

The is the complete syllabus for the package, available on the website, and you can access it through the provided link.

Preview

- What do we learn from this package?
- Teaching plan and Prerequisites and Next steps
- Package specification

Introduction

- When do you need to use?
- How to use UMAT and VUMAT Subroutines?
- What is the Difference between material subroutines like USDFLD(VUSDFLD), UHARD(VUHARD), UHYPER, and UMAT(VUMAT)?
- What is the difference between UMAT and VUMAT Subroutines?
- How to convert UMAT to VUMAT and vice versa?
- What are the Complete theories about hook's law and implementation in the subroutine?
- What is the flowchart of writing different UMAT and VUMAT subroutines?
- How does ABAQUS solve the problem by these subroutines step by step?
- What is the difference in the method of solution for ABAQUS/standard and ABAQUS/explicit?
- Where different user subroutines (like CREEP, FRIC, UEL, UEXPAN, UGENS, USDFLD, UMAT, DLOAD, FILM, HETVAL, UWAVE and etc.) fit into Abaqus in solving the problem?
- How to calculate the jacobian matrix in UMAT?
- How to familiar with different types of equations, applications, and how they are derived for elastic material like isotropic, orthotropic, anisotropic in different types of elements like a shell, plane stress, plane strain, and continuum elements?

Workshop 1: Writing UMAT Subroutine for Isotropic Isothermal Elasticity

- How to familiar with different variables in UMAT subroutine (DDSDDE, STRESS, STATEV, SSE, SPD, SCD and etc.) and how to calculate and differences between them (mandatory and alternative)?
- what is the difference between time variables like DTIME, KINC and, etc.?
- Which articles could help to write subroutines?
- How to write the subroutine line by line?
- How to add subroutines inputs and setting to use the subroutine in GUI of Abaqus?

- How to Simulate the problem in beam model with Abaqus and subroutine and compare with each other to verify the written subroutine?

Workshop 2: Writing UMAT Subroutine for Elasticity and TSAI failure criterion of composite material

- What is the stiffness matrix of orthotropic elasticity?
- What is the TSAI-HILL failure criterion equation?
- How to calculate other mechanical properties of orthotropic material by other inputs?
- How to write the subroutine line by line?
- How to Simulate the problem in shell plate model with the Abaqus material model and subroutine material model and compare with each other to verify the written subroutine?

Workshop 3: Writing VUMAT Subroutine for Brittle Materials + Element Removal

- How to familiar with different variables in VUMAT subroutine (STRESSNEW,newSTATEV,SSE,SPD,SCD and etc.) and how to calculate and differences(mandatory and alternative)
- How to find complete information about every variable in these two types of subroutines?
- What is the difference between stress tensor in UMAT and VUMAT?
- What is the setting to remove element in GUI and the subroutine in VUMAT subroutine?
- How to write the subroutine line by line?
- What is the setting to remove the elements in GUI and the subroutine in VUMAT subroutine?
- Simulate the problem in solid with hole model with Abaqus material model and subroutine material model and compare with each other to verify the written subroutine.

Workshop 4 :Writing VUMAT Subroutine for Isotropic Hardening Plasticity

- what is the equation of yield function, equivalent plastic strain, and other variables which have been used in the subroutine?
- How to find the complete book or references to write the subroutine in computational plasticity filed?
- what is the flowchart and equations which should have been used step by step in the subroutine?
- what is the internal energy and how to calculate it?
- What is the dissipated inelastic specific energy and how to calculate it
- How to Write the subroutine line by line?
- What is VUHARD subroutine?
- What is the interface of VUHARD subroutine and how to write it?

- How to Write the VUHARD subroutine step by step?
- How to simulate the problem in the shell plate model with the Abaqus and subroutine and compare with each other to verify the written subroutine.