


# WAYNE STATE UNIVERSITY

FY2019-2023: 5-Year Capital Outlay Plan

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## Introduction

### Economic Projections for STEM Job Growth

According to the 2012 Report to the President, “Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics,” 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 2012 and 2022 employment in science and engineering occupations is estimated to grow by about 13 percent, compared to 11 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 2,590 to 3,784 for an increase of 46 percent (Table 1). The College of Engineering, which now includes the Department of Computer Science, has seen similar increases, going from 1,233 to 2,167 for an increase of 75 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 766 to 940, or 22 percent. The increase in Engineering from Fall 2011 to Fall 2016 has been similar, going from 496 to 657, or 32 percent!

Table 1: 2012 – 2017 STEM Undergraduate Enrollment Growth by Academic Department for College of Liberal Arts and Sciences (CLAS)

<i>Academic Department</i>	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017	6 Year % Increase
<i>Anthropology</i>	66	83	110	107	90	89	34.8%
<i>Biological &amp; Environmental Sciences</i>	725	896	1,251	1,436	1,452	1417	95.4%
<i>Chemistry and Biochemistry</i>	300	296	353	418	392	367	22.3%
<i>Geology</i>	51	58	51	54	58	57	11.8%
<i>Mathematics</i>	79	85	103	111	113	121	53.1%
<i>Nutrition &amp; Food Science</i>	320	368	444	417	388	376	17.5%
<i>Physics, Astronomy, &amp; Biomedical Physics</i>	96	101	122	133	141	151	57.3%
<i>Psychology</i>	963	1,075	1,223	1,329	1,250	1206	25.2%
<b>Total CLAS</b>	<b>2,590</b>	<b>2,962</b>	<b>3,657</b>	<b>4,005</b>	<b>3,884</b>	<b>3,784</b>	<b>46.1%</b>

Source: Office of Budget, Planning and Analysis

Table 2: 2012 – 2017 STEM Undergraduate Enrollment Growth by Academic Department for the College of Engineering

<i>Academic Department</i>	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017	6 Year % Increase
<i>Biomedical Engineering</i>	76	94	102	116	114	121	59.2%
<i>Chemical Engineering &amp; Material Science</i>	124	134	151	177	187	194	56.4%
<i>Civil &amp; Environmental Engineering</i>	122	131	131	145	155	168	37.7%
<i>Computer Science</i>	286	333	401	474	514	611	113.6%
<i>Engineering Technology</i>	199	195	179	168	205	227	14.1%
<i>Electrical &amp; Computer Engineering</i>	190	183	226	282	324	331	74.2%
<i>Industrial &amp; Systems Engineering</i>	39	50	49	63	63	74	89.7%
<i>Mechanical Engineering</i>	197	227	292	368	419	441	123.9%
<b>Total Engineering</b>	<b>1,233</b>	<b>1,347</b>	<b>1,531</b>	<b>1,793</b>	<b>1,981</b>	<b>2,167</b>	<b>75.8%</b>

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 \$87,570 in 2015, which is considerably higher than the average annual salary of \$45,700 for all U.S. employees. STEM jobs are paying nearly double what 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. STEM education is a growing priority in the United States, and Wayne State is committed to helping our teachers of today in preparing our future leaders of tomorrow by offering a wide variety of STEM education learning opportunities. Examples of such programs include:

- The National Institute of Education 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 National Science Foundation awarded a \$3 million grant to Wayne State University in 2015 for an institutional transformation project aimed at reformulating teaching approaches in STEM courses. The grant, Student Success Through Evidence-based Pedagogies (SSTEP), will be divided into competitive awards of up to \$100,000 and allocated to STEM departments. Successful departments will work to transform their classes from a lecture-based curriculum to incorporate more evidence-based instructional practices. Through this program, students will experience engaged learning while faculty, postdoctoral fellows and graduate students will be trained in modern, evidence-based teaching methods. The project is led by Andrew Feig, associate dean of the Graduate School and professor of chemistry at Wayne State.
- The National Science Foundation awarded a \$1.2 million grant to Wayne State University in 2016 that aims to impact minority students' interest in science, technology, engineering, and math (STEM) related careers. The project, "Promoting Student Interest

in Science and Science Careers through a Scalable Place-based Environmental Educational Program at a Public Aquarium,” will train 90 Detroit Public School (DPS) teachers in biological STEM areas related to fisheries, wildlife, conservation and aquatic sciences. More than 2,300 fifth grade students from DPS will benefit over the course of three years by participating in field trips to the Belle Isle Aquarium and follow-up activities. The project is led by Jeffrey Ram, professor of physiology in Wayne State’s School of Medicine.

- 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.
- The National Institute of General Medical Sciences of the National Institutes of Health (NIH) awarded a five-year grant of more than \$3.6 million that will continue to support the Initiative for Maximizing Student Development (IMSD) program at Wayne State University. The WSU-IMSD program, established in 1978 with NIH support as the Minority Biomedical Research Support (MBRS) program, was developed and has been led by Joseph Dunbar, Ph.D., associate vice president for research at Wayne State, along with Rasheeda Zafar, Ph.D., the program’s coordinator. WSU-IMSD’s goals are to facilitate the entry, persistence and success of significant numbers of underrepresented minority students into science majors, ultimately guiding them to pursue careers in academics and scientific research.

The increased commitment of Wayne State’s faculty and administration to STEM education is helping create the pipeline of future innovators that will move our country forward.

#### 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. Further, the Bureau of Labor Statistics reported last year that of the State's engineers 70 percent of them are employed in the Detroit area. The same report highlights that, on average, Detroit area engineer's annual salaries are 3 percent higher than the State as a whole. 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.

As detailed in Attachment B: Project Request, 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 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 50 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 related STEM fields, offering more opportunities for undergraduate students to learn from and work in research labs. When these backfill projects are implemented, related jobs will be created for 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.

## **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, for which we were awarded FY18 Capital Outlay planning appropriation funds. 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 86 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 27,089 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-nine percent of the University's students are from Michigan, with 69 percent from the tri-county metropolitan Detroit area. With 86 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 2017 enrollment by headcount and degrees awarded from July 1, 2015 to June 30, 2016. 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: 2015-2016 Degrees Awarded and 2017 Enrollment by College

<i>School or College</i>	<b>2015-16 Degrees Awarded</b>	<b>Fall 2017 Enrollment</b>
<i>School of Business Admin.</i>	737	3976
<i>College of Education</i>	680	2474
<i>College of Engineering</i>	777	3699
<i>College of Fine, Performing &amp; Comm. Arts</i>	426	1978
<i>Graduate School</i>	0	29
<i>Law School</i>	149	456
<i>Liberal Arts &amp; Sciences</i>	1,620	9712
<i>Library &amp; Information Science</i>	179	467
<i>School of Medicine</i>	364	1596
<i>College of Nursing</i>	199	726
<i>Pharmacy and Health Sciences</i>	452	977
<i>School of Social Work</i>	502	999
<b>TOTAL</b>	<b>6,085</b>	<b>27,089</b>

Source: Office of Budget, Planning and Analysis

*Projected Academic Programming Changes*

Construction of the State supported Integrative Biosciences Center (IBio), formerly the Multidisciplinary Biomedical Research Building (MBRB), began during December 2012 and was completed on July 17, 2015. This state-of-the-art facility 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 *FY18 5-Year Capital Outlay Plan*, several important projects have been advanced, including:

- Electrical Utility Conversion: Under Construction
- New Data Center: Under Construction
- Weight Room Addition to Matthaei: Under Construction
- BioSci / Nutrition & Food Science Lab Renovations: Completed August 2016
- School of Social Work Relocation: Completed August 2016
- Scott Hall Lab Renovations: Completed April 2016
- Elliman Lab Renovations: Completed December 2016
- Mike Ilitch School of Business: Under Construction
- Anthony Wayne Drive Undergraduate Student Housing: Under Construction
- Thompson House Adaptation for Student Housing: Substantially Completed September 2017

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.

- Campus-Wide Facilities Master Plan: \$1.0 million
- Class Lab Back-Fill Renovations for STEM and Research: \$10.0 million
- Prentis Façade Improvement and Interior Renovations: \$3.0 million

- Hilberry Gateway Performance Complex: \$65.0 million
- Chatsworth Residence Hall Renovation: \$32.0 million
- Parking Structure and Related Improvements: \$10.0 million

### *Unique Characteristics of Wayne State's Academic Mission*

Wayne State is one of the nation's pre-eminent public research universities in an urban setting. Through our multidisciplinary approach to research and education, and ongoing collaboration with government, industry and other institutions including our University Research Corridor partners – the University of Michigan and Michigan State University – Wayne State University and our research and technology park, TechTown, seek to expand knowledge, enhance economic growth and improve the quality of life in the city of Detroit, state of Michigan, and throughout the world.

Through our dedication and leadership, Wayne State University is a nationally recognized center of excellence in research. Our faculty are leading the nation in many key research areas, and their groundbreaking discoveries make a difference in the everyday lives of others around the corner and around the world. We strive to continue making an impact by our innovative research.

Wayne State University is home to the Integrative Biosciences Center (IBio), a \$90 million facility dedicated to studying and eliminating the many health disparities that plague the city's residents. IBio is home to faculty with expertise in environmental sciences, bio and systems engineering, heart disease, diabetes, obesity, asthma and biobehavioral health.

The building, strategically positioned near TechTown, will move discoveries and technologies from the laboratory to the community, and will eventually house over 400 individuals within 200,000 square feet of lab and clinical space designed to foster a collaborative and flexible team science approach to research. These teams of researchers will 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 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 69 National Cancer Institute-designated 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 often not available elsewhere in Michigan.

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. Our faculty are working to find cures for major degenerative conditions such as retinitis pigmentosa. With the help of technology developed by a faculty member in our School of Medicine, we are leading the way to restoring vision in patients with this condition that causes severe vision loss and blindness through a \$60 million acquisition of a Wayne State University startup, RetroSense Therapeutics LLC by Allergan plc, a leading global pharmaceutical company headquartered in Dublin, Ireland.

This important work and many more research accomplishments would not be possible without the valuable partnerships we have formed with universities, hospitals, businesses and organizations around the world. Collaboration is essential to innovation, and combining our expertise is critical to finding solutions that save lives and changing the world.

Examples of some of WSU's larger research projects funded in the past few years include:

- Dr. Deborah Ellis, professor of family medicine and public health sciences in Wayne State University's School of Medicine recently received a \$3.2 million research award from the National Heart, Lung and Blood Institute of the National Institutes of Health. The project, "Translating an Efficacious Illness Management Intervention for African American Youth with Poorly Controlled Asthma to Real World Settings," will adapt and test an evidence-based intervention for use in pediatric emergency rooms and evaluate factors that affect whether the intervention is likely to be used in real-world settings. This project works collaboratively with the Wayne Children's Healthcare Access Program, a community agency providing health care services to underserved children in the Detroit Area.

- Dr. Ann Schwartz, professor of oncology and deputy center director of the Karmanos Cancer Institute, and Dr. Terrance Albrecht, professor and associate director for population sciences at Karmanos and Wayne State, received a \$9 million research award from the National Cancer Institute of the National Institutes of Health. The project, "Detroit Research on Cancer Survivors," is the nation's largest study of factors affecting African Americans with cancer. The study will include 5,560 cancer survivors to better understand major factors affecting cancer progression, recurrence, mortality and quality of life in African American cancer survivors and to better understand the disproportionately high incidence and mortality from cancer and its impact on this specific patient population.
- Wayne State received a \$7.5 million renewal from the National Institute of Environmental Health Sciences of the National Institutes of Health for the Center for Urban Responses to Environmental Stressors (CURES). The previous NIH grant for CURES was \$2.4 million for three years. CURES aims to understand the integrated health impacts of environmental exposures to complex chemical and non-chemical contaminants in Detroit's urban landscape. It is focused on establishing a cleaner and healthier living and working environment in the city of Detroit and throughout the region. Melissa Runge-Morris, M.D. is the director of CURES and WSU's Institute of Environmental Health Sciences.
- A cross-college team of Wayne State researchers are working with epidemiologists, microbiologists, water engineers, and statisticians to understand the water issues in Genesee County surrounding the outbreak of Legionnaires disease following the change from water supplied by the Detroit Water and Sewerage Department to water from the Flint River supplied by the City of Flint. Partnering with the Flint Area Community Health and Environmental Partnership, 790 random water samples in homes of residents of Flint, Genesee County and Wayne County were taken. Preliminary analysis suggests approximately 10 percent of all homes on the Flint municipal water system had chlorine levels less than 0.2 mg/L when measured at the kitchen faucet (bypassing filters when present) after five minutes of flushing. Chlorine is added to water distribution systems to reduce bacterial growth. While a uniform standard does not exist, regulatory agencies typically recommend maintaining a minimum free chlorine residual of 0.2 to 0.5 mg/L within water distribution systems. FACHEP has also worked with the Genesee County Health Department to interview County residents who acquired Legionnaires' disease in 2017. Water samples were also collected from their homes. Analysis of the samples is ongoing and participants will be notified of the results as they are available. Additional results of the study are expected before the end of the year.
- Wayne State received a \$1.2 million National Science Foundation grant to develop an autonomous battery operating system. The project, "Autonomous Battery Operating System: An Adaptive and Comprehensive Approach to Efficient, Safe and Secure Battery System Management," is led by Nathan Fisher, Ph.D., associate professor of computer

science in the College of Liberal Arts and Sciences. It aims to inject intelligence capabilities into battery management system design with the development of the Autonomous Battery Operating System, a more energy-efficient, long-lasting and secure battery driven system. It will be useful in emerging technologies such as electric-drive vehicles and stationary energy storage systems that require improved battery systems.

Wayne State University also allocates significant resources to a number of exemplary research institutes and centers. The following are centers and institutes that fall under the Division of Research:

- 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 institute is home to the Center for Urban Responses to Environmental Stressors (CURES), an NIH-funded center where researchers and community partners work together to understand how human complex exposures to chemical and non-chemical stressors in the urban environment can influence the development of environmentally-linked disease.
- 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.

#### *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. The plan was updated in 2008 and, revisited via a number of focused studies in 2012, in order to incorporate the University's evolving priorities. 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 2019 capital planning cycle, Wayne State University is submitting the STEM Innovation Learning Center to coincide with the planning appropriation received in fiscal year 2018.

During the past few years President M. Roy Wilson, Vice President of Research, Dr. Stephen Lanier; Vice President of Health Affairs, David Hefner; and Vice President for Finance and Business Operations, William 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 2016 – 2021* 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,
- 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 2017 brought with it the fourth consecutive year of a 100 percent occupancy rate within University provided student housing, and this year, we have a wait list of students seeking an on-campus residential experience. 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. This fall the University opened the newly renovated Thompson Home housing which added 80 beds in a themed living space aimed at

students in the Fine, Performing and Communications Arts. The Anthony Wayne Drive Housing complex is currently in construction and will provide 800 new beds of on-campus, apartment-style options to satisfy this need. Additionally, plans are underway to renovate the existing 1920s-era Chatsworth Residence Hall to create 368 beds in 96 units which will significantly increase housing options.

*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 150<sup>th</sup> 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. A number of the projects outlined in our FY19 plan will benefit from this campaign.

*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 2016, Wayne State spent more than \$574 million for compensation, wages, and fringe benefits. The University awarded more than \$331 million in financial aid (federal, institutional, private, outside and state) to 26,915 undergraduate, graduate and professional students for FY16. Expenditures on equipment, supplies, maintenance, design services, and



construction exceeded \$133 million. Of the \$133 million, 62 percent of the contracts were awarded to Michigan.

The University spent over \$213.8 million in research and development during fiscal year 2015. In fiscal year 2015, 58 new patent applications were filed on technologies invented at Wayne State, and 27 total patents were issued. Furthermore, the university spent over \$1.1 million to file and maintain all of its patent applications and issued patents, and received \$695,000 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 Innovation Warriors/Blackstone LaunchPad entrepreneurship program has create and sustain more than 150 student-led ventures since 2011, while the Goldman Sachs 10,000 Small Businesses program has graduated more than 200 second-stage small businesses. TechTown Detroit has served more than 1500 companies, which raised over \$112 million in start-up capital, and contributed more than 1200 jobs to the local economy from 2007 to 2015.

Projects transforming the Wayne State neighborhood include:

- Since 2014, 89 new businesses have opened in the Midtown, TechTown and New Center districts and another 36 are scheduled to open by 2018. A total of 69 businesses have launched from TechTown since 2014.
- The Live Midtown incentive has attracted and retained 2,115 residents since 2011, of which 1,202 were new residents and 913 existing Midtown residents.
- The Stay Midtown incentive was launched in 2016, aimed at cost-burdened households currently residing in the Midtown area. The program has enrolled 50 households and committed \$217,770 in funding to support these residents.
- Residential occupancy for rental housing has been at or above 98 percent for the last four years.
- More than \$245.0 million has been invested in residential development in Midtown in recent years.
- Midtown has seen a 55% decline in major crime since 2009, due in large part to Wayne State University's Police Department and their community policing activities.
- In a survey of over 50 businesses with under 500 employees in the Midtown, TechTown and New Center neighborhoods, Midtown Detroit, Inc found that 51% of employees were residents of Detroit.

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

- 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 along Cass Avenue, from Canfield to Kirby, on Wayne State's campus was recently completed.
- Investment of \$3.0 million in the recently completed QLine streetcar running along 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 as well as introduce a significant amount of new office and retail space.
- Through the Innovation Warriors hub, the University offers students, alumni, faculty, staff and the community six programs focused on all aspects of entrepreneurship. The programs offer entrepreneurship courses, workshops, and activities across campus.

### **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 2017 enrollment is 27,089. This is 289 less students than Fall 2016, a decrease of less than 1 percent. Undergraduate enrollment is up 42 students, just under 0.2 percent. Graduate enrollment decreased 304 students, a loss of 3.8 percent while Professional enrollment increased by 53 students, 2.6 percent.

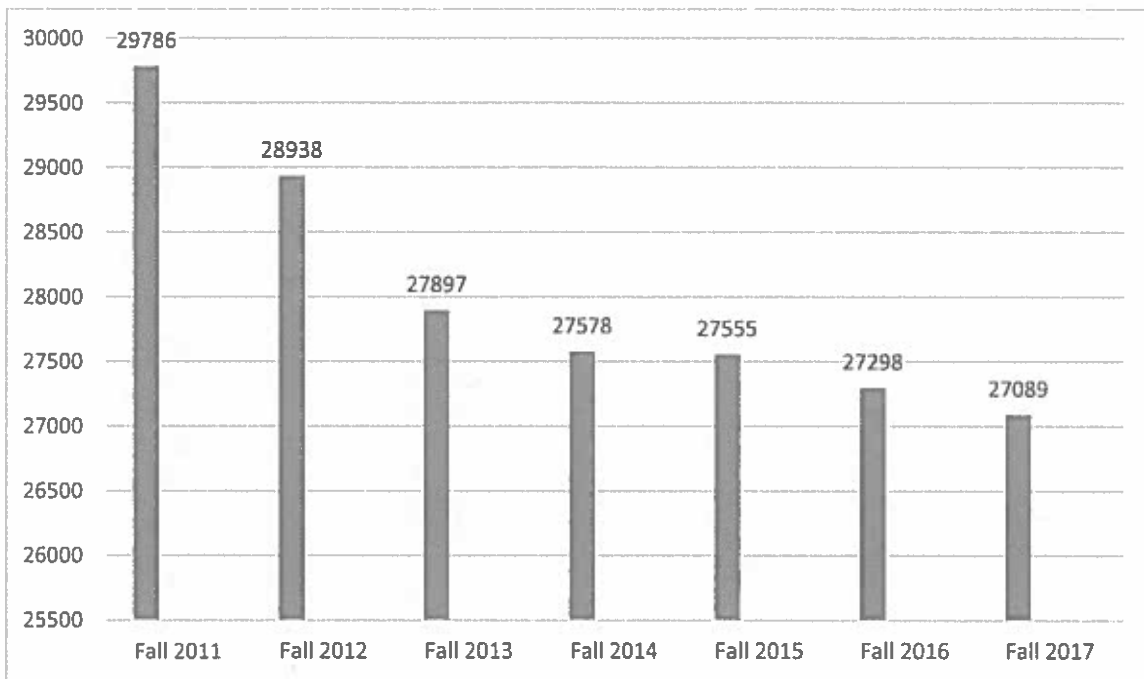
Enrollment of new freshmen increased by 65 students, 2.5 percent, and the returning freshmen retention rate decreased by 0.5 percent, compared to Fall 2016. New transfer and other new students increased by 16 students, 0.9 percent. Total undergraduate enrollment is 17,322.

Full-time undergraduate students increased by 3.1 percent, and part-time undergraduates decreased by 326 students, a 6.2 percent drop. Full-time graduate and professional enrollment decreased by 321 students, or 5 percent. Part time graduate and professional enrollment also increased by 1.8 percent, or 70 students. Total credit hours are 300,712, a 1 percent increase from Fall 2016. Undergraduate credit hours are up 2 percent. While graduate and professional credit hours are down by 1.1 percent.

Michigan residents represent 90 percent of our student population, 3 percent are from other U.S. states, and 7 percent are international. There are 847 students from other U.S. states and 1,974 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 2017 we had 2,195 students enrolled in courses at the extension centers, a 13.5 percent decrease from Fall 2016 (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, College of Fine, Performing, and Communication Arts, College of Liberal Arts and Science, College of Nursing, Mike Ilitch School of Business, School of Library and Information Science, 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 389 web-based sections in Fall 2017, down 1 section from the 390 sections offered in Fall 2016. Innovative course options, combined with campus residential choices, help position Wayne State as a desirable destination school.

*Extension Center Summary & Web Class Report*

Table 4: Extension Center 2016:2017 Comparison

	Section Count		Section Enrollment		Average Section Enrollment	
<b><i>Class Section Enrollment</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>
<b><i>All Extension Centers TOTAL</i></b>	210	181	3,282	2,945	15.6	16.3
<b>Student Headcount and Credit Hours</b>						
<b><i>Student Level</i></b>	Headcount		Credit Hours		Average Credit Hours	
	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>
<i>Undergraduate Totals</i>	1,948	1,721	8,112	7,268	4.2	4.2
<i>Graduate Totals</i>	589	473	2,013	1,697	3.4	3.6
<i>Professional Totals</i>	1	1	3	3	3.0	3.0
<b><i>TOTAL</i></b>	2,538	2,195	10,128	8,968	4.0	4.1

Source: Office of Budget, Planning and Analysis

Table 5: Web Class 2016:2017 Comparison

	Section Count		Section Enrollment		Average Section Enrollment	
<b><i>Class Section Enrollment</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>
<b><i>TOTAL</i></b>	390	389	9,572	10,591	24.5	27.2
<b>Student Headcount and Credit Hours</b>						
<b><i>Student Level</i></b>	Headcount		Credit Hours		Average Credit Hours	
	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>	<b><i>2016</i></b>	<b><i>2017</i></b>
<i>Undergraduate Totals</i>	4,577	5,165	19,620	22,275	4.3	4.3
<i>Graduate Totals</i>	2,188	2,335	9,440	10,270	4.3	4.4
<i>Professional Totals</i>	7	7	21	18	3.0	2.6
<b><i>TOTAL</i></b>	6,772	7,507	29,081	32,563	4.3	4.3

Source: Office of Budget, Planning and Analysis

*Projected Enrollment over the Next Five Years*

For Fall 2015, a slight overall decrease in student enrollment was reported. We did, however, have increases in the number of new FTIAC, new graduate, and new professional students, which projected a possible overall increase in enrollment. In Fall 2016, this projected increase was

accurate. The overall student enrollment was up 1 percent from 2015. Further, the six year graduation rate for full-time FTIACs has increased by 4 percentage points, to 39 percent. 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). An 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 led to the creation of a chief diversity officer position and an Office of Diversity and Inclusion. It also created a multicultural student success center as well as a campus diversity and culture study.

(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 2017 student to faculty ratio is 16 to 1, which is on par with the national average.

### *Current Class Size*

Class size varies depending on the program and class level. Of all classes, 53.1% have fewer than 20 students. Class sizes of 20 to 49 students make up 39.3%.

## **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 110 buildings and leases space in another 18. The University delivers its programs from over 10 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 6 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 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 last 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.

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 2016, the University has invested more than \$20 million implementing major structural repairs and improvement projects to parking structures and several surface parking lots. During 2016 an additional \$3.2 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.

### *Utilities and Energy Management*

#### *Energy Curtailment Committee*

Facilities Planning and Management employees, including directors, managers, engineers and trades take part in bi-weekly meetings to discuss the best way to conserve energy around campus for the General Fund accounts. This committee has identified well over \$1M in energy conservation measures (ECMs), with priority given to the items with the lowest payback period. The most recent funding request totaled roughly \$200,000 with an annual savings totaling over \$160,000, thus a simple payback of less than 2 years. Some of the recent items identified and completed by this committee are:

- Air Handling Unit Variable Frequency Drive at Biological Science Building
- Various AHU's were running in "hand", now running in "auto"
- Steam Trap repair and replacement- Across campus
- Condensate heat recovery at Scott Hall and Lande
- BMS reprogramming at Welcome Center
- LED lighting initiatives- Across Campus

#### *LED Lighting Retrofits*

Due to recent federal mandates to save energy, T12 fluorescent lamps and ballasts are being phased out of production. According to the U.S. Department of Energy, \$38 Billion a year is spent on electricity costs for lighting alone in commercial buildings. Wayne State has an annual electricity bill of roughly \$13 million and is looking to reduce this number.

Thanks to a Michigan Economic Growth Corporation grant, Wayne State Facilities Planning and Management hired three dedicated electricians to solely convert old T12 lamps to state of the art LED technology. Simultaneously the Lighting Retrofit group is de-lamping in areas where there is excess lighting, conforming to standards set by ASHRAE. For example, an outdated 4-



lamp T12 fixture consumes approximately 120 watts of energy while producing a very low quality light. To achieve the same amount of lumen output, this fixture can be reduced down to two LED lamps consuming a total of 30.6 watts all while producing a cleaner, better looking light without any mercury. Buildings that have recently been converted from T12 to LED include:

- Elliman Clinical Research
- Faculty Administration Building
- Purdy and Kresge Library

Annually, the completed project energy savings equate to nearly 2,000 metric tons of CO2 emissions saved or removing 400 vehicles from the road.

#### *Revolving Steam Trap Replacement*

Starting in 2012 Wayne State FP&M implemented funds for a revolving steam trap repair and replacement program. Steam traps are an excellent opportunity to save money and almost always have payback periods less than 1 year. By utilizing a steam trap repair and energy savings estimation tool, we were able to estimate nearly \$400,000 in potential savings from failed or flooded steam traps across campus during the 2012/2013 heating season. This represented 13% of the traps tested that were failed or defective. In the 2013/2014 heating season, this number dropped to 4.76% failure rate, while the continuous maintenance anticipates an annual average of 3% failure rate and immediate replacement.

#### *DTE Retrocommissioning*

In 2015 Wayne State University took part in a retrocommissioning program associated with DTE and a 3rd party company, Nexant. This program was looking for the "low hanging fruit" of energy savings on the Wayne State Campus. These items were required to be low cost/no cost options and must have had a payback period of 18 months or less with measurement and verification (M&V). The project included initial building audits, energy calculations, and implemented changes across campus.

The initial building audits indicated a lack of coil-cleaning program at the University which was a relatively low-cost item and could have great payback, depending on the application. These coils were used in air handling units for either heating, cooling or energy recovery. If these coils became dirty they lose a great amount of efficiency in their ability to transfer energy. They also can become a clog in the air handler, cause VFD's to ramp up speed to try and maintain a certain static pressure in the ducts. By cleaning the coils, both the efficiency of the energy transfer process and the efficiency at which a VFD operated motor can run at increase. This also helps to maintain occupant comfort.

#### *Sustainability Efforts*

The Office of Campus Sustainability, located within Facilities Planning and Management, works to reduce the environmental impacts created by the University's operation while also engaging

the entire campus community with sustainable actions, initiatives, and opportunities that lead to enhancing outcomes within the learning environment. An additional focus of the sustainability office is to advance environmental education around the campus community by increasing awareness of social, global, economic, and cultural sustainability that will have societal impacts into the future. Since being established in 2011, the Office of Campus Sustainability has implemented and assisted with numerous initiatives, which include:

- Water bottle filling stations installed around campus have helped divert over 2.5 million plastic bottles from the waste stream;
- Green cleaning policy sets guidelines for environmentally-friendly cleaning products and equipment;
- Three, LEED Silver certified buildings awarded;
- Two, LEED Gold certified buildings awarded;
- The Green Ride (sustainability bike tour, held annually) made its first trip exploring city sites;
- Solar Compactors placed around campus for waste and recycling;
- Warrior Exchange developed to give the campus a web-based classified section to facilitate reuse of campus property;
- Toner Cartridge Recycling allows departments to recycle used printer cartridges for remanufacturing;
- Cell phone recycling program keeps mobile devices out of the waste stream;
- And, a scrap metal recycling program has captured over 110,000 lbs. of ferrous and non-ferrous metals from the traditional campus waste stream.

Wayne State University's Office of Campus Sustainability also, in collaboration with various departments and colleges, initiates academic projects that will train current and next generations of sustainability students that will move environmental theory into practical application while addressing urban sustainability issues.

### *Facilities and Land Use*

The overall distribution of academic and research space is expected to continue changing during the next several years. For example, when IBio opened in August of 2015 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. 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*

To measure utilization of Wayne State University's existing facilities, the university utilizes Ad Astra Information Systems, which is a data software that more than 1,000 higher education institutions use. In conjunction with this software, the University of North Dakota's 2013 utilization report, *University of North Dakota: Space Utilization and Planning*, is used as an established benchmark to compare Wayne State University's space utilization efficiencies.

Since Fall 2014, Wayne State University has used Ad Astra more intensely to manage the 192 general purpose classroom spaces. Recently, WSU began using the software to auto assign rooms based off of departmental preferences and to set maximum capacities. This, along with working to move to a new scheduling matrix, will help remove potential barriers from students who need to graduate, and bring WSU to obtain higher classroom utilization.

Beginning Winter 2017, the Registrar's Office shifted focus from inputting data to reporting. A new scheduling matrix will allowed the office to run utilization reports to determine how much improvement has been made in scheduling general purpose classrooms at WSU. The data allows the Registrar's Office to offer suggestions to departments on increasing room utilization, thereby improving their programs. These reports will help departments better understand how to spread class offerings out over the entire scheduling week, reduce unused seats in rooms by scheduling classes into appropriately sized rooms, minimize class offerings that use non-standard meeting patterns, and reduce the offering of unnecessary sections.

The Registrar has pioneered the use of Ad Astra for general purpose classrooms, and other WSU schools, colleges, and divisions have begun migration of their departmentally assigned spaces to Ad Astra. Those schools, colleges, and divisions include the College of Engineering, School of Business, College of Pharmacy, and University Libraries.

In 2013, the University of North Dakota (UND) comprehensively analyzed their utilization rates in their *University of North Dakota: Space Utilization Analysis and Planning* report. Similar to UND, Wayne State University offers courses from 8:00am through 10:00pm, Monday through Saturday. Known for being a university that caters to the nontraditional student, the majority take advantage of this schedule flexibility to allow them to have full-time or part-time jobs, to participate in internships, or to take care of family members and other personal commitments. Although the university does teach courses on Saturdays, these were not analyzed in order to

keep some consistency with the UND benchmark, which analyzed course offerings Monday through Friday, from 8:00am to 4:00pm.

In applying the hourly and daily parameters of 8:00am to 10:00pm, Monday through Friday, a total of 75 hours per week in which classrooms, auditoriums, lecture halls, labs, computer labs, seminar rooms, and auditoriums could be scheduled for classroom use were analyzed. On average, actual classroom time is scheduled for about 26 hours of the 75 available, or 35 percent of the week. When an average 30 minutes of classroom prep time was added to this utilization, the rooms were used an average of 51 percent of the time available. In comparison, the University of North Dakota only analyzed their classroom data for a core 40 hours. Their utilization rates totaled 80 percent of the 40 hours available during the week, but the report notes that many institutions use a target of 40 percent and that reaching 80 percent is extremely difficult. In using the target of 40 percent, WSU is using their current classroom spaces well. Further, the wide timeframe allows the university to continue to cater to the nontraditional student, but additional attention can now be provided to understand how this impacts the university's support services, such as audio-visual assistance, custodial maintenance, etc.

In addition, the rooms that are loaded into Ad Astra were also analyzed for their average seat fill rate. Wayne State's average seat fill for a 75 hour week is 70 percent. In comparison, the University of North Dakota only had an average seat fill of 65 percent for their 40 hour week. This shows that WSU students are taking advantage of the courses that are offered across campus, to the point that each class, on average, is at 70 percent capacity.

As stated previously, WSU continues to optimize Ad Astra in order to provide better data, create better efficiencies, and deliver the courses that students need. WSU is expected to increase utilization percentages as this technology is further taken advantage of, which will also allow support services to tailor their availability.

#### *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
Integrative Biosciences Center	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, FY16, and FY17 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.

*Planned SBA Funded Projects*

STEM Innovation Learning Center (\$40.0 million) following confirmation of planning approval from the State of Michigan Department of Technology, Management and Budget office, the

University released a Request for Proposal for programming and design services. A program advisory committee, chaired by the Provost, has been created and the University anticipates starting the programming process by the end of October 2017. The primary charge for the committee and design professionals is to assist in identifying and consolidating undergraduate science, technology, engineering and mathematics classrooms and laboratories currently spread across campus.

#### *Status of Ongoing SBA Funded Projects*

The Integrative Biosciences Center Building (formerly the Multidisciplinary Biomedical Research Building) is the most recent State-supported project at Wayne State University. Construction of the project is complete and the University continues to use this facility as a prime recruiting tool for new, interdisciplinary research efforts focused on urban communities and health disparities.

#### *Non-State Capital Outlay Projects In Progress*

Mike Ilitch School of Business (\$59.0 million) is currently in construction, the project includes approximately 127,000 gross square feet to replace the current use of Prentis Hall and the Rands House on the main campus. The project develops a site off the main campus, in the burgeoning downtown business district of Detroit. A substantial philanthropic gift provided the funding for this building.

Electrical Utility Conversion (\$6.0 million) will provide new electrical services to all former Detroit Public Lighting buildings. This project provides the scope and necessary upgrades that Detroit Edison (DTE) will not provide.

New Data Center (\$16.9 million) is currently in design and will provide approximately 10,000 square feet of current and best-practice environments to support the University's technology and services while offering flexibility for future growth.

Weight Room Addition to Matthaei (\$2.3 million) provides an 11,000 square foot addition to the Matthaei athletic complex to provide comprehensive weight room facilities for student athletes.

Anthony Wayne Drive Housing (\$119.1 million) will provide 800 new beds of on-campus apartment style options to satisfy growing and unmet demand. The project is currently in construction.

Thompson House Conversion to Student Housing (\$5.9 million) will provide approximately 80 beds of additional housing capacity on Cass to help satisfy unmet demand. The project is currently completing construction.

University Deferred Maintenance Program (\$6.5 million) is an annual, campus-wide initiative and includes regular investments in deferred maintenance beyond the projects listed previously.

*Planned Non-State Capital Outlay Projects*

Campus-Wide Facilities Master Plan (\$1.0 million) will review previous master plans, completed in 2001 and updated in 2008, in terms of the University's current facilities and academic needs. The master plan will be a comprehensive, data-driven effort. Planned projects that follow will be evaluated through the lens of this master plan effort.

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.

Prentis Façade Improvement and Interior Renovations (\$3.0 million) is planned to provide necessary façade improvements to this historic Yamasaki building. Once the building is vacated for the move to the new Mike Ilitch School of Business, interior renovations will also commence to allow re-purposing of the facility.

Hilberry Gateway Performance Complex (\$65.0 million) will provide new construction of a full service, 350-seat theatre, a 100-seat "black box" performance space and full "back of house" production support spaces. The project will also renovate the existing Hilberry Theatre to create a state of the art jazz performance space, assisted by a philanthropic donation.

Chatsworth Residence Hall Renovation (\$32.0 million) will provide renovation of this historic, 1920's era residential building. The project will completely renovate the building to create 368 beds in a total of 96 units. The project will also include upgrades to mechanical and electrical systems as well as accessibility improvements.

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.