Department of Electrical and Computer Engineering  
Checklist for 591 Space Engineering Focus Area  
Combined MSEE & Electrical Engineer Degrees  
(Available to Space Engineering students only)

The program leading to the Master of Science in Electrical Engineering at NPS is accredited at the advanced level through the Accreditation Board of Engineering and Technology. This accreditation is based on degree requirements set forth by the Electrical and Computer Engineering Department at NPS and approved by the NPS Academic Council. This checklist is provided to document the completion of the MSEE and Electrical Engineer Degree requirements.

| Student name: ___________________________; email: ___________________________ |
| Month/year enrolled: ____________________; Graduation date: __________________; |

I certify that 1) the information contained on this form is correct; and 2) courses included in this checklist are not included in the requirements towards another Master degree.

| Student: ___________________________; Date: ___________________________ |

We certify that this student has met the minimum requirements for the MSEE degree.

Signatures:

<table>
<thead>
<tr>
<th>Academic Associate, Date</th>
<th>ECE Assoc. Chair for Students, Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE Department</td>
<td>ECE Department Chair, Date</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program Officer, Date</th>
<th>ECE Department Chair, Date</th>
</tr>
</thead>
</table>

Effective date: 1/1/13; last update: 10/20/15, MPF  
Please read Privacy Advisory at (www.nps.edu/Privacy/index.html)
1. BSEE Degree/Equivalence requirement satisfied by (fill in one):
   - BSEE degree from: __________________________ Month/year: ______________________
   - BSEE equivalence from NPS. Date: __________________

2. Thesis:
   - Number of thesis credits (24 minimum): _____________
   - Advisor: ___________________________
   - Presentation date: __________________ Where? (ECE Seminar?) ________________
   - EC3000 - Not Required of 591 students

   The remaining requirements must be met exclusive of thesis requirements.

3. Program of Study:

   (591 students – Select exactly two Space ECE specialties contained within the Space focus area shown below, and check courses taken in those specialties):

<table>
<thead>
<tr>
<th>Specialties</th>
<th>Focus Area: Space Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Available only to non-590 students.</td>
</tr>
<tr>
<td>Communications</td>
<td>√</td>
</tr>
<tr>
<td>Computers</td>
<td>√</td>
</tr>
<tr>
<td>Cyber</td>
<td>√</td>
</tr>
<tr>
<td>Electronics</td>
<td>√</td>
</tr>
<tr>
<td>Guidance &amp; Control</td>
<td></td>
</tr>
<tr>
<td>Networks</td>
<td>√</td>
</tr>
<tr>
<td>Power</td>
<td>√</td>
</tr>
<tr>
<td>Sensors</td>
<td>√</td>
</tr>
<tr>
<td>Signal Processing</td>
<td>√</td>
</tr>
</tbody>
</table>

   Focus Area selected: Space

   MSEE Specialties selected: (Communications recommended)
   (1) ______________________
   (2) ______________________
For 591 students only

Space specialty satisfied by the following courses in 591 Matrix

<table>
<thead>
<tr>
<th>Required Core Space Courses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS3001 Military Applications of Space (3-2)</td>
</tr>
<tr>
<td>SS3500 Orbital Mechanics (3-2)</td>
</tr>
<tr>
<td>AE3851 Spacecraft Propulsion (3-2)</td>
</tr>
<tr>
<td>AE4870 Spacecraft Design and Integration I (4-0)</td>
</tr>
<tr>
<td>AE4871 Spacecraft Design and Integration II (2-4)</td>
</tr>
<tr>
<td>MA3046 Matrix Analysis (4-1)</td>
</tr>
</tbody>
</table>

List of MSEE Specialties
(Select two specialty areas)

Space Communications Systems:
Required Courses:
- EC 3500 Analysis of Random Signals (Fa) (4-0)  
- EC 3510 Communications Engineering (Wi) (3-1)
Select one of:
- EC 4530 Soft Radios (Su) (3-2)
- EC 4550 Digital Communications (Sp) (4-0)
- EC 4560 Spread Spectrum (Su) (3-2)
- EC 4580 Error Correction Coding (Fa) (4-0)
- EC 4590 Communications Satellite Systems Eng (W) (3-0)  
(This specialty satisfies the EO2525 and EO3525 591 P-code requirement)

Computer Systems:
Select two of:
- EC 3800 Microprocessor Based System Design (Fa) (3-2)
- EC 3820 Computer Systems (Su) (3-2)
- EC 3830 Digital Computer Design Methodology (W) (3-2)
- EC 3840 Introduction to Computer Architecture (Sp) (3-2)
Select one of:
- EC 4810 Fault Tolerant Computing (Su) (3-2)
- EC 4820 Advanced Computer Architecture (Fa) (3-2)
- EC 4830 Digital Computer Design (3-1)
- EC 4870 VLSI Systems Design (Wi) (3-2)  
(This specialty satisfies the SS3035 591 P-code requirement)

Cyber Systems:
Required Course
- EC 3730 Cyber Netw. & Phys. Infrastructures (Fa and Sp) (3-2)
Select two of the Warfare Subspecialty:
- EC 3750 SIGINT Systems I \( ^{(c)} \) (Fa) (3-2)
- EC 3760 Information Operations Systems \( ^{(c)} \) (W) (3-2)
- EC 4765 Cyber Warfare \( ^{(c)} \) (Sp) (3-2)
- EC 4730 Covert Communications (Wi) (3-2)
- EC 4715 Cyber System Vulnerabilities & Risk (3-2)

Space Power Systems:
Required courses:
- EC 3150 Solid State Power Conversion (Su) (3-2)
- EC 3230 Space Power and Radiation Effects (Sp) (3-1)
- EC 4150 Advanced Solid State Power Conv. (Fa) (4-1)

Electronics:
Required courses:
- EC 3200 Advanced Electronics Engineering (Sp) (3-2)
- EC 3220 Semiconductor Device Technology (Fa) (3-2)
Select one of:
- EC 4220 Introduction to Analog VLSI (Su) (3-1)
- EC 4230 Reliability Issues for Military Electr. (Wi) (3-1)
- EC 4950 Emerging Nanotechnology (Su) (3-1)

Signal Processing Systems:
Required Courses:
- EC 3400 Digital Signal Processing (Fa) (3-1)
- EC 3410 Discrete-Time Random Signals (Su) (3-2)
Select one of:
- EC 4440 Statistical Digital Signal Processing (Fa) (3-2)
- EC 4480 Image Processing and Recognition (Wi) (3-2)

Assessment (Su)
- EC 4790 Cyber Architectures & Eng. (Fa) (3-2)

(c): classified course

Effective date: 1/1/13; last update: 10/20/15, MPF
Please read Privacy Advisory at (www.nps.edu/Privacy/index.html)
**Network Engineering:**

**Required Courses:**
- EC 3710 Computer Communications Methods  (3-2)
- EC 4745 Mobile Ad Hoc Wireless Networking  (3-2)

**Select one of:**
- EC 3760 Information Operations Systems\(^{(c)}\)  (3-2)
- EC 4430 Multimedia Info. & Communications  (3-1)
- EC 4710 High-Speed Networking  (3-2)
- EC 4725 Adv. Telecommunication Systems Eng.  (3-2)
- EC 4785 Internet Engineering  (3-2)

\(^{(c)}\): classified course

**Space Sensor Systems Engineering:**

This specialty is completed by completing one of the following two subspecialties:
(This specialty satisfies the PH 3360 591 P-code requirement)

**Radio Frequency Sensors Subspecialty**

**Required:**
- EC 3600 Antennas & Propagation (Su/Wi)  (3-2)

**Select one of:**
- EC 3610 Microwave Engineering (Sp)  (3-2)
- EC 3630 Radiowave Propagation (Sp)  (3-2)

**Select one of:**
- EC 3700 Joint Network-Enabled Electronic Warfare I (Sp)  (3-2)
- EC 4680 Joint Network-enabled Electronic Warfare II (Sp)  (3-2)
- EC 46XX Digital Receivers and Sensor Technology  (3-2)

**Sensor Attack and Protection Subspecialty**

**Required:**
- EC 3600 Antennas & Propagation (Su/Wi)  (3-2)

**Select one of:**
- EC 3610 Microwave Engineering (Sp)  (3-2)
- EC 3630 Radiowave Propagation (Sp)  (3-2)

**Select one of:**
- EC 3700 Joint Network-Enabled Electronic Warfare I (Sp)  (3-2)
- EC 4680 Joint Network-enabled Electronic Warfare II (Sp)  (3-2)
- EC 46XX Digital Receivers and Sensor Technology  (3-2)

**List of ECE and Math Electives not included above**

**Communications Systems**
- EC 4500 Adv. Topics in Communications  (3-0)
- EC 4510 Cellular Communications  (3-0)
- EC 4530 Soft Radios  (3-2)
- EC 4560 Spread Spectrum Communications  (3-2)
- EC 4570 Signal Detection and Estimation  (4-0)
- EC 4590 Communications Satellite Systems Eng.  (3-0)

**Computer Systems**
- EC 4800 Adv. Topics in Computer Eng.  (3-1)

**Electronics Systems**
- EC 3230 Space Power & Radiation Effects  (3-1)
- EC 3280 Intro to MEMS Design Advanced  (3-3)
- EC 4950 Emerging Nanotechnology  (3-1)
- EC 4280 MEMS Design II  (2-4)

**Guidance & Control Systems**
- EC 4300 Adv. Topics in Modern Control Systems  (3-1)

**Sensor Systems**
- EC 4210 Electro-Optics Systems Engineering  (3-0)

**Signal Processing Systems**
- EC 3460 Machine Learning for Signal Analytics  (3-2)
- EC 4450 Sonar Systems Engineering  (4-1)
- EC 4400 Adv. Topics in Signal Processing  (3-0)
- EC 4910 DSP for Wireless Communications  (3-2)

**Systems Engineering**
- EC 4010 Principles of Systems Eng.  (3-2)

**Selected Mathematics Courses** (all others require approval of the Academic Associate)

<table>
<thead>
<tr>
<th>Math Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 3030</td>
<td>Introduction to Combinatorics and its Applications</td>
<td>(4-1)</td>
</tr>
<tr>
<td>MA 3042</td>
<td>Linear Algebra</td>
<td>(4-0)</td>
</tr>
<tr>
<td>MA 3046</td>
<td>Matrix Analysis</td>
<td>(4-1)</td>
</tr>
<tr>
<td>MA 3132</td>
<td>Partial Differential Equations and Integral Transforms</td>
<td>(4-0)</td>
</tr>
<tr>
<td>MA 3232</td>
<td>Numerical Analysis</td>
<td>(4-1)</td>
</tr>
<tr>
<td>MA 3677</td>
<td>Theory of Functions of a Complex Variable I</td>
<td>(4-0)</td>
</tr>
</tbody>
</table>
3. **Course credit requirements**

List all graduate courses taken in approved engineering, mathematics, physical science, and/or computer science.

1) Lab credits count as half credits;
2) Only one instance of EC4900 may be counted towards meeting minimum degree requirements;
3) Do not include any graduate courses already counted for the BSEE equivalence in the Table below.

**Note:** course credit numbers are periodically re-evaluated and may have changed since you took a course. *Only the credits shown on your student transcripts will be counted to satisfy minimum requirements.*

<table>
<thead>
<tr>
<th>3000-level courses</th>
<th>Credits (X-X)</th>
<th>4000-level courses</th>
<th>Credits (X-X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS3500</td>
<td>(4-0)</td>
<td>AE4870</td>
<td>(4-0)</td>
</tr>
<tr>
<td>MA3046</td>
<td>(4-1)</td>
<td>AE4871</td>
<td>(2-4)</td>
</tr>
<tr>
<td>AE3851</td>
<td>(3-2)</td>
<td>EC4 from Specialty</td>
<td>( ) [At least (3-1)]</td>
</tr>
<tr>
<td>SS3001</td>
<td>(3-2)</td>
<td>EC4 from Specialty</td>
<td>( ) [At least (3-0)]</td>
</tr>
<tr>
<td>EC3 from Specialty</td>
<td>( ) [At least (3-0)]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3 from Specialty</td>
<td>( ) [At least (3-0)]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3 from Specialty</td>
<td>( ) [At least (3-0)]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3 from Specialty</td>
<td>( ) [At least (3-0)]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3230 if not specialty</td>
<td>(3-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3600 if not specialty</td>
<td>(3-2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electives**

Subtotal EC: (18-11) (23.5) ( ) [At least (6-1)]
Subtotal Science/Engr: (29-14) (36) ( ) [At least (12-5)]

**Graduate courses counted towards the BSEE equivalence**

(Maximum of 4 allowed after approval by AA):

1)  
2)  
3)  
4)  

(a) Total graduate credits in approved engineering, mathematics, physical science, and/or computer science (36 minimum at 3xxx and 4xxx-level):

____________________

(b) Total credits from (a) in ECE¹ 3xxx and 4xxx courses:

____________________

(24 graded credits EC + 6 graded credits MAE minimum)

(c) Total credits from (a) at 4000 level:

(12 minimum, 4 courses minimum, which must be graded)

____________________

**Note:** 1. Up to 6 credits from graded, graduate-level courses in other engineering and physical science departments can be substituted for ECE courses by 591 students.