



## Data/Information Representation and Organization | INFO-C 307 | 1/1/2020

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### Instructor Contact Information

Instructor: **Dr. Hossein Hakimzadeh (pronounced Hakim-Zadeh)**

Contact: *Canvas e-mail is my preferred means of contact. I will return your e-mails within 48 business hours. In case of emergency only email me at [hhakimza@iu.edu](mailto:hhakimza@iu.edu)*

Phone: (574) 520-4517

Zoom: <https://iu.zoom.us/my/virtualofficehours>

Office: Northside 160H, IU South Bend

Office Hours: [by appointment](#)



### Prerequisites

INFO-C211 (Second semester of Java Programming)

### Course Description

INFO-C 307 Data Representation and Organization (3 cr.) This course will provide an introduction to ways in which data can be organized, represented and processed from low-level to high level. Topics include construction of memory based structures and algorithms using arrays (single, multidimensional), lists (single, double, circular), stacks, queues, binary trees, and hash tables, and basic file manipulation.

### Course Website

You will participate in this course using the [IU Canvas learning management platform](#). Once you are in the platform you can learn how to use Canvas effectively, by clicking the “Help” link on the left navigation of the course page on Canvas.

<https://iu.instructure.com/courses/1815301>

### Course Outcomes

The student who completes this course will be proficient in:

- basic method of representing data inside a computer (characters and numbers)
- binary, octal and hexadecimal number systems.
- basic arithmetic manipulation of binary numbers.
- basic techniques in representing different types of data. (Integer, Char, Boolean, String, Array, Sound, Images, Video, etc.)
- implementation of basic data structures such as queues, stacks, trees and hash tables.
- basic file organizations (sequential, random, indexed)
- basics of logical data modeling (ER), class modeling (UML)
- basics of relational model and databases

At the end of this course, students will be able to

- B1) Apply basic problem solving techniques (pseudocoding, flow charting)



- B2) Understand low level representation of data (bit, byte, int, float, char, unicode, string, audio, video, image)
- B3) Fundamental programming skills (variables, conditionals, loops, sub programs, and parameter passing)
- B4) Demonstrate proficiency in at least one programming language. Proficiency is defined as the ability to design, implement, test, and debug structured and object-oriented programs
- B5) Demonstrate ability to design, implement, test, and debug web-based solutions
- B6) Ability to discuss and/or construct memory based structures and algorithms (Arrays (single, multidimensional), Lists (single, double, circular), stacks, queues, binary trees)
- C2) Ability to perform functional decomposition of a largescale problem
- C5) Ability to identify elements of proper interface design, and ability to build user-centered interfaces
- D1) Proficiency of contemporary technological tools for communication and collaboration
- D2) Proficiency of technological tools for collaboratively designing and coding programs
- E1) Articulate legal and ethical issues when using the creative work of others; respect the intellectual property of others.

### Required Text

- Data Structures and Algorithms in Java by Robert Lafore, 2nd Edition, ISBN-13: 978-0672324536, ISBN-10: 0672324539

### Recommended Text

- Data Structures and Algorithm Analysis in Java. Mark Allen Weiss, Third Edition, ISBN-13: 978-0132576277.

### Technical Requirements

You will need the following in order to participate in this course:

- Computer;
- Reliable internet connection;
- Computer microphone;
- Open Canvas in a Mozilla Firefox browser
- Adobe Reader
- Adobe Flash Player
- Office suite (Including PowerPoint, etc.)
- Access to multiple browsers (Firefox, Chrome, Edge, etc.)
- Access to editing software (e.g., Notepad, Notepad++, etc)
- Access to Java language and Netbeans IDE
- Access to WAMP

Microsoft Office, Adobe Acrobat, and many other programs are available **free to you as an IU student** through Indiana University's license agreements. You can download most of these programs directly at [IUware Online](#). IUware requires you to log in with your IU username and passphrase. Not all software is available online. If you need a program on a DVD, you can purchase discs through all campus bookstore. Some software may also be available through the cloud (client virtualization) using iuanywhere site:



<https://uits.iu.edu/iuanyware> . Other software such as Java, Netbeans, and browsers can be downloaded for free. Simply google these titles for additional information.

### Technical Support

You may also receive support from

- [University Information Technology Services \(UITS\)](#) (human support)
- [IU Knowledge Base \(IUKB\)](#) (guides)
- [IUware](#) (download free software)
- [IUanywhere](#) (client virtualization)

### Descriptions of Course Activities and Assignments

Understanding of data and the ways in which one can represent and manipulate it is essential to the field of computation. This course attempts to examine data from its humble beginnings (i.e., electrical signals) to notations of characters, and numbers, to its volatile manifestation as in-memory data structures, to its more persistent manifestation on disk or other secondary storage devices, to its more logical data models and representations found in databases.

My approach for this course is to discuss one concept, and through a series of labs, and assignments develop deeper understanding, possibly apply these concepts in various problem domains. We will also have discussion forums which provide the opportunity to interact with your colleagues, ask and answer questions, and teach each other. We will also use periodic quizzes and tests to help us reinforce our understanding of the concepts.

So, the layout of this course is generally as follows, every week you will need to:

- 1) **Print the powerpoint notes** provided
- 2) **Watch the video lecture**
  - Pause the video if necessary to take additional notes, or simply write on the printed powerpoints. Also there are times when you want to pause the video to try the code that is explained in the video. **(do not watch the video as if it is a movie!)**
  - Look up additional information from our reference textbook or from electronic resources discussed in the video.
- 3) **Participate in the discussion forum** (to simulate a face-to-face interaction that typically takes place in a regular class)
  - **By Friday (11:59pm)** of every week, you need to submit one posting about the lecture, labs, or the assignment we are working on that week.
  - **By Sunday (11:59pm)** of every week, you need to have read and then commented on another student's post or provide a second posting.
  - Your 2 posts per week will be Evaluated based on the following 3 criteria:
    - i. Relevance (to the concepts being covered)
    - ii. Clarity (of thought and language)
    - iii. Substance (of your contribution. Superficial or Insightful).



- Keep your posts to approximately 5 to 10 lines.
- 4) **Complete the labs** associated with the lecture
  - The labs are designed to provide you with a hands-on proof of concept which should reinforce your knowledge and understanding of the lecture material.
  - Skills learned in the labs will then be used in the assignment. So, it is important to complete the labs before the start the assignment.
- 5) **Complete the quiz** associated with the lecture
  - Quizzes are open note and open book, but the time is limited, so don't expect to read the material during the quiz.
  - You may be able to look up one or two question just to make sure, but you will not be able to read the entire subject while taking the quiz.
- 6) **Complete the assignment**
  - Assignments typically integrate the knowledge and skills developed from the previous lectures, labs, etc. (up to that point)
- 7) **Tests**
  - There will be a midterm and a final which will be done using the Examity Proctoring service.

### Overview of the Assignment Grades

The table below provides an overview of how much each course activity is worth in the grade.

Course Activity	Percentage of overall grade
Homework Assignments	30%
Labs	10%
Quizzes	10%
Midterm Exams	20%
Discussion Forums/Presentation of Work	10%
Final Exam	20%
<b>Total</b>	<b>100%</b>

### Grading Scale

- $\geq 90\%$  = A;  $\geq 80$  and  $< 90\%$  = B;  $\geq 70$  and  $< 80\%$  = C;  $\geq 60$  and  $< 70\%$  = D;  $< 60\%$  = F
- If your grades is with 1.5% of the cutoff, I will provide plus or minus grades. For example 88.6 = B+, and 91.2 = A-
- Note: If you are on track for a D, you are failing the course.



## University Policies

### Accommodations

Every attempt will be made to accommodate qualified students with disabilities (e.g. mental health, learning, chronic health, physical, hearing, vision neurological, etc.) You must have established your eligibility for support services through the appropriate office that services students with disabilities. Note that services are confidential, may take time to put into place and are not retroactive; Captions and alternate media for print materials may take three or more weeks to get produced. Please contact your campus office as soon as possible if accommodations are needed. [Find your campus office serving students with disabilities.](#)

### Intellectual Dishonesty

All work should be your original product, unless explicitly noted otherwise. Any materials you reference or take from others should be properly cited. Cheating, plagiarism, or fabrication in any form will not be tolerated, regardless of any justification. For more detailed information see the [Student Responsibilities section of the Code of Student Rights, Responsibilities, and Conduct](#). Academic misconduct will not be tolerated. The minimum consequence is failing the assignment. In a case of more serious offense, a student may fail the course. **Students should NOT present work from other courses in this class (i.e., using pieces of previous papers you have done is considered plagiarism).** I may use the services of Turnitin.com to check for originality of your written work.

### Title IX Sexual Misconduct

As your instructor, one of my responsibilities is to help create a safe learning environment on our campus. Title IX and our own Sexual Misconduct policy prohibit sexual misconduct. If you have experienced sexual misconduct, or know someone who has, the University can help. I encourage you to visit [Stop Sexual Violence website](#) to learn more. If you are seeking help and would like to speak to someone confidentially, you can make an appointment with a [Mental Health Counselor on campus](#).

It is also important that you know that federal regulations and University policy require me to promptly convey any information about potential sexual misconduct known to me to our Deputy Title IX Coordinator or IU's Title IX Coordinator. In that event, they will work with a small number of others on campus to ensure that appropriate measures are taken and resources are made available to the student who may have been harmed. Protecting a student's privacy is of utmost concern, and all involved will only share information with those that need to know to ensure the University can respond and assist.

### Code of Student Rights, Responsibilities, and Conduct

Students are expected to adhere to the Code of Student Rights, Responsibilities, and Conduct at all times. Any inappropriate behavior, disruptive conduct (e.g., engaging in hostile or disrespectful commentary on the site, or discussing irrelevant evidence) or non-compliance with faculty directions can result in a charge of Academic and/or Personal Misconduct, the consequence of which could be a variety of sanctions either from the instructor or the Dean of Students. For more information see [The Code of Student Rights, Responsibilities, and Conduct](#).



## Campus Grading Policies

The following includes highlights paraphrased from several campus or university policies pertaining to grades and grading. For official descriptions of these and other related policies, click the Campus Course Policies button on your Canvas tool bar and then click the link for Campus Academic Policies.

### *Dropping a Course*

During the first week of classes you may drop a class with no grade recorded on your transcript. From the second week of classes through the ninth week (the 'auto W' period), you may withdraw from a class with an automatic grade of 'W'. This will be recorded on your transcript, but not included in your GPA.

After the ninth week (and before the final exam period), a student wishing to withdraw with a grade of 'W' must be passing the course at that time. You must complete a 'Drop Only' form and contact the offices listed for signatures before giving the form to the instructor. The instructor will confirm on the form that you are passing at that time for a 'W' grade or that your grade is an 'F'. This 'F' grade WILL be included in calculation of your GPA.

Faculty members are required to report any student who stops attending a class and does not withdraw (with a grade of 'W' or 'F'). Failure of a course due to non-attendance may affect financial aid award amounts.

**Summer courses are shorter in duration (6 week, 8 weeks, etc.) and therefore follow a different schedule for dropping. Please consult your campus registrar or your instructor for additional information.**

## Course Expectations

### Classroom Civility

It is important to build a classroom climate that is welcoming and safe for everyone. Please display respect for everyone in the class. You should avoid racist, sexist, homophobic, or other negative language that may exclude members of our campus and classroom community.

### Participation

You should be logging onto Canvas at least three times a week to view assignments, presentations, contribute to discussions, post questions, read posting of others, etc. Activities and assignments will be posted in advance providing ample time for completion. Please plan your schedules accordingly.

### Course Absence

If you plan to be absent from class activities for longer periods of time because of a sport, school, medical, or family event, please let me know and **complete your work in advance**. For a scheduled exam/quiz, forum, or other course events, arrange with me for earlier date. In case you miss these scheduled events, you will receive a zero.



### Late Work

No late homework is accepted after the due date. You should start your work early, and submit what you have by the deadline. Partial credits will be awarded for incomplete work.

### Plagiarism

Honesty requires that any ideas or materials taken from another source for either written or oral use must be fully acknowledged. Offering the work of someone else as one's own is plagiarism. The language or ideas thus taken from another may range from isolated formulas, sentences, or paragraphs to entire articles copied from books, periodicals, speeches, or the writings of other students. The offering of materials assembled or collected by others in the form of projects or collections without acknowledgment also is considered plagiarism. Any student who fails to give credit for ideas or materials taken from another source is guilty of plagiarism.

(Faculty Council, May 2, 1961; University Faculty Council, March 11, 1975; Board of Trustees, July 11, 1975) Source comes from [IU's Policies site](#).

According to the [Indiana University Code of Student Rights, Responsibilities, and Conduct \(2010\)](#), a student must give credit to the originality of others and acknowledge indebtedness whenever:

1. Directly quoting another person's actual words, whether oral or written;
2. Using another person's ideas, opinions, or theories;
3. Paraphrasing the words, ideas, opinions, or theories of others, whether oral or written;
4. Borrowing facts, statistics, or illustrative material; or
5. Offering materials assembled or collected by others in the form of projects or collections without acknowledgement.

### Right of Revision

*The instructor reserves the right to revise or adjust the course syllabus to best accommodate the pace and needs of the students.*

### Fair Use Policy

Copying or recording synchronous classes and asynchronous course materials without the express prior approval of Professor Hossein Hakimzadeh is prohibited. *All copies and recordings remain the property of Professor Hossein Hakimzadeh. Professor Hossein Hakimzadeh reserve the right to retrieve, inspect, or destroy the copies and recordings after their intended use.* These policies are not intended to affect the rights of students with disabilities under applicable law or IU policies.

### Religious Accommodations Statement

If any student will require academic accommodations for a religious observance, please provide me with a written request to consider a reasonable modification for that observance by the end of the second week of the course. Contact me after class, during my office hours, or by individual appointment to discuss the issue. If after discussion we reach no consensus, either party or both should seek the advice of the Department chair or the Dean, and if no consensus is reached, then the advice of the Vice



Chancellor of Academic Affairs (“VCAA”). Either the instructor or the student may appeal the VCAA’s decision to the Office of Affirmative Action within ten business days of the determination.

### **ADA Disability Statement**

If you have a disability and need assistance, special arrangements can be made to accommodate most needs. Contact Director of Disabled Student Services (Administration Building, room 149, telephone number 520-4832), as soon as possible to work out the details. Once the director has provided you with a letter attesting to your needs for modification, bring the letter to me. For more information please visit the web site for Office of Disabled Student Services

[www.iusb.edu/~sbdss/services.shtml](http://www.iusb.edu/~sbdss/services.shtml)





## Tentative Weekly Schedule

*\*IMPORTANT: Due dates vary on each assignment, read carefully. Recommend double checking with the live course as instructor may update during the course.\**

Date	Topic	Discussion Post Due 11:59pm Friday, Sunday	Labs Due 11:59pm Friday	Quizzes/Tests Due 11:59 Sunday	Assignments Due 11:59 Sunday
<b>Week 1</b> 1/13 – 1/19	Welcome, Review of Course Syllabus & Expectations  Unit 1 – Low Level Data Representation • Number System: Binary representation	Post 1	Lab 1	Quiz 1	
<b>Week 2</b> 1/20 – 1/26	• <span style="color: green;">Martin Luther King Jr. Holiday</span> • Bit, Byte, ASCII, Unicode, Integers, Floating point numbers, Boolean, String, etc.	Post 2	Lab 2	Quiz 2	Assign 1
<b>Week 3</b> 1/27 – 2/2	• Audio, Image, Video	Post 3	Lab3	Quiz 3	
<b>Week 4</b> 2/3 - 2/9	Unit 2 – Data Structures • Arrays: single and multi-dimensional	Post 4	Lab 4	Quiz 4	Assign 2
<b>Week 5</b> 2/10 - 2/16	• Linked Lists: single	Post 5	Lab 5	Quiz 5	
<b>Week 6</b> 2/17 - 2/23	• Linked Lists: double and circular, library discussion	Post 6	Lab 6	Quiz 6	Assign 3
<b>Week 7</b> 2/24 - 3/1	• Stacks and Queues	Post 7	Lab 7	Quiz 7	
<b>Week 8</b> 3/2 - 3/8	• Binary Trees: definition, data structure • Recursion: Examples • Review for Midterm	Post 8	Lab 8	Quiz 8	Assign 4
<b>Week 9</b> 3/9 - 3/15	Midterm • Binary trees: traversal and search			Midterm (using Examiity)	
<b>Week 10</b> 3/16 - 3/22	Fall Break (March 14 – 23)	Post 10 Midterm Evaluation	Lab 9	Quiz 9	
<b>Week 11</b> 3/23 - 3/29	• Hashing Tables, • Discussion of use of built-in libraries and building code from scratch	Post 11	Lab 10	Quiz 10	Assign 5
<b>Week 12</b> 3/30 - 4/5	• Algorithm performance: fundamental notation, searching (linear, binary) • Algorithms performance: sorting, hashing • <span style="background-color: yellow;">(performance calculations are done at the intuitive level)</span>	Post 12	Lab 11	Quiz 11	
<b>Week 13</b> 4/6 - 4/12	Unit 3 - File Organizations • Concepts, manipulation, performance issues (sequential, random, indexed)	Post 13	Lab 12	Quiz 12	Assign 6
<b>Week 14</b> 4/13 - 4/19	Unit 4 - ER modeling, UML • ER to Relational model transformation	Post 14	Lab 13	Quiz 13	
<b>Week 15</b> 4/20 - 4/26	Unit 5 – Database Data	Post 15	Lab 14	Quiz 14	Assign 7
<b>Week 16</b> 4/27 - 5/1	Review for the Final Exam			Review the Study Guide	
<b>Week 17</b> 5/4 to 5/8	Finals Week			Final (using Examiity)	