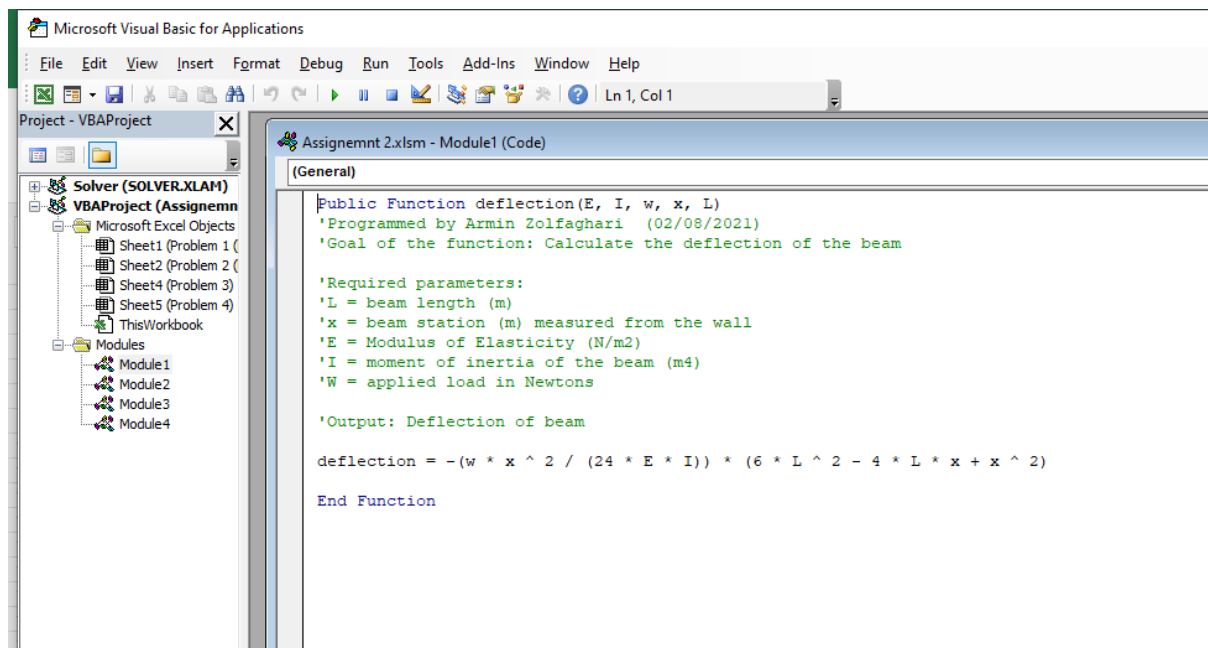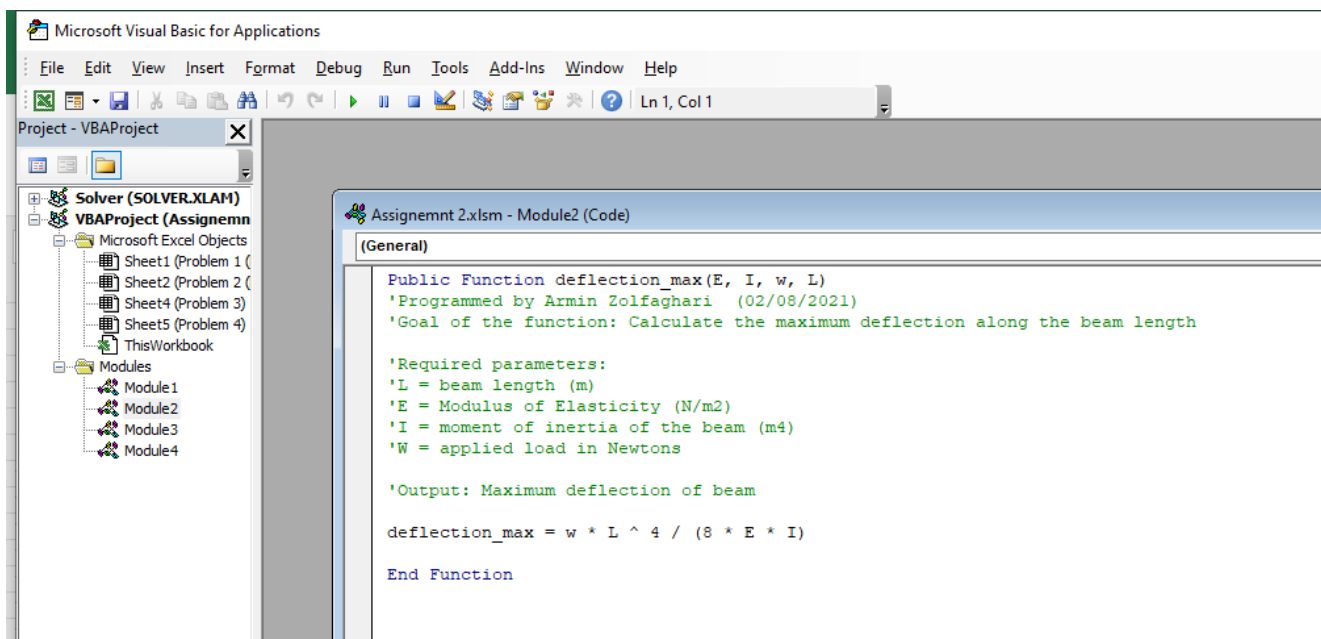CEE 3804 - Computer Applications (Spring 2021) Solution
Problem 1
Excel/VBA Function to estimate deflection

Excel/VBA function to estimate the maximum beam deflection

Excel/VBA function to estimate the slope of the beam deflection

Microsoft Visual Basic for Applications

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Project - VBAProject

- Solver (SOLVER.XLAM)
- VBAProject (Assignemn
  - Microsoft Excel Objects
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    - Sheet2 (Problem 2 (
    - Sheet4 (Problem 3)
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    - ThisWorkbook
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Assignemnt 2.xlsm - Module3 (Code)

(General)

```
Public Function deflection_slope(E, I, w, x, L)
'Programmed by Armin Zolfaghari  (02/08/2021)
'Goal of the function: Calculate the slope of beam deflection

'Required parameters:
'L = beam length (m)
'x = beam station (m) measured from the wall
'E = Modulus of Elasticity (N/m2)
'I = moment of inertia of the beam (m4)
'W = applied load in Newtons

'Output: Deflection slope of beam

deflection_slope = (-1) * w * x / (6 * E * I) * (3 * L ^ 2 - 3 * L * x + x ^ 2)

End Function
```
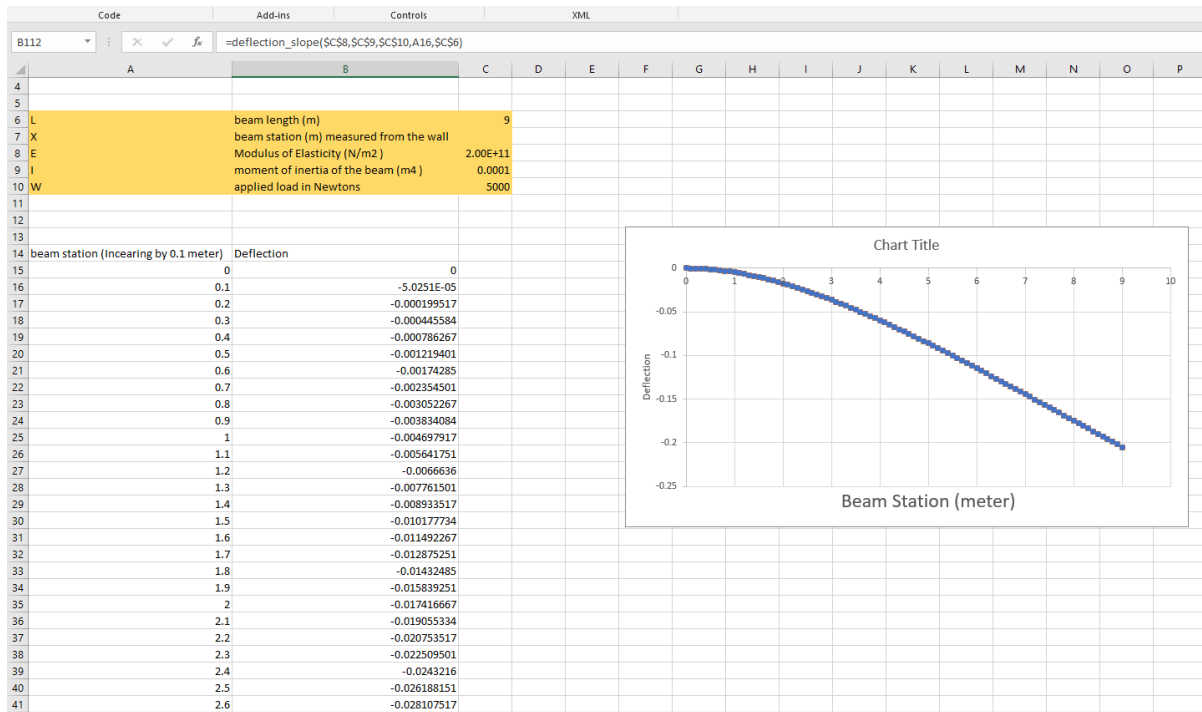
Application of the function and plot.

B112   =deflection_slope(C8,C9,C10,A16,C6)

	A	B	C
6	L	beam length (m)	9
7	X	beam station (m) measured from the wall	
8	E	Modulus of Elasticity (N/m2)	2.00E+11
9	I	moment of inertia of the beam (m4)	0.0001
10	W	applied load in Newtons	5000

	beam station (Incearing by 0.1 meter)	Deflection
15	0	0
16	0.1	-5.0251E-05
17	0.2	-0.000199517
18	0.3	-0.000445584
19	0.4	-0.000786267
20	0.5	-0.001219401
21	0.6	-0.00174285
22	0.7	-0.002354501
23	0.8	-0.003052267
24	0.9	-0.003834084
25	1	-0.004697917
26	1.1	-0.005641751
27	1.2	-0.0066636
28	1.3	-0.007761501
29	1.4	-0.008933517
30	1.5	-0.010177734
31	1.6	-0.011492267
32	1.7	-0.012875251
33	1.8	-0.01432485
34	1.9	-0.015839251
35	2	-0.017416667
36	2.1	-0.019055334
37	2.2	-0.020753517
38	2.3	-0.022509501
39	2.4	-0.0243216
40	2.5	-0.026188151
41	2.6	-0.028107517

Example table with beam stations and deflections

B112   =deflection_slope(C8,C9,C10,A16,C6)

	A	B	C
103	8.8	-0.198956267	
104	8.9	-0.201993751	
105	9	-0.20503125	
106			
107			
108	Maximum deflection	0.20503125	
109			
110	beam station (Incearing by 0.1 meter)	Deflection Slop	
111	0	0	
112	0.1	-0.001001292	
113	0.2	-0.001980333	
114	0.3	-0.002937375	
115	0.4	-0.003872667	
116	0.5	-0.004786458	
117	0.6	-0.005679	
118	0.7	-0.006550542	
119	0.8	-0.007401333	
120	0.9	-0.008231625	
121	1	-0.009041667	
122	1.1	-0.009831708	
123	1.2	-0.010602	
124	1.3	-0.011352792	
125	1.4	-0.012084333	
126	1.5	-0.012796875	
127	1.6	-0.013490667	
128	1.7	-0.014165958	
129	1.8	-0.014823	
130	1.9	-0.015462042	
131	2	-0.016083333	
132	2.1	-0.016687125	
133	2.2	-0.017273667	
134	2.3	-0.017843208	
135	2.4	-0.018396	
136	2.5	-0.018932292	
137	2.6	-0.019452333	
138	2.7	-0.019956375	
139	2.8	-0.020444667	
140			

Problem 2
Regression of car weight and horsepower

Model	Country	Type	Weight	Turning Circle	Displacement	Horsepower	Gas Tank Size
Acura Integra	Japan	Small	2700	37	112	130	13.2
Acura Legend V6	Japan	Medium	3265	42	163	160	18
Audi 100	Other	Medium	2935	39	141	130	21.1
Audi 80	Other	Compact	2670	35	121	108	15.9
Audi 90	Other	Compact	2790	35	141	130	15.9
BMW 325i	Other	Compact	2895	35	152	168	16.4
BMW 535i	Other	Medium	3640	39	209	208	21.1
Buick Century	USA	Medium	2880	41	151	110	15.7
Buick Electra V6	USA	Large	3350	43	231	165	18
Buick Le Sabre V6	USA	Large	3325	42	231	165	18
Buick Riviera V6	USA	Medium	3465	41	231	165	18.8
Buick Skylark	USA	Compact	2640	39	151	110	13.6
Cadillac Brougham V8	USA	Large	4285	44	307	140	25
Cadillac De Ville V8	USA	Large	3545	43	273	180	18
Cadillac Eldorado V8	USA	Medium	3480	42	273	180	18.8
Chevrolet Astro V6	USA	Large	4025	42	262	150	27
Chevrolet Beretta	USA	Compact	2655	38	133	95	15.6
Chevrolet Camaro V6	USA	Sporty	3110	41	191	140	15.5
Chevrolet Camaro V8	USA	Sporty	3320	41	305	170	15.5
Chevrolet Caprice V8	USA	Large	3855	42	305	170	25
Chevrolet Cavalier	USA	Compact	2485	38	133	95	13.6
Chevrolet Corvette V8	USA	Sporty	3280	42	350	250	20
Chevrolet Lumina	USA	Medium	3195	42	151	110	17.1
Chevrolet Lumina APV V6	USA	Large	3630	42	191	120	20
Chrysler Imperial V6	USA	Medium	3570	43	202	150	16
Chrysler Le Baron Coupe	USA	Medium	2975	39	153	150	14
Chrysler Le Baron V6	USA	Compact	3065	41	181	141	16
Chrysler New Yorker V6	USA	Medium	3450	42	202	147	16
Dodge Caravan	USA	Large	3385	42	153	100	20
Dodge Colt	Japan	Small	2270	32	90	81	13.2
Dodge Daytona	USA	Sporty	2885	38	153	100	14
Dodge Daytona Turbo	USA	Sporty	2935	38	135	150	14
Dodge Dynasty	USA	Medium	3080	42	153	100	16
Dodge Grand Caravan V6	USA	Large	3735	47	202	150	20
Dodge Omni	USA	Small	2300	40	135	93	13
Dodge Shadow Turbo	USA	Compact	2670	38	153	150	14
Eagle Premier V6	USA	Medium	3145	39	180	150	17

Chart: **Horsepower** (Horse Power vs Weight) with trendline $y = 0.0525x - 25.187$

Weights	Horse Power
5400	258.313
3250	145.438

Excel/VBA function to estimate horsepower given the car weight

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Microsoft Visual Basic for Applications

Assignemnt 2.xlsm - Module4 (Code)

(General)

Public Function calculate_horse_power(w)
'Programmed by Armin Zolfaghari    (02/08/2021)

'Goal of the function: Calculate the horse power as the function of car weight

'Input: Car weight
'Output: Car horse Power

calculate_horse_power = 0.0525 * w - 25.187

End Function
```
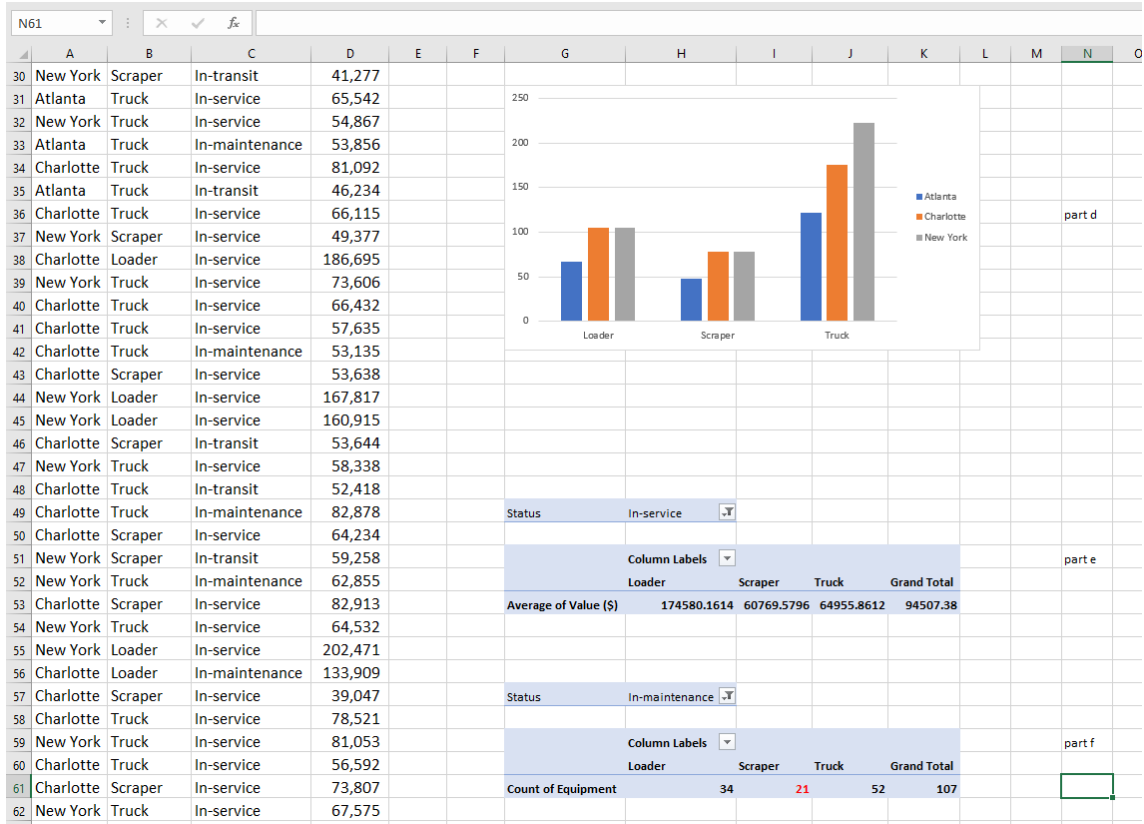
Problem 3

	A	B	C	D	E	F
1	Location	Equipment	Status	Value ($)		
2	Atlanta	Truck	In-service	64,647		
3	Charlotte	Truck	In-service	79,490		
4	Atlanta	Truck	In-service	65,097		
5	New York	Truck	In-service	84,332		
6	New York	Truck	In-service	59,494		
7	New York	Truck	In-service	85,333		
8	Charlotte	Loader	In-service	199,988		
9	New York	Truck	In-service	56,074		
10	Atlanta	Loader	In-maintenance	144,263		
11	Charlotte	Loader	In-transit	148,946		
12	Charlotte	Truck	In-transit	81,672		
13	Charlotte	Truck	In-service	47,606		
14	Charlotte	Truck	In-service	85,379		
15	New York	Scraper	In-service	82,491		
16	New York	Loader	In-service	212,850		
17	New York	Scraper	In-service	77,953		
18	New York	Truck	In-service	52,803		
19	Atlanta	Loader	In-service	188,322		
20	New York	Scraper	In-service	61,496		
21	Charlotte	Loader	In-maintenance	199,651		
22	Atlanta	Truck	In-service	59,776		
23	Charlotte	Truck	In-service	84,737		
24	Charlotte	Scraper	In-service	68,450		
25	New York	Scraper	In-service	83,061		
26	Atlanta	Truck	In-transit	51,444		
27	New York	Truck	In-transit	52,026		
28	Charlotte	Loader	In-service	205,679		
29	Atlanta	Loader	In-service	209,737		
30	New York	Scraper	In-transit	41,277		

Pivot Table — Average of Value ($) — part a

Average of Value ($)	Column Labels			
Row Labels	Atlanta	Charlotte	New York	Grand Total
Loader	179244.5075	172323.4095	172842.6	174194.271
Scraper	59912.02083	60385.42308	61064.46154	60533.6667
Truck	64781.2459	65180.39429	64702.33784	64882.0809
Grand Total	96153.88608	95560.30726	92038.07407	94274.481

part b

Average of Value ($) chart with Location legend (Atlanta, Charlotte, New York); Equipment categories: Loader, Scraper, Truck.

Pivot Table — Count of Equipment — part c

Count of Equipment	Column Labels			
Row Labels	Atlanta	Charlotte	New York	Grand Total
Loader	67	105	105	277
Scraper	48	78	78	204
Truck	122	175	222	519
Grand Total	237	358	405	1000

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
30	New York	Scraper	In-transit	41,277										
31	Atlanta	Truck	In-service	65,542										
32	New York	Truck	In-service	54,867										
33	Atlanta	Truck	In-maintenance	53,856										
34	Charlotte	Truck	In-service	81,092										
35	Atlanta	Truck	In-transit	46,234										
36	Charlotte	Truck	In-service	66,115										
37	New York	Scraper	In-service	49,377										
38	Charlotte	Loader	In-service	186,695										part d
39	New York	Truck	In-service	73,606										
40	Charlotte	Truck	In-service	66,432										
41	Charlotte	Truck	In-service	57,635										
42	Charlotte	Truck	In-maintenance	53,135										
43	Charlotte	Scraper	In-service	53,638										
44	New York	Loader	In-service	167,817										
45	New York	Loader	In-service	160,915										
46	Charlotte	Scraper	In-transit	53,644										
47	New York	Truck	In-service	58,338										
48	Charlotte	Truck	In-transit	52,418										
49	Charlotte	Truck	In-maintenance	82,878		Status	In-service							
50	Charlotte	Scraper	In-service	64,234										
51	New York	Scraper	In-transit	59,258			Column Labels							part e
52	New York	Truck	In-maintenance	62,855				Loader	Scraper	Truck	Grand Total			
53	Charlotte	Scraper	In-service	82,913		Average of Value ($)		174580.1614	60769.5796	64955.8612	94507.38			
54	New York	Truck	In-service	64,532										
55	New York	Loader	In-service	202,471										
56	Charlotte	Loader	In-maintenance	133,909										
57	Charlotte	Scraper	In-service	39,047		Status	In-maintenance							
58	Charlotte	Truck	In-service	78,521										
59	New York	Truck	In-service	81,053			Column Labels							part f
60	Charlotte	Truck	In-service	56,592				Loader	Scraper	Truck	Grand Total			
61	Charlotte	Scraper	In-service	73,807		Count of Equipment		34	21	52	107			
62	New York	Truck	In-service	67,575										

Problem 4

	A	B	C	D	E	F	G	H	I
1	Characteristics			Loan for 15 years		Loan for 25 years			
2									
3	Amount			4.63E+08		4.63E+08			
4	Yearly interest			0.0375		0.0375			
5	Duratiion (month)			180		300			
6									
7	Monthly payement			($3,356,550.69)		($2,373,011.79)			
8									
9	Total amount paid			($604,179,123.95)		($711,903,537.69)			
10									
11	Saving			($107,724,413.74)					
12									