



**Jordan University of Science and Technology**  
**Faculty of Computer & Information Technology**  
**Cybersecurity Department**

CY461 Introduction To Steganography - JNQF Level: 6

First Semester 2023-2024

**Course Catalog**

3 Credit Hours. This course introduces the fundamentals of steganography. It covers the concepts of digital steganography, digital steganalysis, and digital watermarking including hiding algorithms on different carrier files (image, audio, and video files). The course includes an introduction to well-known tools to both hide and extract information. Furthermore, this course consists of a set of laboratory experiments that provides hands-on experience in this topic.

**Text Book**

<b>Title</b>	Steganography in Digital Media: Principles, Algorithms, and Applications.
<b>Author(s)</b>	Jessica. Fridrich
<b>Edition</b>	1st Edition
<b>Short Name</b>	Steganography in Digital Media
<b>Other Information</b>	Cambridge University Press, 2009. (ISBN No.: 978-0-52-119019-0)

**Course References**

Short name	Book name	Author(s)	Edition	Other Information
Digital Watermarking and Steganography	Digital Watermarking and Steganography: Fundamentals and Techniques	Frank Y. Shih	2nd Edition	Second Edition. ISBN-13: 978-1498738767, ISBN-10: 1498738761.
Noiseless Steganography	Noiseless Steganography: The Key to Covert Communications	Abdelrahman Desoky	1st Edition	ISBN-13 978-1138199361. Publisher ? : ? Auerbach Publications; 1st edition (April 19, 2016)
Digital Image Processing	Digital Image Processing	R. C. Gonzalez, R. E. Woods, D. J. Czitrom, and S. Armitage	2nd Edition	United States: Prentice Hall, 2007. (ISBN No.: 978-0-13-168728-8 )

**Instructor**

Name	<b>Dr. Khaled Alrawashdeh</b>
Office Location	-
Office Hours	Sun : 10:30 - 12:00 Mon : 10:00 - 12:00 Tue : 11:00 - 12:00 Wed : 10:00 - 11:30
Email	kmalrawashdeh@just.edu.jo

<b>Class Schedule &amp; Room</b>
Section 2: Lecture Time: Mon, Wed : 08:30 - 10:00 Room: M2008

<b>Prerequisites</b>		
Line Number	Course Name	Prerequisite Type
1772610	CY261 Cryptography	Prerequisite / Study

<b>Tentative List of Topics Covered</b>		
Weeks	Topic	References
Weeks 1, 2	Introduction: Steganography throughout history, Modern steganography, The prisoners problem, Steganalysis, The warden's job, Steganographic security, Steganography and watermarking, Text Steganography and Image Steganography	
Week 3	LSB (Least Significant Bit) Embedding, Data Hiding by Mimicking Device Noise (Stochastic Modulation), Digital image formats , Data Hiding in Palette (GIF) Images, Hiding by Decreasing Colour Depth, Gifshuffle, - Lab1 available	<b>Chapter 2</b> From <b>Steganography in Digital Media</b>
Week 4	Color representation. Color sampling. Spatial-domain formats. Raster formats. Palette formats. Quiz 1	<b>Chapter 2</b> From <b>Steganography in Digital Media</b>
Week 5	Transform-domain formats (JPEG) and F5 Algorithm, Color subsampling and padding, Discrete cosine transform, Quantization, Decompression, Typical DCT block, Modeling DCT coefficients - Lab 2 Linux is available	<b>Chapter 2, Chapter 3</b> From <b>Steganography in Digital Media,</b> From <b>Noiseless Steganography</b>
Week 6	AUDIO STEGANOGRAPHY- Amplitude Coding, Cepstral Domain Codecs Domain: Codebook, Modification Bitstream, Introduction Video Streams, Substitution-Based Techniques	<b>Ch 2,3. Supplemental materials will be provided by the instructor</b> From <b>Steganography in Digital Media</b>
Week 7	Naive steganography, Histogram attack, Quantitative attack on Jsteg	<b>Chapter 5</b> From <b>Steganography in Digital Media</b>

Week 8	Matrix embedding using binary Hamming codes, Binary linear codes, Matrix embedding theorem, Bound on embedding efficiency for codes of increasing length, Matrix embedding for large relative payloads - Lab 2 is due - Lab 3 available - Second Exam	<b>Chapter 8 From Steganography in Digital Media</b>
Week 9	q-ary Hamming codes. Minimizing embedding impact using sum and difference covering set. ? VIDEO STEGANOGRAPHY Introduction Video Streams - Substitution-Based Techniques Transform. Domain Techniques	<b>Chapter 8 and supplemental materials From Steganography in Digital Media</b>
Week 10	Relationship between Watermarking and Steganography. Digital Watermarking Basics: Models of Watermarking. Basic Message Coding. Error Coding. Digital Watermarking. Theoretic Aspects - Lab 3 is due - Lab 4 is available	<b>Supplemental materials will be provided by the instructor. From Digital Watermarking and Steganography</b>
Week 11	Designing a Good Digital Mark. Theoretical Analysis of Digital Watermarking. Types of Watermarking Fragile. Semi-Fragile. Quiz2	<b>Supplemental materials will be provided by the instructor. From Digital Watermarking and Steganography, From Noiseless Steganography</b>
Week 12	SPREAD SPECTRUM WATERMARKING: Transform Domain Watermarking. Quantization Watermarking. Protocols: Buyer Seller Watermarking protocols, Efficient and Anonymous Buyer-Seller Watermarking Protocol	<b>Supplemental materials will be provided by the instructor From Digital Watermarking and Steganography, Supplemental materials will be provided by the instructor From Noiseless Steganography</b>
Week 13	STEGANALYSIS: Typical scenarios. Statistical steganalysis. Steganalysis as detection problem. Modeling images using features. Optimal detectors. Receiver operating characteristic (ROC)	<b>Chapter 10 From Steganography in Digital Media</b>
Week 14	STEGANALYSIS Cont.: Quantitative steganalysis. Blind steganalysis. Classification. Alternative use of blind steganalyzers. Targeted steganalysis. Benchmarking. System attacks. Lab 4 is due	<b>Chapter 10 From Steganography in Digital Media</b>
Week 15	Recent developments in Steganography. Final Exam Review	
Week 16	Final Exam	

<b>Mapping of Course Outcomes to Program Outcomes and NQF Outcomes</b>	<b>Course Outcome Weight (Out of 100%)</b>	<b>Assessment method</b>
Understand steganography's fundamental concepts and principles. [1SO1] [20L6K2]	20%	
Identify and assess diverse types of data-hiding techniques in various image formats like GIF, BMP, etc., and various data-hiding methods like LSB, EzStego, and F5. [1SO2] [15L6S2]	15%	

Describe the block codes and their usage for covert communication. [1SO4] [15L6K2]	15%	
Demonstrate the use of watermarking for copyright protection and steganography for secret communication in various digital media. [1SO2] [25L6C4]	25%	
Evaluate the various types of steganalysis methods. [1SO5] [15L6S1]	15%	
Assess the strength of any data-hiding algorithm against steganalysis techniques [1SO2] [10L6C1]	10%	

Relationship to Program Student Outcomes (Out of 100%)				
SO1	SO2	SO3	SO4	SO5
20	50		15	15

Relationship to NQF Outcomes (Out of 100%)				
L6K2	L6S1	L6S2	L6C1	L6C4
35	15	15	10	25

Evaluation	
Assessment Tool	Weight
First Exam	15%
Second Exam	15%
Final Exam	50%

Policy	
Teaching & Learning Methods	<ol style="list-style-type: none"> <li>1. Class lectures and lecture notes are designed to achieve the course objectives.</li> <li>2. You should read the assigned chapters before class and participate in class.</li> <li>3. Do whatever it takes for you to grasp this material and ask lots of questions.</li> <li>4. You are responsible for all material covered in the class.</li> <li>5. Please communicate any concerns or issues either in class or at my office hours.</li> </ol>

Policies	<p>Attendance: Excellent attendance is expected. According to university regulations, students missing more than 20% of total classes are subject to failure. No excuses will be accepted. If you miss class, you must find out about any announcements or assignments you may have missed. Attendance will be recorded at the beginning or end of each class.</p> <p>Participation: Participation in, and contribution to class discussions will affect your final grade positively. Raise your hand if you have any questions. Making any kind of disruption and (side talks) in the class will affect you negatively, Cell phone (Mobile) MUST BE SHUT OFF before you get into the class.</p> <p>Exams &amp; Quizzes: All exams and quizzes will be CLOSE-BOOK. The format for the exams is generally as follows: Multiple-choice, True/False, and/or Short essay questions.</p> <p>Makeup Exams: Makeup exams should not be given unless there is a valid excuse. Arrangements to take an exam at a time different than scheduled MUST be made before the scheduled exam time. By university regulations, students should bring a valid excuse authenticated through valid channels in JUST.</p> <p>Important Note: There will be NO MAKEUP for the quizzes</p> <p>Workload: The average workload a student should expect to spend is 4 hours/week.</p> <p>Code of Conduct: Exams need to be done individually. Copying another student's work, even if changes are subsequently made, is inappropriate, and such work will not be accepted. Cheating or copying from a neighbor on the exam is an illegal and unethical activity and the standard JUST policy will be applied. All graded assignments must be your work.</p>
----------	---

Date Printed: 2023-10-21