

# Digital Forensics

## ITP 375 (3 Units)

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### Objective

In 2021, worldwide cybercrime profits exceeded \$6 Billion profits. Computers are becoming more of a threat today than ever before. From cyber-terrorism to identity theft, the digital age has brought about a change in the way that crime is being committed. The usage of computers in crime has led to the emerging field of computer forensics. This course is designed to give students the tools and techniques for investigating crime involving digital evidence.

This course is designed as an introductory course in computer forensics. Students will first understand the need for computer forensics. Students will learn best practices for general incidence response. The course will then focus on the tools and techniques to perform a full computer forensic investigation.

### Concepts

Upon completing this course, students will:

- Understand the fundamentals of computer forensics
- Understand the legal aspects of forensics
- Understand the relationship between IT and forensics
- Learn best practices for incidence response

### Prerequisites

ITP 125 or Instructor Approval

<b>Instructor</b>	Howard Williamson
<b>Contacting the Instructor</b>	<a href="mailto:howardwi@usc.edu">howardwi@usc.edu</a>
<b>Office Hours</b>	Zoom, By Appointment
<b>Lab Assistants</b>	Sterling Hahn, Vatsala Thapar

<b>Lecture/Lab</b>	9:00 – 10:15 Tuesday & Thursday, Zoom
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<b>Textbook</b>	None
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### Website

All course material will be on Blackboard (<http://blackboard.usc.edu>).

### Grading

Grading will be based on percentages earned in assignments. Students will have structured labs throughout the semester, to be conducted during the scheduled lab time.

Lab Assignments	60%
Midterm Exam	15%
Final Exam	25%
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Total	100%

## Grading Scale

The following shows the grading scale to be used to determine the letter grade.

93% and above	A
90% - 92%	A-
87% - 89%	B+
83% - 86%	B
80% - 82%	B-
77% - 79%	C+
73% - 76%	C
70% - 72%	C-
67% - 69%	D+
64% - 66%	D
63% and below	F

## Policies

No make-up exams (except for documented medical or family emergencies) will be offered nor will there be any changes made to the Final Exam schedule.

The labs will be posted on Blackboard under the “Assignments” section. Each lab will include instructions, a due date, and a link for electronic submission. Labs must be submitted using this link.

It is your responsibility to submit your assignments on or before the due date. Assignments turned in one day late will have 20% of the total points deducted from the graded score. Assignments turned in two days late will have 50% of the total points deducted from the graded score. After two days, submissions will not be accepted and you will receive a 0.

All assignments will be digitally submitted through Blackboard except where specified. Do not email them to the lecturer or lab assistant.

## Incomplete and Missing Grades

Excerpts for this section have been taken from the University Grading Handbook, located at <http://www.usc.edu/dept/ARR/grades/gradinghandbook/index.html>. Please see the link for more details on this and any other grading concerns.

A grade of Missing Grade (MG) “should only be assigned in unique or unusual situations... for those cases in which a student does not complete work for the course before the semester

ends. All missing grades must be resolved by the instructor through the Correction of Grade Process. One calendar year is allowed to resolve a MG. If an MG is not resolved [within] one year the grade is changed to [Unofficial Withdrawal] UW and will be calculated into the grade point average a zero grade points.

A grade of Incomplete (IN) “is assigned when work is no completed because of documented illness or other ‘emergency’ **occurring after the twelfth week** of the semester (or 12<sup>th</sup> week equivalency for any course scheduled for less than 15 weeks).”

## **Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

## **Students with Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to your course instructor (or TA) as early in the semester as possible. DSP is located in STU 301 and is open from 8:30am to 5:00pm, Monday through Friday. Website and contact information for DSP [http://sait.usc.edu/academicssupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicssupport/centerprograms/dsp/home_index.html) (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) [ability@usc.edu](mailto:ability@usc.edu)

## **Emergency Preparedness/Course Continuity in a Crisis**

In case of emergency, when travel to campus is difficult, if not impossible, USC executive leadership will announce a digital way for instructors to teach students in their residence halls or homes using a combination of the Blackboard LMS (Learning Management System), teleconferencing, and other technologies. Instructors should be prepared to assign students a “Plan B” project that can be completed ‘at a distance.’ For additional information about maintaining your classes in an emergency, please access: <http://cst.usc.edu/services/emergencyprep.html>

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### Course Outline

Note: Schedule subject to change

#### Week 1 (Jan 11 & 13, 2022) – Introduction to Computer Forensics & Hardware

- Course overview
- Understanding the need for computer forensics
- Defining computer forensics
- Processing the scene
- Understanding computer components

#### Reading

Lectures 1 & 2

#### Week 2 (Jan 18 & 20, 2022) – Digital Media & Storage

- Digital Media
- Hard disk basics

#### Reading

Lectures 3 & 4

#### Assignment/Lab

**Lab 1:** Chain of Custody

- Assigned Jan 20
- Due Jan 28

#### Week 3 (Jan 25 & 27, 2022) – Forensic Tools

- Forensic hardware
- Hardware write-blockers
- Overview of different software packages
- EnCase Introduction
- Hard drive acquisitions
- Windows versions
- Virtualization

#### Reading

Lecture 5

#### Assignment/Lab

**Lab 2:** Acquisition & Authentication with FTK Imager

- Assigned Jan 27
- Due Feb 4

#### Week 4 (Feb 1 & 3, 2022) – File Systems

- Windows file systems

- FAT32
- NTFS
- Forensic file images

### **Reading**

Lecture 6

### **Assignment/Lab**

**Lab 3:** File System Analysis

- **Assigned Feb 3**
- **Due Feb 11**

## **Week 5 (Feb 8 & 10, 2022) – Bookmarking, Searching & Hash Analysis**

- Bookmarks
- Creating basic search queries
- Hex, Decimal, and Binary
- ASCII
- Unicode
- Hash Analysis

### **Reading**

Lecture 7 & 8

### **Assignment/Lab**

**Lab 4:** Searching Evidence

- **Assigned Feb 10**
- **Due Feb 18**

## **Week 6 (Feb 15 & 17, 2022) – File Type Analysis; Windows Forensic Artifacts**

- Office documents
- PDFs
- Image types
- Metadata analysis
- Operating Systems
- Windows Folder Structure
- Page File
- Unallocated Clusters
- Slack Space

### **Reading**

Lectures 9 & 10

### **Assignment/Lab**

**Lab 5:** Office File Metadata Analysis

- **Assigned Feb 17**
- **Due Feb 25**

## **Week 7 (Feb 22 & 24, 2022) – GREP; Forensic Report Writing**

- Understanding GREP
- Building Regular Expressions

- Creating GREP keywords
- Viewing and managing keywords and cases
- Creating a forensic report
- Proper report writing
- Explaining forensics to the uneducated

### **Reading**

Lectures 11 & 12

ITP Report Writing Guidelines

### **Assignment/Lab**

**Lab 6:** GREP

- **Assigned Feb 24**
- **Due Mar 4**

**Midterm (Case 1)**

- **Assigned Feb 24**
- **Due Mar 11**

**Week 8 (Mar 1 & 3, 2022) – Midterm Practical (Case 1)**

**Week 9 (Mar 8 & 10, 2022) – Midterm Practical (Due Mar 11, 2022)**

**Week 10 (Mar 15 & 17, 2022) – Windows Registry**

- Introduction to the Windows Registry
- Registry Hives
- Registry Artifacts

### **Reading**

Lecture 13

AccessData Registry Cheatsheet

### **Assignment/Lab**

**Lab 7:** Windows Registry

- **Assigned Mar 17**
- **Due Mar 25**

**Week 11 (Mar 29 & 31, 2022) – Tracking User Activity**

- Windows Explorer artifacts
- Jumplists
- UserAssist
- Link Files
- Shellbags
- Print Spool

### **Reading**

Lecture 14

### **Assignment/Lab**

**Lab 8:** Tracking User Activity

- **Assigned Mar 31**

- **Due Apr 8**

### **Week 12 (Apr 5 & 7, 2022) – USB Device Tracking**

- Device Descriptors
- Extracting USB information from the registry and logs
- Tracking USB activity using shortcuts and Explorer artifacts

#### **Reading**

Lecture 15

#### **Assignment/Lab**

**Lab 9:** USB Device Tracking

- **Assigned Apr 7**
- **Due Apr 15**

### **Week 13 (Apr 12 & 14, 2022) – Time Stamps; Internet & Email Analysis**

- Timestamps
- Internet Artifacts
- Viewing e-mail
- Webmail
- POP
- IMAP

#### **Reading**

Lectures 16, 17

#### **Assignment/Lab**

**Lab 10:** Timestamp Analysis

- **Assigned Apr 14**
- **Due Apr 22**

**Final Practical (Case 2)**

- **Assigned on Apr 14**
- **Due Apr 29**

### **Week 14 (Apr 19 & 21, 2022) – Deleted File Analysis**

- Recycle Bin Analysis
- USN Journal Parsing
- Carving for deleted files from Unallocated Space and Pagefile
- Wiping tools

#### **Reading**

Lecture 18

#### **Assignment/Lab**

**Lab 11:** Deleted File Analysis

- **Assigned Apr 21**
- **Due Apr 29**

### **Week 15 (Apr 26 & 28, 2022) - Conclusion**

- Review for the final exam

- Conclusion to the course  
**Final Practical (Case 2) Due on Apr 29, 2022**

**Final Exam to Be Held According to the Schedule of Classes  
Tue May 10, 2022 (0800-1000)**