Introduction to Excel

**Cooling load calculations
using RTS method**

MEP451

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Outline
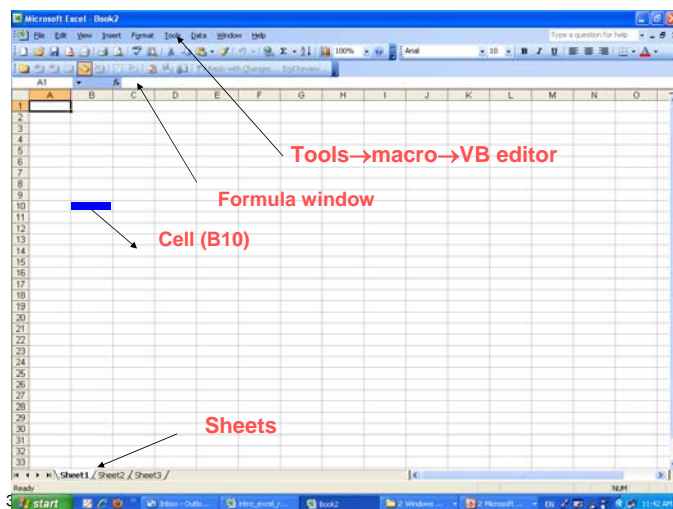
Excel environment

Built in functions

User Defined Functions (UDF)

RTS functions

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Excel User Interface

Tools→macro→VB editor

Formula window

Cell (B10)

Sheets

3

Absolute and reference to cell

=sum(C6,D6)

To Copy cell: Go to Cell E6 and draw from the corner downward till cell E10

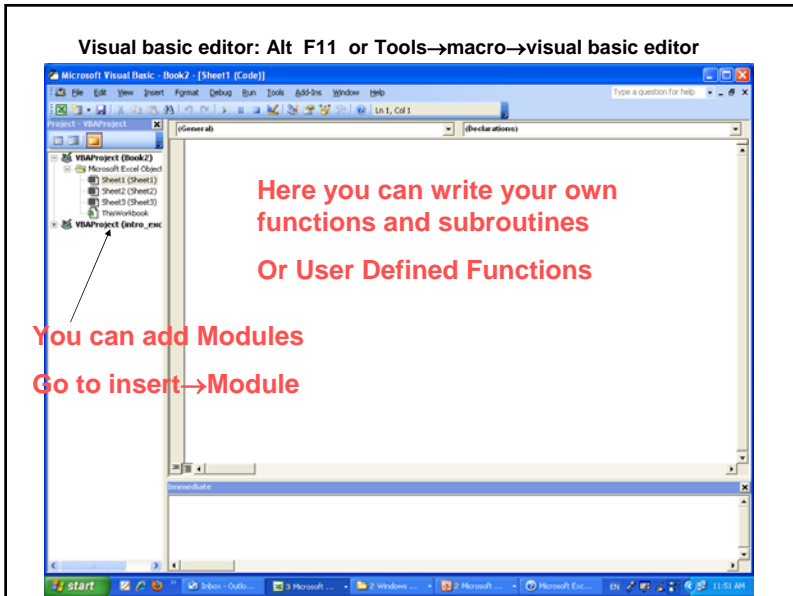Pressing F4 on a cell in formula window will make that cell absolute referenced

1	C	D	E	F
2				
3	=m	10		
4				
5	x	y	z	w
6	1	6	7	17
7	2	7	9	19
8	3	8	11	21
9	4	9	13	23
10	5	10	15	25

=sum(E6+$D3$)

**Notice what happens for
cells F7 till F10**

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Slide 1

Visual basic editor: Alt F11 or Tools→macro→visual basic editor

Here you can write your own functions and subroutines

Or User Defined Functions

You can add Modules

Go to insert→Module

Slide 2

Built in Functions

Example of built in functions: sum, average, sin, cos, countif

Sum the column B1 to B5 in Cell B7

Write the following in cell B7

=sum(B1:B5)

The answer will be 65

Another example: write =sin(2) in cell B10

=sin(2)

The answer will be 0.909

Notice that the angle must be in radian

	A	B
1		11
2		12
3		13
4		14
5		15
6		
7		=sum(B1:B:5)
8		
9		
10		=sin(2)

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Slide 3

Some of the built functions

1-Trigonometric functions (sin, cos, acos, atan, sinh, tanh, etc

2-Math functions (countif, log, ln, sumproduct,

3-Statistical functions: sum, average, stdv, slope, intercept, rsq. min, max, large, small, etc

4-Matrix: mmult, inverse, etc

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Slide 4

Matrix functions

Multiplication of two vectors

Row and column vector

Result=(1*9+2*8+3*7)=46

On cell j3 type

=mmult(D3:F3,H3:H5)

After closing the bracket press control_shift_return

The result you get is 46

	D	E	F
3	1	2	3

H
9
8
7

J

=mmult(D3:F3,(H3:H5)

Answer will be 46

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Using the matrix multiplication function mmult

	D	E	F	I	H		J
6	1	2	3		0.1		2.6
7	4	5	6		0.3		6.1
8	7	8	9		0.7		9.4

Select the column J6:J8 and type

=mmult(D6:F8,H6:H8)

After closing the bracket press
control_shift_return

The result will be a vector in column J and the values are
as shown above

Built in Functions

To see all built in functions select a
cell press on fx icon to the right of
the formula window. Functions are
written in categories. Select the
category you want. For example
Math, trig, statistical, text, date, etc

User Defined functions

These are functions written by the user and
only accessible by the user. But you can
detach them from the excel sheet as a module
and use them in other workbooks or other
excel file.

Excel power with visual basic power are
combined to give the user lots of freedom
to write programs and codes

User defined functions

To access the visual basic editor

tools→macros →visual basic editor

Or just type Alt-F11

You will see the visual basic

Go to insert and insert a module

You can view the project ad see that a module is
added to the project. In the module now you can
add functions and subroutines

User defined functions: An Example

Suppose we want to add a function
that do the followings

$$y = a_0 + a_1 x + a_2 x^2$$

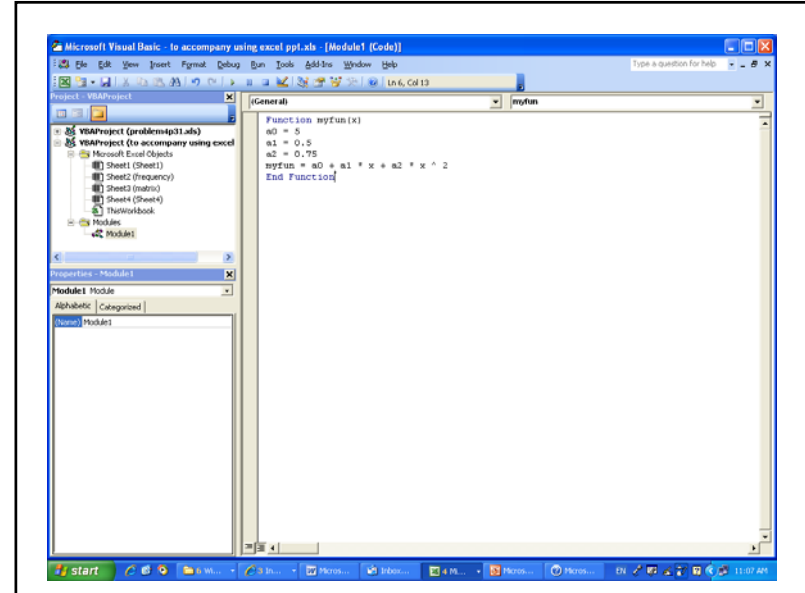**Go VB editor and write the following code**

Function myfun(x)

a0=5

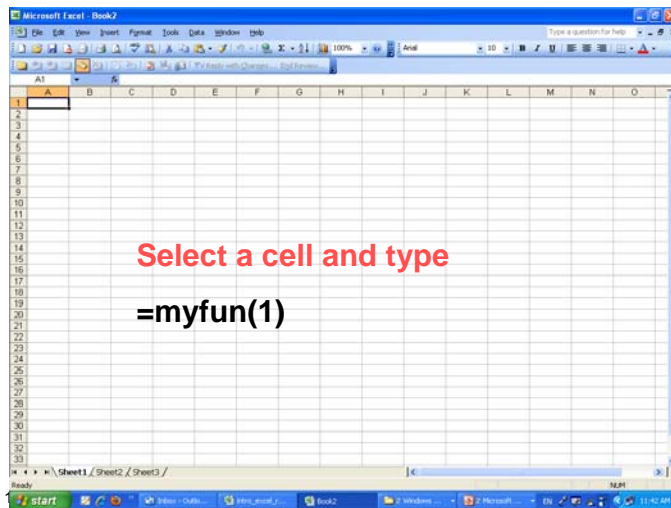a1=0.5

a2=0.75

myfun=a0+a1*x+a2*x^2

End function

Now you can go to the excel sheet and type =myfun(1) the
answer will be 6.25

Excel User Interface

Select a cell and type

=myfun(1)

To see all user defined functions and
subroutines

go to tools→macro→visual basic editor

And press on module

Built in Basic functions for RTS Cooling load method

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Finding the declination angle

Function name is dec(n)

In Excel in any cell write dec(n), where n is day number to get the solar declination in degrees

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Hourly outdoor temperature

=ASHRAE_hourly_temperature(hour, peakT, DR)

where

hour: the hour at which the outdoor temperature is to be evaluated

PeakT is the design temperature

DR is the daily range

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Find the solar altitude angle beta (β)

=betadeg(m,id,hour, latdeg)

where

m =month number

id= day number in the month

hour=solar time

latdeg=latitude angle in deg

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Excel Intro & RTS method

Covert radiative heat gain into cooling load

=rts_calc($N$17:$N$40,$G$55:$G$78,hour)

where

N17:N40 = 24 values of the radiative heat gain

G55:G78= RTS

hour=hour at which the cooling load is desire

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Some of RTS method user defined functions

Function daynum(month As Integer, day As Integer)

Function dec(n)

Function ASHRAE_hourly_temperature(hour, peakT, DR)

Function betadeg(m As Integer, id As Integer, ts, latdeg)

Function phideg(m As Integer, id As Integer, ts, latdeg)

Function ashrae_a(month As Integer)

Function ashrae_b(month As Integer)

Function ashrae_c(month As Integer)

Function solairC(tout, alpha, Gt, ho, tilt)

Function incidence_angle(latitude, declination, solar_time, surface_azimuth, tilt)

Function incident_solar(latitude, declination, solar_time, facing_dir, tilt, A, B, C, CN, rhog, mode As integr)

Function rts_calc(v1 As Range, v2 As Range, hr As Integer)

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How to insert a module into a workbook

1-Open a new excel sheet file

2-Go to tools-macro-VB editor

3-On the right of the screen you will see the project components

4-Press over this workbook and with right click on the mouse select import file

5-Select the module you want to insert

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