

## INTEGRATING ENGINEERING, ART, AND BUSINESS INTO A MULTIDISCIPLINARY ARCHITECTURE PROGRAM

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### Abstract

At the University of Hartford, we are establishing an architectural program that integrates art, engineering and business with architecture. Architecture by its very nature is connected to other disciplines, however architectural education is often criticized for a lack of integration in the curriculum. By increasing the awareness of the interrelationship between different areas of study, we are attempting to strike a new and more effective balance. Resonating throughout the curriculum are the benefits of having an architectural program at an independent, comprehensive university that can provide educational programs in the liberal arts and professional disciplines for undergraduate and graduate students.

### Introduction

Developing our new Master of Architecture program and improving our existing Bachelor of Science in Architectural Engineering Technology program creates an opportunity to view the programs as an entity. Additionally, we can begin to understand the importance of having a single, universally understood mission that is evident in every component of the school's programs. Educators and students alike must recognize that the curriculum which counts ultimately is one that changes perspective and is still apparent in the lives of students ten or twenty years later.

The Carnegie Report "Building Community: A New Future for Architecture Education and Practice" by Ernest Boyer and Lee Mitgang criticized architecture programs for lack of integration of the curriculum. At the University of Hartford's Department of Architecture we have been challenged by this criticism and have developed our curriculum in response. The uniqueness of architectural education lies in its combination of theory and technology courses in the lecture/seminar format within the design studio.

The original mission of the architecture program was as follows: To prepare students for a variety of professional careers in the design and construction industries. We have decided to continue to embrace this goal but have expanded it to include the opportunity to take advantage of much more of what our state, city, community, university, program, curriculum, design studio, accreditation agencies, and department structure can provide.

### The City

Hartford, Connecticut's Capital City, is centrally located halfway between Boston and New York in the heart of New England. The city is rich in architectural heritage as well, with significant works by both modern (Richard Meier, I.M. Pei, Cesar Pelli, Robert Venturi, and Wallace K. Harrison) and historic (H.H. Richardson, A.J. Davis, Cass Gilbert, Ernest Flagg, Richard Upjohn, James Gamble Rogers, and Charles Bulfinch) architects. In addition, new buildings are being planned by Robert A.M. Stern and Frank Gehry.

The University of Hartford's adjacency to the state's capital and legislative bodies provides opportunities for contact and interaction with legislators and others concerned with the issues facing the design and construction industry. For example the State of Connecticut Licensing Board is located in Hartford.

The Department of Architecture faculty have a working and ongoing relationship with professional organizations in Connecticut including the American Institute of Architects Connecticut chapter (AIA/CT). The AIA/CT runs seminars and workshops relevant to the profession including sessions on each section of the Architectural Licensing Exam.

The proximity to Yale University in New Haven, Connecticut, a forty-minute drive from the University of Hartford, provides further opportunities for the students to expand their architecture education. Students have taken advantage of the Yale School of Architecture, library, lecture series, open juries, student shows, and general interaction with the Yale graduate students. We anticipate that this interaction will broaden in scope and frequency with the new Master of Architecture program at the University of Hartford.

### **The Community**

The Department of Architecture will prove to be a major and vital part of the life of the academic and public community it serves. The community focus of the program could build a bridge to the City of Hartford as a laboratory for our architectural projects and research. The program could provide some “gowns to towns” opportunities the University so desires. The advantage to the University of Hartford of committing to create such a program is to attract more quality students while adding to the reputation we have already established in art, music, business, education, and engineering.

### **The University**

The University of Hartford is a private, independent, comprehensive university with nine schools and colleges providing educational programs in the liberal arts and professional disciplines for undergraduate and graduate students. The University was founded in 1877 and chartered in 1957, when three long-established Hartford institutions of higher learning were joined together: the Hartford Art School (1877), Hillyer College (1879), and the Hartt School (of Music) (1920). The College of Arts and Sciences; the College of Engineering; the Barney School of Business; the College of Education, Nursing and Health Professionals; and Ward College of Technology all originated in Hillyer but now have their own identity. In 1991, Hartford College for Women joined the University. The University of Hartford is accredited by the New England Association of Schools and Colleges.

Architecture by its very nature is connected to other disciplines, however architectural education is often criticized for a lack of integration in the curriculum. We hope that the architectural program at the University of Hartford will successfully integrate art, engineering, business and other disciplines with architecture. By increasing the awareness of the interrelationship between different areas of study, we are attempting to strike a new and more effective balance in the curriculum.

For students who want to further broaden their education at the undergraduate or graduate levels, the Department of Architecture could support several combined or dual degree programs in conjunction with other undergraduate or graduate programs at the University. At the graduate level this might include a MArch/MFA, MArch/MEngr, or MArch/MBA.

### **The Program**

The architecture program will support the mission of the University while emphasizing an integration of artistic principles, engineering fundamentals, and business understanding with the constant exploration of innovative design. In a collaborative multidisciplinary setting, the architecture program provides a professional education joined with other programs in the Hartford Art School, College of Engineering, and the Barney School of Business. The practitioner-based program balances theoretical, technical, professional, and creative knowledge. Students are prepared for careers in architecture and a wide assortment of other design, construction or business related professions.

### **The Curriculum**

The existing undergraduate program, initiated in 1991, leads to a Bachelor of Science degree in Architectural Engineering Technology (AET). AET is a rigorous academic discipline that will prepare students for graduate

school and a variety of professional careers in the design and building industries. The major is structured to provide a proper foundation in mathematics and the basic sciences, while retaining the hands-on laboratory and studio features that are the hallmark of all architectural and engineering technologies. The program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) and is as follows:

TABLE I [1]  
2000-2001 Architecture Curriculum

Sem 1	Course	Credits/Contact Hrs
AET 110	Introduction to Architectural Process	4 Credits/8 Hours
AET 155	Architectural History I	4 Credits/4 Hours
EN 111	English I	3 Credits/3 Hours
ET 111	Introduction to Engineering Technology	1 Credit/1 Hour
MTH 112	Math for Technology I	3 Credits/3 Hours
Sem 2	Course	Credits/Contact Hrs
AET 113	Architectural Design I	4 Credits/8 Hours
AET 156	Architectural History II	4 Credits/4 Hours
PHY 120	Algebra based Physics I	4 Credits/4 Hours
MTH 122	Math for Technology II	3 Credits/3 Hours
Sem 3	Course	Credits/Contact Hrs
AET 232	Materials and Methods	4 Credits/8 Hours
AET 233	Architectural Design II	4 Credits/8 Hours
MTH 232	Math for Technology III	3 Credits/3 Hours
PHY 121	Algebra based Physics II	4 Credit/6 Hour
Sem 4	Course	Credits/Contact Hrs
AET 241	MEP Systems	4 Credits/4 Hours
AET 242	Construction Documents	4 Credits/8 Hours
AET 244	Architectural Design III	4 Credits/8 Hours
MTH 241	Math for Technology IV	3 Credits/3 Hours
Sem 5	Course	Credits/Contact Hrs
AET 355	Engineering Mechanics	4 Credits/6 Hours
AET 352	Architectural Design IV	4 Credits/8 Hours
HSS 1	Human/Soc. Science Elective	3 Credits/3 Hours
TECH 1	Technical Specialty	4 Credits/4 Hours
AUC 1	All-University Curriculum Elective	3 Credits/3 Hours
Sem 6	Course	Credits/Contact Hrs
AET 364	Structural Analysis	4 Credits/6 Hours
AET 367	Architectural Design V	4 Credits/8 Hours
EN 241	English II	3 Credits/3 Hours
TECH 2	Technical Specialty	4 Credits/4 Hours
AUC 2	All-University Curriculum Elective	3 Credits/3 Hours
Sem 7	Course	Credits/Contact Hrs
AET 474	Design of Steel Structures	4 Credits/6 Hours
PROF 1	Professional Elective	3 Credits/3 Hours
EN 481	English III	3 Credits/3 Hours
SCI 1	Lab Science Elective	4 Credits/6 Hours
AUC 3	All-University Curriculum Elective	3 Credits/3 Hours
Sem 8	Course	Credits/Contact Hrs
AET 484	Design of Concrete Structures	4 Credits/6 Hours
TECH 3	Technical Specialty	4 Credits/4 Hours
PROF 2	Professional Elective	3 Credits/3 Hours
PROF 3	Professional Elective	3 Credits/3 Hours
AUC 4	All-University Curriculum Elective	3 Credits/3 Hours
Total	Bachelor of Science Program	130 Credits Hrs

The following curriculum is the final version of a proposed three-step process that will be implemented over a six year period. The proposed curriculum is designed to improve our existing undergraduate program and establishing our new graduate programs by incorporating courses from art, engineering and business disciplines. Ultimately,

undergraduate students will be required to take three courses from the art school, five courses from the engineering school and two courses from the business school plus other science and humanities electives. Graduate students will be required to take one or two electives courses in each of their four semesters, giving them an opportunity to either focus on art, engineering, or business or any combination of their choosing. This approach allows graduate students to customize their education while building on the foundation of the undergraduate program. With more courses, combined or dual degrees could be pursued. The proposed curriculum is as follows:

TABLE II  
2007-2008 Architecture Curriculum

Sem 1	Course	Credits/Contact Hrs
AET 155	Architectural History I	4 Credits/4 Hours
ART 110	2D Design I	2.5 Credits/5 Hours
ART 116	3D Design I	2.5 Credits/5 Hours
EN 111	English I	3 Credits/3 Hours
MTH 232	Math for Technology III	3 Credits/3 Hours
Sem 2	Course	Credits/Contact Hrs
AET 120	Introduction to CAD	2.5 Credits/4 Hours
AET 156	Architectural History II	4 Credits/4 Hours
PROF 1	Professional Elective in Art	2.5 Credits/5 Hours
EN 241	English II	3 Credits/3 Hours
MTH 241	Math for Technology IV	3 Credits/3 Hours
Sem 3	Course	Credits/Contact Hrs
AET 123	Architectural Design I	4 Credits/8 Hours
AET 232	Materials and Methods	4 Credits/8 Hours
PHY 120	Algebra based Physics I	4 Credits/6 Hours
AUC 1	All-University Curriculum Elective	3 Credits/3 Hours
Sem 4	Course	Credits/Contact Hrs
AET 233	Architectural Design II	4 Credits/8 Hours
AET 242	Construction Documents	4 Credits/8 Hours
PHY 121	Algebra based Physics II	4 Credits/6 Hours
AUC 2	All-University Curriculum Elective	3 Credits/3 Hours
Sem 5	Course	Credits/Contact Hrs
AET 244	Architectural Design III	4 Credits/8 Hours
AET 355	Engineering Mechanics	4 Credits/6 Hours
AET 358	Computer Modeling	3 Credits/4 Hours
SCI 1	Lab Science Elective	4 Credits/6 Hours
AUC 3	All-University Curriculum Elective	3 Credits/3 Hours
Sem 6	Course	Credits/Contact Hrs
AET 352	Architectural Design IV	4 Credits/8 Hours
AET 364	Structural Analysis	4 Credits/6 Hours
AET 241	MEP Systems	4 Credits/4 Hours
AET 473	Rendering & Portfolio Development	3 Credits/4 Hours
AUC 4	All-University Curriculum Elective	3 Credits/3 Hours
Sem 7	Course	Credits/Contact Hrs
AET 367	Architectural Design V	4 Credits/8 Hours
AET 474	Design of Steel Structures	4 Credits/6 Hours
TECH 1	Technical Specialty in Architecture	4 Credits/4 Hours
ECON 110	Macroeconomics	3 Credits/3 Hours
EN 481	English III	3 Credits/3 Hours
Sem 8	Course	Credits/Contact Hrs
AET 371	Architectural Design VI	4 Credits/8 Hours
AET 484	Design of Concrete Structures	4 Credits/6 Hours
TECH 2	Technical Specialty in Architecture	4 Credits/4 Hours
PROF 2	Professional Elective in Business	3 Credits/3 Hours
HSS 1	Human/Soc. Science Elective	3 Credits/3 Hours
Total	Bachelor of Science Program	130 Credits Hrs

Sem 9	Course	Credits/Contact Hrs
Arch 511	Architectural Studio I	6 Credits/12 Hours
Arch 512	Advanced Site Planning	4 Credits/8 Hours
Arch 513	Advanced Building Systems	3 Credits/3 Hours
UH	Professional Electives	3 Credits/3 Hours
Sem 10	Course	Credits/Contact Hrs
Arch 521	Architectural Studio II	6 Credits/12 Hours
Arch 522	Advanced Building Economics	4 Credits/8 Hours
Arch 523	Advanced Structures	3 Credits/3 Hours
UH	Professional Electives	3 Credits/3 Hours
Sem 11	Course	Credits/Contact Hrs
Arch 611	Architectural Studio III	6 Credits/12 Hours
Arch 612	Advanced Design Theory	4 Credits/8 Hours
Arch 613	Thesis Research	3 Credits/3 Hours
UH	Professional Electives	3 Credits/3 Hours
Sem 12	Course	Credits/Contact Hrs
Arch 621	Master of Architecture Thesis	6 Credits/12 Hours
Arch 622	Advanced Urban Issues	4 Credits/8 Hours
Arch 623	Advanced Professional Practice	3 Credits/3 Hours
UH	Professional Electives	3 Credits/3 Hours
Total	Master of Architecture Program	64 Credits Hrs
Total	BSci and MArch Programs	194 Credits Hrs

### The Design Studio

The design studio has traditionally been the hallmark of architectural education, the place for integrative learning to take place.[2] Schools throughout the country have been criticized for not living up to their goals. At the University of Hartford we have been challenged by this criticism and in response have redeveloped our design studio curriculum.

The knowledge introduced and the skills developed in these classes include:

- Critical thinking – using knowledge base to evaluate design solutions;
- Problem definition – the ability to clearly understand and define what the problem is;
- Problem solving – the ability to understand a given problem and develop appropriate solutions;
- Presentation - emphasis is placed on communication, both oral and written;
- Creativity – thinking beyond the ordinary and given path; to use your background and personal interpretation to put things together in new ways;
- History/Theory – through lectures and exercises to explore precedence and understand the ideas behind them;
- Documentation – further develop both traditional and technological documentation methods and explore multiple ways to express ideas graphically;
- Design – the process of coalescing and blending the above important skills.

The design studio courses will constantly be called upon to reinforce the importance of integration and more effective cross-disciplinary teamwork. It is in the design studio that students are expected to bring together knowledge from the different disciplines to inform the development of their architectural designs.[3]

### Accreditation

Our undergraduate program in architecture is one of only six baccalaureate degree programs in the US that have received TAC/ABET accreditation. We plan to maintain this accreditation, as it is an important element of our distinctiveness. We are also in the process of seeking additional accreditation from the National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit United States professional degree programs in architecture. Since most state registration boards in the United States require any applicant for licensure to have graduated from a NAAB-accredited program, obtaining such a degree is an essential aspect of preparing for the professional practice of architecture.

## Department Structure

In an effort to improve the Department's structure and organization, the Director is now responsible for managing all aspects of the academic and administrative operations for the Department of Architecture. The Director also coordinates the development and implementation of strategic planning, initiates fund-raising, provides oversight for professional and accreditation requirements and reviews and manages both the daily and long-range administration of the Department of Architecture. The Director reports to the Dean of the College of Engineering, the College of Technology and the Department of Architecture, who in turn reports to the Provost. This provides clear and unobstructed access to the Chief Executive Officers of the University.

## Conclusions

The Architectural Program will emphasize an integration of artistic principles, engineering fundamentals, and business understanding with the constant exploration of innovative design. In a collaborative, integrated and multidisciplinary setting, the Architectural Program will provide a professional education joined with other programs in the Hartford Art School, College of Engineering, and the Barney School of Business. The practitioner-based program will balance theoretical, technical, professional, and creative knowledge. Students are ultimately prepared for careers in architecture and a wide assortment of other design, construction, or business related professions. Architecture curriculum is by nature connected.

According to Boyer and Mitgang, our most distinctive feature is the design studio, which is a model for the integration and application of learning.[4] Other disciplines on campus could well profit from observing this approach to teaching and learning. The Department of Architecture's curriculum is based on the blending of academic based theoretical studies with industry based problem-solving activities. We do our best to tie learning to life by doing work that connects the studios to the community. Our program prepares students for a career of lifelong learning and professional success.

Many believe that learning in a compartmental fashion has never been fully successful; our architecture curriculum is by its nature integrated and connected. We have found that the most important element in good teaching is involving students to enable them to think and learn on their own. However, more importantly, our graduates are finding a flattering reflection of their active-learning educational experience in the integration-rich workplace. Architecture is a multidisciplinary field of study that draws on many areas of study. Architecture education must successfully involve the integration of art, engineering, business, and other disciplines.

## References

- [1] 2000-2001 University of Hartford Bulletin, ARCHITECTURE Program Course Descriptions.
- [2] Boyer, E., and Mitgang, L., "Building Community, A New Future for Architectural Education and Practice", Carnegie Foundation for the Advancement of Teaching, 1996.
- [3] Nicol, D., and Pilling, S., "Changing Architectural Education", E & FN Spon Press, 2000.
- [4] Boyer, E. and Mitgang, L., "Building Community, A New Future for Architectural Education and Practice", Carnegie Foundation for the Advancement of Teaching, 1996.

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