ENGR 102 Project 2

Engineers of the 21st century are charged with creating a safe and secure way of transferring information through cyberspace. Nearly every facet of your lives involves secure communications – from emails, text messages to banking, etc. It's one of the most important challenges you'll face – so much that the National Academy of Engineering has declared securing cyberspace one of the fourteen engineering grand challenges.

Securing communications is not a new concept. Leaders as early as Julius Caesar (100 B.C.-44 B.C.) were using simple substitution ciphers to communicate in secret. This led to the creation of many other ciphers and encryption techniques.

EX: 'dh zsxdozy vwjpo ocdn kmjezxo' translates to 'im excited about this project' if you use a Caesar shift of 21.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
0	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Original Alphabet
1	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	Caesar Shift - 1
2	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	Caesar Shift - 2
3	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	Caesar Shift - 3
4	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	Caesar Shift - 4
5	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	Caesar Shift - 5
6	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	Caesar Shift - 6
7	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	Caesar Shift - 7
8	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	Caesar Shift - 8
9	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	Caesar Shift - 9
10	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	Caesar Shift - 10
11	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	Caesar Shift - 11
12	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	Caesar Shift - 12
13	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	Caesar Shift - 13
14	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Caesar Shift - 14
15	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Caesar Shift - 15
16	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Caesar Shift - 16
17	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	Caesar Shift - 17
18	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Caesar Shift - 18
19	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Caesar Shift - 19
20	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	Caesar Shift - 20
21	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	Caesar Shift - 21
22	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	Caesar Shift - 22
23	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Caesar Shift - 23
24	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Caesar Shift - 24
25	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Caesar Shift - 25

Choose one of the 4 options below to program in MATLAB. You will create a single script for each option and allow the user to decide if the message is to be encrypted or decrypted. The background section of the technical report should include research in areas of cryptography, history of cryptography, types of encryption, current uses, future applications, ethics surrounding cryptography, and other topics related to this project.

Important*: Students who have done no research have nothing to contribute to their teams, so any student who does not turn in a Background section will be removed from their groups and will not participate in the technical reporting portion of the project, and will receive 0 credit for that portion.*

Team memberships may be changed if needed. Each section should be about a page of double-spaced text (12 pt. font), with at least THREE referenced with proper in text citations.

Part 1: (Individual)

Each team member will select one of the following options to encode. Once chosen, you will create user-defined functions to both encrypt and decrypt a message.

Option A	Option B	Option C	Option D	Option E
Vigenère Cipher	Running-Key Cipher	Auto-Key Cipher	Beaufort Cipher & Porta Cipher	Gronsfeld Cipher

Requirements

For options A – D, create a single script that can both encrypt and decrypt a message. Option D is a special case where the encryption process is identical to the decryption process.

Option E is ONLY to be used if you have a 5th team member.

1. Remove any special characters, punctuation and spaces from the message to be encoded.
2. Convert all lowercase letters to uppercase and use the 26-character alphabet used to create the encryption squares. (you can use the `upper` function in MATLAB)
3. Generate the encryption/decryption key.
4. Encrypt/decrypt the message and output the result.
    - Note: The Porta Cipher will have two outputs. One coded message, and a new key used for decryption.
5. Decrypt the given message.

Restrictions

1. You must use techniques taught in the class – anything else needs approval from Mr.Brewster
2. The 'find' function is not allowed.
3. You must use loops and branching statements to receive full credit.
4. Any solicitation of solutions will result in an F in the course, with recommendations for an Unforgivable F.

Part 2: (Team)

Technical Report

Oral Presentation (not a poster)

Deliverables for the Project:

Deliverables	Percent of Project	Deadline	Note
Team Charter	HW	04/05/2020 11:59 PM	One submission per team.
Gantt Chart	HW	04/05/2020 11:59 PM	One submission per team.
Meeting Video	HW	04/05/2020 11:59 PM	One submission per team. (Should include information on how the Team Charter, Gantt Chart and the decision on which option each team member chose).
Individual Pseudocode	HW	04/10/2020 11: 59 PM	One submission per team member. You can write an outline of what you are trying to do with your code. This can be hand-written and submitted as a PDF. (Apps such as Genius Scan can use your phone's camera to scan documents).
MATLAB Code, Individual Portion	40%	04/17/2020 11:59 PM	Each student must submit his/her own individual script saved as LastName_FirstName_Section_Method. eCampus submission only.
Individual Background	HW	04/17/2020	Each student will submit their individual background research.
Meeting Video	HW	04/24/2020 11:59 PM	One submission per team. (Should include collaboration on the technical report and presentation).
Technical Report	35%	TBD	Last week of class – for the Gantt Chart – assume the 26th. Electronic copy uploaded to eCampus.
Peer Review	10%	TBD	Last week of class – for the Gantt Chart – assume the 26th.
Oral Presentation	15%	TBD	More information to follow.