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> # Prof. Dr. Serkan Dağ
  # ME 451 Introduction to Composite Structures
> # File 4.1
  # How to invert compliance matrix of an isotropic material
> restart :
  with(LinearAlgebra) :
> # Define compliance matrix
```

$$> S := \begin{bmatrix} \frac{1}{E} & -\frac{nu}{E} & -\frac{nu}{E} & 0 & 0 & 0 \\ -\frac{nu}{E} & \frac{1}{E} & -\frac{nu}{E} & 0 & 0 & 0 \\ -\frac{nu}{E} & -\frac{nu}{E} & \frac{1}{E} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{G} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{G} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{G} \end{bmatrix};$$

$$S := \begin{bmatrix} \frac{1}{E} & -\frac{\nu}{E} & -\frac{\nu}{E} & 0 & 0 & 0 \\ -\frac{\nu}{E} & \frac{1}{E} & -\frac{\nu}{E} & 0 & 0 & 0 \\ -\frac{\nu}{E} & -\frac{\nu}{E} & \frac{1}{E} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{G} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{G} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{G} \end{bmatrix} \quad (1)$$

```
> # Carry out matrix inverse operation to find stiffness matrix
> C := MatrixInverse( S );
```

(2)

$$C := \begin{bmatrix} \frac{(\nu-1)\,E}{2\nu^2+\nu-1} & -\frac{\nu\,E}{2\nu^2+\nu-1} & -\frac{\nu\,E}{2\nu^2+\nu-1} & 0 & 0 & 0 \\ -\frac{\nu\,E}{2\nu^2+\nu-1} & \frac{(\nu-1)\,E}{2\nu^2+\nu-1} & -\frac{\nu\,E}{2\nu^2+\nu-1} & 0 & 0 & 0 \\ -\frac{\nu\,E}{2\nu^2+\nu-1} & -\frac{\nu\,E}{2\nu^2+\nu-1} & \frac{(\nu-1)\,E}{2\nu^2+\nu-1} & 0 & 0 & 0 \\ 0 & 0 & 0 & G & 0 & 0 \\ 0 & 0 & 0 & 0 & G & 0 \\ 0 & 0 & 0 & 0 & 0 & G \end{bmatrix} \tag{2}$$

```
> # Simplify the entries
```

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> C11 := factor( C[1, 1] );
```

$$C11 := \frac{(\nu-1)\,E}{(\nu+1)\,(2\nu-1)} \tag{3}$$

```
> C12 := factor( C[1, 2] );
```

$$C12 := -\frac{\nu\,E}{(\nu+1)\,(2\nu-1)} \tag{4}$$

```
> C13 := factor( C[1, 3] );
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$$C13 := -\frac{\nu\,E}{(\nu+1)\,(2\nu-1)} \tag{5}$$

```
> C21 := factor( C[2, 1] );
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$$C21 := -\frac{\nu\,E}{(\nu+1)\,(2\nu-1)} \tag{6}$$

```
> C22 := factor( C[2, 2] );
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$$C22 := \frac{(\nu-1)\,E}{(\nu+1)\,(2\nu-1)} \tag{7}$$

```
> C23 := factor(C[2, 3]);
```

$$C23 := -\frac{\nu\,E}{(\nu+1)\,(2\nu-1)} \tag{8}$$

```
> C31 := factor(C[3, 1]);
```

$$C31 := -\frac{\nu\,E}{(\nu+1)\,(2\nu-1)} \tag{9}$$

```
> C32 := factor(C[3, 2]);
```

$$C32 := -\frac{\nu\,E}{(\nu+1)\,(2\nu-1)} \tag{10}$$

```
> C33 := factor(C[3, 3]);
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$$C33 := \frac{(\nu-1)\,E}{(\nu+1)\,(2\nu-1)} \tag{11}$$

```
> C44 := C[4, 4];
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$$C44 := G \tag{12}$$

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> C55 := C[5, 5];
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$$C55 := G \tag{13}$$

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> C66 := C[6, 6];
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$$C66 := G \tag{14}$$

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>
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