The Hashemite University

الجامعـــــة الهاشميـــــة

Deanship of Academic Development and International Outreach

عمادة التطوير الأكاديمي والتواصل الدولي

Syllabus: Special Topics in Cyber Security (2010021794)

Second Semester 2021/2022

COURSE INFORMATION

Course Name: Special Topics in Cyber Security **Semester:** Second Semester 2021 /2022 **Department:** Department of CIS **Faculty:** Prince Al-Hussein bin Abdullah II Faculty for Information Technology	**Course Code:** 2010021794 **Section:** 3 **Core Curriculum**:
Day(s) and Time(s): Sunday: 10-11 Tuesday: 10-11 **Classroom:** IT: 303	**Credit Hours:** 3 **Prerequisites**: None

COURSE DESCRIPTION

Data hiding has enabled technology for securing multimedia communication, and it is now in various applications including broadcast monitoring, movie fingerprinting, steganography, video indexing and retrieval, and image authentication. Data hiding and cryptographic techniques combined to complement each other, thus triggering the development of a new research field of multimedia security.

The course focus on information hiding topics, such as steganography, steganalysis, digital watermarking, anonymity. It also covers a variety of multimedia security topics including multimedia identification and authentication, multimedia forensics, biometrics, and privacy.

DELIVERY METHODS

The course will be delivered through a combination of active learning strategies. These will include:

- PowerPoint lectures and active classroom-based discussion
- Course Project
- E-learning resources: e-reading assignments through Model and Microsoft Team

FACULTY INFORMATION

Name	**Emad Eddien Awad Abdallah**
Academic Title:	**Professor**
Office Location:	**IT 326**
Telephone Number:	**5010**
Email Address:	**Emad@hu.edu.jo**
Office Hours:	**Sunday** 1.00-2.00 / **Tuesday** 2.00-3.00 *Please send an e-mail (Emad@hu.edu.jo) to meet at any other time.*

REFERENCES AND LEARNING RESOURCES

Required Textbook:

- Lu, Zhe-Ming, and Shi-Ze Guo. Lossless information hiding in images. Syngress, (2017).

Suggested Additional Resources:

- Emad Abdallah, "Robust Digital Watermarking Techniques for Multimedia Protection", LAP Lambert Academic Publishing, ISBN: 978-3659178009, (2012).
- I. Cox, M. Miller, J. Bloom, J. Fridrich, T. Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann (2007).
- Chun-Shien Lu, “Multimedia Security: Steganography and Digital Watermarking Techniques for Protection of Intellectual Property”, Idea Group Publishing, ISBN-10: 1591401925, (2004).

Useful Web Resources:

https://www.youtube.com/watch?v=O2RwWHWHQlM

COURSE OBJECTIVES

- To learn about the watermarking models and message coding
- To learn about watermark security and authentication.
- To learn about steganography - Perceptual models
- To Evaluate watermarking systems
- To Evaluate the perceptual impact
- Explain Secure Spread Spectrum coding
- Identify the Embedding in Perceptually significant coefficients
- Be able to identify several research challenges of data hiding schemes.
- Be able to work effectively in teams, collaborate with other cyber and information security specialists, and take the initiative in solving complex technical problems

ACADEMIC SUPPORT

It is The Hashemite University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their Instructor to ensure that their individual needs are met. The University through its Special Need section will exert all efforts to accommodate for individual's needs.

Special Needs Section:

Tel: 053903333 EXT 5023/4583

Location: (https://hu.edu.jo/facnew/index.aspx?typ=68&unitid=70000000)

Email: (huniv@hu.edu.jo)

COURSE REGULATIONS

Participation

Class participation and attendance are important elements of every student's learning experience at The Hashemite University, and the student is expected to attend all classes. A student should not miss more than 15% of the classes during a semester. *Those exceeding this limit of 15% will receive a failing grade regardless of their performance*. It is a student's responsibility to monitor the frequency of their own absences. **Attendance record begins on the first day of class irrespective of the period allotted to drop/add and late registration. It is a student's responsibility to sign-in; failure to do so will result in a non-attendance being recorded.**

In exceptional cases, the student, with the instructor's prior permission, could be exempted from attending a class provided that the number of such occasions does not exceed the limit allowed by the University. The instructor will determine the acceptability of an absence for being absent. A student who misses more than 25% of classes and has a valid excuse for being absent will be allowed to withdraw from the course.

Plagiarism

Plagiarism is considered a serious academic offence and can result in your work losing marks or being failed. HU expects its students to adopt and abide by the highest standards of conduct in their interaction with their professors, peers, and the wider University community. As such, a student is expected not to engage in behaviours that compromise his/her own integrity as well as that of the Hashemite University.

Plagiarism includes the following examples and it applies to all student assignments or submitted work:

- **Use of the work, ideas, images or words of someone else without his/her permission or reference to them.**
- **Use of someone else's wording, name, phrase, sentence, paragraph or essay without using quotation marks.**
- **Misrepresentation of the sources that were used.**

The instructor has the right to fail the coursework or deduct marks where plagiarism is detected

Late or Missed Assignments

In all cases of assessment, students who fails to attend an exam, class project or deliver a presentation on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a fail grade for this part of the assessment.

- Submitting a term paper on time is a key part of the assessment process. Students who fail to submit their work by the deadline specified will automatically receive a 10% penalty. Assignments handed in more than 24 hours late will receive a further 10% penalty. Each subsequent 24 hours will result in a further 10% penalty.
- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with University regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

Student Complaints Policy

Students at Hashemite University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

COURSE ASSESSMENT

Course Calendar and Assessment

Students will be graded through the following means of assessment and their final grade will be calculated from the forms of assessment as listed below with their grade weighting taken into account.

Assessment	Grade Weighting	Deadline Assessment
Midterm exam	30%	To be announced
Project	20%	To be announced
Presentations and Assignments	10%	Monthly
Final Exam	40%	To be announced

Description of Exams:

Test questions will predominately come from the material presented in the lectures. Semester exams will be conducted during the regularly scheduled lecture period. Exam will consist of a combination of multiple-choice, short answer, match, true and false and/or descriptive questions.

Homework:
Will be given for each chapter, while the chapter in progress you are supposed to work on them continuously and submit in next lecture when I finish the chapter.
You are also expected to work on in-chapter examples, self-tests and representative number of end of chapter problems. The answers of self-tests and end of chapter exercises are given at the end of the book.

Quizzes: Unannounced quizzes will be given during or/and at the end of each chapter based upon the previous lectures. It will enforce that you come prepared to the class.
No make-up exams, homework, or quizzes will be given. Only documented absences will be considered as per HU guidelines.

Grades are not negotiable and are awarded according to the following criteria*:

Letter Grade	Description	Grade Points
A+	Excellent	4.00
A		3.75
A–		3.50
B+	Very Good	3.25
B		3.00
B–		2.75
C+	Good	2.50
C	Fail	2.25

WEEKLY LECTURE SCHEDULE AND CONTENT DISTRIBUTION

Course Plan

Week no.	Topic	chapters
1	**Introduction:** Implicit and Explicit Data Hiding Applications of Information Hiding History of Steganography Uses of Steganography Steganography Principles Steganography Process Types of Cover Media	
2	**Digital watermarking** Digital watermarking Digital watermarking classification Watermarking vs. Steganography Attacking methods Image Watermarking Properties Least Significant Bit Watermarking Carriers Discrete Fourier Transform (DFT) Discrete Walsh–Hadamard Transform (DWHT) Discrete Cosine Transform (DCT) Discrete wavelet transform (DWT)	
3	**Secure Spread Spectrum Watermarks for Multimedia** Embedding and Extracting Evaluating the similarity of the watermark Uniqueness of the Watermark Attacks	
4	**Singular Value Decomposition (SVD)** Orthogonal Matrix Noise Reduction with SVD SVD for image compression SVD–based digital image watermarking scheme	

Week no.	Topic	chapters
5	**DCT-Domain Watermarking** Block DCT/IDCT DCT – Embedding DCT – Extraction	
6	**Watermarking scheme using fast Hadamard transform** ICPR–FHT AN ADAPTIVE WATERMARKING PROCESS IN HADAMARD TRANSFORM	
7	**DWT-SVD Domain Image Watermarking** Robust_DWT- SVD_domain image watermarking embedding Robust DWT–SVD image watermarking with a hybrid technique for embedding data in all frequencies.	
8	**DWT, FHT, and SVD Image Watermarking** Improved image watermarking scheme using fast Hadamard and discrete wavelet transforms	
9	**Image watermarking using Nonnegative matrix factorization** A Hybrid Secure Watermarking Scheme Using Nonnegative Matrix Factorization and FastWalsh–Hadamard Transform	
10	**Image watermarking using NMF and DWT** Image watermarking scheme using nonnegative matrix factorization and wavelet transform	
11	**Video Watermarking** Introduction to Video Watermarking – APPLICATIONS – CHALLENGES	
12	**MPEG Video Watermarking Using Tensor Singular Value Decomposition** **Video watermarking using wavelet transform and tensor algebra**	
13	**3D Watermarking**	
14+15	**Student Presentations**	