



TRYING TIMES FOR U.S. ENGINEERS

A Statement by

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on behalf of

**The Institute of Electrical and Electronics
Engineers – United States of America**

at the

**Pan Organizational Summit on the
U.S. Science and Engineering Workforce**

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Introduction

I appreciate your invitation to participate in today's meeting and look forward to sharing IEEE-USA's perspectives and policy recommendations on important engineering workforce issues.

The Institute of Electrical and Electronics Engineers (IEEE) is a transnational professional engineering society made up of more than 360,000 electrical, electronics and computer engineers in 147 countries. Our primary purposes are to advance the theory and practice of electrical, electronics and computer engineering to advance the careers of electrical, electronics and computer engineers; and to improve their ability to innovate and create wealth for the benefit of societies in which they live.

IEEE-USA was established in 1973 – during an earlier economic downturn – to promote the professional careers and technology policy interests of IEEE's 235,000 U.S. members.

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New Economy Workforce Utilization Practices Are Putting American Engineers at Risk

One of IEEE-USA's principal concerns is that recent increases in engineering unemployment may not be a short term, cyclical phenomenon, but the result of a much more fundamental structural change in engineering utilization that could have a long-term negative impact on our nation's security and economy. We are apprehensive that current engineering workforce management practices are driven by cost savings that shorten the careers of U.S. engineers, while increasing our nation's reliance on temporary foreign workers, short-term contract employees (perma-temps), and the exportation of engineering work to lower cost, off-shore locations. The corporate mantra seems to have become more, better, faster, cheaper; and when it comes to workers, more is always better and cheaper is best.

These changing labor practices make engineering jobs less secure and careers more tenuous than ever. U.S. engineers - new graduates, middle age and older professionals - are having a harder and harder time getting and keeping jobs in an economy in which technologists are treated as a disposable commodity.

- Increasing Unemployment: In the past 18 months, unemployment among America's engineers and computer scientists has reached historically high levels. According to the Bureau of Labor Statistics (BLS), 68,000 engineers and 84,000 computer scientists are currently looking for work. Unemployment among electrical and electronics engineers peaked at 4.8% earlier this year. Even more ominous is BLS data showing that the gap between general unemployment and engineering unemployment has narrowed considerably in recent years. This gap is alarming because engineers are the innovators who turn ideas into high value-added goods and services that increase productivity and generate wealth. Substantial numbers of unemployed engineers may be a signal that the economy has stalled. Further increases in engineering unemployment could complicate already shaky prospects for a national economic recovery.
- Job Shrinkage: More than 100,000 engineering jobs disappeared in the 3rd Quarter of 2002. (See appended BLS Employment Statistics)
- Flat/Declining Compensation: Engineers are expected to work longer hours for salaries that have been flat or declining when adjusted for inflation since the 1980s. (See appended Engineering Workforce Commission (EWC) Salary Statistics)
- Lack of Support for Training/Life Long Learning: To remain employed, engineers are required to keep pace with changing technologies and learn new skills but increasingly employers are not providing time off or financial support for this training. Engineers who are unemployed or under-employed are also required to keep pace with changes in technology with little to no financial means for doing so.

If current workforce utilization practices continue to devalue engineering careers, even more of our best students will pursue careers in other fields, further increasing our growing reliance on foreign sources of engineering talent.

The Science and Engineering Pipeline and the Risk of Unintended Consequences

IEEE-USA is greatly concerned that policies designed to expand the workforce based on unsubstantiated claims of shortages will create a self-fulfilling prophecy as high school and college students perceive that the reality of an engineering career means periodic unemployment, career insecurity, and flat or declining compensation.

In the past, U.S. students elected science and engineering majors or decided to pursue careers in science, engineering and technology for a number of reasons. They were attracted to the opportunity to pursue intellectually challenging work. They were drawn to technical careers by family interests (e.g., a parent or relative who was a scientist or engineer). And/or they were attracted by perceived financial rewards, expectations of job security, or related considerations. In making their choices, they also considered the relative difficulty of the curriculum, but often selected the more difficult education path in order to have the perceived benefits offered by the career choice.

U.S. students are influenced by their peers' attitudes about the scientific and technical professions. They are also influenced by their experiences at the pre-college and introductory-level courses within the discipline. They take stock of the employment opportunities and salaries available to recent graduates in these various degree fields. In weighing these considerations, they choose from among a number of attractive professional alternatives, including business, law, and medicine. In today's work environment, college students often decide that engineering and related degrees do not offer enough benefits to warrant the more rigorous curriculum.

Artificial manipulations of the supply-demand cycle, management practices that devalue engineering careers, and inadequately supported projections of job demand all serve to discourage students from electing careers in engineering. Initiatives designed to fill the science and engineering pipeline with a significant numbers of U.S. students will ultimately fail and compound the U.S. workforce problem, if the destination that lies beyond the end of that pipeline continues to be unattractive.

Getting Back to Basics in Education and Workforce Development

What's gone wrong in recent years is due in part to what Federal Reserve Chairman Alan Greenspan calls irrational exuberance and in part to an overemphasis by many businesses on short-term shareholder value. Too many managers feel compelled to concentrate on the short term in order to satisfy the demands of the financial community at the expense of their real stakeholders – their customers, their employees, their communities and their shareholders. IEEE-USA believes that the United States needs to return its focus to the long term and get back to basics in building a sustainable science and technology (S&T) workforce that retains and attracts America's best and brightest by delivering rewarding scientific and engineering careers.

Therefore, IEEE-USA recognizes that there is a need to have a well educated technically literate public and that we also need to educate, retain, and reward capable people at all levels, including support for:

- talented, motivated engineers and computer scientists, including women, minority, handicapped and older Americans;

- continuing education programs that address lifelong employment needs of the engineering workforce;
- qualified K-12 math, science and technology teachers;
- adequate population of focused and diverse population of university students; and
- talented researchers and education focused engineering faculty members.

Since resources are limited, the education focus must be on how to leverage available resources and target stakeholder partnerships. Key technology stakeholders include the engineering and scientific workforce, employers, educators, government agencies, professional societies, labor unions, and others with a record of success in training, retraining and rewarding capable people. And to be successful, much of the work must be done at the local and regional levels.

The S&T Workforce, Immigration and Non-Immigrant Admissions

IEEE-USA honors the immigrant scientists and engineers from Benjamin Franklin to Albert Einstein to Andy Grove who helped build this country and who continue to make important contributions to America's economy, technological competitiveness, and national security. Similarly, we understand that many foreign nationals on temporary educational and work visas bring special talents and diverse skills to classrooms and job sites throughout the nation. However, we also know that various issues including economic and employment status of the resident U.S. workforce need to be taken into consideration when immigration and temporary worker visa quotas are changed.

There are various ways to bring talented engineers and scientists to the United States and facilitate their transition to legal permanent resident status. Permanent employment-based programs include: an EB-1 program for extraordinary ability individuals, outstanding professors and researchers and multi-national executives; an EB-2 program for professionals with advanced degrees; and an EB-3 program for baccalaureate degree professionals and certain skilled and unskilled workers.

U.S. engineering labor markets are also impacted by foreign students and professionals who are admitted on temporary educational and work-related visa programs. Among the most important are the B-1 (business visitor); E (treaty trader or investor); F (academic student); H (temporary worker); J (exchange visitor); L (intra-company transfer); O (extraordinary ability); and TN (NAFTA professional) temporary visa programs. Most have no annual admission ceilings.

Although limited in size and scope, the H-1B baccalaureate degree professional visa program is by far the most controversial. This program was originally intended to facilitate the temporary admission of limited numbers of foreign professionals with specialized skills not readily available in the United States. However, the cap on H-1B visas has been steadily increased from the original authorization of 65,000 a year to the current temporary level of 195,000 with additional exemptions for workers in research institutions. In addition to the increased authorization level, the visa duration has been extended from 3 years to a total of 6 years with renewal.

As an indication of the continual focus on temporary workers, the 21st Century Department of Justice Appropriations Authorization Act (H.R. 2215) incorporated provisions allowing out-of-status guest-workers who have filed for permanent resident status to remain until a decision is

made on their application. As long as an application has been in process for at least 365 days and the job for which they were recruited ends, the temporary worker is free to compete with U.S. scientists and engineers for other positions.

As a result of the various changes to H-1B visa caps, it is estimated that more than 750,000 H-1B guest-workers are currently living and working in the United States. More than half of these temporary workers are in the science, engineering and technology workforce.

IEEE-USA believes that instead of providing a short term remedy for spot skill shortages, the H1B visa has become widely used as by employers as a reduced-cost probationary employment program for foreign professionals and students seeking work sponsorship for legal permanent resident status. These professionals and new graduates are willing to trade lower salaries and a temporary work status for the ability to enter and/or remain in our nation.

As the National Academy of Engineering noted in its “Building a Workforce for the Information Economy” (2001) report: “. . .to the extent that foreign workers compete with native U.S. workers, economic principles suggest that (a) the foreign workers may displace the domestic workers and (b) the presence of the foreign workers may hold down wages in those jobs. Wages may be depressed even if all employers paid temporary nonimmigrant workers the wages prevailing for the jobs for which these nonimmigrant workers are hired.”

Or as stated by noted economist Milton Friedman (ComputerWorld, July 22, 2002): "There is no doubt that the (H-1B) program is a benefit to their employers, enabling them to get workers at a lower wage, and to that extent, it is a subsidy."

IEEE-USA also believes that the labor condition attestation requirements established to safeguard jobs, wages and working conditions in the United States are weak and unenforceable; and that the H-1B program, like other “guest-worker” programs, is subject to fraud and abuse.

And because of the fact that H-1B workers are dependent on their employers to sponsor the much sought after legal permanent resident status, there is significant potential for improper exploitation of these workers with respect to wages, hours, and living conditions.

National Security Considerations

A new and increasingly important S&T workforce consideration in post-9/11 America relates to national security. Current workforce development and admission policies are increasing our dependence on foreign sources of technical expertise for maintenance of critical defense, energy, financial, intelligence, telecommunications and transportation infrastructures. As recently reported by Congress’s General Accounting Office (see GAO-02-972), at least 15,000 foreign S&T workers from “countries of concern” that are subject to security-related export licensing restrictions were able to take 15,000 U.S. jobs in 2001. These 15,000 foreign workers have access to sensitive technologies; and their countries avoid Commerce Department export license screening safeguards while transferring technology through their citizens.

The U.S. security risk is compounded by the forecasted imminent retirement of substantial numbers of scientists and engineers employed by the Departments of Defense and Energy, the National Aeronautics and Space Administration, and national laboratories. This is of some

concern because the duration of the present economic downturn may serve to divert more U.S. students from engineering and scientific degrees. More importantly, disenchanted unemployed engineers are becoming more vocal and personally steering students away from engineering. While employers and government officials have ignored the concerns of engineers who feel thrown away, the younger population may be inclined to take the engineers' advice as appropriate and act accordingly.

Conclusions and Recommendations

In conclusion, IEEE-USA believes that all of the organizations represented at this summit face an incredibly formidable, five-part challenge:

- How to assign responsibility for and share the cost of lifelong learning that will enhance the viability of engineering careers with continual focus on performance, productivity and employability;
- How to make professional careers in engineering more attractive to US citizens and legal permanent residents at a time when more and more employers view engineering services as commodities to be purchased at the lowest possible cost, here or overseas;
- How to address U.S. corporate needs for maintaining a positive worldwide competitive position while also maintaining a viable technical workforce for the security and economic vitality of the U.S.;
- How to reconcile fundamental economic laws of supply and demand with the special interest pleadings of powerful political constituencies; and.
- How to minimize the unintended consequences of targeted government interventions, like the H-1B visa program, that often distort labor market supply and demand balancing mechanisms, depress wages and increase unemployment.

Our engineering workforce policy recommendations include the following:

- **Life Long Learning:** Commit to a substantial, long-term collaborative effort to improve access to and the quality of continuing education opportunities for employed, underemployed, unemployed and recently displaced engineers and scientists.

Improve the utilization of Federal tax dollars and user fees (including H-1B visa fees) by funding educational scholarships and skills re-training programs offered by public and private sector entities with an established track record for meeting the current and future workforce development needs of communities in which they operate.

Make cost-effective use of new and emerging Internet-based technologies to meet the instructional needs of individual professionals and improve the effectiveness, convenience and affordability of conventional educational offerings.

- **Workforce Data Needs for the 21st Century:** Better data is needed for effective education and workforce planning and policy development. Special needs include:

Improved forecasting capabilities that can be used to more effectively assess the probable impact of changing demographic, economic, societal, technological and national security conditions on science and engineering workforce needs.

Timely national, state, and local labor market information, including total U.S. population (supply) of engineers and computer scientists; reliable population of unemployed and under-employed engineers and computer scientists, inventory of high demand knowledge and skills requirements and identified training for satisfying skills requirements, employment and re-training opportunities, types and levels of compensation and available financial assistance,

Better statistics on educational and employment-based visa holders, including countries of origin, educational attainment, profession or occupation, age and sex, sponsorship, and levels of compensation; and

More effective means for assessing the validity and reliability of international comparisons of pre-college student achievement.

- **Non-Immigrant Worker (H-1B) Visa Reforms:**

Reduce the current H-1B visa quota to the original levels of 65,000 by the end of FY2003; work to reduce levels below 65,000, and limit visa duration to one non-renewable three-year period.

Immediately repeal the H-1B extension feature of the 21st Century Department of Justice Appropriations Authorization Act (H.R. 2215), which allows out-of-status H-1B visa holders to extend their stay beyond the statutory six-year period if their labor certification request has been pending for at least 365 days.

Ensure that the educational qualifications of H-1B petitioners are rigorously verified as part of the visa application process and conduct an audit of H-1B visa applications to see if there is a problem with respect to fraudulent representation of academic qualifications.

Ensure that foreign S&T services companies are not utilizing the L visa (intra-company transfer) to circumvent the H-1B restrictions by establishment of U.S. subsidiaries designed solely for the purpose of importing temporary S&T workers.

Strengthen essential safeguards for U.S. and foreign workers by requiring all sponsors to make domestic recruitment and retention as well as prevailing wage attestations.

Mandate the collection and timely publication of pertinent statistics, including age, educational attainment, profession or occupation, country of origin, compensation and sponsorship for all recipients of educational and employment visas.

Establish a viable Immigration and Naturalization Services (INS) tracking system to ensure that out-of-status H-1B visa holders and other non-immigrant admissions do not become undocumented aliens (see General Accounting Office report GAO-03-188, Nov. 2002).

- **Immigration Reform (“Green Cards, Not Guest Workers”):** Encourage employers to decrease our national dependence on temporary skilled professionals and other knowledge workers by re-training the present workforce and/or hiring holders of permanent resident visas.
- **Undergraduate and Graduate Education:** Increase the cost-effectiveness and relevance of technical and professional science, engineering and technology education programs at America’s accredited colleges and universities;

Increase support for stipends and assistantships that will enable more U.S. students to pursue graduate and post-graduate level education, while also decreasing use of foreign students and professionals as a means to stretch research dollars.

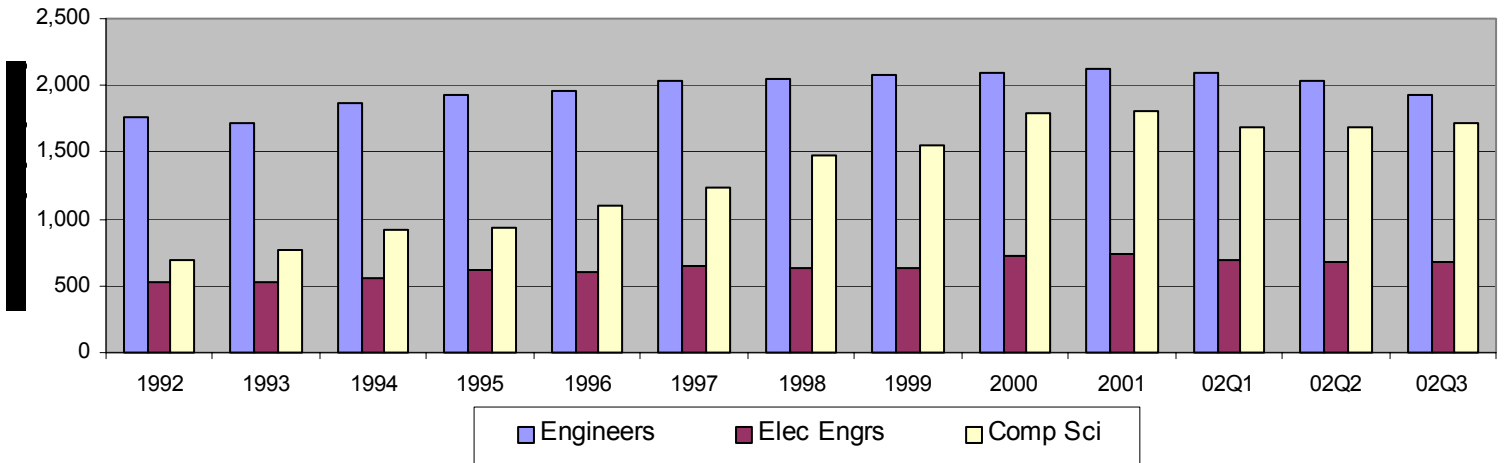
Conduct a comprehensive assessment of the impact of increasing reliance by American colleges and universities on foreign students, instructional and research personnel on the quality of U.S. undergraduate and graduate education and implications for U.S. students, including women and other under-represented minorities.

- **Pre-College Education:** Continue to work together to improve the quality of instruction in math, science, communications, and problem-solving and increase technological literacy in grades K-12

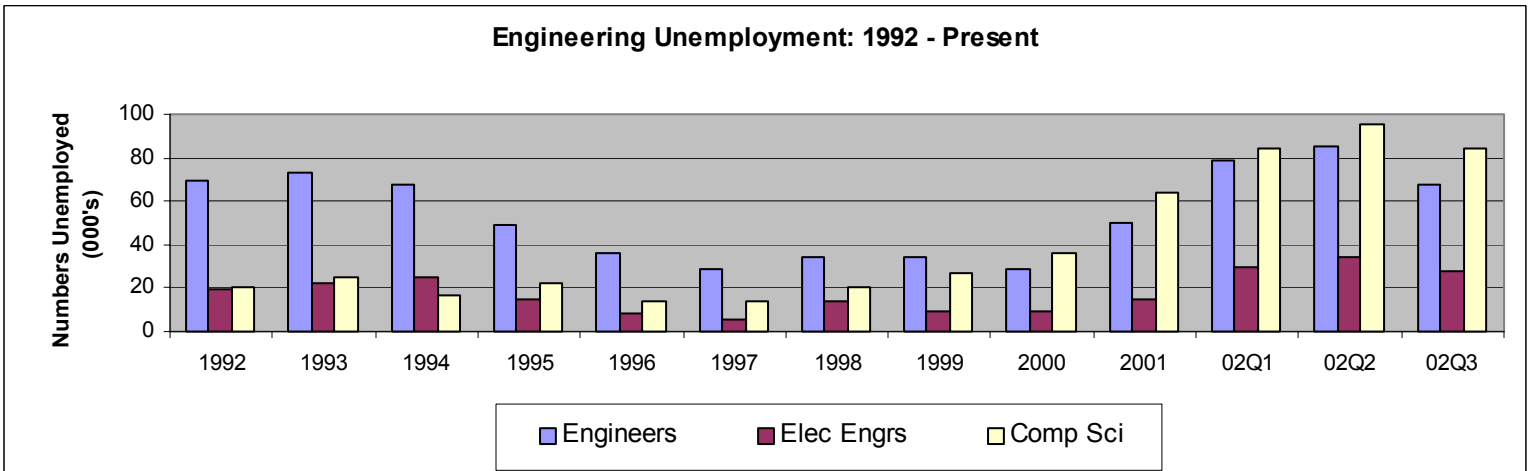
Support funding for recently established Math and Science Partnerships programs at levels originally authorized by Congress.

Increase public and private support for programs with an established track record for successfully recruiting, training, retaining and rewarding capable teachers and students, including those from groups that are under represented in scientific and engineering fields, such as women, minorities, handicapped and older Americans.

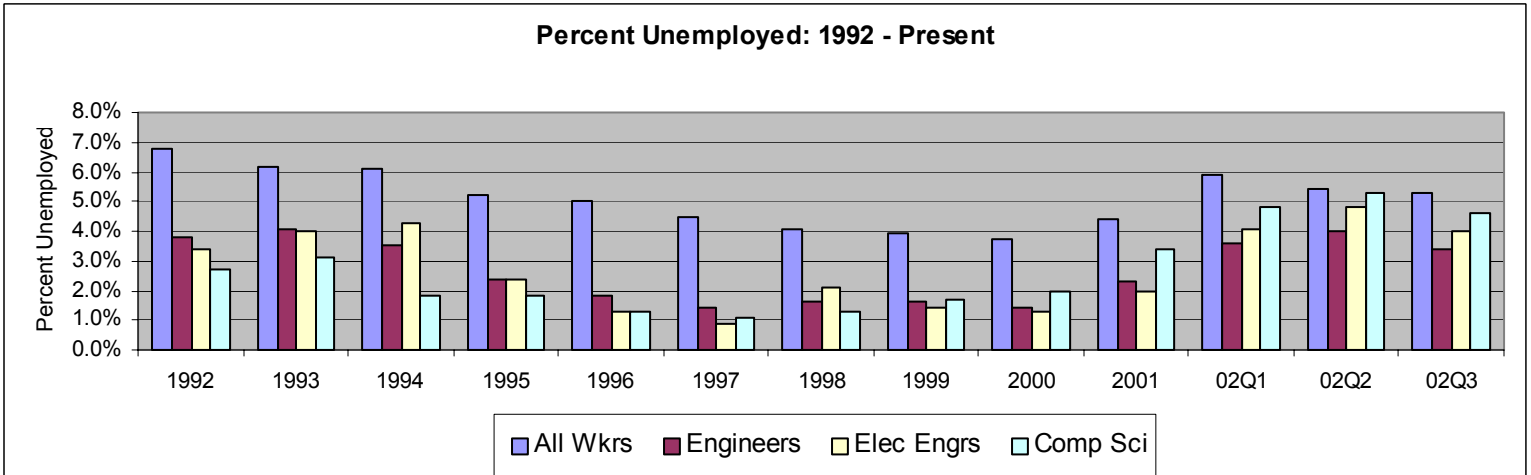
Engineering Employment: 1992 - Present



Engineering Unemployment: 1992 - Present

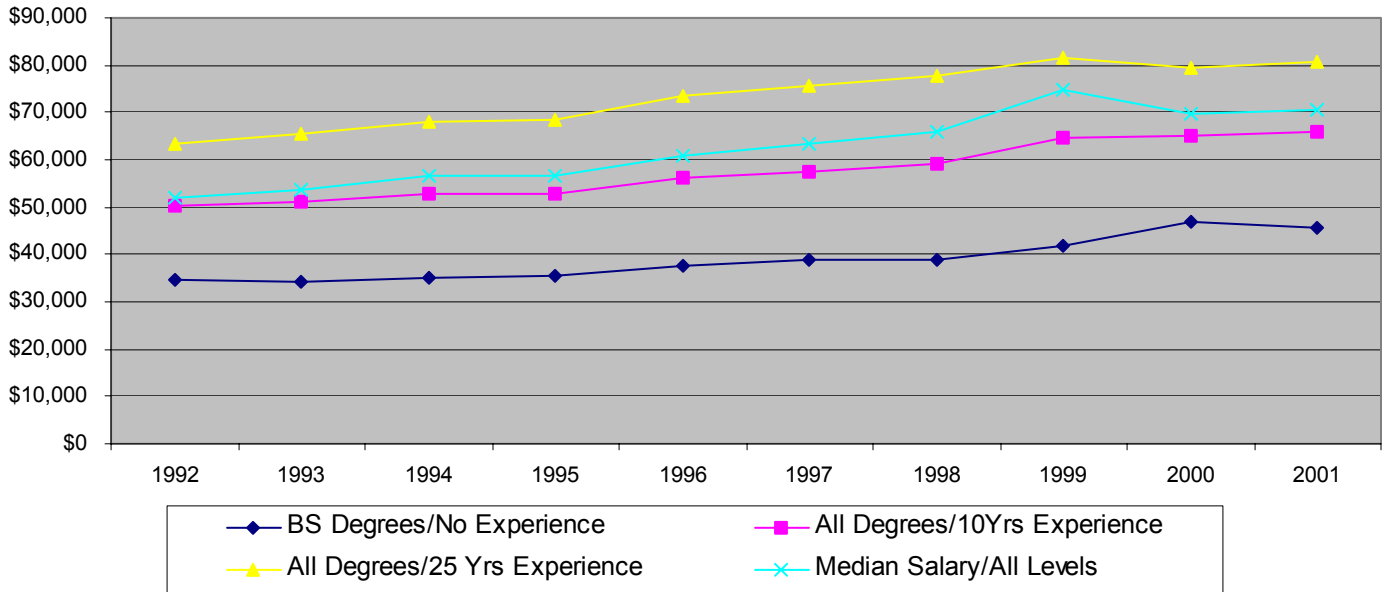


Percent Unemployed: 1992 - Present

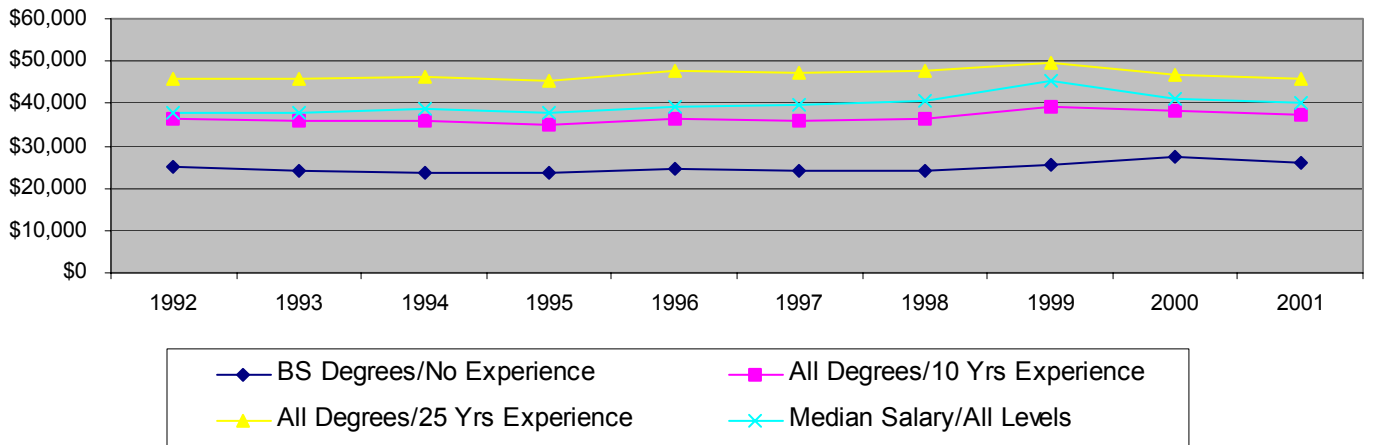


Source: U.S. Department of Labor; Bureau of Labor Statistics

Median Engineering Salaries: 1992 -2001 (Actual)



Median Engineering Salaries: 1992 - 2001 (Constant)



Source: American Association of Engineering Societies; Engineering Workforce Commission