specified (without human or other sources of help), attend all group meetings, if group projects are assigned, and contribute significantly to group work
* regularly take notes and revise and summarize them

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### *Academic Integrity –*

All work must be completed individually unless otherwise stated. Commission of any of the following acts shall constitute scholastic dishonesty: acquiring or providing information for any assigned work or examination from any unauthorized source; informing any person or persons of the contents of any examination prior to the time the exam is given in any subsequent sections of the course or as a makeup; plagiarism; submission of a paper or project that is substantially the same for two courses unless expressly authorized by the instructor to do so. For more information, see (particularly discussion beginning on page 28 – Section A: Academic Integrity Code):

<http://www.wtamu.edu/studentcode/>

Cheating in any form will not be tolerated. Cheating includes, but is not limited to: copying from another student's homework; having someone else take an exam for you; using unauthorized resources (another person, cell phone, book, notes, etc. . .) during an exam; exiting the room during an exam without permission and returning to finish the exam. If a student is found cheating, Mr. Ramljak reserves discretion as to the penalty for the offense. Such penalty may include, but not necessarily be limited to: a 0 for an assignment or exam; an F in the course; and/or filing a “Statement of Fact and Resolution” in the Provost's Office.

**NOTE:** Take care of bodily functions prior to beginning an exam. You will not be permitted to leave the exam unless your instructor or GA accompanies you to the restroom – and that may not be possible in many situations.

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### *ADA Statement –*

West Texas A&M University seeks to provide reasonable accommodations for all qualified persons with disabilities. This University will adhere to all applicable federal, state and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student's responsibility to register with Student Disability Services (SDS) and to contact faculty members in a timely fashion to arrange for suitable accommodations. The SDS Office is located in the Student Success Center, CC 106 and their phone number is 806-651-2335.

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### *Acceptable Student Behavior –*

Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (*Code of Student Life*). Unacceptable or disruptive behavior will not be tolerated. Students engaging in unacceptable behavior may be instructed to leave the classroom. Inappropriate behavior may result in disciplinary action or referral to the University’s Behavioral Intervention Team. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc.

In order to create a smooth and harmonious learning community, it is important that EVERY student understand the expectations for conduct and engage completely in the experience. Thus, Professor Ramljak expects you to adhere to the Association for Computing Machinery (ACM) Code of Ethics which includes (among other items) the following behaviors:

* Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing
* Avoid harm to others
* Be honest and trustworthy
* Be fair and take action not to discriminate
* Respect the work required to produce new ideas, inventions, creative works, and computing artifacts
* access computing and communication resources only when authorized to do so
* Respect the privacy of others
* Honor confidentiality
* Give serious thought to the potential consequence of any behavior associated with computers, networks or entire systems

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### *Copyright Statement –*

Copyright 2019 Dusan Ramljak as to this syllabus and all instructional material; materials may not be reproduced without Dusan Ramljak's written consent. Students are prohibited from selling (or being paid for taking) notes during this course to or by any person or commercial firm without the express written permission of Dusan Ramljak.

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### *Evacuation Statement –*

If you receive notice to evacuate the building, please evacuate promptly but in an orderly manner. Evacuation routes are posted in various locations indicating all exits, outside assembly area, location of fire extinguishers, fire alarm pull stations and emergency telephone numbers (651-5000 or 911). In the event an evacuation is necessary: evacuate immediately. Do not use elevators; take all personal belongings with you; report to outside assembly area and wait for further information; students needing assistance in the evacuation process should bring this to the attention of the instructor at the beginning of the semester.

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### *Observations Regarding Letters of Recommendation –*

As you continue your college career, there well may come a moment when you may feel the need to ask your professors to recommend you for graduate programs, jobs, or internships. Please be aware that professors are not obligated to write references for any student just because they ask. I don’t write a reference for a student unless I can write a very positive and specific one. Therefore, your job as a college student is to become the kind of student professors can rave about in recommendations — hardworking, collegial, intellectually inquisitive and honest, you take team projects seriously and contribute to the success of the team. Consider maintaining relationships over time with all your professors, so that they know you well enough to write for you.

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### *Tips for Doing Well in this Course –*

◦Students should do all the assigned work and make timely submissions for those assignments requiring a submission. This means that the payoff in knowledge and grades is directly proportional to a consistent and timely approach to the work for this course.

◦Start working on assignments the day they are posted. Most students grossly underestimate the time required to do quality work in this course. Assignments get progressively more difficult as the course progresses. It is not unusual for some of the assignments to require 10 to 20 hours to complete.

◦Pay attention in class. Avoid the temptation to surf the web, engage in online games, etc.

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### *CRITICAL DATES:*

* **August 26:** Fall Semester Classes begin
* **August 29:** Last day to add a course or register for classes
* **September 2:** Labor Day – No Classes
* **September 11:** Last day to drop (NOT WITHDRAW) and receive any refund; 12th Class Day
* **September 24:** Fall Green Lighting begins
* **October ??:** Career Expo 10:00 am – 02:00 pm (Mandatory Attendance)
* **October 11:** Mid-term (half-way point of semester)
* **October 31:** 5 PM deadline for a student to drop a course or completely withdraw (drop all courses) from the spring semester and receive the grade of X
* **November 1:** Spring priority registration begins for Graduates
* **November 4:** Registration opens for Seniors
* **November 6:** Registration opens for Juniors
* **November 11:** Registration opens for Sophomores
* **November 18:** Registration opens for Freshmen
* **November 27 – December 1:** Thanksgiving Holiday
* **December 5:** Last day of classes
* **December 6:** Dead Day
* **December 7 and 9 - 13:** Final Exams
* **December 14:** Graduation
* **December 16**: Grades due in Registrar’s Office by 9:00 AM

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### *Title IX Statement --*

West Texas A&M University is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect in an environment free of sexual misconduct and discrimination. Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. Harassment is not acceptable. If you or someone you know has been harassed or assaulted, you can find the appropriate resources here:

* WTAMU Title IX Coordinator Richard Webb – Kilgore Research Center 147, **or** call 806.651.3199
* WTAMU Counseling Services – Classroom Center 116, **or** call 806.651.2340
* WTAMU Police Department –  806.651.2300, **or** dial 911
* 24-hour Crisis Hotline –  800.273.8255, **or** 806.359.6699, **or** 800.692.4039 <https://www.notalone.gov/>

***For more information, see the Code of Student Life at*** [http://www.wtamu.edu/webres/File/Student Life/Code-of-Student-Life.pdf](http://www.wtamu.edu/webres/File/Student%20Life/Code-of-Student-Life.pdf)

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## *PROFESSIONAL RESPONSIBILITIES -*

A computing professional should…

### 2.1 Strive to achieve high quality in both the process and products of professional work.

Computing professionals should insist on high quality work from themselves and from colleagues. This includes respecting the dignity of employers, colleagues, clients, users, and anyone else affected either directly or indirectly by the work. Computing professionals have an obligation to keep the client or employer properly informed about progress toward completing the work. Professionals should be cognizant of the serious negative consequences affecting any stakeholder that may result from poor quality work and should resist any inducements to neglect this responsibility.

### 2.2 Maintain high standards of professional competence, conduct, and ethical practice.

High quality computing depends on individuals and teams who take personal and group responsibility for acquiring and maintaining professional competence. Professional competence starts with technical knowledge and with awareness of the social context in which the work may be deployed. Professional competence also requires skill in reflective analysis and in recognizing and navigating ethical challenges. Upgrading necessary skills should be ongoing and should include independent study, conferences, seminars, and other informal or formal education. Professional organizations and employers should encourage and facilitate those activities.

### 2.3 Know, respect, and apply existing rules pertaining to professional work.

“Rules” here includes regional, national, and international laws and regulations, as well as any policies and procedures of the organizations to which the professional belongs. Computing professionals must obey these rules unless there is a compelling ethical justification to do otherwise. Rules that are judged unethical should be challenged. A rule may be unethical when it has an inadequate moral basis, it is superseded by another rule, or it causes recognizable harm that could be mitigated through its violation. A computing professional who decides to violate a rule because it is unethical, or for any other reason, must consider potential consequences and accept responsibility for that action.

### 2.4 Accept and provide appropriate professional review.

High quality professional work in computing depends on professional review at all stages. Whenever appropriate, computing professionals should seek and utilize peer and stakeholder review. Computing professionals should also provide constructive, critical reviews of other’s work.

### 2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

Computing professionals should strive to be perceptive, thorough, and objective when evaluating, recommending, and presenting system descriptions and alternatives.

Computing professionals are in a position of trust, and therefore have a special responsibility to provide objective, credible evaluations to employers, clients, users, and the public. Extraordinary care should be taken to identify and mitigate potential risks in self-changing systems. A system for which future risks cannot be reliably predicted requires frequent reassessment of risk as the system evolves in use, or it should not be deployed. Any issues that might result in major risk should be reported.

### 2.6 Have the necessary expertise, or the ability to obtain that expertise, for completing a work assignment before accepting it. Once accepted, that commitment should be honored.

A computing professional is accountable for evaluating potential work assignments.

Once it is decided that a project is feasible and advisable, the professional should make a judgment about whether the work assignment is appropriate to the professional’s expertise. If the professional does not currently have the expertise necessary to complete the assignment, the professional should disclose this shortcoming to the employer or client. The client or employer may decide to pursue the assignment with the professional after time for additional training, to pursue the assignment with someone else who has the required expertise, or to forego the assignment. A computing professional’s ethical judgment should be the final guide in deciding whether to work on the assignment.

### 2.7 Improve public awareness and understanding of computing, related technologies, and their consequences.

Computing professionals should share technical knowledge with the public, foster awareness of computing, and encourage understanding of computing. Important issues include the impacts of computer systems, their limitations, their vulnerabilities, and opportunities that they present. Additionally, a computing professional should counter false views related to computing.

### 2.8 Access computing and communication resources only when authorized to do so.

No one should access another’s computer system, software, or data without permission. A computing professional should have appropriate approval before using system resources unless there is an overriding concern for the public good. To support this principle, a computing professional should take appropriate action to secure resources against unauthorized use. Individuals and organizations have the right to restrict access to their systems and data so long as the restrictions are consistent with other principles in the Code.

### 2.9 Design and implement systems that are robustly and usably secure.

Breaches of computer security cause harm. It is the responsibility of computing professionals to design and implement systems that are robustly secure. Further, security precautions are of no use if they cannot or intentionally will not be used appropriately by their intended audience in practice; for example, if those precautions are too confusing, too time consuming, or situationally inappropriate. Therefore, the design of security features should make usability a priority design requirement.

<https://ethics.acm.org/2018-code-draft-3/>

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