***Department of Electrical and Computer Engineering***

***Checklist for 591 Space Engineering Focus Area***

***MSEE Degree***

***(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 these 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:**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Academic Associate, Date ECE Assoc. Chair for Students, Date**

**ECE Department**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Program Officer, Date** **ECE Department Chair, Date**

**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 (16 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,** and check courses taken in those specialties):

|  |  |
| --- | --- |
| **Specialties** | **Focus Area:****Space Systems**Available only to non-590 students |
| Communications | √ |
| Computers | √ |
| Cyber | √ |
| Electronics | √ |
| Guidance & Control |  |
| Networks | √ |
| Power | √ |
| Sensors | √ |
| Signal Processing | √ |

*Focus Area selected:* ***Space***

*MSEE Specialties selected:*

 *(Communications recommended)*

*(1) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*(2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

***For 591 students only***

***Space Focus satisfied by the following courses in 591 Matrix***

# **Required Core Space Courses:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | SS3001 | Military Applications of Space | (3-2) |
|  | SS3500 | Orbital Mechanics | (3-2) |
|  | AE3851 | Spacecraft Propulsion | (3-2) |
|  | AE4870 | Spacecraft Design and Integration I | (4-0) |
|  | AE4871 | Spacecraft Design and Integration II | (2-4) |
|  | MA3046 | Matrix Analysis | (4-1) |
|  | EC3230 | Space Power and Radiation Effects | (3-1) |

***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) | (3-2) |

**Select one of:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 4550 | Digital Communications (Sp) | (4-0) |
|  | EC 4580 | Error Correction Coding (Su) | (4-0) |

(This specialty satisfies the EO2525 and EO3525 591 P-code requirement)

***Computer Systems:***

**Select two of:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3800 | Microprocessor Based System Design | (3-2) |
|  | EC 3820 | Computer Systems | (3-2) |
|  | EC 3830 | Digital Computer Design Methodology | (3-2) |
|  | EC 3840 | Introduction to Computer Architecture | (3-2) |

**Select one of:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 4810 | Fault Tolerant Computing  | (3-2) |
|  | EC 4820 | Advanced Computer Architecture  | (3-2) |
|  | EC 4830 | Digital Computer Design  | (3-1) |
|  | EC 4870 | VLSI Systems Design | (3-2) |

***Cyber Systems:***

**Required Course**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3730 | Cyber Netwk. & Phys. Infrastructures (Fa and Sp) | (3-2) |

**Select two of the Warfare Subspecialty:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | [EC 3750](http://www.nps.edu/Academics/Schools/GSEAS/Departments/ECE/Handbook/CourseList/ec_courses.html)  | SIGINT Systems I (C)  | (3-2) |
|  | [EC 3760](http://www.nps.edu/Academics/Schools/GSEAS/Departments/ECE/Handbook/CourseList/ec_courses.html) | Information Operations Systems(C) (W) | (3-2) |
|  | EC 4765 | Cyber Warfare(C) (Sp) – requires EC3760 | (3-2) |
|  | EC 4730 | Covert Communications (Fa) | (3-2) |
|  | EC 4715 | Cyber System Vulnerabilities & Risk Assessment (Su) | (3-2) |

(c) : classified course

***Space Power Systems:***

**Required courses:**

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

***Electronics:***

**Required courses:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3200 | Advanced Electronics Engineering (W) | (3-2) |
|  | EC 3220 | Semiconductor Device Technologies (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 | (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) |

***Network Engineering:***

# **Required Courses:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3710 | Computer Communications Methods (Fa) | (3-2) |
|  | EC 4745 | Mobile Ad Hoc Wireless Networking (Sp) | (3-2) |

**Select one of:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3760 | Information Operations Systems(C) (W) | (3-2) |
|  | EC 4710 | High-Speed Networking (Su) | (3-2) |
|  | EC 4725 | Adv. Telecommunication Systems Eng. (Su) | (3-2) |
|  | EC 4785 | Internet Engineering (Wi) | (3-2) |

(C) : classified course

***Space Sensor Systems Engineering:***

**This specialty is completed by completing one of the following two subspecialties:**

**Radio Frequency Sensors Subspecialty**

 **Required:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3600 | Antennas & Propagation (Wi) | (3-2) |

**Select one of:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3610 | Microwave Engineering  | (3-2) |
|  | EC 3630 | Radiowave Propagation (Sp) | (3-2) |

 **Select one of:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 4610 | Radar Systems (Su) | (3-2) |
|  | EC 4630 | RCS Prediction & Reduction (Fa) | (3-2) |
|  | EC 4640 | Airborne Radar Systems  | (3-2) |

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**Sensor Attack and Protection Subspecialty**

 **Required:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3600 | Antennas & Propagation (Wi) | (3-2) |
|  | EC 3700  | Joint Network-Enabled Electronic Warfare I (Fa) | (3-2) |

**Select one of:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | EC 3610 | Microwave Engineering  | (3-2) |
|  | EC 3630 | Radiowave Propagation (Sp) | (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)

|  |  |  |  |
| --- | --- | --- | --- |
|  | MA 3030 | Introduction to Combinatorics and its Applications | (4-1) |
|  | MA 3042 | Linear Algebra | (4-0) |
|  | MA 3046 | Matrix Analysis | (4-1) |
|  | MA 3132 | Partial Differential Equations and Integral Transforms | (4-0) |
|  | MA 3232 | Numerical Analysis | (4-1) |
|  | MA 3677 | Theory of Functions of a Complex Variable I | (4-0) |

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.*

|  |  |  |  |
| --- | --- | --- | --- |
| **3000-level courses** | **Credits (X-X)** | **4000-level courses** | **Credits (X-X)** |
| **Selected Required Courses** |
| SS3500 | (4-0) | AE4870 | (4-0) |
| MA3046 | (4-1) | AE4871 | (2-4) |
| AE3851 | (3-2) | EC4 from Specialty | ( ) [At least (3-1)] |
| SS3001 | (3-2) | EC4 from Specialty  | ( ) [At least (3-0)] |
| EC3230  | (3-1) |  |  |
| EC3 from Specialty | ( ) [At least (3-0)] |  |  |
| EC3 from Specialty | ( ) [At least (3-0)] |  |  |
| EC3 from Specialty | ( ) [At least (3-0)] |  |  |
|  |  |  |  |
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|  |  |  |  |
|  |  |  |  |
| **Electives** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Subtotal EC |  |  |  |
| Subtotal Science/Engr |  |  |  |

|  |
| --- |
| **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 credits minimum and 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.*