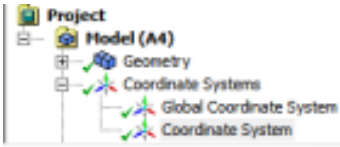
Varying Material Properties Along Object

The example project may be downloaded by right clicking this link: spatially_varying_modulus_via_do_looop.wbpz

Open up Model in the Project Schematic to bring up the Mechanical window.

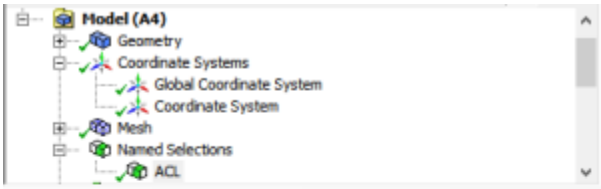
Under Coordinate Systems, create your own local coordinate system. The screenshot below results in the coordinate system's origin at the middle of the top face of the cube for our example project.



Details of "Coordinate System"

Definition	
Type	Cartesian
Coordinate System	Manual
Coordinate System ID	100.
Suppressed	No
Origin	
Define By	Geometry Selection
Geometry	Click to Change
Origin X	-0.19685 in
Origin Y	0.3937 in
Origin Z	0.19685 in
Principal Axis	
Axis	X
Define By	Global X Axis
Orientation About Principal Axis	
Axis	Y
Define By	Default
Directional Vectors	
Transformations	
Base Configuration	Absolute
Transformed Configuration	[-0.19685 0.3937 0.19685]

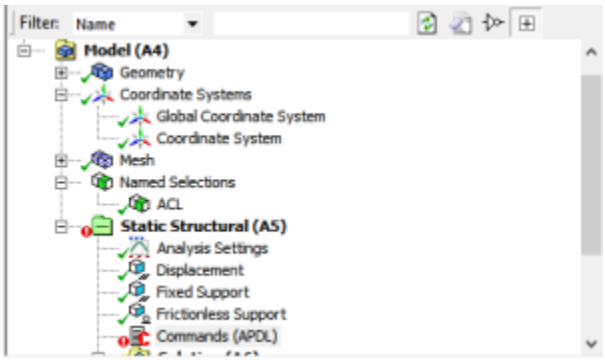
Create your own Named Selection with the following properties.



Details of "ACL"

Scope	
Scoping Method	Geometry Selection
Geometry	1 Body
Definition	
Send to Solver	Yes
Visible	Yes
Program Controlled Inflation	Exclude
Statistics	
Type	Manual
Total Selection	1 Body
Suppressed	0
Used by Mesh Worksheet	No

Under Static Structural, insert a Commands option



Copy paste the following text into the Commands window (also attached is a screenshot from the example project):

Commands

```
!   Commands inserted into this file will be executed just prior to the ANSYS SOLVE command.
!   These commands may supersede command settings set by Workbench.

!   Active UNIT system in Workbench when this object was created:  Metric (mm, kg, N, s, mV, mA)
!   NOTE:  Any data that requires units (such as mass) is assumed to be in the consistent solver unit system.
!               See Solving Units in the help system for more information.
finish
/prep7

cmsel,s,ACL
*get,elementcount,elem,,count
*get,maxmp,mat,0,num,max
mat_ref = maxmp
E0 = 2e+05                                  ! Youngs modulus at surface
Einf = 1.5*E0                               ! Youngs modulus at infiniti
beta = 1                                   ! Rate of exponential decay

*do,i,1,elementcount
 csys,100                                   ! Set active coordinate system to 100 to match the manual numbered coordin
                                            ! If you change the coordinate system, you must clear the results and reru
 *GET, depth, ELEM, i, cent, y,             ! Calculate element centroid in active coordinate system
  value = Einf-(Einf-E0)*exp(-beta*depth)   ! Calculated youngs modulus at given location
 mat_ref = mat_ref+1
 MP,EX,mat_ref,value                        ! Defining the new material
 MP,PRXY,mat_ref,0.3
 emodif,i,mat,mat_ref                       ! Assign the new material to the current element
*enddo

allsel

finish
/solu
csys,0
mplist
```

! Commands inserted into this file will be executed just prior to the ANSYS SOLVE command.
! These commands may supersede command settings set by Workbench.

! Active UNIT system in Workbench when this object was created: Metric (mm, kg, N, s, mV, mA)
! NOTE: Any data that requires units (such as mass) is assumed to be in the consistent solver unit system.
! See Solving Units in the help system for more information.
finish
/prep7

cmsel,s,ACL
*get,elementcount,elem,,count
*get,maxmp,mat,0,num,max
mat_ref = maxmp
E0 = 2e+05 ! Youngs modulus at surface
Einf = 1.5*E0 ! Youngs modulus at infiniti
beta = 1 ! Rate of exponential decay

```
*do,i,1,elementcount
csys,100 ! Set active coordinate system to 100 to match the manual numbered coordinate system in the object tree under Coordinate Systems
! If you change the coordinate system, you must clear the results and rerun
*GET, depth, ELEM, i, cent, y, ! Calculate element centroid in active coordinate system
value = Einf-(Einf-E0)*exp(-beta*depth) ! Calculated youngs modulus at given location
mat_ref = mat_ref+1
MP,EX,mat_ref,value ! Defining the new material
MP,PRXY,mat_ref,0.3
emodif,i,mat,mat_ref ! Assign the new material to the current element
*enddo

allsel

finish
/solu
csys,0
mplist
```