# *NJIT Academic Plan: 2013-2015*

**New Jersey Institute of Technology**

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**Final**

*A Commitment to Academic Excellence*

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**Executive Summary**

The *NJIT Academic Plan: 2013-2015* advances the academic priorities of the university. Whether preparing students for successful careers through research-based instruction, conducting interdisciplinary applied research, serving our broad range of constituents, or building community through economic development, the academic function of the university is the centerpiece of the NJIT mission. As a cohesive vision to ensure the university's thriving intellectual future, the academic plan establishes a system of decision making leading to research facilitation, fairness in workload assignment, student success, and sustainable investment.

This document, *transitional* in nature, describes a process of academic planning that will be strengthened through collaboration and refinement. At the core of the plan is attention to fair, impartial, and transparent processes that will lead to evidence-based decisions that will support the academic programs we offer, the faculty and researchers who cultivate them, and the students we serve.

The academic plan is focused on five outcome areas: 1. The university's thematic priorities to enable groundbreaking research and education that will advance the standing of our leading programs in national rankings; 2. Developing a culture of strategic planning and assessment; 3. Fair and transparent faculty workload assignments; 4. Student success, from admission, to employment to maximize the reputation of our academic programs and encourage student career aspirations and satisfaction; and 5. Sustainable investment in our future. These outcomes resonate with, and support, the existing *NJIT Strategic Plan, 2010-2015.*

Two empirically-based processes inform the decision making to achieve the four outcomes. The first, designed to guide decisions making, including strengthening the thematic areas and enhancing student success, is based on assessment and measuring key indicators of success. The second system is designed to inform decisions pertaining to faculty workload assignment and investment in the academic programs; the system is based on credit hours delivered, research productivity, and actual dollar value based on generated tuition. Using a wide range of available information, the academic plan establishes a process of decision making that will be modified and strengthened through collaboration. In turn, the academic plan will culminate with the development of the next *aspirational* academic plan for the university. Using this basic approach, the academic plan unifies financial and academic measures in the service of mission fulfillment and efficient resource use.

## 1.0 Introduction

At the center of the *NJIT Academic Plan: 2013-2015* are our faculty and students. Their success is the university's *raison d'être.*

With superior preparation and outstanding career achievements, the national reputation for academic excellence of the NJIT faculty and instructional staff is well established. Faculty members are deeply involved in all aspects of academic program development, from instruction to assessment. Since 2002, the amount of research conducted at NJIT has increased 45.4% from $69.1M to $100.5M. Faculty service to the NJIT community and the profession at the local, national, and international levels is extraordinary, and faculty participation in economic development is reflected by a doubling in invention disclosures.

Now in its 132nd year, NJIT is equally well known for its dedication to students in pre-college programs, undergraduate, graduate, and continuing professional education. The university's commitment to excellence prepares students for productive careers that amplify their potential for lifelong personal and professional growth. Throughout its history, student success has been a core index of university effectiveness; we continue to become nationally recognized for attracting high achieving students from diverse national and international populations.

Together, the work of faculty and their students is interwoven by the NJIT Academic Affairs Core Values: lifelong learning, community service, leadership, technological application for social good, entrepreneurial inquiry, civility, and diversity. Our faculty, instructional staff, and their students sustain each of the four-pronged mission elements of NJIT in education, research, service, and economic development. External validation was added to the demonstrated accomplishments of the university community in the report of the Middle States Commission on Higher Education Evaluation Team following its 2012 visit. "The New Jersey Institute of Technology is making a disproportionate impact in higher education given its means," the report concluded. "In particular, NJIT is providing an admirable service to first-in-family students attending college. The students are excellent, well trained, and graduates are highly successful after leaving the university. NJIT's success in providing a first-class education and college experience to a diverse student body is enviable." Such praise is due, in large measure, to our dedicated faculty and instructional staff.

The university's reputation relies on the excellence of its faculty. Because of this fact, the *NJIT Academic Plan: 2013-2015* advances the academic priorities of the university through the leadership of faculty and instructional staff. Transitional by design, the academic plan can only be realized if it is faculty led. Faculty and instructional staff will ensure that research is facilitated, workload allocation is fair, students are successful, and investments are well made. The entire academic plan is guided by faculty and instructional staff, with additional review by key shareholders, including university senior staff and the Board of Trustees.

In July of 2010, a strategic plan for NJIT covering the period of 2010-2015 was completed. The plan, which was revised in the summer of 2011, is now mid-way through its implementation phase. Concurrently, over the last several years, NJIT's colleges, schools, and departments have engaged in strategic and academic planning. The present document, the *NJIT Academic Plan:*

*2013-2015*, brings into the process important academic priorities that have emerged from this planning. The academic plan is constructed in support of the current NJIT strategic plan during its remaining period of implementation. As such, the document that follows is a transitional academic plan, and one that will be a living document updated continually as we engage the entire campus community in faculty-led discussions, aiming to produce the aspirational *Academic Plan for NJIT, 2015-2020*.

Following are the five interdependent goals that will be addressed now in order to reap significant gains from this and future planning exercises:

- Strengthening NJIT's thematic areas of emphasis based on coherent assessment criteria and established metrics in order to facilitate groundbreaking research and advance the standing of our leading programs in the national rankings;
- Promoting a robust culture of program evaluation and outcomes assessment to guide strategic planning, program improvement, and educational innovation;
- Ensuring efficiency, equity, and consistency in workload assignment through processes that guarantee fairness while growing resources for investing in the quality of the academic programs;
- Enhancing student success from admission to employment, through retention and graduation, to maximize the reputation of our academic programs in industry and sustain students' career aspirations and satisfaction; and
- Providing state-of-the-art facilities, classrooms, laboratories, instructional technology, and support services.

Succeeding in the goals articulated here will improve the academic performance of our university. It will promote the efficient use of existing resources and generate new revenue sources. It will also foster transparent decision making and improve shareholder communication.

## 2.0 Key Thematic Areas and a Model of Measurement for Determining Program Levels

A successful academic plan can be achieved only by paying attention to mission and measurement. "Mission" refers to the university's overall strategic priorities and objectives. "Measurement" refers to clear and consistent criteria used to determine which programs among those that fulfill the university's mission demonstrate the highest level of achievement and, therefore, deserve the greatest amount of resources.

### 2.1 Expanding NJIT's Research Profile and Strengthening NJIT's Research Mission

The *NJIT Strategic Plan, 2010-2015*, identifies as one of its academic strategic priorities and objectives national recognition in three core integrated areas of research and education:

- Convergence of Life and Healthcare Science and Engineering
- Sustainable Systems
- Digital *Everyware*

The objectives specific to each of the thematic areas in the *NJIT Strategic Plan, 2010-2015* are all related to increases in scholarly activities.

### 2.2 Identifying Program Levels

A key objective of the proposed model is to determine three levels of programs, based on the assessment of (1) faculty success, (2) student success, and (3) overall program success. The three levels are:

- Leading*:* These are the university's flagship programs, considered the most likely to produce national and sometimes international recognition for the university.
- Important*:* These are programs that contribute substantially to the mission of the university, producing regional and state recognition for NJIT.
- Sustaining*:* These are the core programs of the university, which contribute fundamentally to the fabric of NJIT's mission.

These levels are to be regarded as fluid rather than permanent, so that incentives exist for improvement. They are also to be regarded as program specific, so that different programs within a particular academic unit may occupy different levels (e.g., a graduate program within an academic department may be a leading program while an undergraduate program within the same department may be a sustaining program). Once program levels have been determined, they can be used to prioritize resource allocation.

### 2.3 Using Categories of Measurement for Determining Program Levels

In this model, program levels are determined using the three categories of measurement described in section 2.2. Each measurement category is then divided into sub-categories. Most of the results can be quantified in order to reach a total score which can be used as the basis for resource allocation. Some quantified measures must be qualitatively weighted. For example,

more weight is given to articles published in top journals, to books published by major presses, to prestigious national or international honors and awards, etc.

*Table 1a Program Performance Metrics*

| | Performance Measure | Subcategory | Qualitative/ Quantitative |
|---|---|---|---|
| **I.** | **Faculty Success Category** | | |
| A. | Teaching | • Teaching Evaluations (mean score Q11) | Quantitative |
| | | • Teaching Innovations, including integration of IT | Qualitative |
| | | • Integration of Research Into Teaching | Qualitative |
| B. | Scholarship | • Contracts, Grants and Sponsored Research, $/faculty | Quantitative |
| | | • Refereed Books and Articles | Quantitative |
| | | • Non-Refereed Publications | Quantitative |
| | | • Presentations | Quantitative |
| | | • Creative Performances, Buildings, Exhibits, including Artistic and Professional Performances | Qualitative |
| | | • Scholarly Editing | Qualitative |
| | | • Honors and Awards | Quantitative |
| | | • Competitive Fellowships | Quantitative |
| | | • Citations and References | Quantitative |
| | | • Invitations to Give Keynote/Plenary Lectures | Quantitative |
| C. | Service | • Administrative | Quantitative |
| | | • Professional | Quantitative |
| | | • Public | Quantitative |
| D. | Support of NJIT Mission | • Interdisciplinary/cross Program Collaborations | Qualitative |
| | | • Community Outreach | Qualitative |
| | | • Program Innovation | Qualitative |
| **II.** | **Student Success Category** | | |
| A. | Student Profile SATs, GMAT, etc. | | Quantitative |
| B. | Retention Rate and Basis (Number of Students) | | Quantitative |
| C. | 6-year Graduation Rate and Basis (Number of Students) | | Quantitative |
| D. | Gender and Diversity of the Student Body | | Quantitative |
| E. | Career/Placement | Students Employed at Time of Graduation, % of graduates | Quantitative |
| F. | Satisfaction Surveys | | Quantitative |

*Table 1b Program Performance Metrics (Continued)*

| | Performance Measure | Subcategory | Qualitative/Quantitative |
|---|---|---|---|
| **III.** | **Overall Program Success** | | |
| A. | Deployment of Faculty Resources | Avg. instructional CHs* per TT faculty, (a) | Quantitative |
| | | Avg. sponsored research release CHs per TT faculty (includes grant match release as provided by SVP R&D, administrative release as approved by Provost, no anticipatory release), (b) | Quantitative |
| | | (a+b)/total CH | Quantitative |
| B. | Significant Initiatives | | Qualitative |
| C. | US News & World Report Relative Ranking of Undergraduate Programs | Ranking | Quantitative |
| D. | US News & World Report Relative Ranking of Graduate Programs | Ranking | Quantitative |
| E. | NRC Rankings of Research/Doctorate Programs | Ranking | Quantitative |
| F. | Cost per Credit Hour delivered | $ Cost/credit hour | Quantitative |
| G. | Cost per Contact Hour Delivered | $ Cost/contact hour | Quantitative |
| H. | Sponsored Research Student Support | $ of sponsored research to support students per year | Quantitative |
| I. | Tuition Revenue | $ Tuition revenue per credit hour delivered-cost | Quantitative |
| | | $ Total Revenue/faculty-cost | Quantitative |

## 2.4 Refining the Model to Allow for Variations by College and Type of Program

The measurement model in section 2.3 provides only a basic impression. In order to achieve balanced scores and fair determinations of program levels, algorithms appropriate to each college must be developed, and different standards must be established for STEM and for non-STEM disciplines. Informed by the all-inclusive classification method of the *Carnegie Foundation for the Advancement of Teaching*, this model will allow academic units to review and propose crucial criteria to be used in the decision-making process. To the extent resources permit the implementation of the model above, it will offer empirical evidence showing the relative effectiveness of all departments and programs. The result will facilitate fair and equitable decision making in the present and provide an empirically based path toward excellence.

* CH denotes contact hours.

## 3.0 Culture of Strategic Planning and Assessment

Effective strategic planning moves the university toward a higher standard in education, research, and student success. It depends first and foremost on the accurate evaluation of strengths and weaknesses across the university. This evaluation constitutes the foreknowledge without which improvement comes only through happenstance.

The first goal of the *2013-15 Academic Plan* is transparency and evidence based decision making. As a prelude to the 2015-2020 aspirational plan, it intends to advance strategic planning through the systematic assessment of academic and administrative programs. Only by increasing the transparency of resource allocation and the availability of evidence for decision making can NJIT realize its potential and become a leading technical university.

The goal is continuous institutional improvement through the following five principles for assessment:

- Targeted—Assessment must focus on key programs with a design that can produce useful results.
- Cost Effective—The design must always consider the availability of resources and provide answers appropriate for decision-making needs, not more.
- Candid—Good assessment is open and honest.
- Systematic—The process must proceed at a regular pace and, whenever possible, according to a set plan.
- Independent—Assessment must not have any conflicts of interest.

Throughout this Academic Plan the assessment of courses, programs, and teaching, are a recurrent theme. From the Institute for Teaching Effectiveness to recruitment and advising, achieving strategic objectives relies on assessment as a guide to improvement and effective decision making.

### 3.1 Campus Climate and Student Support

Beyond academic programs, student support and the campus climate are also critical to fulfilling the university mission. The university must foster a supportive campus environment where students actively engage other students, faculty, and administrative staff. This will create a more positive campus community where students' social, cultural, and personal needs are met.

Effectiveness of administrative units is measured through multiple means including surveys and evaluations by the incoming, current and former students. The Office of Institutional Research and Planning (IRP) conducts nearly a dozen major annual student surveys (e.g. entering students, graduating students, alumni, student satisfaction, etc.) and coordinates participation in national surveys (e.g. National Study of Student Engagement-NSSE). It also conducts program evaluations through the analysis of all data related to program performance.
Improving the student experience therefore requires the continuous enhancement of these programs and policies through rigorous and continuous assessment. Benchmarking of student

goals, aspirations, engagement and satisfaction are essential increasing our understanding of the risk factors associated with success in persistence and graduation.

The university takes these objectives seriously and will apply rigorous standards as it seeks to achieve strategic goals. Toward this end, it will focus primarily on how programs can be improved to promote retention, persistence, progress, graduation, and student satisfaction.

### 3.2 Student Learning Outcomes

Improved learning outcomes are a fundamental strategic objective of the university and are therefore a critical component of improving institutional effectiveness. The Program Review process at NJIT will continue to focus on student learning and insist on demonstrable results for the curriculum. This continuous evaluation of program relevance, curricular effectiveness, and instructional delivery will apply across the campus. At NJIT, program review is conducted through the Office of Institutional Research and Planning, under the direction of the provost. The process of academic program review has internal and external assessment components, as elaborated below; both are critical to the successful assessment of student learning outcomes.

Course instruction is fundamental and effective course delivery is critical to providing a quality educational experience. At NJIT measurable learning outcomes are required in all courses, undergraduate and graduate, and should be readily accessible through online syllabi. With the increasing use of digital media in all types of courses, the effective use of online course management systems is recommended in assessing both distance and face-to-face courses. For example, using ePortfolios for course and program assessment aligns with NJIT's commitment to an evidence-centered design for educational effectiveness. EPortfolios promote engagement with course and curricular goals and can be built into courses to document student achievement. By showcasing students' skills and achievements, ePortfolios also communicate the educational effectiveness of NJIT to prospective students, employers, and other key shareholders.

Expanding NJIT's online educational programs must be informed by rigorous assessment to assure that professional, effective, and rigorous standards guide our efforts. This requires the development of more effective tools to evaluate the quality of online courses. The Teaching, Learning and Technology Committee and the Committee on Student Assessment have used a a course-based rubric for the past three years. This approach sets clear standards for online course formats. It will be expanded to incorporate digitally based tools for evaluating course content and student learning. This assessment driven approach can make NJIT a leader in providing a premier learning experience through online courses.

#### 3.2.1 Internal Assessment

In a period of innovation, course and program review for continuous improvement gains importance. The program review process and external accreditations occur only at five to seven year intervals; this is not enough to effectively guide innovation. NJIT must develop a culture of internal assessment under which department chairs and program directors expect to continuously monitor the quality of student learning.

Beyond attention to key indicators, programs must also monitor student performance within courses. Program directors should know what courses and classes have high failure rates and should be considering how best to lower them. This is the essential point of innovation in academic support. When department chairs and program directors constantly monitor course performance, they can respond to problems in real student time—not in accreditation-review cycle time. Properly, a department chair or a program director should respond by making tutoring available, facilitating study groups, improving instructional effectiveness, or providing some other type of assistance. This process is called formative assessment and is the basis of successful continuous assessment.

### 3.2.2 External Assessment

Shareholders often think of assessment as a strictly internal process. Assessment also requires an external component to anchor the evaluation of student learning outcomes in a broader professional and academic context. In a period of rapid innovation for NJIT and higher education as a whole, external assessment with the capacity to benchmark learning becomes critical to understanding the success of any implemented change.

An external evaluation also helps faculty understand whether the standards they set are appropriate and consistent with practices and expectations elsewhere. There is nothing better than rigorous external assessment for improving a program amid rapidly changing technology.

The external standard must directly assess the extent to which students achieve program learning goals. A general standardized exam, however, seldom suffices to assess advanced discipline-specific learning. The academic plan, therefore, sets NJIT on the course toward routine evaluation of ePortfolios, student projects, or program-designed exams by non-program affiliated professionals. This approach offers the best means of assessing program outcomes because it evaluates student learning and the relevance of department teaching.

## 3.3 Program Evaluation: The Partner of Innovation

Every proposed innovation, from a new academic program to a new student support service must include an assessment plan. It must have a defined baseline, delineated goals, and clear performance measures. It must also have a plan for conducting the assessment both formatively (in process evaluations) and summatively (outcomes evaluations). This process will allow the new program or project to make adjustments along the way and determine final success after a stated time period.

The assessment must be as thorough and independent as possible, with the expectation that negative results are always possible. The university must also acknowledge that an innovation which does not succeed is not a black mark against the people who undertook it. Any innovation, even with the most skilled implementation, may fail. Recognizing this, we are all partners of innovation and, at all levels, the innovator must be recognized. The ability to innovate, not program success or failure, should be the measure of individual performance. If an innovation is undertaken with due consideration; then, we all bear responsibility for it and those who implement it must be lauded regardless of the outcome.

## 4.0 Ensuring Efficiency, Equity, and Fairness in Workload Assignment to Improve Academic Quality

The key component of curriculum delivery is effective, quality teaching to advance student learning. At the same time, a strong research university must also conduct substantial funded research and produce high quality scholarship. The *NJIT Academic Plan: 2013-2015* pursues a strategy for attaining quality in education and research through improved faculty load equity and advancing curricular innovation in the service of teaching excellence. Fairness and efficiency in teaching load assignments is necessary to improve curriculum delivery without compromising research and scholarship.

The current system for assigning faculty load suffers significant inefficiencies and inequities in actual productivity because the process has no clear standards or consistent expectations. In recent years, the actual teaching requirement has been increasingly obscured by uncertainty about the equivalence between contact hours and credit hours.

This academic plan implements a fundamental principle long agreed upon by all affected shareholders: that the normal baseline teaching expectation for all tenured and tenure-track faculty is the contact hour equivalent of nine credit hours per semester (usually three courses). This teaching load incorporates the assumption of a base level of research and service engagement. For faculty not engaged in the minimum expected level of scholarship and service, a 12 load hour standard applies.

Deviation from this standard can occur in two ways. First, in some rare cases, as documented by a memorandum of understanding between the university and the Professional Staff Association, faculty who only engage in teaching and have no proven research agenda and are not engaged in service, may be asked to teach more. Second, an active faculty researcher may be released from teaching one or more courses in order to pursue his or her scholarship. An objective of this academic plan, then, is to suggest a method for measuring scholarship and research productivity, with the goal of equitably establishing levels of scholarship and research that warrant variable reductions in the standard work load requirement.

Establishing a rigorous system to assign teaching is critical. A new world of technological innovation in higher education is emerging and curriculum delivery must adapt to remain competitive. This academic plan proposes that the system for assigning faculty workload will promote innovation by developing an incentive structure that will lead to more efficient curriculum delivery.

### 4.1 Faculty Teaching Load

The current course assignment system is complex and inconsistently implemented. It formally requires faculty to account for 12 contact hours of teaching with a three credit load reduction for active scholars and researchers. However, a 1993 document and a Memorandum of Understanding (MOU) signed in 2009 intentionally foster the expectation of a standard nine contact hours of teaching, typically a three course load. Today, loads vary widely by school and

department. In some departments a nine-contact hour load is common; in others it is virtually never assigned. In either case, the original intention of the policy has been subverted. The work load requirement is satisfied based primarily on sections taught—often of any size—and no rigorous link to research and scholarship is equitably enforced. Everyone agrees that this system requires change in the interest of equity and productivity.

*Table 2* shows the number of contact hours and the number of credit hours currently delivered, by college and department. In most cases the numbers are fairly close. However there are some significant variations. Establishing the value of efforts through credit hours or contact hours is a long-standing problem in post-secondary education. In computer science, for example, there is a direct match between contact and credit hours. In contrast, the difference is striking in architecture. The efforts of faculty members in both units are equally important, but the challenge is in equating efforts.

*Table 2. Credits Hours vs. Contact Hours of the NJIT Disciplines*

| College | Department | Course Contact Hours | Course Credit Hours |
|---|---|---|---|
| CCS | CS | 261 | 261 |
| CCS | IS | 60 | 60 |
| CoAD | ARCH | 443 | 261 |
| CSLA | BIOL | 22 | 21 |
| CSLA | CHEM | 126 | 105 |
| CSLA | HIST | 78 | 78 |
| CSLA | HUM | 147 | 147 |
| CSLA | MATH | 432 | 409 |
| CSLA | PHYS | 113 | 99 |
| NCE | BIOM | 90 | 82 |
| NCE | CBPE | 152 | 130 |
| NCE | CE | 244 | 227 |
| NCE | EE | 331 | 292 |
| NCE | MIE | 314 | 286 |
| NCE | TECH | 113 | 97 |
| SOM | SOM | 291 | 291 |

Most tenured and tenure track faculty at NJIT contribute to the university at or beyond the expectation of long established policy. They are active scholars and researchers who continue to teach and mentor students. The difficulty lies in two related causes: first, teaching expectations vary widely, and secondly, measuring teaching productivity is far more difficult than measuring research/scholarship productivity. There are instances where teaching a course with 10 students counts as much as teaching a course with 90 students, or where teaching a course with more classroom time (contact hours) and far fewer students counts more than teaching a course with fewer in-class hours but dramatically more grading because it serves far more students. This

system fails to link productivity in scholarship to actual student education because it ignores the revenue-generating product of higher education: the credit hour delivered.

By ignoring tangible revenue-generating activities, the existing system not only allows some faculty to contribute less to the real teaching product, it also makes impossible any formal link between teaching loads and externally funded research. In reality, externally funded research has the advantage of coming to the university in measured dollar amounts which at least approximate work expectations. Research productivity is quantifiable and comparable to teaching productivity, something the current teaching load assignment policy does not use to its advantage.

### 4.1.1 Equity in Faculty Load

Assigning faculty load in a manner which readily equates to the real revenue-generating unit of productivity, the credit hour delivered, offers two dramatic advantages. First, it measures faculty teaching productivity by a standard unit tied directly to education. Teaching a three-credit/contact hour class with 10 students will no longer be equated to teaching a three-credit/contact hour class with 90 students. Under the proposed system, there will be fewer debates about the number of in-class hours compared to the number of required grading hours. A delivered credit is a formal unit of education and that is the final standard. Second, teaching load will be related to externally funded research productivity. Although specifics of the comparison need further discussion as provided below, externally funded research has a dollar value for the university and therefore can be compared directly to a delivered credit hour. A guide for this formula is the conversion of credit hours (or the equivalent contact hours) delivered into tuition revenue generated and allowing a one-to-one offset from externally funded research (excluding equipment grants and sub-contracts).

Currently, NJIT neither monitors nor sets targets for productivity according to the revenue-generating unit of productivity. As a result, the current faculty productivity in delivered credit hours varies wildly. At the high end, one faculty member in FY 2010 was responsible for 1,767 credits delivered. At the low end, a faculty member, in the same year, delivered a combined 21 credits. This is fundamentally unfair to the faculty. Moreover, compared campus wide, some faculty members who are highly productive researchers continue to teach at loads exceeding those of their less research-active peers. Correcting these irrationalities will render the system both more efficient and more equitable.

The formal faculty load standard used since 1993, with a 2009 revision, expected a base of six, three-credit courses (in cases where credit hours are equal to contact hours— when not equal, the formula equating contact hours to credit hours remains to be determined) per year with a rough average of 30 students each. In terms of credits delivered, this translates into the delivery of 540 credit hours per faculty member. The individual faculty member's externally funded research and scholarly activity reduced this expectation, as did other limits such as classroom size or potential student enrollment. However, the average number of credits delivered in FY 2010 was 298 per faculty member. Most of this difference results from superlative faculty effort in the non-teaching areas expected at a major research university. Nevertheless, irrationalities and inequities remain and the system of assignment by course counting does not reveal them. By eliminating

artificially low caps on class size, eliminating unnecessarily small classes, and assigning teaching loads more equitably based on real class sizes, the number of credits delivered can be raised. Clearly, pedagogical impact on the learning process will be carefully assessed.

To assure greater equity, workload hours should reflect class size. The following table offers department chairs *general* guidelines for assigning load hours to teaching schedules. These should be adjusted, as appropriate, based on the amount of support a faculty member receives for teaching. The table below assumes only minimal support. With graders and teaching assistants involved in delivering the course, the load hours awarded may be reduced. As the workload recording system improves, the system will be refined for greater equity.

*Table 3*

| **Class Size** | **Load Hours** |
|---|---|
| 50+ students | 1.5 x contact hours |
| 100+ students | 2.0 x contact hours |

Class size will be determined by the 10th day course enrollment report.

### 4.1.2 Lecturer Load

The incentive structure to promote equity and efficiency in teaching should apply to lecturers as well as tenured and tenure track faculty. By concentrating on credits delivered, inequities can be reduced while promoting innovation. The logic applied above means that lecturers are currently expected to teach eight, three-credit (or equivalent contact hour) courses per year to an average of 30 students each, for a total of 720 credits delivered. The actual distribution of credits delivered by individual lecturers varies, although not as much as among tenure/tenure track faculty. At the low end, loads should be increased. At the high end, performance should be supported with additional grading and recitation support.

An innovative and efficient system where all full time faculty, including lecturers and tenure/tenure track faculty, use technology and grading support to offer substantially more credits will promote significant savings. This does not mean a greater work load, rather an environment where instruction takes place more efficiently and savings are invested in support for curriculum delivery.

### 4.1.3 Innovations and Instruction Delivery

As a university dedicated to training students in applied technology, NJIT must create opportunities for current practitioners to teach. This will offer students access to training in the most current and relevant skills. Achieving this depends on a base of professional instructors who are highly skilled technology professionals willing to teach on a non-permanent basis. Achieving this requires a change in the way the university treats and remunerates instructors.

As teaching hospitals employ practicing clinicians for high level instruction, NJIT will create the position of professor of practice to parallel the existing rank of research professor. These non-

tenure track professors will support the engagement of expertise in professional practice and provide a formal association with academic, business, artistic, or government leaders who are making major impacts on fields and disciplines important to NJIT's programs. This designation represents an effective and meaningful way for NJIT to involve accomplished professionals who seek an association with NJIT. The position will normally deliver four courses (12 contact hours) per semester and be subject to annual evaluation managed by the academic unit of appointment. This evaluation will include a review of the instructor's ongoing relevance and currency in professional practice. The role a professor of practice plays in departmental governance will be determined through the bylaws of the academic unit of appointment.

To further enhance the quality of instruction, adjunct instructors must be treated as the professionals they are. This requires a significant increase in remuneration and the determination to provide them with access to facilities as their position requires. This should include, but may not be limited to, library and computer facilities use and office space.

### 4.1.4 Research, Scholarship and Teaching

As a research-intensive university, all NJIT faculty members are expected to conduct research and publish scholarly works. Therefore, chairs should also factor "substantial" research and scholarly activity into the workload of a faculty member, as suggested below.

In the case of STEM-related disciplines, three main forms of academic release are identified, and the following standards can be applied:

- Academic Year Faculty Salary (Externally funded release). Faculty members may budget in a grant or contract AY salary for academic release (externally funded release). One month of AY salary, fringe and administrative cost is considered equivalent to one 3-credit course. It is strongly recommended that funds from academic release be channeled directly back to the faculty member's department.
- Graduate student support. Faculty members may budget in a grant or contract full academic year support (including stipend, indirect costs, and tuition) for one graduate student for release of one 3-credit course. No limit on how many students can be supported should be imposed, with the understanding that a lower limit of 6 credit-hours of teaching per year cannot be reduced further (see "Target Maximum and Minimum Teaching Load" section).
- Funded release. It is recommended that we adopt an approximately 'one-for-one' dollar match from grants towards release time. This would apply to STEM-related disciplines, for which a one 3-credit course should be equivalent to the tuition revenue of a 3-credit course of average size (currently 27-students). For release from two 3-credit courses, this funding level corresponds, currently, to approximately a $100,000 grant or contract, excluding equipment grants. Grant sub-contracts also do not count toward release time. It is expected that this grant include stipend, tuition, fringe, and administrative support for at least one graduate student. This funding level should be determined in agreement between the respective chair, dean and the provost.

*Notes: 1) Release time may be made in the year of grant awards or in successive years. 2) Grant dollars count in only one category of release time. 3) Subject to approval by the provost, release time may be granted for significant proposal writing.*

Budgeting for academic release of a faculty member from multiple grants should be allowed. The budget of a grant that includes multiple PIs must be pro-rated according to the percentage participation and agreed to by the PI and all co-PIs (approved by the chair) at the time the grant is awarded. As part of the discretion accorded to chairs, additional release for exceptional and/or exemplary scholarly and service activities must be allowed and should be determined in agreement between the respective chair and dean, and the provost.

It is important to recognize that developing a research program takes time to establish. Thus, release time for junior or new faculty in initial years must be determined at the department level, be open for all to know, and be clearly stated in the initial contract letter. It is expected that initial contracts will include formal release time at the discretion of chair, dean, and provost.

#### 4.1.4.1 Non-STEM disciplines

Non-STEM departments at NJIT include History, Humanities, Management, Architecture, etc. For these disciplines, research is often not conducted on campus as it requires resources typically distributed over the country or even the world, in libraries, museums, etc. Thus, funds may not come to the university to produce something while on campus. Rather, funds release faculty to work off campus. The products of this work are scholarly achievements: books, papers, book reviews, conference papers, invited talks, awards, etc. No uniform standard as enumerated above for STEM-related disciplines can easily be outlined, although where STEM standards can apply to non-STEM faculty comparable guidelines should be used. For non-STEM programs, standards need to be determined by each department for each of the output categories appropriate to the specific discipline. Clear metrics and appropriate standards must be determined. Because of the nature of the work, e.g. a book takes years to write, papers can be delayed, etc., a sliding average over three or more years may be applied. These metrics must be developed by each department in agreement between faculty, the chair, the respective dean, and the provost. The metrics criteria and resulting teaching load assignments should be posted for faculty access each semester.

#### 4.1.4.2 Target Minimum Teaching Load

Teaching release will vary according to the level of research and service activity of the faculty member. The aspiration that education will always be a principal mission of the university demands, however, that all faculty members participate in teaching every semester. Thus, with the exception of individuals with significant administrative responsibilities, the following standards shall apply:

- All T/TT faculty members should teach at least one 3-credit course per semester, regardless of total accumulated release time.
- It is recommended that each faculty member deliver not less than 81 student credit/contact hours per semester. That means one 3 credit course of average 27 student enrollment.

Chairs are encouraged to vary both the level and format of courses taught by individual faculty members. Senior faculty members should teach an occasional introductory course, and most research active faculty should have opportunities to teach at the graduate level. These recommendations will benefit students and faculty alike, and will help achieve more equity in course-credit hours delivered among faculty members.

### 4.1.5 Equity and Fairness in Scheduling and Pedagogy

As teaching loads should be assigned equitably, the teaching schedules and pedagogy expectations for faculty should also be assigned equitably. The scheduling process should incorporate rules which reasonably reflect individual needs without unduly favoring any instructors. For example, no faculty member should teach course sessions back to back if it can be avoided. Continuous teaching should be limited to a 4-hour maximum with at least 1 hour before the next class. Rules assuring equity and good pedagogy should be built into the scheduling process and adhered. Beyond scheduling, significant investment of time is required in the development of a new course. The same may be true also of major course revisions. Work load assignment decisions should consider new course development and revisions when such revisions are judged to be significant. As with research release, these accommodations should be explained and approved by the chair, dean, and provost.

## 4.2 Changing the Incentive Structure

A well conceived approach to teaching load concentrates on credit hours delivered rather than on sections taught. This changes the incentive structure; rather than promoting small classes, it rewards those who deliver the curriculum more efficiently. Department chairs and administrators will ask different questions: How are some instructors so productive? Can the practices be replicated by other instructors and in other departments? This will, by itself, promote larger class size because faculty will have incentives to teach more students. Put in curriculum delivery terms, it could over time mean generating substantially more credits. If fewer small classes were taught, more credits would be delivered by the same number of instructors without any formal change in work load.

In FY 2010 NJIT delivered 2657 sections; of those sections 1487 had an enrollment of less than 26. Of those, 995 had an enrollment of under 20 and 318 had fewer than 11. Reducing the number of small classes will allow instructors to serve more students without adding additional courses. Tracking credits delivered will also allow the fair rebalancing of faculty load in successive semesters. Faculty members who teach low enrollment courses in one semester can expect to teach higher enrollment courses in the second. Enrollment might not be known at the initial course assignment, but in the next semester adjustments can be made.

It is important that not all classes can or should enroll at least 27 students. The university infrastructure does not allow for many large classes and in some cases smaller classes are required for pedagogical reasons. Writing, design, and laboratory sections should often operate with as few as 20 students while seminars and graduate courses may also require enrollments of only 10-15 students. Faculty teaching these courses should be counted as teaching a full section

load. As with all exemptions, certification of a class as meeting the full enrollment standard will be made by the dean and provost. The approval will be recorded in the assignment system.

### 4.3 Streamlined Program Offerings

Over the past decade NJIT has demonstrated a remarkable ability to create new programs and only a passing interest in eliminating them. There are now 143 distinct programs registered with New Jersey Higher Education. This is more than one program for every two tenure and tenure track faculty. Too often, programs have enrollments so small that upper division required courses never have full enrollment. Undersubscribed programs are also those of moderate size with an inordinate number of tracks and specialized courses. Because only a small number of students are required to take certain courses, they are small and offered infrequently, sometimes causing extended delays in student progress toward the degree. This inefficiency reduces retention and impedes graduation.

The change in the incentive structure proposed here will discourage unnecessary program expansion or fragmentation and promote student graduation. Using a work load model based on credit-hours delivered encourages either program innovation or elimination by changing the incentive structure. Faculty teaching in a program with excessively low enrollment courses will find it impossible to reach the targeted average of 27 students per course. This will encourage them to share required courses with related programs, simplify the program, or shut down the program entirely.

### 4.4 Transparency

Transparency in workload assignments will foster fairness and discourage inequities by recording release decisions and making actual load assignment practices known. The first step in transparency is accurate recording of teaching load assignments in the system of record. A coding system will be implemented to show a credit-by-credit accounting of teaching load and release time based on research and service. All release time will be justified and the explanations will be recorded. This will serve two purposes, it will assist chairs, deans, and the provost in balancing teaching load over time and provide a record which can be assessed and published. Faculty load reports prepared under the direction of the Provost will manage this information and provide clear information for regular monitoring of the workload assignment process and offer analyses by departments/colleges and by semesters and years to check for patterns.

### 4.5 Issues for Further Discussion

Working with the provost and the Office of Institutional Research and Planning, a committee will be formed to address the following issues:

- Developing a relation/formula governing the use of contact hours vs, credit hours in those cases where they do not match for a course (in this formula, the fundamental guiding principle is equity in faculty teaching and productivity);
- Establishing guidelines for release time that might be awarded based on significant scholarly activity in STEM fields that is not funded by external research;

- Establishing guidelines governing release time for scholarly activities not addressed above;
- Establishing guidelines for exceptional cases that may emerge as this model is implemented;
- Completing a thorough review of this faculty work load plan after the first and second year for formative and summative evaluation.

## 5.0 Enhancing Student Success: Admission, Retention, Graduation, Employment, and Becoming Alumni

An NJIT education aims to have certain common characteristics, regardless of discipline. These characteristics shape both the pedagogy for our students and the expectations of their employers. Our aspiration is to provide an optimal learning environment in order for our graduates to be professionally ready, technologically savvy, and socially responsible.

*Professionally ready:* In their respective professional majors, undergraduates possess the necessary knowledge and skills to start a career, including fluency in written and spoken communication. It also means developing the right attitudes and an entrepreneurial spirit. We want to produce graduates with initiative, motivation and the will to embark on a path of lifelong learning. Throughout their education, our students have to apply their skills and knowledge to problem solving and critical thinking. The aim should be to provide hands-on learning opportunities in all professional disciplines.

*Technologically savvy*: As a university of science and technology, NJIT must provide its students with a full understanding of technology's potential in all human endeavors, but particularly in the endeavors represented by the various professional programs at NJIT. Students need to be exposed to cutting-edge technology and become experts concerning the social impact of technological innovation. Our graduates must be viewed by industry as agents of change. Academic programs need to be designed not just to respond to industry needs, but also to anticipate them.

*Socially responsible*: It is critical for NJIT's students to understand that technology needs to be applied in a socially responsible, ethical way. Each student must be made aware of his or her respective civic responsibilities. Each should have an understanding of the relationship between individual gain and societal benefits. All students need to understand the idea of a common good as well as the pursuit of their own self-interests.

### 5.1 Achieving Student Success

Two crucial measures of student success – retention and graduation – are also the two essential indicators of university performance. This plan envisions a comprehensive strategy toward improving retention and graduation. Student success begins with integrated admissions and enrollment strategies designed to place students in appropriate courses while offering the flexibility to change majors. From the earliest opportunity, the freshmen must be engaged to facilitate their transition from high school to university study including support in mastering the reading, writing and mathematical skills essential to success at NJIT. High quality advising during the first two years is essential to helping them negotiate that critical period. To advance higher level knowledge of professional fields, research must be integrated into program curricula. Finally, NJIT must promote links between local industry, successful alumni, and students to increase the employment potential of graduates.

The use of graduation and retention rates to guide university programs and endeavors requires carefully chosen supplemental metrics to assure that these measures capture their intended

meaning. A detailed system of metrics that are regularly updated and made available to colleges, departments and other units should be developed. A working group with representation from all academic units should oversee the development of this system of metrics and regularly review and adjust this system to assure it continues to serve as the best possible indicator of student success.

### 5.1.1 Recruitment and Admission

An admitted student is a qualified student. However, admission standards should be sufficiently rigorous to identify those who are at risk of not graduating from NJIT before acceptance. At the same time, no admission standard can anticipate lack of motivation to succeed, absence of tenacity, or other intervening factors. We must identify and evaluate these at-risk students early and options should be immediately and clearly communicated to students and their parents. We are doing no favors to potential students who will struggle at NJIT and eventually withdraw because of their inability to cope with the rigor of our curricula. Refining the admissions process is the first step in increasing retention and graduation rates.

## 5.2 Academic Services

### 5.2.1 Accurate First-Year Placement

First year, first semester placements are crucial factors in the retention and success of students. With well-structured curricular goals that are matched to placement tests within a validated system, academic departments are best equipped to determine how these placements will be made, especially in general education courses and the first-year curricula for their majors. The Office of First Year Studies should provide support to the academic departments in making placements, but the departments should make actual placement decisions based on a validated system of assessment. Academic departments that will be delivering courses required of the entering students must consider placement issues of the highest priority and continually assess the validity, reliability, and impact of their methods. These placement systems will be designed and validated by the departments, with support of the Office of Institutional Research and Planning, and approved by the deans and provost.

### 5.2.2 Learning Communities

Our curricula must be rethought to more fully engage and support our students through learning communities, adaptive learning, a focus on learning by doing and other pedagogical methods more effective than the traditional passive lecture format. If a student is not immersed in his or her chosen field of study in the first year, it is difficult to keep up enthusiasm and commitment going forward. Quality and extent of student interactions with advisors and faculty fuel the success of learning communities. The implementation of learning communities based around students' majors is now in its second year, and the commitment of faculty and instructional staff to planning and improvement of the program is essential to its sustainability. This approach to improving student engagement creates cohorts of like-minded individuals who share experiences in and out of class. Preliminary survey results show significant improvements in student

satisfaction but more data will be collected. The opportunity to belong to a cohort should be made available to every NJIT undergraduate.

### 5.2.3 A Hybrid Model for Academic Advising

Students should not feel alone in their selection of and timing of required and elective courses that will ultimately lead to their graduation. The role of the advisor is a crucial element for the retention and success of our students. The advising process should begin at admission, to include counseling about the choice of major and the structure of the first-year curriculum. Additionally, honest and professional counseling should occur to alert those who are not adequately prepared for the rigors of NJIT and to present them with viable alternatives, such as a community college transfer route that may be better suited to their current level of preparation.

Provision of advising according to a model specifically developed for NJIT students that follows the principles and practices of nationally recognized and highly effective advising programs provides students with the opportunity to discuss their options with broadly knowledgeable advisors. These advisors should also be capable of recommending a repertoire of possible appropriate actions, such as a change of major. A realistic choice of major, when feasible, should be made at admission time or any time prior to matriculation; however, accurate and empathetic advising is critical for efficiently facilitating decisions about changes in majors and helping to create an academic culture where changes of major are not stigmatized. For these reasons students should have access to a centralized advising office. Many students, however, already have access to professional advising within their departments and this must remain so. Students without declared majors, or those contemplating major change, should be assigned directly to the centralized advising office. The centralized advising office should also help other students in transition, such as transfers.

During the junior and senior years, mentoring by faculty in the academic departments of the students' majors should enrich the advising process where both professional and faculty advisors are involved in guiding students through the remaining stages of their curricula, both in the courses required for a specific major and the upper level General University Requirements (GURs). The professional advisors, whether in the department or in the centralized advising office, are best equipped to steer students toward the completion of their academic requirements and faculty advisors are crucial for preparing students for employment or post-graduate work in their chosen field.

### 5.2.4 Multiple Support Programs to Facilitate Success in the First-Year Mathematics Sequence

Quantitative skill is the backbone of the NJIT curriculum. Without competency in mathematical reasoning, NJIT students cannot succeed in college or career. In consultation with the provost and dean, the Department of Mathematical Sciences delivers the placement system and attendant courses which will fulfill the requirements of every major, and for developing and employing multiple approaches which will facilitate student success. For students who have been admitted but, for a variety of reasons, have demonstrated that they are in need of intensive remediation, an advising model and tailored curriculum for the individual student should be provided and

completed within one year. Ensuring competency in mathematical reasoning will be the absolute priority focus for the entering freshmen. This process will require a nimble approach that coordinates closely with the registrar and other academic departments up to and including mid-semester changes in scheduling if remediation is to be accomplished in less than a one-year period. The student in need of remediation should be assigned to take a program of remediation specifically tailored to his or her needs.

Selection of the nature of remediation will be the responsibility of the Department of Mathematical Sciences to maximize success during a period of one year. Students not achieving the required level of skills to progress to the standard mathematics curricula should be assisted in choosing a major with less demanding math requirements.

### 5.2.5 Pre-College Initiatives

NJIT is committed to strengthening its pipeline to active learning, beginning with pre-college programs that connect middle and high school students in our region with NJIT students, faculty, and alumni. Programs like Real World Connection (RWC), designed to build pre-college students' knowledge and skills and the sense of ownership for their learning, are important opportunities for service and recruitment. As well, they foster leadership in the undergraduate mentors who engage in such programs. Greater coherence between pre-college initiatives and other academic programs, such as learning communities, enhances the visibility of NJIT's excellence in its service to its urban environment and in preparing students for productive careers.

## 5.3 Curriculum and Instruction

### 5.3.1 Common First Year Curriculum

When students first enter a university they often lack self-knowledge and, after some time, realize that a different major would be a better choice. Historically, changing majors at NJIT has often cost students time as they progress toward a degree. To increase flexibility in the selection of majors, NJIT should strive for adoption of a common first year curriculum. In some disciplines, this may also extend to the second year. This means students, first within colleges and then increasingly across all colleges, will share a common course sequence at least in the first year. As students move through the first year they will have multiple opportunities to work with advisors and reevaluate their strengths, weaknesses, and interests. If they elect to change majors they should be able to without being slowed in their progress toward graduation. Departments may need to be more flexible with regard to minor variations in the GURs that do not impact the major. High quality GURs are an important core for a student's future professional success, providing a foundation of communication skills, cultural understandings, global awareness, ethical leadership skills, and fundamental knowledge of science and technology.

### 5.3.2 Freshman Academic Engagement

Paramount among the many transitions experienced when students move from high school to college is the transition to the academic expectations at the university level. Academically, students must perceive and respond to expectations, often requiring significant new commitments of time and attention. For freshmen, care must be taken to assure that these expectations are effectively communicated and that students failing to properly perceive or respond to the academic demands receive timely feedback regarding their need to redirect their time and attention. The university should identify those freshmen courses forming a foundation for success at NJIT and implement a program of freshmen engagement, such as Learning Communities, in these foundational courses that assures that students quickly understand what it takes to be successful in college level study. In these courses, provision should be made to see that students demonstrate their understanding of the behaviors needed for success at the university. Instructors should identify and record students requiring further assistance. Data gathered should be shared with academic advisors to facilitate assistance through measures such as mandatory tutoring and academic counseling. This program should provide instructors in these courses with training and additional support to permit their effective involvement in helping freshmen succeed in university-level study. Both will support the students throughout their academic career.

### 5.3.3 Research-Based Undergraduate Curricula

The connection between education and research lies at the core of NJIT's mission. The excellent scholarly work of our faculty in the discovery and dissemination of new knowledge strengthens the educational programs and provides a distinguishing characteristic for the university. NJIT prides itself in providing a rich environment for student-faculty interaction in both general education courses as well as major courses. This interaction should be strengthened by increasing the number of research-active faculty that teach undergraduate courses, sharing with students the excitement of relevant and cutting-edge research, exemplifying an engaged pedagogy, and promoting students' intellectual independence and maturation. Our faculty also stands to benefit from these interactions and the curricular enhancements that will ensue.

NJIT's research capacity has grown tremendously over the last decade, and we are at the forefront of many emerging scientific developments. Our researchers have state-of-the-art facilities in which to carry out their work. Many are recognized experts in their fields and already have considerable experience in mentoring both graduate and undergraduate students, and they have demonstrated commitment and understanding of the definite value of research at the undergraduate level. Given this, we should consider taking the natural next step to promote undergraduate research within the curriculum with full understanding of its value to the students and the university. This means continued support for our current faculty and making NJIT a place where the best young researchers in engineering, design, computing, science, and management want to come.

The connection between teaching and research and the transfer of research results from the laboratory into the classroom and to industry is also a defining characteristic of NJIT. The instances where teaching and research come together, as in project-based learning, should be

reinforced and increased. For our faculty, classroom teaching is shaped by their commitment to research in their discipline. However, positive teaching and research connections do not always occur automatically; they need to be explicitly forged. It is important to develop strategies that we can use to examine our curricula and courses and strengthen the teaching and research connections for the benefit of student learning. We should develop our students' understanding of the role of research in their disciplines, starting as undergraduates, by integrating current and prior research developments in the field into the curriculum, involving students in research experiences as part of their course work, and providing them with opportunities to understand how research is organized and carried out in the respective disciplines. Clearly, continuing to infuse our curricula with the best research should be a priority of NJIT.

### 5.3.4 Establishing Early Student-Industry Contacts and Relationships

New Jersey hosts many of the most important high-technology companies in the United States, and indeed in the world. NJIT should be the institution of choice in searching for their qualified new employees, especially in science and technology disciplines. To achieve the reputation of providing a pool of highly qualified, desirable employees, our academic standards and procedures must be of the highest quality, and the other objectives of this academic plan address this.

More than that, however, NJIT-industry contacts should be established at the undergraduate level. This can best be achieved by increasing student participation in the university's Cooperative Education (Co-op) Program and internships. Co-op work experiences are closely aligned with a student's major studies and help to improve understanding of the relationship between classroom theory and practical application. Co-op students are paid an industry-standard wage that greatly assists students in financing their education. They earn three academic credits that appear on the transcript. Students also maintain their academic connection through contact with their departmental faculty co-op advisor during the term of their employment. More than this, however, all other existing relationships with industry must be exploited and a committee organized to explore ways of increasing student-industry relationships. The goal should be to establish industry relationships with undergraduate students by their junior year. This could be done by increasing opportunities for internships, but other creative methods should be explored. The prospect of industry relationships well before graduation will provide an important incentive for students to complete their courses of study within a reasonable period of time.

Job offers to recent college graduates have become increasingly dependent upon factors that extend beyond the attainment of a specific degree and major. Resumes including previous related work experience and competency in technical and managerial skills are the new entry-level norm. It is therefore important that our course curriculum is designed to ensure that graduates attain knowledge and skills that are up to date and relevant to the needs of employers. It also underscores the importance of ensuring opportunities for students to develop skills outside of the traditional classroom environment, such as experiential education including co-op, internship, civic engagement and capstone as well as leadership development experiences.

Similarly, student success can be enhanced through increasing student participation in formal civic engagement programs. Increasingly, institutions of higher education benefit from the

"value-added" component of community service engagement in strengthening experiential learning and leadership development. Through community service, our students become agents for change while taking part in experiential activities leading to enhanced learning outcomes.

### 5.3.5 Rethinking the General University Requirements and its Delivery Modes

The General University Requirements at NJIT form an important and crucial foundation for the overall curriculum. These courses, which account for roughly one-third of the overall instructional volume, are taught by dedicated faculty, lecturers, and adjuncts. Because of the continuing increase in undergraduate enrollment and the decrease in full-time instructional capacity dedicated to the GUR, there is a need to rethink the current instructional models to allow increased course access to students and increased oversight for quality. The great challenge, however, in rethinking the delivery of the large inventory of GUR courses is to maximize gains in student learning without introducing prohibitive instructional costs.

There are a number of ideas that have the potential to substantially change how teaching and learning occurs in the GUR while expanding access, facilitating degree progress, and controlling costs. A number of institutions, similar in size and mission to NJIT, have embarked on redesigns of their general education curricula employing various models, including a fully online model and an "emporium" model. The learner-centered emporium model has been successful in lower-level courses, allowing for task modularization, individualized assistance, and ongoing assessment. Another possibility, which may be suited for upper-level courses, is to augment internal resources with external ones that may be freely accessible in the public domain, such as the massively open online course (MOOC) model, essentially adopting an open business model.

### 5.3.6 The Emporium Model of Learning

The 2010 Report of the Governor's Task Force on Higher Education recommends consideration of increasing instructional capacity through the use of technology that additionally "produces better learning outcomes for students at a reduced cost to the institution." The Emporium Model is an approach that seeks these benefits. Sometimes described as a learning center "on steroids," a Learning Emporium is a computer laboratory, frequently also possessing face-to-face tutorial facilities, for the computerized delivery of course material in an environment where individualized assistance is readily available from peer-tutors, teaching assistants and faculty members. This model, if fully deployed, augments and possibly replaces classroom instruction with a learning resource center featuring interactive computer software and on-demand human assistance. This model uses a staffing approach that relies less on the traditional role of expert faculty and more on adjuncts, teaching assistants, and undergraduate peer tutors who respond to students' specific needs, answering questions and directing them to appropriate resources from which they can learn. Serious consideration of some variation of the emporium model of learning, especially for delivery of the first-year writing curriculum and for remediation-oriented mathematics courses at NJIT should continue.

For delivering the first-year writing requirements, NJIT has the opportunity to be a ground-breaker. A writing emporium, open for long hours, would emphasize the students' responsibility to achieve their faculty-prescribed learning outcomes by the end of a semester (or before).

Students will have a mandatory number of hours that they are required to spend in the emporium and these hours should be scheduled by NJIT for the student cohorts. Judged by exit exams and/or portfolio review, they will get credit for the course. Groups of faculty are responsible for devising the details of emporium pedagogy, and along with other staff, for tutoring and guiding students through the material. At its most effective and fully employed, oversight of a limited number of faculty members could provide support for the entire freshman class.

The Department of Mathematical Sciences (DMS) has been evaluating appropriate use of technology and the emporium model for some time. Through the use of software frequently used in math emporium-style courses, DMS has gained experience with these technologies and issues surrounding their use. DMS has consulted with experts in the emporium-style learning and the use of technology in math education. Observations from the implementation of adaptive learning software suggest that a modified-emporium or hybrid approach may hold promise. While adaptive learning software is ineffective in delivering primary instruction, it excels at review, re-enforcement, continual assessment, automated grading and supporting classroom management. DMS experience shows that a committed and skilled instructor can provide needed instruction and influence students to obtain the advantages offered by the mathematical software products.

### 5.3.7 The Fully Online Model of Learning

In the early days of online education, NJIT was a pioneer in both the development of content-delivery supporting technology and in pedagogical approaches to virtual learning. Today, an increasing number of undergraduate courses (as well as complete masters-level programs) are delivered online, commonly referred to as distance learning courses. More courses are also being offered in a hybrid fashion, combining elements of face-to-face and online instruction. NJIT must embark on a plan to reclaim its once credible presence in online education. In fact, this has now started with the ongoing efforts at the master's level. Information technology is the major key to meeting this challenge—as a positive disruptive innovation. While a decision to offer complete online undergraduate degrees has not been made, delivering some of our upper-level GUR courses online may be the appropriate entry point for such a discussion at the undergraduate level. Writing courses work especially well online, since writing is the required mode of communication in those courses.

### 5.3.8 The Massive Open Online Courses (MOOCs) Model of Learning

Free online educational content is available to anyone who wants it. Top universities have made courses taught by their superstar instructors openly accessible on the web for some time. Students at all levels and around the world have been using these resources to supplement their own learning needs, as have many adult learners and others that saw a value in such content. More recently, a new paradigm of open education has emerged: the Massive Open Online Courses, or MOOCs, designed to support very large communities of learners. There are significant challenges in adapting such models of learning as the MOOCs, which rely exclusively on automated assessment. While not a panacea, the worth of the MOOCs model for some of our courses should be carefully considered.

### 5.4 Alumni Engagement

NJIT graduates will become NJIT alumni, and a continued relationship with the university is good for both them and the institution. To encourage a life-long connection to their alma mater, early links should be forged between undergraduates and alumni. Seeing the personal and civic advantages of being a graduate of NJIT is another factor that should motivate the individual to stay and graduate. Recent graduates who are on their way to successful and fulfilling careers should be enlisted to take part in this initiative, and the university unit responsible for establishing these connections should be asked to lead in this regard.

One initiative already in place to accomplish this objective is our NJIT Alumni Speed Networking program, which is held annually. The event is produced by Career Development Services in collaboration with the Office of Alumni Affairs and the Alumni Association of NJIT. Speed Networking regularly attracts 75 alumni serving as career advisors and mentors, and 150 students seeking to make connections and learn the "art" and skill of networking. This special information exchange enables current NJIT students to practice their "elevator pitch" and learn career and job search tips from professionals.

### 5.5 Achieving Student Satisfaction

The success of a student can be measured by objective metrics such as time to completion and GPA. However, another factor that is as important and much harder to assess is the satisfaction of a student with the "NJIT experience." Only a satisfied student will recommend NJIT to her/his younger friends, siblings, etc. Front line student services such as the registrar's office, the bursar's office, the financial aid office and on-campus housing, as well as the academic departments, should present their friendliest faces to the student population and should operate efficiently and predictably, treating the students as valued customers. Students have a right to expect clean facilities, fast computers, functioning equipment in laboratories and working elevators. The everyday encounters with necessary student services should be routine and pleasant, not a contributor to stress that interferes with primary activities related to the quality of learning that will lead to a professional career. It is the responsibility of the university to provide the best infrastructure, instruction, student services, and campus activities that will create an environment that is conducive and motivating to student satisfaction which ultimately leads to retention, graduation, and success.

## 6.0 Sustainable Investment

To meet the outcomes of groundbreaking research, workload equity, and student success, resources will be required. A demonstrated need exists for prioritized resource allocation. Our facilities should be upgraded in a systematic multi-year effort because some NJIT buildings are no longer state-of-the-art. Instructional laboratories must be renovated on a predictable cycle basis and a yearly budget provided for their maintenance. Furthermore, some of our equipment is antiquated and regular upgrades for all equipment must be budgeted. Due recognition should be taken of the effect that this issue has on our brand as New Jersey's premier science and technology university. Because of recent and planned growth in the size of the student body, additional laboratories and equipment are urgently required in some areas.

In addition to the required instructional laboratories, the drive for innovation in curriculum delivery also inevitably means some changes will be needed in supporting facilities. Fortunately, the basic drive for equity and efficiency described in this plan can take place largely within the framework of the existing NJIT campus with proper management and wise investment.

### 6.1 Investment

To maintain educational quality and remain a competitive research university, increased productivity and innovation require sustained investment. A substantial portion of the realized increase in actual tuition revenue paid should be invested in the educational process. Larger classes will entail spending more on graders and recitation instructors. They may also require additional tutors or technology-based learning aids. The objective is not merely to make curriculum delivery more efficient, but also to make the overall learning process more effective. Results from the National Survey of Student Engagement (NSSE) underscore existing student concerns about academic support at NJIT. This opportunity for investment has the potential to address these existing weaknesses.

### 6.2 Investment Strategy

To ease the implementation of a faculty-load policy based on credit/contact hours delivered, the university can offer the assurance that the savings realized will be invested in student learning. The measures underlying the credit-hour load assignment model have a dollar value, and just as teaching productivity can be measured, so also can we measure real savings. The dollar value of credit hours delivered is based on the real tuition (excluding fees) it generates. This means the rise in productivity from a baseline average of 298 credits generated per tenured and tenure-track faculty member can be calculated. (If productivity gains apply to other instructor categories, then a similar calculation applies.) The increased revenue generated from the credit-hour load plan must be earmarked to improve the educational experience of students. The need for improved academic support is long overdue and this investment can meet this pressing need.

To meet the changing expectations for higher education in the 21st century, NJIT must improve learning and teaching while delivering the curriculum more efficiently. Changing the principles behind faculty load will substantially increase real tuition dollars, but only the investment of such additional resources in the instructional program can offset the disadvantage of offering

fewer small classes. Such investment will also improve faculty productivity in scholarship and research. Not all actual areas for investment can be determined in advance, but it is certain that there will be additional areas for attention to support productivity gains. The process going forward should be one of innovation, consultation, collaboration, implementation, and assessment to determine the most effective strategies for realizing our goals.

### 6.3 Classrooms

Current classroom usage at NJIT, for example, falls well within the requirements of a 10,000-student campus based upon current space utilization, which was about 50% of the maximum possible space utilization (Monday through Saturday, 8 am to 9 pm) for FY 2012. Increases in utilization may be achieved by continually evaluating and adapting scheduling processes and procedures to meet the needs of students and faculty while optimizing space utilization rates. Furthermore, course capacities need to be adjusted to maximize the seat utilization in existing classrooms as well as scheduling courses in classrooms appropriate to the number of students registered.

In addition to increased space and seat utilization, existing classrooms must be examined to determine whether NJIT has the appropriate amount, size and type of space. Classrooms must be developed with improved configurations that are flexible by design, allowing for collaboration, utilizing the most current technology with proper supporting infrastructure to facilitate excellence in teaching and learning. Of equal or greater importance are the appropriate conditions in the classrooms which must be conducive to a comfortable teaching and learning environment such as suitable HVAC conditions, lighting, acoustics and technology. These all should be fully investigated to ensure continued innovation in classroom usage and design.

### 6.4 Laboratories: Instructional and Research

Laboratory instruction plays a critical role in the heavily STEM-focused disciplines of NJIT. Student success both at the instructional and research level depends on having state-of-the-art lab facilities. This academic plan does not foresee any change in that emphasis. The use of laboratories will, however, require a different type of innovation. Space utilization studies suggest that, unlike the number of students using classrooms, instructional laboratory space utilization at any given time cannot be substantially increased. Similarly, virtual classroom technology has not been demonstrated to offer effective lab activity solutions. At least, such advances cannot be confidently foreseen.

The space utilization studies do, however, suggest a direct solution. Some instructional laboratories currently operate under time-scheduling capacity. This means that although the number of students in a section cannot increase, even with the addition of laboratory technicians and other support staff, the number of hours during the day when they are used can increase. Therefore, more intensive scheduling will allow continued support for students even if introductory lecture sections increase in frequency; as with curriculum delivery, this may entail innovation in the assignment and scheduling process. In some disciplines, such as engineering and science, laboratories may require appropriate investment to increase time efficiency of experiments; provide contemporary equipment similar to that used in industry, and allow for a

more engaging hands-on experience. Upgrading and layout of facilities for better space utilization and more visually attractive setting would increase lab effectiveness. Projected increases in enrollment and pedagogical reform, however, will require similar increases in laboratory capacity. For example, adaptive learning initiatives in first-year mathematics courses require an increase in computer laboratory capacity.

Research laboratories are also an essential part of the academic operation including the participation of students from undergraduate research to training post-doctoral fellows. The emphasis on research outlined in section one will continue to bring in new research active faculty. Accordingly, the demand for laboratories and other research facilities will continue to increase. It is clear that research laboratory capacity at NJIT will not suffice in the near future. In addition to the dedication of new spaces for research, creative planning of existing space needs to be a part of meeting the needs of research. For instance, space can be renovated and reconfigured to accommodate changing needs such as flexible open space laboratories, the creation of shared facilities and equipment and common student seating. Planning for successful research of NJIT faculty will also benefit in limiting start up needs, aid in collaboration, and create attractiveness to new research active faculty.

### 6.5 Studios

One powerful way to enrich the learning environment is to provide spaces for students to work, learn and teach in groups. Indeed, to provide some real world experience, educational approaches often use group learning. Dedicated student project workspace has long pressed the limits of assigned space. Unlike classrooms that are shared between many classes, studio space is assigned to a project which occupies the space around the clock for a semester or a shorter length of time. Such space must be made a priority for students to work individually or in groups. To increase the amount of studio space available, we must turn to opportunities of better schedule planning and space management. Increased class sizes and better seat utilization may provide an oversupply of the smallest classrooms which may be repurposed into new studio space. This may also open possibilities for departments seeking to make more use of studio learning in the curriculum.

### 6.6 Technology

The coming wave of innovation in higher education will, inevitably, demand ongoing investment in technology. This does not mean computer labs. Whether this means video and audio equipment, projection capacity, virtual technology, augmented reality, simulations or devices we cannot yet imagine in the classroom, the more intensive use of technology is a certainty. We can also reasonably guess that much of it will be mobile and dependent on cutting-edge wireless technology, computational power, and cloud-based solutions. The new emphasis on portable devices necessitates that NJIT invests in infrastructure that will support a Bring Your Own Device (BYOD) culture rather than building more traditional fixed space labs. An advantage of such powerful, yet compact technology coupled with a BYOD culture is that its presence in a classroom renders it as a laboratory as well.

Without quickly responding to available new technologies, many of the best innovations in higher education will not be possible. NJIT must be prepared to make these commitments in an ongoing and regular manner and budget appropriately for support and maintenance.

Technology-based tutorial systems, sometimes referred to as Adaptive Learning, have also improved dramatically. In the near future, these offer the promise of self-directed tutoring for students. Other options may include online tutoring or other instructional software. These instructional innovations entail experimentation and we should dedicate a certain portion of investment to the regular exploration of new instructional possibilities.

Learning management systems, like Moodle, are developing rapidly and a science and technology university must remain at the forefront in the use of these tools. Doing so demands continuous targeted upgrades and enhancements. These may include improved video capacity and quality or other synchronous and asynchronous instructional technology. Some of these may well involve courses and content shared between multiple universities.

### 6.7 Academic Support: Tutoring and Advising

The new academic support programs developed to assist students in moving through the curriculum will require additional space. This includes offices for staff and rooms to house new support programs. For example, an increase in the number of professional advisors would require new offices. An increase in centralized tutoring services would necessitate more space, while decentralized tutoring programs would require rooms within departments. Other innovative programs and undertakings may also require centralized spaces or rooms. Some of these needs can be met through repurposing the smallest existing classrooms; however, as new learning spaces become available, architectural plans should include the flexibility to accommodate innovative programs that will come to exist but cannot be currently described.

Under this plan, tutoring will gain importance. These services at NJIT may expand their capacity and scope to assist students in a broad range of courses and fundamental skills in a centralized learning support center for students enrolled in majors across the academic spectrum. Alternatively, or perhaps additionally, for major service departments with large lecture style courses, decentralized tutoring centers may prove most beneficial toward providing individual attention and targeted intervention, thereby improving student retention and progress toward graduation. Whether the most effective systems are centralized or decentralized, with peer tutors or faculty/graduate assistant consultants, choosing tutoring center models remains an empirical question yet to be determined. Additional support for advising and tutoring in the academic departments is also necessary in any version of the hybrid advising model

### 6.8 Faculty Instructional Assistance

The focus on increased productivity demands assistance for the faculty also. This will entail more support for automatic grading and student graders. It will also encourage the model of large lectures with recitation support for more individualized instruction.

Such a change in model poses a challenge to facilities where few lecture halls are available. Today technology can easily address this through live streaming video played in numerous smaller classrooms. The timely renovation of Central King Building for developing appropriate space and equipping it with the requisite technology. It is precisely innovations of this sort where NJIT can set a new standard for education.

The increased use of lectures and recitations will afford NJIT the opportunity to shift money from adjunct instruction toward, among other things, graduate support. In leading departments that demonstrate a strong employment market for their graduate students, support based on new TA lines can increase the number of doctoral students at the university. The bulk of any increase in supported doctoral students will come from greater externally funded research activity among the faculty.

### 6.9 The Institute on Teaching Effectiveness

Teaching effectiveness is paramount to improvement in student learning outcomes. Increases in quality student support services are only part of the solution; evidence-based teaching practices and curricular transformations are needed to improve academic performance. Innovation in the classroom requires faculty support in the form of a dedicated teaching and learning organization. The formation of the NJIT Institute on Teaching Effectiveness is an important goal for positioning NJIT as a leader in teaching among its peers.

The proposed NJIT Institute on Teaching Effectiveness will be a faculty-driven center to support, promote, and enhance effective teaching. Under the direction of a community of teaching scholars, including Master Teachers and other faculty who have been recognized for their teaching accomplishments, the Institute would provide consultation, resources, and programs to:

- facilitate the professional development of faculty, lecturers, and graduate students as educators through peer review of teaching;
- assist instructors in building a teaching portfolio: developing, implementing, and assessing pedagogical methods;
- promote a university culture that recognizes and rewards excellence in teaching and the scholarship of teaching and learning;
- advance innovation in teaching and the use of technology.

The Institute would also collaborate with the Program Review Committee to provide direction for strategies in improving student learning outcomes. The Institute would provide workshops on using assessment results to guide implementation of evidence-based practices such as those related to course planning, optimizing learning in a large classroom environment, plagiarism and academic dishonesty, implementing interactive activities, and increasing engagement through project-based learning.

The vision for the Institute is for an increased emphasis on scholarship of teaching and learning, enhancing the dual practitioner-scholar role of faculty. By helping faculty achieve their full potential, the Institute maximizes NJIT's impact on the education of undergraduate and graduate students across disciplines.

### 6.10 Organizational Structure for the Online Education Enterprise

An early-adopter of online education in its infancy, over the last two decades NJIT has experienced a diminished presence in this area. During the same period, other institutions of higher learning have experienced remarkable growth. We have now decided to reemphasize the importance of this online education market. This decision has been made as online education around the world has moved from the periphery of post-secondary education to the mainstream. While the university faces considerable competition in an increasingly crowded market, we still have an opportunity to be on the forefront of this teaching and learning medium. To achieve this advantage, we will need to invest in this medium and also work to bring about a culture change within the university to focus on the importance of our online presence and to make it not only accepted and desired, but also respected for innovation and quality.

NJIT's organizational structure must provide strong support for the online education enterprise, and this is a key element for its success. Online education must move from a distributed model of individual faculty members working independently to manage their online courses to a structured institutional model. Transitioning our university to a successful online education presence requires careful consideration and planning that will integrate online education into the fabric of the university. In doing so, it is time for NJIT to carefully reexamine the decision that was made in 2007 that made individual departments responsible for their online courses. An effective process, therefore, must be implemented that will result in the following:

- making the organizational changes necessary to transform online education at NJIT into a visible and academically sound operation supported by institutional synergies;
- ensuring dynamic academic and operational leadership to develop a new online education model for NJIT;
- creating new position(s) and expanding the organizational structure to increase the understanding of international, national, regional and state forces of online learning and digital marketing;
- properly supporting and investing in state-of-the-art technology that results in the operational capacity for superior online content and service delivery;
- experimenting with digital forms of academic content that may, in turn, result in enrollment, with special attention to MOOCs, content-based STEM webinars, and content-based STEM podcasting;
- instituting training and professional development requirements for faculty and staff, possibly including certification and evaluation practices; and
- formulating rigorous student learning outcomes based on solid assessment criteria, which are integrated with the Institute on Teaching Effectiveness.

Sustainable online education requires academic and financial planning in addition to sophisticated management and forecasting. While the infrastructure for online education may take advantage of existing systems, attention to digital learning will change prevailing norms and rules. Instruction in online environments requires tailored processes, policies, and personnel that are highly focused and able to move flexibly within a market that is experiencing enormous growth. While NJIT has started to address some of these concerns as seen by recent commercial partnerships, we need to ensure that we are properly supporting all of our online courses,

instructors and students. At all times, however, this objective must both support the NJIT mission and build on the comparative advantages of the university.

### 6.11 Faculty Grant Proposal Assistance

Section 2.1 of this document sets out three objectives that must be met in order for NJIT to achieve national recognition in the 2010-2015 Strategic Plan thematic areas. The first of these objectives is "increased sponsored research." To better achieve this primary objective, NJIT will need to invest resources and provide greater faculty support for identifying funding opportunities, writing grant proposals, preparing budgets and managing data. This effort could include the following suggested components:

- Encouragement and facilitation for frequent Washington, D.C. visits by faculty and administration to develop ongoing partnerships, communicate with federal government officials and agencies, and to enhance our competitiveness in securing federal grants.
- Support for grant writing and budget preparation. Meeting the objective of increased sponsored research also relies on faculty members to develop research projects, identify possible funding sources, and write grant proposals – in addition to their ongoing research, teaching, professional service, and departmental governance activities. Having at least one grant writer on staff to help to write and edit grant proposals, as well as prepare budgets, will help to streamline the grant submission process. For the many faculty members who learned English as a foreign language, adding a grant writer to the NJIT staff will be especially helpful in preparing strong grants in a timely manner.
- Data management**.** Since December 2010, federal agency guidelines require funding proposals to include data management and sharing plans under the Freedom of Information Act. Two-page data plans include statements about the types of data, standards for their use and re-use, and plans for archiving and sharing data. Establishing standards and models for these data management requirements within NJIT will help to streamline preparation of individual grant proposals.

## 7.0 Conclusion

This academic plan strives to establish an evidence-based and collaborative framework that will guide NJIT in advancing its national standing by achieving its thematic objectives; in creating a system whereby faculty workload assignments will be made in a fair, consistent, and transparent manner; in ensuring that students will be successful by monitoring and supporting their NJIT careers from admission to appropriate employment; and in demonstrating that there is a way to provide the institution with state-of-the-art facilities such as classrooms, laboratories, studios, and instructional technology through wise investment. This plan was created in full collaboration with the faculty and is envisioned as a working document with which the faculty and a wide range of other shareholders will be actively engaged in a process that will result in completion of an aspirational academic plan by 2015. The aspirational plan will be a document that is both visionary and practical, and has the support of the NJIT community. Implementation of these plans will ensure that NJIT becomes one of the leading universities of science and technology in the country. Dedication by the entire university community will make it so.