STEM Graduate Degree Industry Career Trends

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Bottom Line Up Front

- **The need for engineering program graduates has grown dramatically over the past 4-5 years**
- **High demand and competition for talent in emerging disciplines**
- **Aerospace and Defense requirement for security clearances means we need more US citizens to seek and obtain STEM degrees**
- **Close engagements at over 90 ABET-accredited universities, professional societies, and student organizations**
  - **Online degree trends increasing**
  - **Certain non-degree certificate programs are high value**
- **Industry focus on graduate STEM training for existing employees**
- **Policy recommendations to increase availability of diverse graduate STEM candidates with US citizenship**

Who are we hiring?

- **Over 150 graduate students hired each year from over 30 schools**
  - **Roughly 85% have STEM master's degrees**
  - **< 10 PhD new hires hired each year**
- **The need for engineering and science program graduates has grown dramatically over the past 4-5 years**
  - **Systems Engineering**
  - **Computer and Software Engineering**
  - **Mechanical Engineering**
  - **Aerospace/Aeronautical Engineering**
  - **Electrical Engineering**
  - **Materials Engineering [RTN]**
- **Hire employees with advanced degrees as we move to new fields**
  - **Computer Science and Math with course focus in software architecture and algorithm development, and machine learning and artificial intelligence [RTN]**
- **Diversity levels for graduate-level hires on par for overall hiring**

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Education Alignment to Industry Needs

- **Anticipate increasing needs:**
  - **Radio Frequency engineering, cyber, and data science**
  - **Software engineering, artificial intelligence, and machine learning [NOC]**
  - **Signal processing and systems engineering [RTN]**
  - **Widespread competition for emerging skills such as machine learning and artificial intelligence [NOC, RTN]**
- **Industry wide production labor shortages anticipated in [1]**
  - **Operations research analysts**
  - **Computer control programmers and operators**
  - **Mathematical science occupations**
- **Customer security clearance requirements drives need for US citizens to seek STEM degrees**
- **Good quality students – just not enough quantity**
  - **Opportunity to increase quantity of diversity in graduate STEM job candidates [RTN]**

[NOC] Provided by Northrop Grumman [RTN] Provided by Raytheon
[1]Department of Labor risk index for the projected 2014-2024 time period

Recruiting Approach

- **Close engagements at over 90 ABET-accredited universities**
- **In-depth masters and PhD student recruitment through funded research, faculty identification and specialized programs**
  - **Example: “NEXT” (accelerated development program to maximize leadership and technical development)**
- **Established partnerships with professional society and student organizations**
- **General preference for masters programs to include thesis research**
  - **Encourage projects related to company focus with a company representative on thesis committee [RTN]**
  - **Some business elements prefer project-based masters**

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Post-Undergraduate Education for Employees

- **Leadership development programs have several hundred current participants. These programs typically highly encourage participants to obtain a master's degree, if not already acquired.**
  - **Engineering and Software Engineering**
  - **Information Systems**
  - **Operations**
- **Professional capability development in an employee's current or future-desired domain encouraged and supported**
  - **Both undergraduate and graduate level coursework**
  - **Certain Certifications**
  - **Some companies offer access to a wide range of technical certifications** [NOC]

[NOC] **Provided by Northrop Grumman**

Education Models & University Partnerships

- **University partnerships through internships and funded research**
- **Seeing a larger online participation rate**
  - **Online is considered equivalent if the program is accredited**
  - **Prefer in-classroom learning and project participation, but support online coursework [RTN]**
- **Graduate certificates and certifications supplementary to basic degree requirements**
  - **Cyber security certifications are very valuable**
- **Companies are partnering with universities to develop curriculum programs in need areas**
  - **Systems Engineering at Johns Hopkins University [RTN]**
  - **Radio Frequency engineering at University of Colorado - Boulder**

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Policy and Government Considerations 1 of 2

- **Recommend government grants to universities that bring academia and industry together to address STEM attraction and retention**
  - **DoD-sponsored grants for schools which include security clearances**
  - **Consider Australian model: Government pays for technology PhD programs, permitting industry "top-ups" to add additional research direction and guidance**
- **Student loan payoff programs for diverse, female, underrepresented minorities, and first generation college graduates pursuing STEM degrees [NOC]**
- **Immigration and visa policy targeted towards retaining top talent in high demand STEM fields in the U.S.**
- **Increase mobility between industry, academia, and government laboratories and institutions**

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Policy and Government Considerations 2 of 2

- **Communicate business and industry needs for better understanding that STEM education requirements extend beyond math and science to engineering, technology, and computer science [RTN]**
- **Encourage policies that boost quality STEM education [RTN]**
  - **Ensure teachers receive high quality professional development, support, and the necessary resources to effectively teach at all levels [RTN]**
  - **Emerging trends/best practices, such as hands-on STEM competitions, classroom strategies, state of the art educational technologies, and project-based learning [RTN]**
  - **Promote public/private partnerships, incentives, and effective business & industry engagement in STEM education [RTN]**
  - **Implement full government funding for STEM related educational research and innovation investments (for example, Every Student Succeeds Act) [RTN]**

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