

## EGN 3420 - Engineering Analysis

- Catalog Description:** EGN 3420: PR: A High-level computer Language, MAC 2312. Engineering Applications of numerical methods, Including curve fitting, matrix operations, root finding, Integration, and plotting.
- Textbook:** Chapra, S.C., Applied Numerical Methods with Matlab For Engineering and Scientist, McGraw-Hill (3rd edition)
- Instructor:** C.S. Bauer, Ph.D., P.E., C.M.S.P, Professor of Engineering (ret.) Phone 407-823-2236, Office HEC 359, Email: [christian.bauer@ucf.edu](mailto:christian.bauer@ucf.edu)
- Students:** Desiring a guaranteed appointment time are asked to Make prior arrangements with the instructor in class Are by phone or email.
- Objective:** This course is designed to provide freshman and Sophomore ECE students with a background in The theory and application of matrices, and an Introduction to numerical methods (with Computer Oriented analysis) and an understanding of the Relationship between error and digits of Significance. The MATLAB programming System will be used for Course assignments.
- Prerequisites by Topic:** 1. Understanding of differential and Integral calculus Of one variable. (MAC 2312)

## 2. Familiarity with a high-level computer Language. (COP 3223)

### Topics:

1. Introduction: Mathematical Modeling, Numerical Methods, and Problem Solving.
- 2,3. Matlab will be covered by class lectures.
4. Round off and Truncation Errors
5. Roots: Bracketing Methods
6. Roots: Open Methods
8. Linear Algebraic Equations and Matrices
9. Gauss Elimination
11. Matrix Inverse and Condition
12. Iterative Methods
13. Linear Regression
14. General Linear Least Squares and Nonlinear Regression
15. Polynomial Interpolation
17. Numerical Integration
18. Numerical Integration of Functions

### Computer Usage:

Eight homework assignments which require a computer-Aided analysis will be assigned as the semester progress. Each assignment will have a one week deadline for Completion.

### Grading Scheme: (The +/- will not be used in this course.)

Homework: (8-1 week each)	25%
Test I (open book)	25%
Test II (open book)	25%
Test III (open book)	25%

Test III is during last day of class, but is not comprehensive.

**Additional Information:**

1. LATE homework will not be accepted.
2. Homework is due at the BEGINNING of class on the day it is due.  
Homework is late if it is not in the instructor's possession at the start  
Of class on the day it is due.
3. Homework assignments are individual project-NO group projects  
(i.e., do your own work.) You may consult with others on procedures,  
Algorithms, etc., but identical computer programs are not allowed.
4. If you cannot be present for an exam, notification and arrangements  
MUST be made prior to the start of the exam.
5. Some additional class policies may be stated during the lectures.
6. Students are responsible for keeping current with reading assignments  
And for resolving areas of misunderstanding through questions in class  
Or visits to the instructor's office (with an appointment).

## Summer '11 Significant Dates

Class Begin	Monday, May 16
Memorial Day	Monday, May 30
Withdrawal Deadline	Friday, June 24
Independence Day	Monday, July 4
Last day of classes (Exam III held last day of class)	Friday, August 5

HEX AND DECIMAL CONVERSION

decimal: Find the decimal weights for corresponding characters beginning with the least significant character. The decimal weight is the decimal value of the hexadecimal

hexadecimal: Find the highest decimal value in the table less than or equal to the decimal number to be converted. The hexadecimal character is the most significant. Subtract the value found from the decimal number to be converted. Repeat the process to find subsequent hexadecimal

Hex	Dec	Hex	Dec
0	0	0	0
1	16	1	16
2	32	2	32
3	48	3	48
4	64	4	64
5	80	5	80
6	96	6	96
7	112	7	112
8	128	8	128
9	144	9	144
A	160	A	160
B	176	B	176
C	192	C	192
D	208	D	208
E	224	E	224
F	240	F	240

ASCII CHART

MS Dig.		ASCII CHARACTER SET (7-Bit Code)							LS Dig.	
0	1	2	3	4	5	6	7	0	1	
NUL	DLE	SP	0	@	P	p	P	0	256	
SOH	DC1	!	1	A	Q	q	Q	1	512	
STX	DC2	"	2	B	R	r	R	2	768	
ETX	DC3	#	3	C	S	s	S	3	1,024	
EOT	DC4	\$	4	D	T	t	T	4	1,280	
ENQ	NAK	%	5	E	U	u	U	5	1,536	
ACK	SYN	&	6	F	V	v	V	6	1,792	
BEL	ETB	.	7	G	W	w	W	7	2,048	
BS	CAN	,	8	H	X	x	X	8	2,304	
HT	EM	-	9	I	Y	y	Y	9	2,560	
LF	SUB	_	:	J	Z	z	Z	A	2,816	
VT	ESC	~	<	K	[	]	[	B	3,072	
FF	FS	^	=	L	\	^	\	C	3,328	
CR	GS	~	>	M	]	~	]	D	3,584	
SO	RS	~	?	N	^	~	^	E	3,840	
SI	US	~		O	_	~	_	F		

5

BONUS: DECODE THIS ASCII HEX STRING FOR  
 2 BONUS POINTS ~ |47|4F|20|47|41|54|4F|52|53|07|

ANSWER =

11

this program  
 pgm. muscle  
 the output  
 the precision req'd.

INDIVIDUAL WORK REQD  
 (TEAM SOLUTIONS NOT ACCEPTED)

6

Write a ~~FORTRAN~~ <sup>LANG. (OPTIONAL)</sup> program which will  
 Print a table of the following form  
 giving the monthly mortgage payment and  
 total amount of payments on a \$100,000 house loan:

MORTGAGE PAYMENT PLAN

PRINCIPAL	INTEREST RATE	DURATION (YEARS)	MONTHLY PAYMENT	TOTAL PAYMENT
100 000.00	XX, XX	NN	XXXXX.XX	XXXXXX.
↓	↓	↓	↓	↓

Exercise the program for interest rates of 6, 7, 8, 9, and 10 percent, and each rate for mortgage periods of 5, 10, 15, 20, 25, and 30 years.

The formulas to compute the monthly payment and total amount are

$$M = \frac{P \cdot \frac{i}{12}}{1 - \left( \frac{1}{1 + \frac{i}{12}} \right)^{T \cdot 12}}$$

$$A = M \cdot T \cdot 12$$

where:

- P = principal
- i = interest rate
- T = mortgage duration in years
- M = monthly payment

FROM  
 Lehmkuhl,  
 Forman 77-  
 A Top Down  
 Approach,  
 Macmillan, 1983

Select C:\Documents and Settings\Josh\Desktop\JCF\VEGN 3420\3420 assign 1.exe

Principal	Interest	Years	Payment	Total
100000	0.06	5	1933.28	115996.81
100000	0.06	10	1110.21	133224.60
100000	0.06	15	843.86	151894.23
100000	0.06	20	716.43	171943.45
100000	0.06	25	644.30	193290.42
100000	0.06	30	599.55	215838.19
100000	0.07	5	1980.12	118807.19
100000	0.07	10	1161.08	139330.18
100000	0.07	15	898.83	161789.09
100000	0.07	20	775.30	186071.74
100000	0.07	25	706.78	212033.76
100000	0.07	30	665.30	239508.90
100000	0.08	5	2027.64	121658.37
100000	0.08	10	1213.28	145593.11
100000	0.08	15	955.65	172017.38
100000	0.08	20	836.44	200745.62
100000	0.08	25	771.82	231544.87
100000	0.08	30	733.76	264155.25
100000	0.09	5	2075.84	124550.13
100000	0.09	10	1266.76	152010.93
100000	0.09	15	1014.27	182567.99
100000	0.09	20	899.73	215934.23
100000	0.09	25	839.20	251758.91
100000	0.09	30	804.62	289664.14
100000	0.10	5	2124.70	127482.27
100000	0.10	10	1321.51	158580.88
100000	0.10	15	1074.61	193428.92
100000	0.10	20	965.02	231605.19
100000	0.10	25	908.70	272610.22
100000	0.10	30	877.57	315925.77

Press any key to continue . . .

$$M = \frac{P \cdot \left(\frac{I}{12}\right)}{1 - \left(\frac{1}{1 + \frac{I}{12}}\right)^{T \cdot 12}}$$

hurricane info and maps

<http://www.nhc.noaa.gov>