

WAYNE STATE UNIVERSITY

FY2017-2021: 5-Year Capital Outlay Plan

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Introduction

Economic Projections for STEM Job Growth

According to the 2012 “Report to the President” from the President’s Council of Advisors on Science and Technology (PCAST), if the nation is to remain competitive in science, technology, engineering, and mathematics (STEM), American universities collectively will need to increase graduates in these areas by one-third annually over current rates; universities will need to produce approximately one million more STEM professionals over the next decade than is predicted under current assumptions in order to retain the United States’ historical preeminence in science and technology.

The U.S. Bureau of Labor Statistics forecasts that during the decade between 2010 and 2020 employment in science and engineering occupations is estimated to grow by about 19 percent, compared to 14 percent for all occupations. There is further evaluation, which suggests that of the projected engineering occupation increase, 59 percent will be in computer and mathematical science positions, which also have the largest occupational growth rate at 23 percent. Furthermore, biological, agricultural, and environmental life science job opportunities are expected to increase by about 20 percent, with social science and psychology following behind at a 19 percent expected increase. Supporting the validity of these projections, the U.S. Department of Commerce reported in 2011 that the actual growth rate in STEM jobs was 8 percent for the decade of 2000 through 2010, while non-STEM jobs only grew by about 3 percent nationally. They too project future STEM job growth rates that approximate those of the Bureau of Labor Statistics. Wayne State University students appear to recognize these trends as evidenced by enrollment and corresponding graduation rate increases in STEM fields.

Wayne State University STEM Enrollment Trends and Economic Impacts

During the past six years, Wayne State University has experienced unprecedented growth in students majoring in STEM programs that lead to related bachelor degrees upon graduation. Within the College of Liberal Arts and Sciences, the number of students who have declared a major in a STEM field has risen from 1,476 to 4,005 for an increase of 171 percent (Table 1). The College of Engineering, which now includes the Department of Computer Science, has seen similar increases, going from 1,135 to 2,113 for an increase of 86 percent over the same period of time (Table 2). The number of Wayne State students that have been granted STEM degrees has also increased significantly during this time frame. For the College of Liberal Arts and Sciences, undergraduate degrees in these areas have increased from 533 to 812, or 52 percent. The increase in Engineering from Fall 2010 to Fall 2015 has been similar, going from 165 to 244, or 48 percent!

Table 1: 2011 – 2015 STEM Undergraduate Enrollment Growth by Academic Department for College of Liberal Arts and Sciences (CLAS)

Academic Department	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	6 Year % Increase
<i>Anthropology</i>	50	86	66	83	110	107	114.0%
<i>Biological & Environmental Sciences</i>	399	782	725	896	1,251	1,436	259.9%
<i>Chemistry and Biochemistry</i>	156	291	300	296	353	418	167.9%
<i>Geology</i>	18	41	51	58	51	54	200.0%
<i>Mathematics</i>	29	69	79	85	103	111	282.8%
<i>Nutrition & Food Science</i>	231	331	320	368	444	417	80.5%
<i>Physics, Astronomy, & Biomedical Physics</i>	74	86	96	101	122	133	79.7%
<i>Psychology</i>	519	953	963	1,075	1,223	1,329	156.1%
Total CLAS	1,476	2,639	2,590	2,962	3,657	4,005	171.3%

Source: Office of Budget, Planning and Analysis

Table 2: 2011 – 2015 STEM Undergraduate Enrollment Growth by Academic Department for the College of Engineering

Academic Department	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	6 Year % Increase
<i>Biomedical Engineering</i>	17	43	76	94	102	116	582.4%
<i>Chemical Engineering & Material Science</i>	104	103	124	134	151	177	70.2%
<i>Civil & Environmental Engineering</i>	98	110	122	131	131	145	48.0%
<i>Computer Science</i>	97	216	286	333	401	474	388.7%
<i>Engineering Technology</i>	201	183	199	195	179	168	-16.4%
<i>Electrical & Computer Engineering</i>	151	166	190	183	226	282	86.8%
<i>Pre-engineering</i>	286	279	316	287	381	320	11.9%
<i>Industrial & Systems Engineering</i>	37	33	39	50	49	63	70.3%
<i>Mechanical Engineering</i>	144	168	197	227	292	368	155.6%
Total Engineering	1,135	1,301	1,549	1,634	1,912	2,113	86.2%

Source: Office of Budget, Planning and Analysis

The U.S. Bureau of Labor Statistics also reports that the average annual salary of STEM employees was \$82,160 in 2012, which is considerably higher than the average annual salary of \$45,790 for all U.S. employees. STEM jobs are paying nearly 80 percent more than the average U.S. worker earns annually! Because the vast majority of Wayne State STEM graduates remain and accept jobs in the tri-county metropolitan area of Detroit, this statistic is particularly exciting because these graduates offer the opportunity to contribute to the revitalization of Detroit and further strengthen the local economy. These STEM graduates will not only serve as replacements for retiring employees but will also likely secure jobs that do not exist today, jobs arising from the commercialization of products, services, and ideas that are developed by STEM entrepreneurs. The *New York Times* article, "Where the Good Jobs Are – and Why," reported that for each STEM-related job produced in a city, five non-STEM jobs are created, further fueling a local economy. Wayne State University STEM graduates are making these impacts possible.

Transforming STEM Education Delivery

Wayne State University recently completed the development of its 2016-2021 strategic plan, titled *Distinctively Wayne State University*. Two of the core focus areas of this plan are student success and teaching excellence. As part of these areas, we have applied for and received two National Science Foundation (NSF) grants aimed specifically at improving our STEM education efforts. The first, an NSF WIDER (Widening Implementation and Demonstration of Evidence-Based Reforms), was aimed at the evaluation of evidence-based methods in STEM instruction. The program supported a STEM faculty self-assessment of current teaching methods, which included peer-mentor led learning communities and the initiation of departmental conversations on teaching reforms. This pilot grant led to a set of interventions in foundational STEM courses through the use of workshops and other interactions that supported faculty engagement with the initiative. This became part of the University's strategic plan, which also pinpointed the importance of adopting evidence-based teaching methods to improve student success.

The second grant, a recently awarded \$3 million NSF grant titled *Student Success Through Evidence-based Pedagogies*, further supports the University's commitment to continue increasing the use of evidence-based teaching methods in foundational STEM courses. Once the initiatives of this grant are implemented, we expect that all of the core STEM academic departments will utilize this teaching method in all lower division courses, with emphasis on the twenty-five foundational courses, and will allow us to study the impact on student achievement in these basic science classes. Since our student body is about 50 percent non-traditional and 25 percent minority, this will be the first analysis of this type of teaching carried out on a non-traditional student population. This transformational grant will provide faculty resources and stipends to assist in reformulating classes from a lecture-based curriculum to one dominated by active-engagement and experiential learning methods. Part of the objectives of the grant is to longitudinally track the students through to graduation, which will allow us to assess the impact on academic and career trajectories of the students enrolled in these transformed courses.

The Wayne State University STEM Innovation Learning Center

As noted, STEM initiatives are a large part of the focus areas of the recently developed *Distinctively Wayne State University, Strategic Plan 2016 - 2021*. A key resource needed to implement these STEM initiatives is the construction of a Laboratory Classroom building that will foster new methods in educating our STEM undergraduate majors. This directly impacts the State's economy because many studies show that increased focus on STEM fields will be critical in maintaining and advancing Michigan's economy, which is presumably the reason that one of the State's performance funding metric is the number of STEM degrees awarded. Not only will this new facility enable us to develop new science education curricula, it will also be essential in attracting and retaining science and technology majors and increasing the University's capacity to produce more STEM graduates.

When initially planned, the project was envisioned as new construction to provide teaching laboratories and support facilities for various academic programs and course offerings in physics, engineering, computer science, psychology, nutrition and food science, and biological science, for a cost of \$20.0 million. When the State Budget Office evaluated the project, it scored well, accumulating 123 points, ranking fifth among twelve University projects submitted during the 2015 fiscal year planning cycle. Last year, a new opportunity developed in which the University was able to propose renovating and repurposing an existing structure, the Science and Engineering Library, rather than building a new STEM Innovation Learning Center. When scored, the project accumulated 134 points but still fell short of those projects that did receive State funding support. With this 2017 fiscal year Project Request, we continue to propose the renovation of the University's Science and Engineering Library and repurposing it as a STEM Innovation Learning Center.

As shown on the floor plans that accompany the Project Request, the project will provide undergraduate instructional laboratories and support spaces for the 25 foundational STEM courses in biology, chemistry, math, and physics, which will continue to undergo transformation through the efforts of the aforementioned NSF grant titled *Student Success Through Evidence-based Pedagogies*. We are confident that this critical initiative will improve STEM student retention, time to degree, and graduation rates. Space will also be provided for courses in engineering, computer science, geology, nutrition and food science, psychology, and anthropology, all of which demand more instructional laboratory capacity due to the unprecedented growth rates in undergraduate student enrollment. The project also features several new program enhancements, outlined below, that will increase student skill set acquisition well beyond foundational course work.

Because the footprint of the first floor is under both the seven-story tower of the building and a section that is comprised of a single-story structure, we intend to develop fume hood intensive instructional laboratories for chemistry and biology in the single-story portion of the first floor to facilitate lab exhaust requirements that avoid running ductwork vertically seven-stories. This provides (1) organic chemistry lab, (2) inorganic chemistry labs, and (5) biology labs to serve this growing population of STEM students. In comparison to previous proposals of the STEM

Innovation Learning Center, the first floor program will now also allocate space to a Corporate Engagement and Entrepreneurial Development Center (CEED Center) that will provide learning opportunities with local industry, business start-ups from the University's TechTown Detroit, and an entrepreneur certificate from our School of Business, which is an evolving plan that will be geared toward STEM students. This ties the project to an additional focus area of the Wayne State strategic plan, entrepreneurial development. These program components will interface with the Cornerstone Project Colloquium in which students and business partners will jointly present their case studies and learning outcomes.

Each of the upper floors of the project will provide space for four to six instructional laboratories, equipment storage, teaching assistants, and student gathering. In addition to the (8) instructional laboratories planned for the first floor, (18) are planned for the upper floors along with (4) general purpose classrooms. These new spaces will allow the implementation of evidence-based teaching methods where hands-on experiential, project-based learning are emphasized. Each will be equipped with pods of shared platform technology that will transform traditional fixed seating lecture methods of teaching and learning to those that effectively engage students in collaborative, team-based problem solving and discovery in authentic research experiences. We are currently piloting such approaches through the NIH-funded REBUILD Detroit grant, where we introduced an interdisciplinary research project to explore the impact of pollution on urban gardening. In this project, students collect water, soil, and plant samples and learn how to analyze them and how they are impacted by a variety of pollutants. Adding to the excitement of the STEM Innovation Learning Center will be (2) maker hacker labs that will give students interdisciplinary exposure to skill set development that are not possible in most instructional settings. For example, mechanical engineering students might work with astronomy students to fabricate a telescope for viewing the evening sky, or mathematics and computer science majors might work together developing algorithms and code that advance applications that benefit homeland security.

Renovating and repurposing the Science and Engineering Library for STEM instruction is a financially and environmentally responsible solution by comparison to new construction due to the avoidance of constructing the foundation, frame, and building enclosure systems. The building also shares mechanical infrastructure with the adjacent, recently renovated A. Paul Schaap Chemistry Building, eliminating the need to purchase new heating and cooling plants. These cost avoidances enable the University to minimize the project cost per square foot.

The facility will allow integration and reassignment of many existing and transformationally redesigned STEM courses that are currently offered in aged and obsolete facilities and teaching labs, some of which were constructed over fifty years ago and have seen limited updates since. Courses from departments that are presently disbursed throughout main campus will be brought together to take advantage of interdisciplinary teaching and learning opportunities and shared resources, thereby reducing some facilities costs. Most importantly, however, is that this project will provide a critical context for best practices in STEM teaching and learning that will translate into more graduates who will be successful in their chosen field.

Plans for the existing obsolete facilities and teaching labs, previously noted, include eventual renovation to provide STEM instruction space in order to support capacity requirements from our growing STEM enrollment rates. Another possibility is to renovate and reassign the space to traditional research programs in biology and geology, whose initiatives are restricted due to space limitations. Projects included in the University's 5-Year Capital Outlay Plan will accomplish these improvements following the implementation of the STEM Innovation Learning Center project. When these backfill projects are executed there will also be related jobs created for the new STEM faculty needed to educate the growing number of STEM majors.

In summary, by implementing the planned STEM Innovation Learning Center, Wayne State will significantly improve its facilities dedicated to STEM teaching and learning environments. These are resources that are critical in preparing students to excel in an increasingly advanced and interconnected global society. In addition to the significant advantage that the facility will provide to our students, the University and the State will both benefit from increasing the number of STEM graduates who are well prepared to meet a rising need and to contribute to the State's economic progression.

Wayne State is requesting \$14.75 million in State Capital Outlay funding (50 percent of the \$29.5 million total project cost) to support the STEM Innovation Learning Center project and will use philanthropic gifts or bond proceeds to fund its \$14.75 million share of the project.

I. Mission Statement

As stated in the *Distinctively Wayne State University Strategic Plan 2016-2021*, our mission is to create and advance knowledge by preparing a diverse student body to thrive and positively impact local and global communities. To achieve our mission, strategic objectives and tactical action plans have been created and center around seven strategic focus areas: student success, teaching excellence, research, diversity and inclusion, entrepreneurship, financial sustainability and operational excellence, and community engagement.

As Michigan's only urban research university, academic programs and course offerings in science, technology, engineering and mathematics are at the core of our instructional responsibility. STEM programs and course offerings are foundational to every degree that Wayne State University grants, and they are fundamental in preparing our graduates to be effective critical thinkers and major contributors to an increasingly diverse local, state, and global economy. Tactical action plans involving STEM initiatives permeate every focus area of our Strategic Plan. Among these initiatives is the necessity to advance implementation of the STEM Innovation Learning Center, which is Wayne State University's top Capital Outlay Project Priority Request for the third consecutive year. The STEM Innovation Learning Center, along with the other initiatives which includes the pedagogical developments through recent National Science Foundation grants that are designed to improve STEM program teaching and learning outcomes, will be transformative, resulting in improved student retention rates with those students declaring a STEM major, leading to corresponding increases in STEM graduation. When coupled with the unprecedented increases in STEM program enrollment experienced in recent years, STEM graduation rate performance is expected to surpass all other programs the University offers. Because upwards of 75 percent of Wayne State graduates stay in Michigan for their entire career, these outcomes will serve as major drivers in spurring entrepreneurship and business start-ups, and providing additional fuel to well established industries that particularly benefit job creation in Detroit and southeast Michigan.

II. Instructional Programming

Existing Academic Programs

Wayne State is a comprehensive research University with thirteen schools and colleges administering more than 380 academic programs, including 116 bachelor's, 116 master's, and 67 doctoral degree programs, three professional programs, and 57 certificate and specialist programs, many of which rank in the top tier nationally. The University currently enrolls 27,222 students. Six extension centers in the metropolitan area provide access for residents to a wide selection of off-campus courses. Wayne State is a significant and influential force in metropolitan Detroit's educational and cultural landscape, and TechTown, the 43 acre research and technology park that the University supports, has made it a major player in Michigan's economic turnaround.

Eighty-eight percent of the University's students are from Michigan, with 78 percent from the tri-county metropolitan Detroit area. With 92 percent of Wayne State graduates staying in Michigan after graduation, Wayne State graduates provide the highly educated workforce necessary to transform and power Michigan's economy in the twenty-first century.

Wayne State graduates serve the citizens of Michigan with advanced professional training in business; engineering; education; law; pharmacy and health sciences; medicine; nursing; social work; fine, performing and communication arts; liberal arts; and the basic sciences. Every day, Wayne State graduates play a critical role in Michigan life, from local physicians to scientists and engineers working in the latest high-tech spin-off companies.

Table 3 illustrates the University's fall 2015 enrollment by headcount and degrees awarded from July 1, 2014 to June 30, 2015. Note that the Library & Information Science program moved from the Graduate School in Spring/Summer 2009 and is now being reported separately. In addition, these Figures, and all subsequent Figures, exclude graduate medical education students.

Table 3: 2014-2015 Degrees Awarded and 2015 Enrollment by College

School or College	2014-15 Degrees Awarded	Fall 2015 Enrollment
<i>School of Business Admin.</i>	690	3,195
<i>College of Education</i>	675	2,673
<i>College of Engineering</i>	657	3,547
<i>College of Fine, Performing & Comm. Arts</i>	500	2,052
<i>Graduate School</i>	4	17
<i>Law School</i>	143	439
<i>Liberal Arts & Sciences</i>	1,684	10,718
<i>Library & Information Science</i>	235	437
<i>School of Medicine</i>	391	1,630
<i>College of Nursing</i>	227	573
<i>Pharmacy and Health Sciences</i>	569	971
<i>School of Social Work</i>	455	970
TOTAL	6,230	27,222

Source: Office of Budget, Planning and Analysis

Projected Academic Programming Changes

Construction of the State supported Multidisciplinary Biomedical Research Building (MBRB) began during December 2012 and was completed on July 17, 2015. The renamed Integrative Biosciences Center (IBio) will strengthen the University's ability to conduct basic, clinical, and translational research focused on diseases and quality-of-life issues associated with health

disparities in urban areas, which the National Institute of Health identified as a key scientific need. IBio is essential in helping Wayne State bring additional research dollars to campus and providing students and research faculty with laboratories and the technology necessary for continued academic success and expanded scientific discovery.

The STEM Innovation Learning Center and the NSF grant project to increase the use of evidence-based teaching methods in foundational STEM courses will be transformational in terms of their contribution toward further improving the University's student enrollment, retention, time to degree, and graduation rates in STEM programs. The impact these two initiatives will have on job creation will be incredibly beneficial to Detroit's continued revitalization and the southeast Michigan economy.

The fact that the repurposed Science and Engineering Library is located adjacent to the A. Paul Schaap Chemistry Building, Science Hall, Biological Sciences, the Engineering complex, and Physics, which form the core of our non-medical research buildings, will provide our undergraduate STEM students with countless opportunities to engage and be involved with active research projects with principal investigators and research faculty. Undergraduate student involvement in active research is another effort that is central to the student success focus area of the University's mission and strategic plan. Creating greater opportunities for such involvement and incorporating exposure to entrepreneurial development is another strategic focus that will yield positive outcomes for our urban communities going forward.

With respect to the University's *FY16 5-Year Capital Outlay Plan*, several important projects have been advanced, including:

- Multidisciplinary Biomedical Research Building: Completed July 2015
- Student Center Building Renovations: Completed August 2015
- Fountain Court Improvements Phase I: Completed August 2015
- Electrical Infrastructure Upgrades: Under Construction
- BioSci / Nutrition & Food Science Lab Renovations: Under Construction
- School of Social Work Relocation: Under Construction
- Scott Hall Lab Renovations: Out for Bid
- Elliman Lab Renovations: In Design

In addition to the STEM Innovation Learning Center, the following list summarizes the University's other major facility priorities during the next five years. The need and scope of these projects is provided in the Implementation Plan below.

- School of Business Administration: \$50.0 million
- Anthony Wayne Drive Undergraduate Student Housing: \$40.0million
- Forest Graduate Student Apartments: \$12.5 million
- Scott Hall Laboratory Renovations: \$75.0 million
- Life Science Building Renovation: \$20.0 million

- Rackham Building Acquisition: \$8.0 million
- Mackenzie House Adaptation for Student Housing: \$2.5 million
- Thompson House Adaptation for Student Housing: \$5.0 million
- Manoogian Basement Classroom Renovations: \$8.0 million
- DeRoy Reflecting Pool Restoration: \$3.0 million
- Hilberry Gateway Phase I: \$25.0 million
- BioEngineering Building Renovation and Expansion: \$19.25 million
- Class Lab Back-fill Renovations for STEM and Research: \$10.0 million
- State Hall Classroom Building Renovation: \$20.0 million
- Student Innovation Center for Engineering: \$10.0 million
- Law School Classroom Building Renovation: \$10.0 million
- University Deferred Maintenance Program: \$35.0 million
- Parking Structures and Related Improvements: \$10.0 million
- Housing Facilities and Related Improvements: \$5.0 million

Unique Characteristics of Wayne State's Academic Mission

Wayne State is one of three universities in Michigan with the Carnegie classification of institutions with "Research University – Very High Research Activity," which only 3.5 percent of universities hold. There is a major emphasis on multidisciplinary research, focused on urban problems that require complex solutions.

The recently completed, State supported, Integrative Biosciences Center aims to create and share knowledge that contributes to improving the quality of life and eliminating the many health disparities that plague Detroit's residents and other communities around the world. All of the research teams — environmental sciences, biobehavioral health, cardiovascular health, metabolic disorders, bio and systems engineering, and systems biology — will be working together toward discoveries that have a translational impact on the community. IBio was designed not only to give researchers world-class lab space but, more importantly, to engage broadly with communities through prevention, education, and partnering.

For decades, Wayne State has changed the face of modern medicine, with discoveries such as the invention of the world's first mechanical heart pump in 1952 – a development that made it possible to conduct lifesaving open heart surgery. Wayne State is also home to the only National Institutes of Health branch dedicated to the study of premature birth and infant mortality. Since locating to Detroit in 2000, the Perinatology Research Branch has produced lifesaving research and care for more than 20,000 at-risk mothers. The Barbara Ann Karmanos Cancer Institute at WSU is one of 25 National Cancer Institutes designated as Comprehensive Cancer Centers in the United States. Karmanos is the only hospital in Michigan dedicated exclusively to fighting cancer. Caring for approximately 12,000 new patients annually and conducting more than 800 cancer-specific scientific investigation programs and clinical trials, the Karmanos Cancer Center is among

the nation's best cancer centers. Karmanos offers access to more than 90 cancer treatments that no other local hospital provides.

But our expertise goes beyond medicine. Around the world, you'll find Wayne State faculty and students engaged in research in nearly every field. Our researchers are making discoveries in their urban environments that will affect diverse populations everywhere. Our Institute of Environmental Health Sciences is home to the Center for Urban Responses to Environmental Stressors, a NIH-funded center that uses state-of-the-art technologies to identify the central mechanisms that lead to environmentally-linked disease, a major problem throughout the world. Researchers in the College of Engineering and College of Liberal Arts and Sciences are expanding our knowledge solving complex water-related problems through collaboration on public health, water use, technological innovation, and public policy. Partners include governmental agencies, industry, and community groups. They work on projects focused on pollution monitoring and impacts, invasive species, watershed-related public policies, dams, sediments, drinking and recreational water, ecosystem health, and waterborne diseases. In addition, our faculty are experts in the field of automotive safety, smart sensors, nanotechnology, data science, and more! They are working to minimize the effects of diseases through nanotechnology-based drug treatments, making airplanes safer, improving the performance of online storage systems, along with other great discoveries

This work wouldn't be possible without the valuable partnerships we have formed with universities, hospitals, businesses and organizations around the world. Collaboration is key to innovation, and combining our expertise is essential to finding solutions that save lives and changing the world.

Examples of some of Wayne State's research projects funded in the past year include:

- A consortium of Marygrove College, University of Detroit Mercy, Wayne County Community College District, and Wayne State University has been awarded \$21.2 million over five years by the National Institutes of Health to implement a program encouraging more undergraduate students from underrepresented and economically disadvantaged backgrounds to pursue careers in biomedical research. The grant was awarded through the NIH's Building Infrastructure Leading to Diversity (BUILD) initiative, created to get more minority and economically disadvantaged students in the STEM pipeline, expose students to research in laboratories, and enhance the research-training environment. Studies have shown students from underrepresented backgrounds enter early biomedical research training in numbers that reflect the general population, but they are less likely to persist. The Detroit consortium's project is called REBUILD Detroit - an acronym for Research Enhancement for Building Infrastructure Leading to Diversity. Dr. Ambika Mathur, dean of the Graduate School, is leading Wayne State University's efforts on this program.
- Keith Kaye, M.D., professor of infectious diseases in the School of Medicine, received a \$4.9 million, five-year grant from the National Institute for Allergy and Infectious Diseases

of the National Institutes of Health, for the study, “Optimizing clinical use of polymyxin B: teaching an old drug to treat superbugs.” The study will provide urgently needed information to guide clinicians in the proper intravenous dosing of polymyxin B in critically-ill patients. The dosing guides are critical to assure that this agent of last resort is preserved and that these superbugs do not become resistant to it. The guides will aid in minimizing unnecessary toxic side effects of the drug.

- Chunying Li, Ph.D., assistant professor of biochemistry and molecular biology in the School of Medicine, secured a five-year, \$1.9 million R01 grant from the National Heart, Lung, and Blood Institute of the National Institutes of Health to study the role and mechanism of the chemokine receptor CXCR2 in regulating new blood vessel formation, the so-called angiogenesis. The grant, “Chemokine Signaling in EPC Angiogenesis: A Role of Lysine Methylation,” aims to provide valuable information and potential therapeutic targets for enhancing endothelial progenitor cells (EPCs)-based cell therapy for certain vascular diseases, as well as advance the field of chemokine receptor biology.
- Prashant Mahajan, M.D., professor of Pediatrics and Emergency Medicine, chief of the Division of Emergency Medicine in the Department of Pediatrics at Wayne State University and Children’s Hospital of Michigan, was awarded a five-year, \$5.76 million grant by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health. Dr. Mahajan and his collaborators are studying how febrile infants – babies two months or younger who are brought to emergency rooms with invasive bacterial infections – can avoid invasive procedures such as lumbar punctures, overuse of antibiotics, and unnecessary hospitalizations through a new, rapid, and more accurate testing to be developed by their research team.
- Haidong Gu, Ph.D., assistant professor of biological sciences in Wayne State University’s College of Liberal Arts and Sciences, was awarded a five-year, \$1.8 million grant from the National Institute for Allergy and Infectious Diseases of the National Institutes of Health, for the project, “Dissecting the Functional Domains of Infected Cell Protein 0 of Herpes Simplex Virus 1 (HSV-1).” The study aims to garner more genomic information about HSV-1 and develop an understanding on how it employs multifunctional proteins to disrupt host defenses and escape immune surveillance. In particular, Gu and her team will look at infected cell protein 0 (ICP0), which plays a leading role in the tug-of-war of HSV-1 infection with nuclear domain 10 (ND10), the site of DNA virus transcription and replication.

Wayne State University also allocates significant resources to a number of exemplary research institutes and centers, including:

- The Institute of Gerontology is dedicated to research in social and behavioral sciences and cognitive neuroscience on issues of aging and urban health. The institute prepares

tomorrow's leaders in aging research, and connects with health care providers, seniors and their families to disseminate current knowledge and best practices in gerontology.

- The Merrill Palmer Skillman Institute works to improve the development, health, and well-being of infants, children, youth, and their families across the lifespan, through research, education, and outreach. The institute conducts research focusing on urban populations at increased risk due to community, environmental, biomedical, psychosocial, and other challenges.
- The Institute of Environmental Health Sciences is a core of research scientists who use state-of-the-art technologies to identify the central mechanisms that lead to environmentally-linked disease. The institute aims to benefit human health through the prevention or early detection of environmentally-induced disease.
- The Center for Automotive Research prepares students to solve practical problems in many engineering disciplines. The center focuses on projects with demonstrated potential benefit to Michigan's economy, including alternate and renewable fuels, biofuels and emission controls.
- The Bioengineering Center promotes the discovery, design, and development of technologies as well as education in the understanding, mitigation, and prevention of impact-associated injuries.
- The Center for Molecular Medicine and Genetics focuses on increasing the understanding, diagnosis, treatment, and prevention of disease. The center's activities range from basic research to clinical genetics to translation from the lab to the bedside.
- The Center for Health Research advances nursing knowledge and improves the urban community's health through research.

Other Initiatives Impacting Facilities Usage and Needs

As part of its mission to prepare students to excel on a campus with exceptional student life experiences, Wayne State has embarked on several initiatives that are impacting this *5-Year Capital Outlay Plan*.

2020 Campus Master Plan and 2012 Update

The 2020 Campus Master Plan, which provided the framework for improving and expanding the physical facilities of Wayne State, grew out of a University strategic planning process that concluded in 2001. The 2020 Campus Master Plan has served as a flexible document, written to provide direction and accommodate unanticipated conditions. The 2020 plan produced a clear depiction of the limitations and opportunities for expanding the main campus. It placed the University's highest priority on facilities that support our academic and research mission and

many of its high priority recommendations have since been implemented. During 2012, the Campus Master Plan was updated to incorporate the University's evolving priorities, and that effort has impacted and changed projects proposed in previous 5-Year Plans. Wayne State University's new project priorities are represented in the Projected Academic Programming Changes section above and are described in greater detail in the Implementation Plan of this document. For the fiscal year 2017 capital planning cycle, Wayne State University is submitting the STEM Innovation Learning Center as its top priority for State capital outlay funding consideration.

During the past two years President M. Roy Wilson, Vice President of Research, Steve Lanier; Vice President of Health Affairs, David Hefner; and Vice President for Finance and Business Operations, Bill Decatur have joined the University's executive leadership team. Since their arrival, the University has established new institutional priorities, and *Distinctively Wayne State University, Strategic Plan 2015 – 2019* has been published. Our vision, mission, and values have been updated, and the strategic focus areas of student success, teaching excellence, research, diversity and inclusion, entrepreneurship, community engagement, financial sustainability and operational excellence will drive all that we do. With this has come the realization that the University's Campus Master Plan needs to be renewed, accordingly. Many constituent groups from across the University will spend the next 12 to 18 months responding to goals, including but not limited to:

- creating a multi-year space allocation strategy founded on current space utilization and future need,
- conducting a physical condition assessment of our buildings and other real estate assets,
- updating our housing and retail development strategy,
- updating our parking and transportation plan,
- and creating a fully integrated 10-year capital budget and resourcing plan.

We expect this effort will significantly inform the content of future Wayne State University Capital Outlay Plans and Project Requests for several years to come.

Housing Demand Market Study

The resurgence of Midtown and Downtown Detroit has greatly increased the number of Wayne State students seeking to live on or near campus. The academic year that began in the fall of 2015 brought with it the second consecutive year of a 100 percent occupancy rate within University provided student housing, and this year, we have a wait list of over 500 students seeking an on-campus residential experience. To satisfy the needs of our international student population it became necessary to lease rooms in the local St. Regis Hotel where 87 students will reside for the fall semester. A recently completed housing demand study has concluded an immediate need to develop 400 more beds of apartment style housing on the main campus to

support the demand of junior and senior students, and serious consideration is being given to advancing a P3 relationship that would provide additional housing options for graduate students within the University Village, located just south of the main campus. We are also investigating the adaptive reuse of two other buildings for housing. Each of these are now included in our 5-year plan.

P3 Development of Mixed-Use Housing / Hotel / Retail

The University's 2020 Campus Master Plan for the housing expansion included the goal to create Public – Private Partnerships (P3) that would result in new student housing solutions located on our real estate under long-term land leases, wherein the private partner provides the construction capital. During 2007, Wayne State completed its first such project on Woodward Avenue through a venture with Studio One LLC out of Grand Rapids, Michigan. The project produced a \$25.0 million market rate apartment building that many of our students reside in. The University's administration has recently executed a relationship with another private developer to advance an \$80.0 million project that includes market rate apartments, a hotel, and additional retail venues at the corner of Cass and Canfield on the south end of campus. We expect that many of our students, faculty, staff, and visitors will benefit from this project.

Pivotal Moments: Our Campaign for Wayne State University

On October 8, 2014, we formally launched the public phase of the University's second comprehensive capital campaign to fundraise \$750 million by 2018, when our 150th anniversary is celebrated. Each of the University's thirteen colleges and schools have critical goals to achieve through Pivotal Moments, some of which benefit facilities. Specific projects represented in our FY17 Plan include the Hilberry Gateway Phase I, Law School Classroom Building Renovation, the College of Engineering Student Innovation Center, and the New School of Business Administration.

Wayne State University Research and Technology Park

TechTown is Detroit's business innovation hub. As the city's most established business accelerator and incubator, it provides a powerful connection to a broad network of resources, catalyzing entire communities of entrepreneurs best poised to energize the local economy.

TechTown is a 501(c)(3) nonprofit and is located within the Woodward Technology Corridor SmartZone, north of the University's main campus. It offers both tech and place-based economic development programs.

In the district, Wayne State students and faculty work alongside entrepreneurs at TechTown to refine new generations of tech businesses. TechTown not only contributes significantly to the University's research capital but also strengthens and diversifies the region's economy. The relationship with TechTown highlights one of Wayne State's greatest strengths, its ability to partner with industry and government for the good of the populations the University serves.

TechTown fosters a community of engaged, connected, and better served entrepreneurs, who will accelerate the region's transition into an innovation-based economy.

Economic Development Impact of Current/Future Programs

As previously mentioned, Wayne State University's impact on Southeast Michigan is substantial, estimated by the Anderson Economic Group to be over \$2.5 billion per year! The significant percentage of alumni who remain in the area after graduation contributes greatly to the region's well-being through their professional and personal accomplishments, community activities, and financial resources. Additionally, the University is the seventh largest employer in the City of Detroit with more than 8,500 full- and part-time faculty and staff.

In fiscal year 2015, Wayne State spent more than \$566.3 million for compensation, wages, and fringe benefits. The University awarded more than \$341.6 million in financial aid (federal, institutional, private, outside and state) to 23,292 undergraduate, graduate and professional students for FY14. Expenditures on equipment, supplies, maintenance, design services, and construction exceeded \$133 million. Of the \$133 million, 60 percent of the contracts were awarded to Michigan.

The University spent over \$218.4 million in research and development during fiscal year 2014. In fiscal year 2014, 47 new patent applications were filed on technologies invented at Wayne State, and 18 total patents were issued. Furthermore, the university spent almost \$1.3 million to file and maintain all of its patent applications and issued patents, and received \$456,336 in revenue from license and startup companies.

Through fiscal year 2015, the University's intellectual property portfolio contained over 500 technologies. Over 100 of those technologies were licensed, 23 to Michigan companies. The University has assisted in the start-up of more than 25 companies, most based in Michigan.

Wayne State is committed to establishing infrastructure that supports the creation of new companies and encouraging an entrepreneurial culture. The Blackstone LaunchPad entrepreneurship program has helped found more than 150 student-led ventures in the past four years, and TechTown Detroit has served 1,026 companies, which raised over \$107 million in start-up capital, and contributed to 1,190 jobs to the local economy from 2007 to 2014.

Projects transforming the Wayne State neighborhood include:

- Midtown now hosts over 99 restaurants, 41 arts and entertainment opportunities, and 49 retail shops. Since 2013, 128 new businesses have opened in Midtown.
- Over 1,600 new residents have moved to Midtown through the Live Midtown initiative. Since the program's inception in 2011, approximately \$5.0 million has been spent to attract and retain residents in the neighborhood.

- Residential occupancy for rental housing has been at or above 97 percent for the last four years.
- More than \$245.0 million has been invested in residential development in Midtown in recent years.

Wayne State is committed to being a catalyst for economic growth in the city of Detroit. Recent initiatives include:

- Announcement of a \$80.0 million development with private developer Broder Sachse. The development will include 248 apartments, a hotel with 128 rooms, and 19,000 square feet of street level retail space.
- Contribution of \$300,000 to the final phase of the Midtown Greenway Loop project, a two mile pedestrian and bicyclist pathway connecting key destinations in Midtown. The final phase of the Loop will be along Cass Avenue, from Canfield to Kirby, on Wayne State's campus, and is now under construction.
- Investment of \$3.0 million in the M-1 rail streetcar, currently under construction.
- Construction of \$68.0 million development for the Wayne State University Physicians Group on 3750 Woodward Avenue.
- Completion of the \$93.0 million IBio on Woodward Avenue has spurred significant private development interest in its immediate area. The University is actively negotiating the sale of property that may bring up to 100 additional residential units to this neighborhood just north of the main campus.
- Graduation of five cohorts (150 graduates) of the Goldman Sachs 10,000 Small Businesses program.

III. Staffing and Enrollment

Enrollment

Several initiatives during the past few years have contributed to an increase in applications, including enhancements to the Honors and scholarship programs, aggressive enrollment management efforts, opening the Welcome Center and three new residence halls, and expanding the Comerica Charitable Foundation Academic Success Center.

Referring to Figure 1 below, Fall 2015 enrollment is 27,222. This is 356 fewer students than Fall 2014, a decrease of 1 percent. Undergraduate enrollment is down 678 students, 4 percent, while graduate and professional enrollment rose by 322 students, or 4 percent.

Enrollment of new freshmen increased by 367 students, 17 percent, and the returning freshmen retention rate decreased by 4 percent, compared to Fall 2014. New transfer and other new students decreased by 570 students, 27 percent. Total undergraduate enrollment is 17,669.

New graduate students increased by 236, 14 percent, as did new professional students by 41 students, 8 percent.

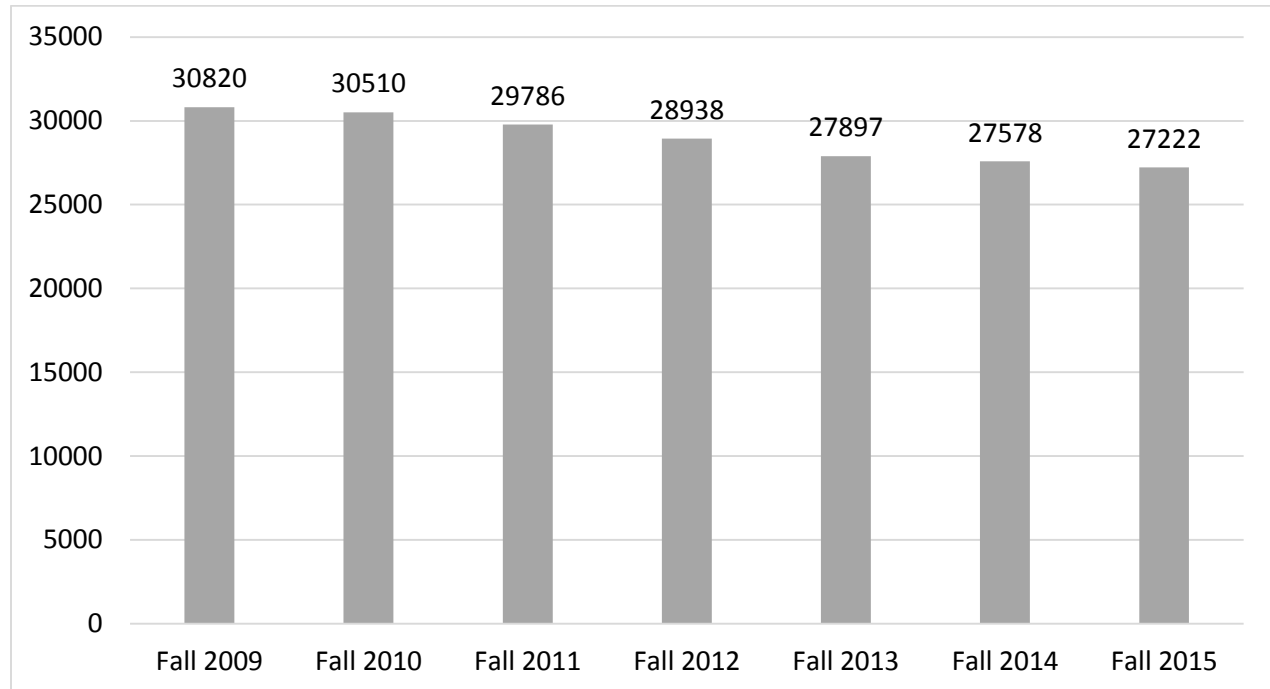
Full-time undergraduate students decreased by 1 percent, and part-time undergraduates decreased by 555 students, a 9 percent drop. Full-time graduate and professional enrollment increased by 259 students, or 5 percent. Part time graduate and professional enrollment also increased by 2 percent, or 63 students.

Total credit hours are 296,184, a 1 percent decrease from Fall 2014. Undergraduate credit hours are down 3 percent. While graduate and professional credit hours are up by 3 percent. Slightly increased attempted credit hour loads lead to the credit hour percentage decreases being slightly smaller than enrollment percentage declines.

Michigan residents represent 88 percent of our student population, 3 percent are from other U.S. states, and 9 percent are international. The University has increased in the numbers of international students and the number of non-resident domestic students is about the same as last year. There are 913 students from other U.S. states and 2,417 international students.

Enrollment Patterns over the Past Six Years

Figure 1: Total Headcount Enrollment by Year



Source: Office of Budget, Planning and Analysis

In addition to courses held on the main campus in Detroit, Wayne State University offers instruction at six off-site locations in the tri-county area. In Fall 2015 we had 2,487 students enrolled in courses at the extension centers, a 15 percent decrease from Fall 2014 (Table 4). A substantial number of these students are enrolled in classes on main campus as well. Distance-learning initiatives have been launched in the College of Education, School of Business Administration, Law School, School of Medicine, School of Social Work, Eugene Applebaum College of Pharmacy and Health Sciences, and College of Engineering; the number of web-based classes, in which all or most of the coursework may be completed online, is consistently increasing (Table 5). The University offered 343 web-based sections in Fall 2015, up from the 322 sections offered in Fall 2014. Innovative course options, combined with campus residential choices, help position Wayne State as a desirable destination school.

Table 4: Extension Center 2014:2015 Comparison

	Section Count		Section Enrollment		Average Section Enrollment	
<i>Class Section Enrollment</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>
<i>All Extension Centers TOTAL</i>	252	217	3,995	3,343	15.9	15.4
<i>Student Headcount and Credit Hours</i>	Headcount		Credit Hours		Average Credit Hours	
<i>Student Level</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>
<i>Undergraduate Totals</i>	2,142	1,878	9,903	8,203	4.6	4.4
<i>Graduate Totals</i>	708	609	2,642	2,228	3.7	3.7
<i>Professional Totals</i>	1	0	3	0	3.0	0.0
<i>TOTAL</i>	2,851	2,487	12,548	10,431	4.4	4.2

Source: Office of Budget, Planning and Analysis

Table 5: Web Class 2014:2015 Comparison

	Section Count		Section Enrollment		Average Section Enrollment	
<i>Class Section Enrollment</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>
<i>TOTAL</i>	322	343	7,630	8,540	23.7	24.9
<i>Student Headcount and Credit Hours</i>	Headcount		Credit Hours		Average Credit Hours	
<i>Student Level</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>	<i>2014</i>	<i>2015</i>
<i>Undergraduate Totals</i>	3,902	4,394	16,135	18,296	4.1	4.2
<i>Graduate Totals</i>	1,630	1,768	7,348	7,937	4.5	4.5
<i>Professional Totals</i>	3	5	8	15	2.7	3.0
<i>TOTAL</i>	5,535	6,167	23,491	26,248	4.2	4.3

Source: Office of Budget, Planning and Analysis

Projected Enrollment over the Next Five Years

While the University, as a whole, experienced a very slight decline in total enrollment in Fall of 2015, the number of new students increased by 1 percent. With increases in the number of new FTIAC, new graduate, and new professional students, the data suggests that we are turning the

corner on previous declines in enrollment. Further, the six year graduation rate for full-time FTIACs has increased by 9 percentage points, to 35 percent, over the past five years. To continue this progress, Wayne State has committed to a concerted and coordinated effort to improve student success and learning, to increase retention and graduation rates, and to narrow achievement gaps. This initiative has 12 major thrusts, which are described here.

The first six thrusts were funded and initiated as part of the *WSU Retention Implementation Plan*, launched in 2012.

(1) **Undergraduate Academic Advising Initiative.** This initiative provided funding to hire 45 new professional academic advisors on campus, which allowed us to approximately double our institutional advising capacity and bring our student to advisor ratios into alignment with national best practices.

(2) **General Education Review.** The purpose of this initiative is to streamline, simplify, and better communicate general education requirements.

(3) **Support for Teaching and Learning.** In 2013, Wayne State University began to restructure and reinvigorate the Office for Teaching and Learning (OTL). A new Associate Provost and Director, who has extensive experience and a national reputation for faculty and instructional development, was hired for the OTL. The staffing and resources of the Office for Teaching and Learning were increased to enable expansion of both services and impact.

(4) **Readiness for College.** Nationally, as access to college becomes a national priority, fewer students are coming to college ready to meet college readiness benchmarks and prepared for the rigor of a post-secondary education. Increasingly, remediating this gap is the challenge of colleges and universities who must simultaneously meet retention and graduation rate goals. This challenge has become particularly acute at Wayne State University, where we have enduringly had a mission of equal access and opportunity. To address this challenge, we have enhanced and expanded many of our support programs. In particular, the Academic Pathways to Excellence (APEX) Scholars program now offers a Summer Bridge Program that provides an opportunity for 132 students to earn up to eight college credits in a free, supported, and residential environment before joining Wayne State University in the fall, which increases their college readiness and gives them a head start on academic success.

(5) **Expanded First Year Experiences.** The transition into the first year of college is critically important to student success. In the form of learning communities, enhanced orientation programs, curriculum enhancements, and other forms of support, WSU has made investments into the first year experience for many years.

(6) **Expansion of Financial Aid.** For students in need of financial assistance, Wayne State University increased its financial aid by \$6.2 million, or 11 percent for the 2013-2014 year. More than 80 percent of all Wayne State undergraduate students receive some form of need or merit-based financial aid. We are exploring and piloting various approaches to use financial aid to support degree attainment in more direct ways, while maintaining our mission of access.

(7) **GRAD: Greater Retention and Achievement through Diversity.** To build on our historical commitment to educational opportunity, WSU committed in July 2013 to launch the Greater Retention and Achievement through Diversity initiative, which aims to increase our retention and graduation rates for students of color and other underrepresented groups and to advance a mission of inclusive excellence. This strategic initiative funds the creation of a multicultural student success center as well as a campus diversity and culture study. In addition, it calls for further strategic planning to lead to the creation of a chief diversity officer position and an Office of Diversity and Inclusion.

(8) **Big Data and Student Success.** WSU has embarked on a program to use “big data,” analytics and machine learning to disclose patterns in data that influence desired outcomes. Early results have been interesting and are helping us discover student success factors that had not been considered before.

(9) **Community College/Transfer Student Initiative.** Various initiatives have successfully increased the number of students transferring to Wayne State University from community colleges.

(10) **High Impact Educational Experiences.** Wayne State University has made many investments in High Impact Educational Experiences – learning practices and environments that have been shown to be most effective in contributing to student engagement, motivation, deep learning, and long-term student success.

(11) **Pre-College Collaborative.** Wayne State University has more than 50 programs that provide educational experiences for pre-college students. These programs are delivered by a variety of units, schools and colleges, and programs throughout WSU. During 2013, the providers of these programs organized into a pre-college collaborative to share best practices and develop the capacity of these programs to support college access, readiness, and success within our local communities.

(12) **Strategic Graduation Action Project.** Direct intervention and other initiatives designed to help students graduate.

Student-to-Faculty Ratios

The published student to faculty ratio is based on full-time equivalent students (full time plus 1/3 part time) and full-time equivalent instructional faculty (full time plus 1/3 part time) and excluding students and faculty in stand-alone graduate programs. The Fall 2015 student to faculty ratio is 15 to 1, which is on par with the national average.

Current Class Size

Class size varies depending on the program and class level. Lecture class sections average about 24 students. Subsections (e.g. labs and discussion groups) average about 14 students.

IV. Facilities Assessment

Functionality of Existing Structures and Space Allocations to Programs, Deferred Maintenance and Facilities Condition, Current Replacement Value

Wayne State owns and operates 106 buildings and leases space in another 24. The University delivers its programs from over 12 million gross square feet of space. Over the years, the University has used a number of methods to estimate and quantify its deferred maintenance backlog. Approximately 15 years ago, the University commissioned an evaluation of its major research buildings and programs to facilitate the development of capital investment and program expansion priorities. The study included detailed facility assessments for 16 research buildings. During 2002, the University conducted assessments of 12 non-research buildings, which concluded that the overall condition of several of these buildings is poor. In November 2009, another detailed facilities condition assessment was completed for six of the University's parking structures. The parking study was updated again this past summer. During 2012 a building condition assessment was conducted for all apartment and dormitory buildings. A follow-up study of DeRoy Apartments was just completed in September 2015.

Beyond these building investigations, the University has commissioned single building studies that produced the Manoogian Building Condition Analysis and the Student Center Building Assessment of Existing Conditions, which led to completing major renovation projects in both buildings. The University also conducted studies on individual building systems that resulted in the Chiller Replacement Master Plan and the Roof Condition Report. Each of these studies helped establish capital outlay plans and a realistic estimate of the University's deferred maintenance backlog.

When Wayne State reported its current replacement value and deferred maintenance backlog, the aforementioned reports were used to define a baseline to which inflation assumptions were added over the years. Because most of the data was from studies conducted over a decade ago, the data accuracy came into question. During 2014, Turner Construction was retained to develop a new cost estimate for the current replacement value of each of our buildings using their extensive database of historical construction costs. Their analysis quantifies the University's current replacement value at approximately \$2.7 billion just for the cost of construction. Adding 25 percent to this value for design fees, non-construction project scope and contingencies increases the value to approximately \$3.4 billion.

A separate analysis this year of the University's actual capital construction investments since 1997 resulted in understanding that of our 85 general-fund buildings only 20 of them have received substantive renovations that would address deferred maintenance. Furthermore, the average age of the 85 general-fund buildings is 57 years, and most continue to operate with their

original mechanical, electrical, and plumbing infrastructures. Previous estimates of the deferred maintenance backlog were as high as \$330 million. Recognizing the age of the portfolio, and that 65 general-fund buildings have received little reinvestment other than operating funds, it would not be unreasonable to assume that the University's deferred maintenance backlog is much higher, perhaps exceeding \$500 million. The scope of the 2025 Campus Master Plan noted above plans to include effort to quantify our deferred maintenance backlog.

Wayne State also conducted an electrical vulnerability study of its critical and sensitive building and scientific assets during 2012. This was done in response to the continuing unreliable public utility electrical infrastructure supporting the University from the former Detroit Public Lighting Department and Detroit Edison. Because significant power interruptions have been occurring with greater frequencies in recent years, occurrences that have resulted in two University shutdowns during the past five years, the University has been forced to install back-up power generation stations in several critical areas. During 2006, four stations were constructed to support research-intensive facilities, and in 2012, the University installed a new back-up generator station to fully support its main Data Center. The electrical vulnerability study resulted in a Board of Governors approval to invest an additional \$12.1 million to upgrade electrical service entrances and substations, install additional back-up generators, and provide UPS equipment to protect sensitive scientific equipment. The implementation of this project is expected to finish this coming winter.

The University's infrastructure of parking structures and lots, roads, pedestrian walkways and site lighting continues to advance into a very good overall condition. From 2010 through 2015, the University has invested more than \$20 million implementing major structural repairs and improvement projects to parking structures and several surface parking lots. During 2015 an additional \$3.6 million was invested in the parking infrastructure. This *5-Year Capital Outlay Plan* includes \$10 million to continue implementing improvements to this portion of the University's facility portfolio.

Strategic Energy Plan

As part of a 2008 environmental sustainability initiative, the University developed a Strategic Energy Plan which is based on three parts: energy procurement, energy production, and energy conservation. All natural gas is purchased through a consortium with the State of Michigan. Water and sewer services are purchased from the City of Detroit. On July 1, 2014, Detroit Edison acquired the assets and customer base of the former Detroit Public Lighting Department (PLD). Edison now supplies the University with all of its electricity. Terms of the Edison acquisition will have them constructing a new substation in the midtown area of Detroit and from it providing a new electrical service to each of the 43 former PLD serviced buildings. Edison's replacement infrastructure is now being designed. Implementation is expected to begin next year and be completed by 2018. When this occurs, Wayne State expects most of its recurring electrical reliability problems to be issues of the past.

Since 2007, the University has self-generated nearly all of its steam used for heating and cooling. During 2012, the University executed contracts with Detroit Thermal to provide steam for the Pharmacy Building and Scott Hall. Wayne State has always generated its own chilled water for comfort and process cooling. Because we do not have the land resources for a central heating and cooling plant, there are many small individual plants serving single or small groupings of buildings across campus. When individual plants require replacement or refurbishment, each is evaluated on a case by case basis to determine the most appropriate and economically justifiable approach for the future. Two such evaluations are now in progress for Physics and Biological Sciences.

With respect to energy consumption or conservation, the University has a long history of implementing many energy conservation measures. An emerging element of the energy plan is the retro-commissioning of existing buildings. Most retro-commissioning effort to-date has been focused on energy intense research and medical school building, where the greatest saving can be realized. Facilities Planning and Management has also organized an energy curtailment committee whose members have proposed and received funding to implement many energy conservation projects since its inception in 2012.

Facilities and Land Use

The overall distribution of academic/research space is expected to continue changing during the next several years. For example, when IBio opened this summer a larger percentage of the University's physical plant was dedicated to research. Academic and research uses make up the dominant share, now 4.5 million gross square feet (GSF). Included in this designation are classrooms, lecture halls, laboratories, and a significant portion of faculty and graduate student offices. While academic and research definitions may overlap, these two broad classifications are roughly equal in scope. Technology and distance learning will further redefine and shape future classroom space allocations and development.

Within the timeframe of the 2020 Campus Master Plan, which was completed in 2000, the University has developed additional space to expand many of its programs. Most of this additional space has or will be delivered to three major elements of the facilities portfolio: expanding on-campus residential opportunities, growing research and academic programs, and new parking structures.

The University has accomplished expansion primarily on land it owns. As this continues, the floor-area ratio is expected to increase to 1.60. Earlier land use evaluations concluded that a floor-area ratio of 2.0 to 2.25 was achievable and would not be detrimental to the campus or adjacent neighborhoods in terms of overall bulk or massing of the facilities. Planned development will preserve ample mall and green space for the community.

Building and Classroom Utilization Rates

Approximately 90 percent of our instructional space is scheduled at use rates that are categorized as moderate (60 to 70 percent of available time) to heavy (70 to 85 percent of available time), with heavy use slightly exceeding 50 percent, Monday through Thursday, according to a review of classroom scheduling data. Friday, Saturday, and Sunday use is low to no use. In terms of time of day, approximately 25 percent of our courses are offered before 10am, 45 percent between 10am and 3pm, and 35 percent between 3pm and 9pm. For the 25 foundational courses in biology, chemistry, physics, math, and psychology that are the focus of the NSF grant, only chemistry has over 90 percent of its courses scheduled during peak hours. The others schedule 62 to 67 percent of their courses during peak hours.

While the STEM student enrollment impact on utilization cannot be readily quantified, we have added sections to most STEM courses to address demand, thereby increasing utilization to current levels in the general-purpose and laboratory classrooms to which they are assigned. Renovating and repurposing the Science and Engineering Library as the STEM Innovation Learning Center will return to full use a mostly vacant building. The project will add new contemporary laboratory classroom capacity to this portion of our facilities portfolio, providing additional flexibility in terms of room scheduling options that are, in some cases, constrained by various factors. This flexibility and capacity will be very important as enrollment is expected to continue increasing in STEM programs.

Mandatory Facilities Standards

As a “Carnegie Research University, Very High Activity” institution, Wayne State complies with required facilities standards.

- Animal research facilities are distributed throughout the main and medical campus buildings. Facility standards for laboratory research animals are rigorous and regulated by the national accrediting agency, the Assessment and Accrediting of Laboratory Animal Care.
- The University’s offices of Environmental Health and Safety and Health Physics and Radiation Control are responsible for the collection, short-term storage and disposition of hazardous waste materials. These activities are regulated nationally by the Environmental Protection Agency, Nuclear Regulatory Commission, and locally by the State Department of Environmental Quality.
- Chemical and biological laboratories that contain fume hoods and store chemicals and/or reagents are spread throughout the main and medical campuses. These facilities are regulated by Occupational Safety and Health Administration standards (OSHA).

- Specialized facilities such as laser laboratories, large testing equipment and laboratories, and biohazard laboratories exist in the colleges of Liberal Arts and Sciences, Engineering, the Eugene Applebaum College of Pharmacy and Health Sciences, and the School of Medicine. These laboratories have special OSHA regulations and requirements and often need significant modification to the buildings and utility systems.
- The clinical behavioral science laboratories used for conducting research on human subjects are regulated by the National Institutes of Health. The University's Institutional Review Board is responsible for implementing these regulations.

Bond Status

The University has five building projects with obligations to the State Building Authority.

<u>Building</u>	<u>Lease Began</u>	<u>Lease Ends</u>
Old Main Renovation	November 1997	2032
Undergraduate Library	February 1998	2033
Pharmacy and Health Sciences	September 2002	2037
Welcome Center	December 2002	2037
Engineering Development Center	December 2009	2044
Multidisciplinary Biomedical Research Building	August 2015	2050

V. Implementation Plan

Throughout this document, Wayne State University has presented comprehensive information regarding its capital project plans. Consistent with our FY15 and FY16 Plan, this *5-Year Capital Outlay Plan* continues to present the STEM Innovation Learning Center as our number one priority State Capital Outlay Project Request for funding consideration. In addition to the STEM Innovation Learning Center, the University has in progress plans to advance several other capital projects as described below. As steps are taken during the next 12 months to move projects and fundraising efforts forward, current plans may be modified.

Status of Ongoing SBA Funded Projects

The Multidisciplinary Biomedical Research Building is the only active State supported project at Wayne State University at this time. Construction of the project is complete and limited FF&E items remain to be purchased and installed. Processing of all payment applications and invoices is in progress, and related State reimbursement will be completed as required by July 2016.

Non-State Capital Outlay Projects In Progress

Electrical Infrastructure Upgrades (\$12.1 million) is under construction and will address various electrical vulnerabilities that were noted in the Facilities Assessment above. The project will provide emergency back-up generators to several key research buildings, UPS equipment to protect sensitive scientific instruments, and delay time re-start devices on freezer equipment. The project was approved by the University's Board of Governors on November 22, 2013.

Various Research Laboratory Renovations (\$5.5 million) are under construction in Science Hall and will be implemented in supporting the Department of Nutrition and Food Science and in the Biological Sciences Building, supporting the research conducted by the Biological Sciences Department.

School of Social Work Relocation (\$3.0 million) is under construction and involves renovating the recently acquired building from the Detroit Institute for Children located at 5447 Woodward Avenue and moving the University's School of Social Work to this location from the Thompson House.

Scott Hall Research Laboratory Renovations (\$5.0 million) is out for bid and will improve approximate 10,000 square feet of space on the fourth floor for cardiovascular programs within the School of Medicine. Project scope addressing HVAC equipment that serves floors 5 through 9 is also included.

Elliman Research Building Renovation (\$8.9 million) is being designed to renovate laboratories that will eventually be occupied by research faculty from the Karmanos Cancer Institute and others from the School of Medicine.

Planned Non-State Capital Outlay Projects

School of Business Administration (\$50.0 million) will construct approximately 120,000 gross square feet to replace the current use of Prentis Hall and the Rands House on the main campus. The project intends to develop a site off the main campus, in the downtown business district of Detroit. A substantial philanthropic gift is the enabler of this project.

Anthony Wayne Drive Undergraduate Student Housing (\$40.0 million) will provide 400 new beds of on-campus apartment style options to satisfy growing and unmet demand.

Forest Graduate Student Apartments (\$12.5 million) will provide 200 new beds of off-campus apartment style options to satisfy growing and unmet demand. This project will likely be delivered in a P3 relationship.

Detroit Edison Integration (\$7.5 million) will provide new electrical services to all former Detroit Public Lighting buildings. This project provides the scope and necessary upgrades that DTE will not provide.

Scott Hall Laboratory Renovations (\$75.0 million) will comprehensively renovate the 200,000 square foot research tower portion of the building for the School of Medicine.

Life Science Building Renovation (\$40.0 million) will comprehensively renovate this College of Liberal Arts and Science research building.

Rackham Building Acquisition (\$TBD million) is planned due to the expiration of our 25 year lease in 2019. The University's Communication Sciences and Disorders programs occupy Rackham.

Mackenzie House Adaptive Reuse for Housing (\$2.5 million) will provide approximately 20 beds of additional housing capacity at Cass and Forest to help satisfy unmet demand.

Thompson House Adaptive Reuse for Housing (\$5.0 million) will provide approximately 80 beds of additional housing capacity on Cass to help satisfy unmet demand.

Manoogian Classroom Renovations (\$8.0 million) will renew approximately 30 general-purpose classrooms on the lower level.

The Hilberry Gateway Phase 1 (\$25.0 million) will provide new construction of a "Black-box" theater adjacent and connected to the existing Hilberry Theater. Once completed, a second phase project is planned to renovate the existing Hilberry and further expand the complex to permit consolidation of production support functions that are located in separate facilities.

BioEngineering Building Renovation and Expansion (\$19.25 million) will provide 23,000 GSF of additional research space and renovate the existing building. Within the College of Engineering, the BioEngineering Department is targeted for significant student and research program growth and is expected to have very high interaction with initiatives formed from the new Multidisciplinary Biomedical Research Building.

Class Lab Back-fill Renovations for STEM and Research (\$10.0 million) will renew existing teaching laboratories or convert them to new research space following the completion of the STEM Innovation Learning Center.

The State Hall Classroom Building Renovation (\$20.0 million) will renew and upgrade the remainder of this building's aging infrastructure. Constructed in 1948, State Hall is a general purpose classroom building critical to delivering courses for almost every academic program. Recent upgrades have included replacement windows on the north and south sides of the building, the renovation of the fourth floor to return it to general purpose classroom use, and cosmetic improvements in the basement through third floor. Building improvements which still need to be addressed include replacement of the mechanical and electrical systems, ADA issues including elevator replacement, and the replacement of windows on the east and west facades.

Student Innovation Center for Engineering (\$10.0 million) will showcase engineering competition teams such as Formula SAE and hybrid vehicle programs, and include space for design, testing, and fabrication.

Law School Classroom Building Renovation (\$10.0 million) will complete a decade long quest to expand and renew the Law School complex. The scope will replace the tiered, stadium seating classrooms with flat and raised floor seating options, upgrade MEP systems, and introduce current educational technology.

University Deferred Maintenance Program (\$35.0 million) is a campus-wide initiative and includes regular investments in deferred maintenance beyond the projects listed previously.

Parking Structure and Related Improvements (\$10.0 million) will continue a multi-year initiative to structurally repair and upgrade various parking structures. The program also includes important surface parking lot improvements such as paving, site lighting, gate and control equipment, and surface water drainage systems.

Housing Facilities and Related Improvements (\$5.0 million) will continue to address various needs including life safety systems, technology upgrades, building envelope repairs, kitchen and bathroom modernization, and mechanical and electrical systems.