# Syllabus 2021 FALL CS 470/570 Programming Languages

# **CRN : 50548 CS 470-002**

**CRN : 53433 CS 470-301**

# **CRN : 50551 CS 570-001**

**CRN : 53430 CS 570-301**

# General Information

# Contact Your Instructor

**Name:** R.B.Abhyankar

**Email:** R.B.Abhyankar@indstate.edu

**Office:** Root Hall, A-182

## Lecture, Exam, Office Hours

Lecture: 9:30 a.m. to 10:45 a.m. TR, RO-A019 (for face-to-face sections)

**Exam:** Information about Final Exam will be provided later.

**Instructor Office Hours:** 8:00 a.m. to 9:00 a.m. MWF

via land line telephone: 812-299-5177

Also by appointment.

**Website**: There is no course web site, but there is material on Blackboard.

## Prerequisites

A grade of C or better in CS 201, or consent of instructor.See <http://cs.indstate.edu/info/courses.php>

A 500 level course cannot be taken as part of the MS program if you have completed the same 400 level course at ISU. For example, if you completed CS 470 as an undergrad, you **cannot** take CS 570 as an MS student and count it towards the degree.

## Recommended and/or Required Text

Online Resources are given below.

[1] Learn Prolog Now

http://www.learnprolognow.org/

[2] Learn You a Haskell for Great Good

http://learnyouahaskell.com/

[3] Squeak Smalltalk

<https://squeak.org/>

[4] The Little Book of Semaphores

<http://greenteapress.com/semaphores/LittleBookOfSemaphores.pdf>

[5] Syntax and Semantics of Programming Languages

http://homepage.divms.uiowa.edu/~slonnegr/plf/Book/

## Course Announcements

Students should regularly check Learning Modules and Announcements on Blackboard course site and check their ISU email.

Classroom conduct

You may not use cell phones, iPods/music players, etc. during class. You should be civil and respectful to both the instructor and your classmates, and you should arrive to class a few minutes before the scheduled lecture so you are ready for lecture to begin on time. You may use your computer during class if you are using it to follow along with the examples that are being discussed. You may not check email, facebook, work on other courses, etc. during class.

# Course Description

The official description of this course from the catalog is :

The purpose of the course is to develop an understanding of the organization of programming languages and introduce the formal study of programming language specification and analysis. Topics covered usually include: language definition structure, data types and structures, control structures and data flow, run-time consideration, interpretative languages, lexical analysis, and parsing.

# Course Outline

Prolog and Logic Programming Paradigm (4 weeks), Haskell and Functional Programming Paradigm (3 weeks), Smalltalk and Object Oriented Paradigm (2 weeks), Concurrent Programming Paradigm (1 week), Syntax and Semantics of Programming Languages (2 weeks), Special topics: More on Concurrency, Dependent Types, as time permits.

Normal Content

The course begins with a history of programming languages, and the various programming paradigms are introduced. The Logic Programming paradigm is covered using Prolog as the example. Backtracking, unification, recursion, the cut , depth first search are covered. Stack overflows, occurs check , and floundering problems are covered. Applications covered are list processing, state space problem solving, constraint processing, expert systems, natural language processing and parsing.

The Functional Programming paradigm is illustrated using Haskell. Covered are list processing and the conversion to tail recursion using the method of accumulating parameters, fixed point computation, square root computation and sorting, testing of perfect numbers, and implementing the Sieve or Eratosthenes using Lazy Evaluation, available in Haskell. Proofs of list properties using structural induction are covered, and the implementation of data structures using Haskell is covered.

The Object Oriented Programming paradigm is covered using Smalltalk: introduced are the elements of the GUI: browsers, Workspaces, and Transcripts, Defining classes, and objects, inheritance and aggregation hierarchies are introduced. Avoidance of conditional code through polymorphism, polymorphism within and across inheritance hierarchies is considered, and the model –view – controller pattern through the use of the dependency mechanism are described. The issue of aggregation vs. inheritance is discussed via a concrete example.

The Concurrent Programming paradigm is introduced. Three synchronization problems are considered: Serialization, Mutual Exclusion and the Rendezvous. Semaphores are introduced and the use of Semaphores in solving the synchronization problems are discussed. Implementations of the solutions are given in Smalltalk, using the Process and Semaphore implementations available in Smalltalk.

Aspects of the syntax and semantics of programming languages are covered.

# Learning Outcomes

After completing the course the student should be able to write programs using the logic, functional, object-oriented and concurrent programming paradigms.

# 

# Expected Amount of Work

If you take this class seriously and get what you should out of it, some weeks you will likely be spending around 4 **hours/week** or more on the class. The students who get A’s in their CS courses and have an easy time finding jobs do spend this much time on this course. Not everyone would need to spend this much time and not all weeks will be the same, but you should plan on putting in whatever time it takes.

# Grading and Assignments

The students of this course have the following responsibilities: read assigned readings before lecture, attend lecture, complete homework assignments, take in-class quizzes, take exams, and complete a project.

DISTRIBUTION OF POINTS

Assignments: 70 %

Quizzes: 5 %

Final Exam: 25 %

## CS Course Policies

Note that this course follows all standard CS course policies. In particular check the CS course policies related to - cheating/plagiarism, attendance, missing exams. See <http://cs.indstate.edu/info/policies.html> for details.

## Late Homeworks

Assignments submitted late may not earn full credit due.

## 

## Start Homeworks Early

We suggest attempting a homework assignment the day it is given, or the day after, so that if you have a problem you can ask early. If you continue to have problems in trying to complete the assignment, you will have time to ask again. Many of the homework assignments require thought and problem solving, which takes “time on the calendar” not just “time on the clock”. By that we mean that spending two hours on 3 consecutive days may be more productive than trying to spend 6 hours at once on the assignment.

## Grade Cutoffs

GRADING SCALE:

Percentage Minimum Grade

95 and up A

90-93 A -

87-89 B +

84-86 B

80-83 B -

77-79 C +

74-76 C

70-73 C -

67-69 D +

64-66 D

60-63 D -

59 and below F

Our goal is that the different grades have the following rough meaning.

**A+/A**   
You can do *all* the assignments *on your own*.

**B+/A-**You understand nearly everything, and should be all set to use this knowledge in other courses or in a job.

**B-/B**

Most things you understand very well and a few you might not (more towards the former for a B and more towards the latter for a C).

**C/C+**  
Learned enough and have the minimum skills to move on in the subject.

**D+/C-**   
You did put some effort in, and understand many things at a high level, but you haven’t mastered the details well enough to be able to use this knowledge in the future.

**D-**

Students will normally *not* get an F if - you attend 80% of the lectures, complete some of the assignments up through the end of the course, and get nearly half of the problems on the final exam correct.

**F**   
Normally, students that get an F simply stopped doing the required work at some point.

# Blackboard

The course has a blackboard site. Click [here](http://blackboard.indstate.edu) to go to blackboard. You should see this course listed under your courses for the current term.

# Academic Integrity

Follow the standard CS course policies in terms of what is and is not allowed on assignments: <http://cs.indstate.edu/info/policies.html>

Please ask the instructor if you have doubts about what is considered cheating in this course.

# Special Needs / Student Disabilities

Indiana State University recognizes that students with disabilities may have special needs that must be met to give them equal access to college programs and facilities. If you need course adaptations or accommodations because of a disability, please contact us as soon as possible in a confidential setting either after class or in my office. All conversations regarding your disability will be kept in strict confidence. Indiana State University's Student Support Services (SSS) office coordinates services for students with disabilities: documentation of a disability needs to be on file in that office before any accommodations can be provided. Student Support Services is located on the lower level of Normal Hall in the [Center for Student Success](http://www.indstate.edu/services/student-success/cfss) and can be contacted at 812-237-2700, or you can visit the ISU website under A-Z, [Disability Student Services](https://www.indstate.edu/services/student-success/cfss/student-support-services/disability-student-services) and submit a Contact Form. Appointments to discuss accommodations with SSS staff members are encouraged.

Once a faculty member is notified by Student Support Services that a student is qualified to receive academic accommodations, a faculty member is obligated to provide or allow a reasonable classroom accommodation under ADA.

**Statement on Discrimination, Sexual Harassment, and Sexual Misconduct**

Indiana State University [Policy 923](https://www.indstate.edu/policy-library/non-discrimination-and-anti-harassment) strictly prohibits discrimination on the basis of: age, disability, genetic information, national origin, pregnancy, race/color, religion, sex, gender identity or expression, sexual orientation, veteran status, or any other class protected by federal and state statutes in ISU programs and activities or that interferes with the educational or workplace environment.

Title IX of the Educational Amendments of 1972 prohibits discrimination based on sex, including sexual harassment. Sexual harassment includes quid pro quo harassment, unwelcome verbal or physical conduct, sexual assault, dating violence, domestic violence, and stalking.

If you witness or experience any forms of the above discrimination, you may report to:

Office: Equal Opportunity & Title IX; (812) 237-8954; Rankin Hall, Room 426

Email: [ISU-equalopportunity-titleix@mail.indstate.edu](mailto:ISU-equalopportunity-titleix@mail.indstate.edu)

Online: <https://cm.maxient.com/reportingform.php?IndianaStateUniv&layout_id=10>

Disclosures made to the following confidential campus resources will not be reported to the Office of Equal Opportunity and Title IX:

ISU Student Counseling Center: (812) 237-3939; Gillum Hall, 2nd Floor

Victim Advocate: (812) 237-3829; HMSU 7th Floor

UAP Clinic/ISU Health Center: (812) 237-3883; 567 N. 5th Street

**COVID syllabus language: revised 8/9/21, Faculty Senate**

Students are expected to adhere to course attendance policies, as stated in the course syllabus. Students must complete the Sycamore Symptom Assessment by email before arriving on campus each day unless they have documented their COVID immunization and have been exempted from the program. Documented COVID-related absences will be treated like any other serious medical issue. ​ Following University policy, students with a documented, serious medical issue must contact the Office of the Dean of Students for assistance. The Office of the Dean of Students will supply documentation for faculty. Students with a documented serious medical issue should not be penalized and will be given a reasonable chance to complete exams or assignments. Once notification is made, faculty will make reasonable efforts to accommodate the student’s absence and will communicate that accommodation directly to the student. Please note that faculty are not required to accommodate a serious medical issue with virtual content options, like streaming or recorded lectures. Students who have been notified by contact tracers of a close contact who has tested positive for COVID must abide by their instructions, which will include a mandatory period of quarantine, especially if the student is unvaccinated, and/or mandatory testing. To avoid the potential of missing significant class time, students are strongly encouraged to receive the COVID vaccination that has been made available on campus. For more information about the vaccines or to find a vaccination site, go to: [**ourshot.in.gov**](https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Ft.e2ma.net%2Fclick%2Fvuh8wd%2Fvehpdpg%2Ff2kbah&data=04%7C01%7CR.b.Abhyankar%40indstate.edu%7Ca736de0ac18c4e69be6a08d95ce7029f%7C3eeabe396b1c4f95ae682fab18085f8d%7C0%7C0%7C637642969567699279%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=dDMvLJAbenE%2B8UdbJUZcbYUGV9ZD3S3eSxE%2Ba9uf7PI%3D&reserved=0). The [**ISU Health Center**](https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Ft.e2ma.net%2Fclick%2Fvuh8wd%2Fvehpdpg%2Fvulbah&data=04%7C01%7CR.b.Abhyankar%40indstate.edu%7Ca736de0ac18c4e69be6a08d95ce7029f%7C3eeabe396b1c4f95ae682fab18085f8d%7C0%7C0%7C637642969567699279%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=0jAu3%2BFoFBrGVLZq3KJXS6nIPnMINWBbpZN57ceP31M%3D&reserved=0) also administers COVID-19 vaccines by appointment.

Students should contact the [Office of the Dean of Student](https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Ft.e2ma.net%2Fclick%2Fvuh8wd%2Fvehpdpg%2Fbnmbah&data=04%7C01%7CR.b.Abhyankar%40indstate.edu%7Ca736de0ac18c4e69be6a08d95ce7029f%7C3eeabe396b1c4f95ae682fab18085f8d%7C0%7C0%7C637642969567709288%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=RpWh3sTnWq55syVjmJCTu6U5pV%2BrfztJRFFHKbTLskk%3D&reserved=0)**s** with questions by calling **812-237-3829**.

The information provided in this section of the syllabus is subject to modification based on guidance by public health authorities. Please follow [**this link**](https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Ft.e2ma.net%2Fclick%2Fvuh8wd%2Fvehpdpg%2Frfnbah&data=04%7C01%7CR.b.Abhyankar%40indstate.edu%7Ca736de0ac18c4e69be6a08d95ce7029f%7C3eeabe396b1c4f95ae682fab18085f8d%7C0%7C0%7C637642969567719270%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=9%2BGK%2FtoL71OatxXDD3%2BCd0CcJxZ6inredKfLv7C3Ez8%3D&reserved=0) for updated information on ISU’s Fall 2021 requirements.