

Prerequisite: Advanced Engineering Math I 15500 or Applied Mathematics 15600.

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Prerequisite: Continuum Mechanics I 115501.

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15513 Advanced Vibrations 3 Cr. Small oscillations of discrete or discretized systems of high dimensions. Free and forced vibrations. Modal expansion. Continuous systems. Exact and approximate solutions. FEM for reductions of continuous systems.


15515 FEM in Solid Mechanics I 3 Cr. Discretization. FEM for 2D and 3D structures using rod and/or beam elements. Shape function. Stiffness matrix for rectangular and triangular elements in planar stresses. Use of PVM. Hexahedral elements in 3D systems. FEM for structural vibrations.
Prerequisite: Advanced Engineering Math I 15500 or Applied Mathematics 15600.


15519  **Advanced Mechanisms Design**  3 Cr. Geometry of constrained motion in three dimensions. Applications to design of mechanisms.


15526  **Heat Transfer (Radiation)**  3 Cr. Properties of surfaces and materials. Radiation exchange in enclosure, absorbing, emitting, and scattering media. Radiation combined with conduction and/or convection.


15538 **Advanced Thermodynamics** 3 Cr.  

15539 **Propelling Systems** 3 Cr.  

15540 **Advanced Combustion** 3 Cr.  

15541 **Mechanics of Robotic Systems** 3 Cr.  

15549 **Analysis & Design of Robotic Systems** 3 Cr.  

15550 **Nonlinear Systems** 3 Cr.  

15551 **Dynamic Systems** 3 Cr.  

15552 **Theory of Plates & Shells** 3 Cr.  

15553 **Nonlinear Vibration** 3 Cr.  

15554 **Hydraulics and Pneumatics** 3 Cr.  

15556 **C. F. D. I** 3 Cr.  

15560 **C. F. D. II** 3 Cr.  

15561 **Advanced Turbomachinery** 3 Cr.  

15562 **Viscous Flow** 3 Cr.  

15565 **Optimization** 3 Cr.  

15569 **Robust Control Systems** 3 Cr.  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15581</td>
<td>Welding</td>
<td>3 Cr.</td>
<td>Technology of welding. Heat sources for welding and cutting. Heating effects before and after welding. Welding cracks. Effects of alloys on welded structures. Mechanical properties of welded structures. <strong>Prerequisite:</strong> Metallurgy in Manufacturing 15593</td>
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Prerequisite:  15500 or 15600.

