Environmental Engineering (12 hours)

Course | Title | Credits
--- | --- | ---
ECIV 730 | Advanced Soil Mechanics | 3
Select three of the following: | | 9
ECIV 590 | Intermediate Special Topics | *
ECIV 731 | Slope Stability, Retaining Systems and Lateral Earth Pressure | *
ECIV 732 | Theoretical and Numerical Methods in Geomechanics | *
ECIV 733 | Physico-chemical Properties of Soils | *
ECIV 734 | Soil Dynamics and Geotechnical Earthquake Engineering | *
ECIV 736 | Ground Improvement Techniques | *
ECIV 737 | Advanced Foundation Design | *
ECIV 790 | Selected Topics in Civil Engineering | *
Select one USC graduate (500-level or higher) course | | *

Total Credit Hours: 12

* To be approved by student's advisor and ECIV graduate director through program of study (MPOS) form.

Railway Engineering (12 hours)

Course | Title | Credits
--- | --- | ---
Select two of the following "Fundamental" core courses: | | 6
ECIV 580 | Railway Engineering I | *
ECIV 582 | Operation and Logistics of Railway Systems | *
ECIV 588 | Design of Railway Bridges and Structures | *
ECIV 590 | Intermediate Special Topics | *
Select one "Advanced" core course | | *
Select one "Advanced" or "Cross-Disciplinary" core course | | **
Select one of the following "Advanced" core courses: | | 3
ECIV 707 | Management of Engineering Projects | *
ECIV 724 | Dynamics of Structures | *
ECIV 734 | Soil Dynamics and Geotechnical Earthquake Engineering | *
ECIV 784 | Dynamic Analysis of Railway Systems | *
ECIV 789 | Design Project in Railway Engineering | *
ECIV 790 | Selected Topics in Civil Engineering | *
Select one of the following "Cross-Disciplinary" core courses: | | 3
Select one Environmental Engineering core course | | *
Select one Geotechnical Engineering core course | | *
Select one Structural Engineering core course | | *
Select one Transportation Engineering core course | | *
Select one Water Resources Engineering core course | | *
Select one USC graduate (500-level or higher) course | | *

Total Credit Hours: 12

* To be approved by student's advisor and ECIV graduate director through program of study (MPOS) form.
** Applies to PhD student with MS/ME degree only. May be taken for either "Fundamental" core course credit, or "Advanced" or "Cross-Disciplinary" core course credit, not both.
### Structural Engineering (12 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 720</td>
<td>Advanced Structural Mechanics and Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Select three of the following: 9

- ECIV 590  Intermediate Special Topics *
- ECIV 722  Theory and Design of Plates and Shells
- ECIV 724  Dynamics of Structures
- ECIV 725  Advanced Analysis and Design in Structural Metals
- ECIV 726  Repair and Retrofit of Structures
- ECIV 727  Advanced Analysis and Design of Reinforced Concrete
- ECIV 728  Prestressed Concrete Analysis and Design
- ECIV 737  Advanced Foundation Design
- ECIV 790  Selected Topics in Civil Engineering *

Select one USC graduate (500-level or higher) course *

**Total Credit Hours** 12

* To be approved by student's advisor and ECIV graduate director through program of study (MPOS) form.

### Transportation Engineering (12 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 535</td>
<td>Geotechnical Engineering in Transportation</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 540</td>
<td>Transportation Systems Planning</td>
<td></td>
</tr>
<tr>
<td>ECIV 541</td>
<td>Highway Design</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following: 3

- ECIV 542  Traffic Engineering
- ECIV 748  Traffic Flow Theory

Select one of the following: 3

- ECIV 705  Deterministic Civil and Environmental Systems Engineering
- ECIV 706  Probabilistic Civil and Environmental Systems Engineering

Select one of the following: 3

- ECIV 590  Intermediate Special Topics *
- ECIV 790  Selected Topics in Civil Engineering *

Select one USC graduate (500-level or higher) course *

**Total Credit Hours** 12

* To be approved by student's advisor and ECIV graduate director through program of study (MPOS) form.

### Water Resources Engineering (12 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 560</td>
<td>Open Channel Hydraulics</td>
<td>0-3</td>
</tr>
<tr>
<td>ECIV 562</td>
<td>Engineering Hydrology</td>
<td></td>
</tr>
<tr>
<td>ECIV 563</td>
<td>Subsurface Hydrology</td>
<td></td>
</tr>
<tr>
<td>ECIV 590</td>
<td>Intermediate Special Topics</td>
<td></td>
</tr>
</tbody>
</table>

Select up to one of the following: 0-3

- ECIV 760  Computational Hydraulics
- ECIV 761  Numerical Methods in Subsurface Hydrology
- ECIV 762  Advanced Hydrology

Select at least two of the following: 6-12

- ECIV 763  Unsaturated Flow Theory
- ECIV 764  Contaminant Transport
- ECIV 765  Erosion and Sediment Control
- ECIV 766  Fluid Transients
- ECIV 767  Sediment Transport and River Mechanics
- ECIV 790  Selected Topics in Civil Engineering *

Select one USC graduate (500-level or higher) course *

**Total Credit Hours** 12

* To be approved by student's advisor and ECIV graduate director through program of study (MPOS) form.