FC F-Chart Software

EESy Solutions

Engineering Equation Solver Newsletter

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Welcome

This is the 27th issue of EESy Solutions, a newsletter that provides news, tips, and other updates to users of the Engineering Equation Solver software. This issue is dedicated to new version of EES that can run on most Android devices.

EES has been a commercial software product for more than two decades. If you have missed any of the previous issues of EESy Solutions, they can be downloaded from www.fchart.com.

EES for the Android!

A version of EES is now available for the Android operating system. EES for the Android provides the most powerful engineering calculator application that is currently available for your portable device! It is ideal for carrying out simple engineering calculations on the go as it brings most of the powerful functionality you expect from EES to your portable device. The Android version of EES provides a powerful and inexpensive tool for doing engineering calculations on a tablet or phone.

The EES Android application is compatible with the Android operating system 4.0 or newer. It will work on most Android tablets and phones.

EES for the Android vs. EES for Windows

The Android version of EES provides a subset of the capabilities that are included in the full version that is designed for the Windows operating system. The Windows version of EES can solve either 6,000 or 12,000 simultaneous equations depending on whether you have the Commercial or Professional versions, respectively. The Android version can solve 250 simultaneous equations. Both versions provide the core capabilities you expect from EES: they can solve nonlinear equations and access property data for a large number of fluids and substances. Both versions can keep track of units and provide unit conversion capability. However, the more advanced features such as Tables, Plots, Functions and Procedures, etc. are not supported by the Android version.
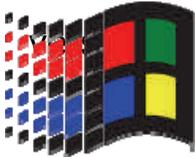
| Feature	Windows	Android
Maximum number of variables	6,000 or 12,000	250
Solve non-linear equations	Yes	Yes
Property data	Yes	Yes
Unit checking	Yes	Yes
Save files that are compatible with both versions	Yes	Yes
Parametric, Lookup, Integral and Array Tables	Yes	No
Plotting	Yes	No
Functions, Procedures, Modules, and Subprograms	Yes	No
Optimization, Uncertainty	Yes	No
Diagram Windows	Yes	No

Compatibility with Windows version

The Android version of EES reads and saves files having an .EES_ filename extension. These files can be saved and transferred to your PC. The Windows version of EES can also read and write files with the .EES_ extension. Therefore, files can be exchanged easily between the Windows and Android versions. For example, it is possible to develop EES programs using the Windows version of EES and then transfer and run these on the Android version installed on your tablet or phone.

Purchasing the Android version

The Android version of EES can be purchased from the Google Play store: play.google.com

Search for EES_Android and purchase it for $10 for your Android device.
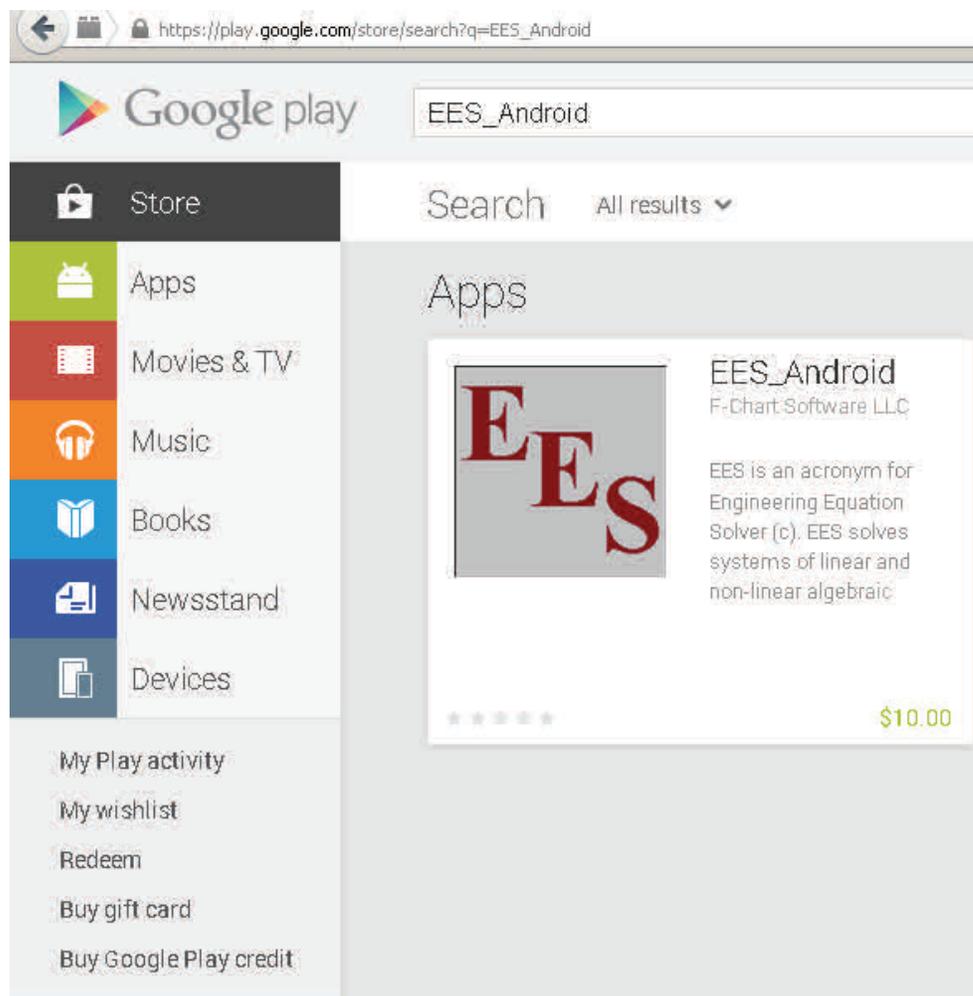
Once purchased, the Android operating system will automatically install EES as an application on your device.
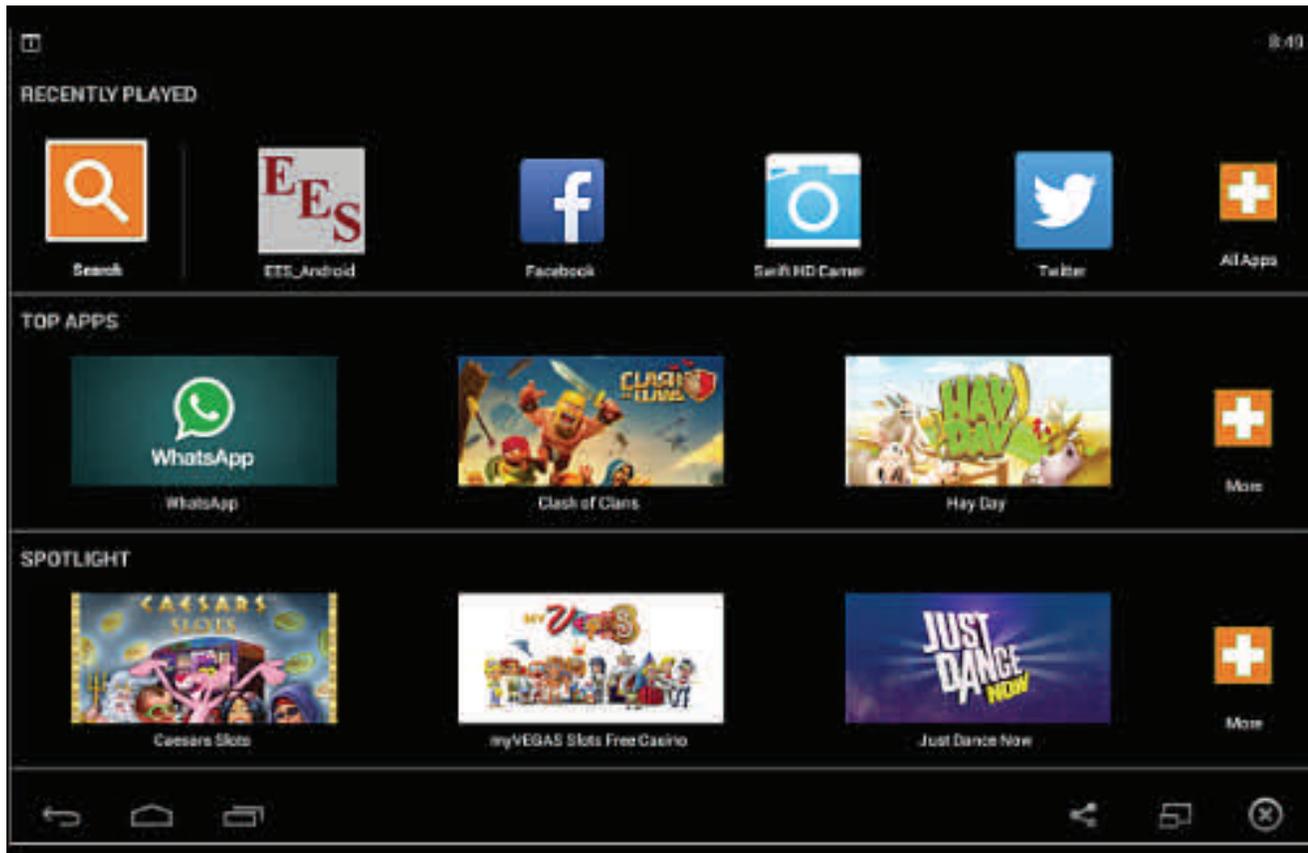

There are a couple of important tips regarding using the Android version of EES.

1. Be sure that your keyboard is set to English so that the EES application interprets information coming from the keyboard correctly.

2. Be sure that the autocorrect (or predictive text) feature is turned off so that the Android operating system does not attempt to change the names of variables that you enter into 'correct' English words.

Running EES for Android

Click or touch the EES icon in order to start the application.
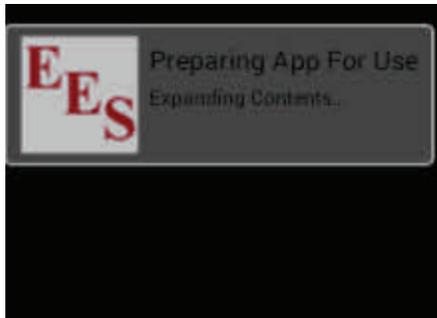
As installed, the program will load a sample program that illustrates the basic features.

Entering and Solving Equations

Select File and then New in order to open a new instance of EES. Enter a set of equations that you want to solve in the Equations Window. If you touch the Equations Window then your virtual keyboard will appear—dismiss the virtual keyboard using the back button ⬅ (NOT the hide button that is available on some keyboards).

Select Solve and the Solutions Window will appear on the right side of the tablet screen (in landscape mode) or on the bottom (in portrait mode).

Equations Window

Solutions Window

Saving & Sending Files

Select File and then Save to access the Save File dialog. EES Android files will automatically be saved with the .EES_ file name extension in order to delineate them from regular EES files. Note that the Windows version of EES can open and write .EES_ files. Click File again to see that the file you just saved is now available to open.
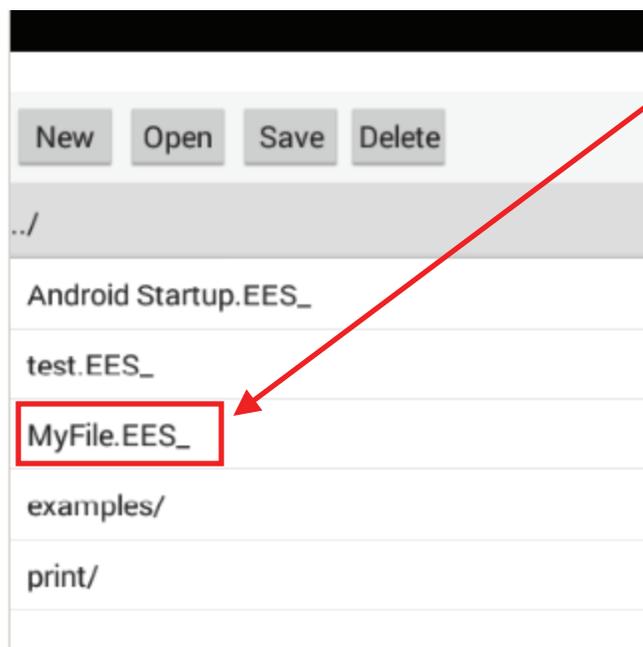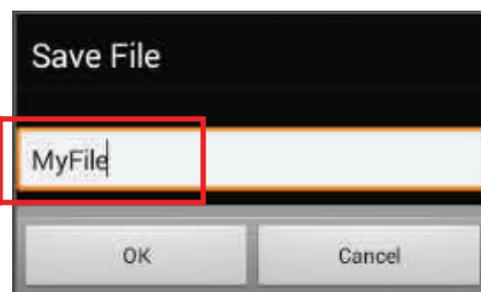
The @ button that is shown in the upper right side of the File window provides a way of sending the selected EES file to another person or computer. The button will activate an email application and allow you to enter a destination email to which the file will be sent as an attachment. Files can also be sent to your Google drive in this way.

Note that updating the EES_Android application on your device will erase all of the .EES_ files in the EES_Android directory. Therefore you may want to use this feature to send these files to another computer before updating.

The P button located in the upper right corner of the screen will send a report that summarizes the EES_ file and its results. Again, a dialog will appear showing a selection of possible communication applications. Select an application and a recipient and click the send button. An email will be sent that includes equations and solution in its body.

Units

EES_A1.2   (new)

| File | Vars | Solve | Units |

L=12
W=24
A=L*W
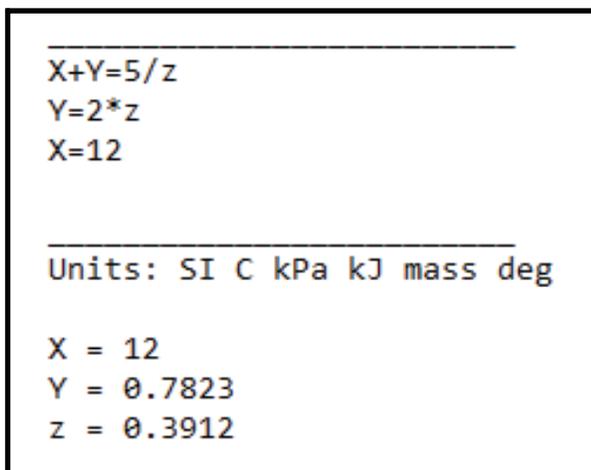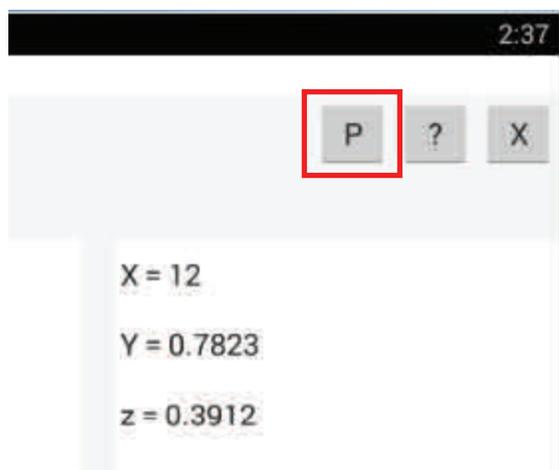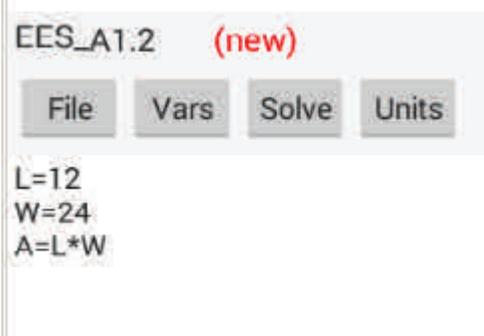
Each variable in an EES program can be assigned a unit. EES will check the unit consistency of the equations and also provide powerful unit conversion functions. For example, let's calculate the area of a rectangle (in units m^2) that is L = 12 inch by W = 24 cm. Solving with no regard to units leads to the incorrect result $A = L \times W = 288$.

A = 288

L = 12

W = 24

However, we can assign units to all of these variables. Select L in the Solutions Window and double click to bring up the Variable Information dialog. Note that units, guess values, limits, and format information can all be entered. Continue this process for the remaining variables. Units can also be entered in the Equations window following the values, e.g., L=12 [inch].

Variable: L

Format   Auto

Units   inch

Guess   1

Lower   -infinity

Upper   infinity

| Cancel | Update | Apply | OK |

A = 288 [m^2]

L = 12 [inch]

W = 24 [cm]

The result is still incorrect but now EES can identify the unit inconsistency in the system of equations. Select the Units button in order to have EES check the units of your program.

Warning

The units of A [m^2] and L * W [inch * cm] differ by a factor of 3937.

OK

The problem can be fixed using the convert function.

EES_A1.2   (new)

| File | Vars | Solve | Units |

L=12
W=24
A=L*W*convert(inch-cm,m^2)

Information

No unit errors were detected.

OK
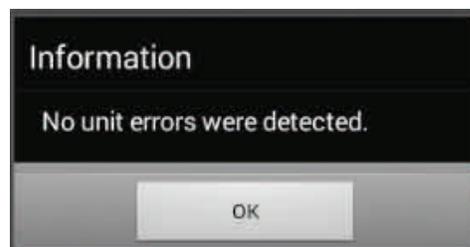
A = 0.07315 [m^2]

L = 12 [inch]

W = 24 [cm]

Properties

The EES database of properties is programmed in the Android version and these properties are accessed in the same way that they are in the Windows version. The unit system should be set using the $UnitSystem directive.

The following set of equations entered in the EES Android application computes the specific volume of R134a at 300 K and 200 kPa. The result should be $v = 0.1173$ m^3/kg

```
$UnitSystem SI K kPa

T = 300 [K]

P = 200 [kPa]

R$ = 'R134a'

V = volume(R$, P = P, T = T)
```

Directives

Directives are instructions to EES rather than equations. The Android version of EES supports a subset of directives.

$CheckUnits On/Off: turns on or off unit checking for a set of equations

$Complex On j: places EES in complex mode and uses j as the complex number

$Keyboard US/EU: changes the decimal separator, list separator, and end of line indicators to be US or EU conventions

$Reference: specifies the reference state used for internal energy, enthalpy, and entropy in the EES property database

$StopCriteria: specifies the Stopping Criteria that control the iterative calculation process used by EES to solve the equations in the Equations Window

$UnitSystem: sets the unit system used by EES to access the internal property database

$UpdateGuesses: causes the guess values to be automatically updated after each time the calculations are successfully completed

$VarInfo: allows variable information (limits, guess values, units, and display format) to be entered in the Equations Window rather than the Variable Information dialog

$Warnings On/Off: turns warnings on or off in EES.

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- A new and more accurate equation of state has been implemented for ethanol.

- Transport property data for R1233zd(E) (previously R1233ze) have been implemented using the method of extended corresponding states.

- Property data has been implemented for R1234ze(Z).

- A plot can be displayed in the Diagram Window. The plot can be made to automatically update and the position, size, and visibility can be set using EES variables and controlled programmatically.

- The $EXPORT directive and the EXPORT macro command both provide the /V option which causes the variable names to be exported with their values.

- It is possible to delete all rows after a selected row in a table using the All After Row radio button in the dialog.

- A new set of property correlations for lithium bromide/water mixtures is provided in the LiBrSSC library.

- Ammonia-water mixture properties can be accessed using EES property functions with the fluid name NH3H2O. The property functions require 3 independent variables which may include temperature, pressure, enthalpy, entropy, internal energy, volume, mass fraction (X), and quality (Q). Note that Q is quality and X is mass fraction in this context. The property function MassFraction returns the mass fraction of the mixture.

- Flow measurement analyses are provided with the procedures OrificePlate and FlowNozzle in the Minor Losses and Flow Measurement section of the Heat Transfer and Fluid Flow library.

Instant Update Service

EES uses a different model for updating than most other programs. Each time that there is a change in the EES program, either to correct a problem or to add a new feature, the version number is incremented by 0.001 and the latest version of EES is placed on our website. Although the program has become very robust and stable, there have been many new versions of EES released since the last EESy Solutions was distributed.

Any user who has a current subscription to our Instant Update Service can download the latest version. All new licenses of EES are provided with one year of Instant Update Service. The fee to continue Instant Update Service after the first year is 20% of the current cost of the program per year. Contact F-Chart Software if you wish to re-subscribe to the Instant Update Service.