



## Request for Independent Study IST 596

Complete the following form with your selected instructor. **Please note:** you are only allowed to take a maximum of 6 credits of IST 596 during the duration of your program to fulfill specialization course requirements. Independent studies must have a deliverable.

**Student:** \_\_\_\_\_ **PSU ID #:** \_\_\_\_\_

**E-mail:** \_\_\_\_\_

**Faculty member who will be your instructor:** \_\_\_\_\_

**Number of credits for which student is enrolling:** 3

**Semester/year for which student is enrolling:** Spring 2019

**Statement indicating why the student's interest cannot be served by a regularly scheduled Penn State course:**

This course is related to and designed for the student's own research, which can help this student enhance the research foundational knowledge and get prepared for the ongoing research. This course focuses more on the details and knowledge of programming languages, and the instructor can provide specific guide to this student so that she can master the knowledge of her own research direction more quickly. Thus, it is better for this student to take this course rather than a regularly scheduled Penn State course.

**Description of Independent Study:**

- **Course Title:**

Advanced topics for programming languages and software engineering

- **Course Description:**

This course will survey the major research areas and challenges in the field of programming languages, with a special focus on the performance and concurrency bugs. The course is writing intensive, mixing literature reviews and critics with research projects. Sample topics include techniques of static analysis and dynamic analysis, formal systems of programming languages, automatic bug-fixing techniques, etc. The course will be structured with weekly readings, discussions, and 2-page writing synthesis. By the end of the course, the student will complete a research proposal aligned to the research direction of his Ph.D. thesis.

- **Learning Objectives:**

To master the basic methodology in the field of programming languages and software engineering.  
To master the academic writing skills.

- **Course Activities:**

Reading academic papers.  
Writing literature review and research papers.  
Discussing research direction and questions.  
Writing weekly papers (2-pages summary)  
Writing academic proposal.

- **Assessment** (Please be specific on how the course activities will be assessed):

weekly papers 50%  
Research paper 25%  
Proposal 25%

- **Meeting Times** (Please be specific on when you will meet with the instructor):

Tuesdays and Thursdays 9:00 am-10:00 am

# Course Syllabus

## IST 596 Independent Study

Spring 2019

**Class time:** Tuesdays and Thursdays 9:00 am-10:00 am

**Instructor:**

It covers latest advances in the research of computer systems including operating systems, distributed system, mobile and cloud computing. Students will read and discuss recent papers in top systems conferences such as OSDI, SOSP, NSDI, EuroSys, MobiSys, ASPLOS and FAST. The course will be structured with weekly readings, discussions, and 2-page writing synthesis. By the end of the course, the student will complete a research proposal aligned to the research direction of his or her Ph.D. thesis. The course is writing intensive, mixing literature reviews and critics with research projects. Example topics include fault-tolerance, reliability, verification, energy efficiency, and virtualization.

## Objectives

Upon completion of this course, students will be able to:

- Master the basic methodology in the field of computer systems.
- Master the academic writing skills.

## Textbook

There is no need to purchase textbooks. Students will be provided with reading materials

## Assessment of Performance

Grades will be assessed on required activities throughout the semester.

## Course Grading Breakdown

Grading Category	Percentage of Final Grade
Weekly papers	50%
Research paper	25%
Proposal	25%
<b>TOTAL</b>	<b>100%</b>

**Course Grading Scale:** The following are minimum cutoffs for each grade:

- 90%+ = A 88%+ = A- 85%+ = B+ 80%+ = B 77%+ = B-
- 75% += C+ 70%+ = C 60%+ = D less than 60% = F

## Course Policies and Expectations

- **Late submission.** Homework, lab reports, and term project reports must be submitted on time. Permission for late submission must be requested from the instructor before any late submission can be accepted. A penalty of up to 30% will be assessed if a submission is within 3 days after the deadline. No submissions will be accepted three days after the deadline.
- **Communication through Canvas-** Students are expected to use Canvas for all course email communication. Please login regularly to check for course updates, announcements, emails, discussions, etc. Every attempt will be made for the instructor (or a substitute) to respond to email questions within 24 hours.
- **Class participation** is required on all scheduled class meetings and will be monitored by attendance survey. Students should devote their full attention to the meetings. At the discretion of the instructor, active participation of class activities may be awarded with bonus points. In case of missing classes for legitimate reasons, the instructor must be notified in advance, and a plan to make up the missing activities must be discussed with the instructor. Missing classes without acceptable reasons will be recorded as penalty grade: 1<sup>st</sup> missing class: -2%; 2<sup>nd</sup> missing class: -3%; 3<sup>rd</sup> missing class: -5%.

# University Policy

**Students with disabilities.** It is Penn State's policy not to discriminate against qualified students with documented disabilities. If you have a disability-related need for modifying your exam or test environment, notify your instructor during the first week of classes so that your needs can be accommodated. You will be asked to present documentation from the Office of Disability Services (located in 105 Boucke Building) that describes the nature of your disability and the recommended remedy. You may refer to the Nondiscrimination Policy in the Student Guide to University Policies and Rules.

**Americans with Disabilities Act.** The School of Information Sciences and Technology (IST) welcomes persons with disabilities to all of its classes, programs, and events. If you need accommodations, or have questions about access to buildings where IST activities are held, please contact the Dean's Office (814) 865-3528 in advance of your participation or visit. If you need assistance during a class, program, or event, please contact any member of our staff or faculty in charge.

**PSU Statement on Academic Integrity.** According to the University Advising Handbook: "Academic integrity is the pursuit of scholarly activity free from fraud and deception, and is the educational objective of this institution. Academic dishonesty includes, but is not limited to, cheating, plagiarism, fabrication of information or citations, facilitating acts of academic dishonesty by others, unauthorized possession of examinations, submitting work of another person, or work previously used without informing the instructor, or tampering with the academic work of other students. Any violation of academic integrity will be thoroughly investigated, and where warranted, punitive action will be taken." Students should be aware that standards for documentation and intellectual contribution may depend on the course content and method of teaching, and should consult instructors for guidance.

## Course Outline and Schedules

This schedule is tentative and subject to change throughout the semester.

Week 1: Hardware Performance Faults

Week 2: File Systems

Week 3: Container Systems

Week 4: POSIX kernel

Week 5: Black-Box Crash Testing

Week 6: Performance of User-Space File Systems

Week 7: Reverse Debugging

Week 8: Asynchrony in Distributed Systems

Week 9: Differential Bug Localization

Week 10: Differential Energy Profiling

Week 11: Resource Disaggregation

Week 12: Compiler Optimizations for Deep Learning

Week 13: Go Programming Languages

Week 14: Rust Programming Languages