# INF2005 Cyber Security Fundamentals

## Assessed Course Work 1.0 – Work Requirements

1. **Design and develop a GUI-based LSB Replacement steganography and steganalysis program**.

- Attempt to meet at least the basic program requirements listed.
- Test program thoroughly before the demo. Program and functional errors will be penalized.
- The program must be able to **handle simple text input, text, image and executable/pdf files as payload**. [You may create your own light weight payload, e.g., executable, and different sizes payload].
- *The steganographic process must incorporate a **user-provided key (eg numeric)** that influences the LSB selection process (e.g., to determine the starting location and bit for embedding, or to slightly permute the order of bits used within a byte for a given segment). This key must be required for both encoding and decoding. **Team shall design your own key format (metadata).**

2. This program can be written in a language of your choice (e.g., Python, C, Java) or customized from a downloaded one.

3. You cannot use online steganography portals.

4. You may use genAI tools as an assistant to augment the process of completing your assignment, such as to understand concepts or questions related to the assignment; generate ideas for the assignment, code; or get suggestions for code improvement.

5. Remember, genAI is not likely to generate a response that would be seen as quality work and any code generated should be debugged and improved. **The unique, custom requirements of this assignment are specifically designed to challenge generic GenAI solutions, thus requiring significant human understanding and adaptation**. It is each team member's responsibility—not the tool's—to fully understand his/her work, ensure the quality, integrity, and accuracy of the assignment you submit. You are expected to explain your work and code.

6. Conduct the demo with clear, comprehensive explanation and with **minimal to no errors**. Your team should prepare readied and relevant payload and cover object files (different sizes and types) to fully demo your program's capabilities within the allocated time for each team.

7. **Demo dates: Weeks 5** (in your lab classes: Tues 30th Sep 2025, Thurs 2nd October 2025). **Plan for a team demo not more than 30 mins**, preferably with all members involved. Upload your demo plan (sequence of what to show, who is showing) to xSite – more details in week 4 together with the **all member duly signed Declaration of Originality form**.

* Considered non-basic.
[1] Innovation consideration for additional mark.

# INF2005 Cyber Security Fundamentals

8. Work in your own team and be responsible for each member's role/task allocations.

9. All team members must be present on the demo dates. Members who are absent will be separately assessed. **Zero marks awarded for absence without valid reason e.g., MC.**

10. **No code submission or report is needed**.

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## Assessed Course Work 1.0 – Program Requirements

1. **Support steganographic encode and decode of a CUSTOM BINARY PAYLOAD (as defined in the work requirements)** with different cover object types as follows:
   - **Image files (e.g., BMP, PNG, GIF)** – at least 1 type. The focus should be on raw pixel manipulation.
   - **Audio files (e.g., WAV, PCM raw audio) –** at least 1 type. The focus should be on raw sample manipulation.
2. **Number of LSBs to use must be selectable** from bits 1 to 8 of the cover object. Selection of number of LSBs to be implemented as part of GUI.
3. **Drag and drop**, and explorer-type functionality as part of GUI to select both cover object and payload, and display of stego object.
4. ***Allow the selection of the location on the cover object to place the payload** – either through mouse-click, drag and drop to location, etc.
5. *The GUI able to **allow input for a key** (e.g., an integer) which is used to influence how the LSBs are selected or permuted within the chosen cover object. The key may also contain the start location for (4). This key must be required for both encoding (embed) and decoding (retrieve) which can be performed separately and independently.
6. Provide clear examples during the demo illustrating how the user-selected LSBs and the numeric key affect the embedding process for each cover type.
7. Program to implement **limit check** and **display error message** should selected payload be too large for selected cover object.
8. The GUI able to **play(execute) payload / display** both cover and stego objects for comparison before and after encoding and decoding.
9. The GUI includes a **visualization feature** that displays the changes introduced to the LSBs of the cover object. For images, this could be a "difference map" highlighting affected pixels; for audio, a visual comparison of waveforms specifically showing LSB alterations; for text, a visual representation of whitespace changes. *Additional steganalysis feature/s[1].
10. *The GUI able to display information about the **capacity** of the selected cover object based on the chosen number of LSBs and chosen cover type, before encoding. [Eg, with a 3 bytes cover object (3 x 8 bits) and a payload of 1 byte ( 8 bits), choosing 2 LSB to use on the cover object (2 bit x 3= 6 bits) will not be sufficient for the 8 bits payload.

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# INF2005 Cyber Security Fundamentals

However, choosing 3 LSB to use on the cover object (3 bit x 3= 9 bits) will be sufficient for the 8 bits payload]. Team shall decide how to present the information clearly. Note also the constraints presented by (4).

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## Assessed Course Work 1.0 – Rubrics (20%)

1. Support for Range of Cover Object Types and payload:
   - Support for different cover object types, including uncompressed image (e.g., BMP/PNG), audio (e.g., WAV/PCM raw)
2. Support and facilitate selection of payload, stego and cover objects via drag and drop/explorer style interaction.
3. Support play / display of cover and stego objects for comparison.
4. Support for the selection of LSB to use:
   - Able to select and use up to 8 LSBs (bits 0, 1, 2, 3, 4, 5, 6 and 7) of the cover object's bytes
5. *Support for the selection of the location on the cover object to embed the payload
6. *Support and facilitate for a user-provided key for both encoding and decoding.
7. Support a visualisation feature for LSB changes or cover/stego object differences.
8. *Support the display of cover object and payload capacity information based on LSB selection.
9. **Individual** : Understanding and Contribution.
10. *Innovation (Optional - Bonus Points)[1]:

    e.g.:

    - **Implementation of MP4 (or other video format) as a cover object type**, specifically ensuring the payload is hidden effectively within **specific video frames or streams (e.g., only I-frames, or a specific audio track)**.
    - **Encryption of the custom binary payload** *before* embedding (encoding), integrity check of payload (after decoding/decryption), embedding encoding/decoding metadata into stego object file header. Key distribution considerations should be articulated.
    - Additional visual Steganalysis features.

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[1] Innovation consideration for additional mark.

# INF2005 Cyber Security Fundamentals

SIT Internal

## Use of Generative AI


### DO'S

- Use generative AI tools as a supplement, *not a substitute*, for your own learning and thinking. You can use them to explore different ideas, generate drafts, or check your work, but **NOT** to copy/ submit the generated content as your own
- Acknowledge and cite the generative AI tools you used in your assignment. You should also explain how you used the generated content and how you evaluated its quality and relevance.

### DON'T'S

- Do not use generative AI tools to produce content that violates the academic integrity policy.
- Do not use generative AI tools to plagiarize or fabricate content from other sources
- Do not rely on generative AI tools to produce content that is accurate, relevant, and original
- It lacks critical thinking, creativity, and originality that are essential for academic work. Therefore, you should always verify, edit, and cite the generated content before using it in your assignment.

* Considered non-basic.

[1] Innovation consideration for additional mark.