ARCHITECTURAL ENGINEERING

Emphasis areas include structural engineering, construction engineering and project management, environmental systems for buildings, and construction materials.

Architectural engineers plan, design, and supervise construction of many essential facilities and structures for residential, commercial, industrial and institutional buildings. These building systems include electrical, communications and control, lighting, heating, ventilating, air conditioning, fire protection, plumbing, and structural systems. Architectural engineers are problem solvers applying the latest in high-tech equipment and sophisticated procedures to address challenges concerning our environment and infrastructure. The diversity of architectural engineers complements the use of multiple systems to the intent and purpose of the project's design.

The bachelor of science in architectural engineering (BSAE) degree requires satisfactory completion of 129 credit hours. In your first two years, you will complete mathematics, physics, English, architectural design and other prerequisite courses. In your third and fourth years, most of your course work will be in engineering sciences. Also in your fourth year you will complete engineering design courses in general and specific areas.

Courses in structural, electrical, mechanical and lighting design are directed toward providing reliable and efficient structures such as stadiums, retail complexes, office buildings and airports. Courses in construction engineering include studies in construction techniques, cost estimating, quality control/quality assurance, and contract administration. History, architectural design and humanities provide the necessary tools to appreciably coexist in the fabric of society.

Architectural engineering is a broad field of endeavor. Because of this breadth, courses are required in each of the above areas. Although you, as an architectural engineer, may specialize within a given area, by the very nature of the profession you will be required to interact with specialists in the other areas. You will find that you will be working with architects and engineers in the other disciplines in the planning, design, and construction of complex facilities.

Architectural engineers also must be effective in communicating with the public. You may be expected to work with property owners, concerned citizens, city officials, attorneys, and even medical doctors for concerns related to public health measures. The results of your work as a architectural engineer will be seen everywhere. Projects in which you will become involved must be economical, appreciable to self and community, and provide a reasonable life expectancy. Use of computer hardware and software is a key component of the BSAE program of study.

Mission Statement

The architectural engineering program will provide students with the tools necessary to solve architectural engineering problems critical to our society's well-being. This will be accomplished through a comprehensive, forward-looking and broad-based architectural engineering curriculum emphasizing fundamentals, practical applications, oral and written communication skills, computer applications skills, and professional practice issues and ethics. The program will prepare graduates for entry into the architectural engineering profession, for life-long learning, and to function as architectural engineers in a global society.

Architectural Engineering Program Educational Objectives

Consistent with the mission statement, graduates of the Missouri S&T architectural engineering program will demonstrate:

Technical competency, as evidenced by:

- holding the PE within six years of graduation
- lead responsibility for project tasks including preparation of project documents, preparation of project specifications, and/or overseeing aspects of contract administration
- utilizing and understanding resources including codes, standards, specifications, contracts and business practices within a company
- critiquing or reviewing others' work
- mentoring staff with less professional experience

An ability to communicate effectively, as evidenced by a combination of:

- successful interaction with clients and peers in written and oral form, such as:
  A. leading role in oral communication/interaction at team level project meetings at three years beyond graduation
  B. leading role in oral communication/interaction at client based project meetings at six years beyond graduation
  C. generating written reports, with supervision, related to project documents, project specifications, and/or contract administration at three years beyond graduation
  D. generating full scope written documents with supervision, related to project proposals at six years beyond graduation
- critiquing or reviewing others' work in oral and written form

Continuing professional development, as evidenced by a combination of:

- holding the PE within six years of graduation
- educational development in the form of:
  A. continuing education/professional seminars (in-house or external)
  B. professional workshops
  C. advancement or completion toward advanced degree
  D. advancement in technological developments (LEED, energy start, sustainability, etc.)
- advancement in their chosen field or career path
- participation in professional societies/organizations
- maintain connections to Missouri S&T

Managerial competence, as evidenced by a combination of:

- managing project tasks and/or a small project with limited supervision
- communicate effectively with clients and staff outside of discipline
- critiquing or reviewing others' work
- develop a scope of service and/or generating a schedule for performance of work
- demonstrating responsibility for:

A. time management
B. cost management and/or scheduling resources
C. management of lower level staff members

An ability to work in teams, as evidenced by:

- an ability to function and communicate within a team
- an ability to provide technical knowledge to a team
- critiquing or reviewing others' work

Professional responsibility, as evidenced by a combination of:

- activity in professional societies/organizations
- an understanding of the greater impact of a particular project (aesthetic concerns, environmental concerns, ethical concerns, financial concerns, and long-term concerns)
- an appreciation for the role of various disciplines within your profession
- mentoring staff with less professional experience
- holding the PE within six years of graduation
- community involvement (at six years after graduation)

Program Outcomes

Consistent with the program educational objectives listed above, the Missouri S&T architectural engineering program graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Architectural Engineering Bachelor of Science

For the Bachelor of Science degree in Architectural Engineering, a minimum of 129 credit hours is required. These requirements are in addition to credit received for algebra, trigonometry, and basic ROTC courses. An average of at least two grade points per credit hour must be attained. An average of at least two grade points per credit hour must also be maintained in all courses taken in Architectural Engineering.

Each student's program of study must contain a minimum of 21 credit hours of course work in general education and must be chosen according to the following rules:

1. All students are required to take one American history course, one economics course, one humanities course, and ENGLISH 1120. The history course is to be selected from HISTORY 1200 (preferred), HISTORY 1300, or HISTORY 1310. The economics course may be either ECON 1100 or ECON 1200. ART 3203 is required.
2. Depth requirement.Three credit hours must be taken in humanities or social sciences at the 2000-level or above. This will be satisfied by taking the required HISTORY 2510 and HISTORY 4550. All courses taken to satisfy the depth requirement must be taken after graduating from high school.
3. The Gen Ed course chosen must meet requirements as specified under "Engineering Degree Requirements" published in the current undergraduate catalog and may include one communications course in addition to ENGLISH 1120.
4. Special topics and special problems and honors seminars are allowed only by petition to and approval by the student's department chair.

The Architectural Engineering program at Missouri S&T is characterized by its focus on the scientific basics of engineering and its innovative application; indeed, the underlying theme of this educational program is the application of the scientific basics to engineering practice through attention to problems and needs of the public. The necessary interrelations among the various topics, the engineering disciplines, and the other professions as they naturally come together in the solution of real world problems are emphasized as research, analysis, synthesis, and design, and are presented and discussed through classroom and laboratory instruction.

Freshman Year

First Semester	Credits	Second Semester	Credits
CHEM 1100	1	MATH 1215	4
FR ENG 1100[2]	1	General Ed Elective[1]	3
MATH 1214 or 1211	4	MECH ENG 1720	3
ENGLISH 1120	3	PHYSICS 1135	4
General Ed Elective[1]	3		
CHEM 1310 & CHEM 1319	5		
	17		**14**

Sophomore Year

First Semester	Credits	Second Semester	Credits
CIV ENG 2200[2]	3	GEOLOGY 1110	3
MATH 2222	4	CIV ENG 2210	3
PHYSICS 2135	4	CIV ENG 2211	1
CIV ENG 2401[2]	3	ARCH ENG 2103	3
ARCH ENG 2003	3	ART 3203	3
		MATH 3304	3
		MECH ENG 2350	2
	17		**18**

Junior Year

First Semester	Credits	Second Semester	Credits
ARCH ENG 3201[2]	3	STAT 3113	3
CIV ENG 3330[2]	3	ARCH ENG 4800	3
MECH ENG 2527	3	CIV ENG 3116	3
ARCH ENG 3804	3	HISTORY 2510	3

ENG MGT 1210	2	ARCH ENG 3220	3
CIV ENG 3715	3		
	17		**15**

Senior Year

First Semester	Credits	Second Semester	Credits
ARCH ENG 4010	1	ARCH ENG 4097	3
ARCH ENG 3210	3	ARCH ENG Technical Elective[3,4]	3
ARCH ENG 4448	3	CIV ENG 4729	3
ARCH ENG Technical Elective[3,4]	3	General Education Elective[1]	3
HISTORY 4550	3	ARCH ENG Technical Elective[3,4]	3
ARCH ENG 4850	3		
	16		**15**

Total Credits: 129

1 All general education electives must be approved by the student's advisor. Students must comply with the general education requirements with respect to selection and depth of study. These requirements are specified in the current catalog.

2 A grade of 'C' or better required to satisfy graduation requirements.

3 A grade of 'C' or better may be required in ARCH ENG technical elective prerequisite courses. Refer to the Missouri S&T undergraduate catalog for this prerequisite information.

4 Choose technical electives from approved lists under Emphasis Areas for Architectural Engineering Students. A maximum of 3 credits of independent study (ARCH ENG 5000 or ARCH ENG 4099) may be used as a technical elective. Additional independent study course may be taken but will not count towards the B.S. Architectural Engineering degree.

Note: All Architectural Engineering students must take the Fundamentals of Engineering examination prior to graduation. A passing grade on this examination is not required to earn a B.S. degree, however, it is the first step toward becoming a registered professional engineer. This requirement is part of the Missouri S&T assessment process as described in Assessment Requirements found elsewhere in this catalog.

Emphasis Areas and Course Listings by Area for Architectural Engineering Students

Area I, Structural Engineering

ARCH ENG 5001	Special Topics	6
ARCH ENG 5203	Applied Mechanics In Structural Engineering	3
ARCH ENG 5205	Structural Analysis II	3
ARCH ENG 5260	Analysis And Design Of Wood Structures	3
ARCH ENG 5207	Computer Methods of Structural Analysis	3
ARCH ENG 5210	Advanced Steel Structures Design	3
ARCH ENG 5220	Advanced Concrete Structures Design	3
ARCH ENG 5222	Prestressed Concrete Design	3
ARCH ENG 5729	Foundation Engineering II	3
ARCH ENG 5231	Infrastructure Strengthening with Composites	3
ARCH ENG 5206	Low-Rise Building Analysis And Design	3
ARCH ENG 5208	Structural Dynamics	3

Area II, Construction Engineering and Project Management

ARCH ENG 5442	Construction Planning and Scheduling Strategies	3
ARCH ENG 5445	Construction Methods	3
ARCH ENG 5446	Management Of Construction Costs	3
ARCH ENG 5448	Green Engineering: Analysis of Constructed Facilities	3
ARCH ENG 5449	Engineering and Construction Contract Specifications	3
ENG MGT 5110	Managerial Decision Making	3
ENG MGT 5613	Value Analysis	3
ENG MGT 5711	Total Quality Management	3

Area III, Environmental Systems for Buildings

ARCH ENG 5001	Special Topics	0-6
ARCH ENG 5642	Sustainability, Population, Energy, Water, and Materials	3
ARCH ENG 5665	Indoor Air Pollution	3
ARCH ENG 5820	Building Lighting Systems	3
ARCH ENG 5850	Renewable Energy -PV Fundamentals	3
ENG MGT 5513	Energy and Sustainability Management Engineering	3
ENG MGT 5330	Advanced Human Factors	3
IS&T 5885	Human-Computer Interaction and User Experience	3

Mechanical Emphasis Courses

MECH ENG 5309	Engineering Acoustics I	3
MECH ENG 5566	Solar Energy Technology	3
MECH ENG 5575	Mechanical Systems For Environmental Control	3

Electrical Emphasis Courses

ELEC ENG 3340	Basic Programmable Logic Controllers	3
ELEC ENG 5150	Photovoltaic Systems Engineering	3
COMP ENG 2210 & COMP ENG 2211	Introduction to Digital Logic and Computer Engineering Laboratory	4

Area IV, Construction Materials

ARCH ENG 5203	Applied Mechanics In Structural Engineering	3
CIV ENG 5113	Composition And Properties Of Concrete	3
CIV ENG 5118	Smart Materials And Sensors	3
CIV ENG 5156	Pavement Design	3
CER ENG 5810	Principles Of Engineering Materials	3

Architectural Engineering Courses

ARCH ENG 2103	Architectural Materials And Methods Of Construction	3
ARCH ENG 3804	Architectural Design II	3
ART 3203	Architectural Design I	3
ARCH ENG 5820	Building Lighting Systems	3

Architectural Engineering Courses (cross–list with existing civil engineering courses)

ARCH ENG 2003	Engineering Communications and Computations	3
ARCH ENG 2001	Special Topics	0-6
ARCH ENG 3000	Special Problems	1-6
ARCH ENG 3001	Special Topics	0-6
ARCH ENG 2002	Cooperative Engineering Training	1
ARCH ENG 4010	Senior Seminar: Engineering In A Global Society	1
ARCH ENG 3201	Structural Analysis I	3
ARCH ENG 3210	Structural Design in Metals	3
ARCH ENG 3220	Reinforced Concrete Design	3
ARCH ENG 4447	Ethical, Legal and Professional Engineering Practice	2
ARCH ENG 4448	Fundamentals Of Construction Engineering & Management	3
ARCH ENG 4097	Senior Design Project	3
ARCH ENG 5000	Special Problems	6
ARCH ENG 5001	Special Topics	6
ARCH ENG 5205	Structural Analysis II	3
ARCH ENG 5260	Analysis And Design Of Wood Structures	3
ARCH ENG 5207	Computer Methods of Structural Analysis	3
ARCH ENG 5210	Advanced Steel Structures Design	3

ARCH ENG 5220	Advanced Concrete Structures Design	3
ARCH ENG 5222	Prestressed Concrete Design	3
ARCH ENG 5445	Construction Methods	3
ARCH ENG 5446	Management Of Construction Costs	3
ARCH ENG 5449	Engineering and Construction Contract Specifications	3
ARCH ENG 5231	Infrastructure Strengthening with Composites	3
ARCH ENG 4099	Undergraduate Research	6

Civil Engineering Courses (required courses, emphasis area, and/or technical electives)

CIV ENG 3715	Fundamentals of Geotechnical Engineering	3
CIV ENG 3116	Construction Materials, Properties And Testing	3
CIV ENG 4729	Foundation Engineering	3
CIV ENG 3330	Engineering Fluid Mechanics	3
CIV ENG 5113	Composition And Properties Of Concrete	3
CIV ENG 5117	Asphalt Pavement Design	3
CIV ENG 5729	Foundation Engineering II	3
CIV ENG 5441	Professional Aspects Of Engineering Practice	3
CIV ENG 5445	Construction Methods	3
CIV ENG 5446	Management Of Construction Costs	3
CIV ENG 5449	Engineering and Construction Contract Specifications	3

Daniel R Abbott, Lecturer
MS University of Missouri-Rolla

Stuart W Baur, Associate Professor[4]
PHD University of Missouri-Rolla

Joel G Burken, Curators Distinguished Professor[1,5]
PHD University of Iowa

Mohamed Abdelmonem ElGawady, Professor
DE Swiss Federal Institute of Technology

Dimitri Feys, Associate Professor
PHD Ghent University, Belgium

William Gillis, Associate Teaching Professor[6,1]
PHD Missouri University of Science and Technology

Roger Allen LaBoube, Professor Emeritus [1]
PHD University of Missouri-Rolla

Cesar Mendoza, Associate Professor
PHD Colorado State University

John J Myers, Professor[1]
PHD University of Texas-Austin

Heath Pickerill, Assistant Teaching Professor
PHD University of Missouri-Columbia

William P Schonberg, Professor[1]
PHD Northwestern University

Jeffrey W. Schramm, Associate Professor
PHD Lehigh University

William Eric Showalter, Teaching Professor[1,6]
PHD Purdue University

Jeffery S Thomas, Teaching Professor[1]
PHD Missouri University of Science & Technology

ARCH ENG 2001 Special Topics (IND 0.0-6.0)
This course is designed to give the department an opportunity to test a new course. Variable title.

ARCH ENG 2002 Cooperative Engineering Training (IND 1.0)
On-the-job experience gained through cooperative education with industry, with credit arranged through departmental cooperative advisor. Grade received depends on quality of reports submitted and work supervisor's evaluation.

ARCH ENG 2003 Engineering Communications and Computations (LAB 1.0 and LEC 2.0)
Programming and software tools (including computer aided design and drafting, computer-based mathematics, word processing, spreadsheet, and presentation software) with application to and emphasis on written, graphical, and oral communication in professional civil and architectural engineering practice. (Co-listed with Civ Eng 2003).

ARCH ENG 2103 Architectural Materials And Methods Of Construction (LAB 1.0 and LEC 2.0)
A study of the origin and properties of construction materials, methods of construction, and installation. Materials include mineral based, wood, steel, concrete, masonry, asphalt, and gypsum as components of architectural engineering. Prerequisites: Chem 1310, Chem 1319 and Sophomore standing.

ARCH ENG 3000 Special Problems (IND 1.0-6.0)
(Variable) Problems or readings on specific subjects or projects in the department. Consent of instructor required.

ARCH ENG 3001 Special Topics (IND 0.0-6.0)
This course is designed to give the department an opportunity to test a new course. Variable title.

ARCH ENG 3201 Structural Analysis I (LAB 1.0 and LEC 2.0)
Loads on Structures. Analysis of statically determinate and indeterminate beams, frames and trusses. Influence lines and moving loads. Computation of deflections. Development and use of theorems of displacement methods including slope-deflection and moment distribution to analyze statically indeterminate structures. Computer solutions. Prerequisites: Civ Eng 2200, Civ Eng 2210 each with a grade of "C" or better. (Co-listed with Civ Eng 3201).

ARCH ENG 3210 Structural Design in Metals (LAB 1.0 and LEC 2.0)
The analysis and design of structural elements and connections for buildings, bridges and specialized structures utilizing structural metals. Both elastic and plastic designs are considered. Prerequisite: Arch Eng 3201 with grade of "C" or better. (Co-listed with Cv Eng 3210).

ARCH ENG 3220 Reinforced Concrete Design (LAB 1.0 and LEC 2.0)
The analysis and design of reinforced concrete beams, slabs, columns, retaining walls and footings by the elastic and ultimate strength methods including and introduction to the design of prestressed concrete. Introduction to use of computers as a design aid tool. Prerequisite: Arch Eng 3201 with grade of "C" or better. (Co-listed with Civ Eng 3220).

ARCH ENG 3804 Architectural Design II (LAB 2.0 and LEC 1.0)
A continuation of Architectural Engineering Design I with an increased focus on problems and models associated with detail development, principles of acoustic design and building construction as a form determinant. Prerequisite: Art 3203.

ARCH ENG 4010 Senior Seminar: Engineering In A Global Society (RSD 1.0)
Discussion of contemporary issues: public safety, health, and welfare; the principles of sustainable development; lifelong learning; impact of engineering solutions in a global and societal and political context; relationships with owners, contractors, and the public; public service; the Code of Ethics; and the Missouri licensing Statutes and Board Rules. Prerequisite: Senior standing. (Co-listed with Civ Eng and Env Eng 4010).

ARCH ENG 4097 Senior Design Project (LEC 3.0)
Open-ended building design project involving one or more areas of engineering. Planning design projects, philosophy of design, and the application of engineering principles to design problems. Prerequisite: Arch Eng 4448 or Civ Eng 4448.

ARCH ENG 4099 Undergraduate Research (IND 0.0-6.0)
Designed for the undergraduate student who wishes to engage in research. Not for graduate credit. Not more than six (6) credit hours allowed for graduation credit. Subject and credit to be arranged by instructor.

ARCH ENG 4447 Ethical, Legal and Professional Engineering Practice (LEC 2.0)
Discussions of law concerning contracts, torts, agencies, real property, partnerships and corporations. The purposes and implications of the engineering registration law, the effect of legal, ethical and marketing considerations of the practice of Architectural Engineering. Prerequisite: Junior standing. (Co-listed with Civ Eng 4447).

ARCH ENG 4448 Fundamentals Of Construction Engineering & Management (LEC 3.0)
A study of the concepts and techniques used in large construction projects for the preparation of engineer service contracts, detailed and conceptual cost estimating, and construction scheduling analysis. Prerequisite: Junior Standing, Math 1215, and Physics 1135. (Co-listed with Civ Eng 4448).

ARCH ENG 4800 Principles of HVAC I (LEC 3.0)
Heating, ventilating, and air conditioning principles related to the heat loss and heat gain calculations for commercial buildings. Calculations will be performed manually and using current computer software. Analysis and specification of the building envelope components, with an emphasis on improving energy efficiency by reducing heating and cooling loads Prerequisites: Mech Eng 2527 and preceded or accompanied by Civ Eng 3330.

ARCH ENG 4850 Building Electrical Systems (LEC 3.0)
The design of interior and exterior building electrical systems, including power loads, branch circuits and switching. Work includes study of applicable NFPA 70 (NEC) and related building codes. Prerequisites: Math 3304 and Physics 2135.

ARCH ENG 5000 Special Problems (IND 0.0-6.0)
Problems or readings on specific subjects or projects in the department. Consent of instructor required.

ARCH ENG 5001 Special Topics (LAB 1.0 and LEC 2.0)
This course is designed to give the department an opportunity to test a new course. Variable title.

ARCH ENG 5203 Applied Mechanics In Structural Engineering (LEC 3.0)
A study of basic relationships involved in the mechanics of structures. Topic include basic elasticity, failure criteria, fundamental theories of bending and buckling of plates and cylindrical shells for practical application in analysis and design of bridge building floors and shell roofs. Prerequisite: Civ Eng 3201 with grade of "C" or better. (Co-listed with Civ Eng 5203).

ARCH ENG 5205 Structural Analysis II (LEC 3.0)
Classical displacement and force methods applied to structures of advanced design. Analysis of indeterminate structures such as continuous beams, arches, cables, and two and three dimensional frames, and trusses. Analysis of indeterminate structures involving temperature and support settlements effects. Prerequisites: Civ Eng 3201 or Arch Eng 3201. (Co-listed with Civ Eng 5205).

ARCH ENG 5206 Low-Rise Building Analysis And Design (LEC 3.0)
Characterization of various design loads, load combinations, general methodology of structural designs against lateral loads, code-oriented design procedures, distribution of lateral loads in structural systems, application of the International Building Code in design of loadbearing wall systems, building frame system and moment-resisting frame systems. Prerequisite: Preceded and/or accompanied by Civ -Arch Eng 3210 or Civ-Arch Eng 3220. (Co-listed with Civ Eng 5206).

ARCH ENG 5207 Computer Methods of Structural Analysis (LEC 3.0)
Force and displacement matrix methods and computer methods applied to structural analysis. Analysis of indeterminate structures such as continuous beams, and two and three dimensional frames and trusses. Analysis of indeterminate structures involving temperature and support settlements effects using computer methods formulation. Prerequisite: Civ Eng 3201 with grade of "C" or better. (Co-listed with Civ Eng 5207).

ARCH ENG 5208 Structural Dynamics (LEC 3.0)
This course deals with fundamental concepts and structural responses under dynamic loads. Hand calculations and computer methods are developed. Specific topics include resonance, beating phenomenon, equation of motion, dynamic properties, frequencies and mode shapes, and modal and Ritz analyses. Prerequisites: Mech Eng 2350 or equivalent; Civ/Arch Eng 3201 or equivalent. (Co-listed with Civ Eng 5208).

ARCH ENG 5210 Advanced Steel Structures Design (LEC 3.0)
The design of structural steel systems into a final integrated structure. Plate girders, composite systems, stability, connections, rigid frames, single and multistory buildings, and similar type problems of interest to the student. Use of the computer as a tool aid in the design will be emphasized. Prerequisite: Arch Eng 3210 with a grade of "C" or better. (Co-listed with Civ Eng 5210).

ARCH ENG 5220 Advanced Concrete Structures Design (LEC 3.0)
The design of structural concrete systems into a final integrated structure. Two-way slabs, long columns, connections, and discontinuity regions, deflections and cracking of beams and slabs, ACI design criteria, and similar type problems of interest to the student. Use of the computer as a tool to aid in the design will be emphasized. Prerequisite: Arch Eng 3220 with a grade of "C" or better. (Co-listed with Civ Eng 5220).

ARCH ENG 5222 Prestressed Concrete Design (LEC 3.0)
Behavior of steel and concrete under sustained load. Analysis and design of pre-tensioned and post-tensioned reinforced concrete members and the combining of such members into an integral structure. Prerequisite: Arch Eng 3220 with a grade of "C" or better. (Co-listed with Civ Eng 5222).

ARCH ENG 5231 Infrastructure Strengthening with Composites (LEC 3.0)
The course presents composite materials and includes principles of reinforcing and strengthening for flexure, shear, and ductility enhancement in buildings and bridges. It covers the design of existing members strengthened with externally bonded laminates and near surface mounted composites. Case studies are discussed. Prerequisites: Arch Eng / Civ Eng 3201, Arch Eng / Civ Eng 3220. (Co-listed with Civ Eng 5231).

ARCH ENG 5260 Analysis And Design Of Wood Structures (LEC 3.0)
A critical review of theory and practice in design of modern wood structures. Effect of plant origin and physical structure of wood on its mechanical strength; fasteners and their significance in design; development of design criteria and their application to plane and three dimensional structures. Prerequisite: Arch Eng 3201 with a grade of "C" or better. (Co-listed with Civ Eng 5260).

ARCH ENG 5270 Structural Masonry Design (LEC 3.0)
Review of the theory and practice of analyzing low-rise masonry structures, materials and assembly types, constructability considerations, structural masonry components, repair and strengthening, and model code requirements to ensure adequate load resisting buildings. Prerequisites: Arch Eng 3201 or Civ Eng 3201. (Co-listed with Civ Eng 5270).

ARCH ENG 5442 Construction Planning and Scheduling Strategies (LEC 3.0)
The goal of this course is to assist participants in gaining an understanding of schedule control techniques and the application of tools such as Primavera Software. Content areas to be addressed include: development of baseline schedules, progress monitoring and updating, recovery schedules, resource application and leveling. Prerequisite: Civ Eng or Arch Eng 4448. (Co-listed with Civ Eng 5442).

ARCH ENG 5445 Construction Methods (LEC 3.0)
Introduction to construction planning selection of equipment and familiarization with standard methods for horizontal and vertical construction. Application of network analysis and schedules to project control. Prerequisite: Arch Eng 4448 with a grade of "C" or better. (Co-listed with Civ Eng 5445).

ARCH ENG 5446 Management Of Construction Costs (LEC 3.0)
Management of construction projects from inception to completion: estimates, role of network preplanning, project monitoring and control. Prerequisite: Arch Eng 4448 with a grade of "C" or better. (Co-listed with Civ Eng 5446).

ARCH ENG 5448 Green Engineering: Analysis of Constructed Facilities (LEC 3.0)
Environmentally sound design and construction practices. Includes design issues, material selection and site issues that can reduce the impact on the environment caused by the construction process. LEED certification covered in depth. Prerequisites: Civ Eng 4448 or Arch Eng 4448; and Junior Standing. (Co-listed with Civ Eng 5448).

ARCH ENG 5449 Engineering and Construction Contract Specifications (LEC 3.0)
Legal and business aspects of contracts and contracting procedure in the construction industry. Topics include formulation of contracts in common law, engineering services contracts, and construction project contract documents and contract administration issues. Prerequisite: Arch Eng 4448 with a grade of "C" or better. (Co-listed with Civ Eng 5449).

ARCH ENG 5642 Sustainability, Population, Energy, Water, and Materials (LEC 3.0)
This course will examine the concepts regarding the continued advancement of humankind while maintaining our ecological niche on earth. Key topics include: population growth, poverty, and impacts of development; energy consumption, sources, storage, conservation and policy; water quality and quantity; materials and building; and policy implications. Prerequisite: Senior or graduate standing. (Co-listed with Env Eng 5642 and Civ Eng 5642).

ARCH ENG 5665 Indoor Air Pollution (LEC 3.0)
By developing a practical understanding of indoor air pollution sources, physics, chemistry and consequences, students will learn how radon, cigarette smoke, VOCs from furnishings, and so forth affect indoor air quality and apply engineering analyses to specify ventilation rates, choose furnishings and minimize occupant exposure to pollutants. Prerequisite: Civ Eng 2601 or Mech Eng 5571 or Graduate Status. (Co-listed with Civ Eng 5665 and Env Eng 5665).

ARCH ENG 5729 Foundation Engineering II (LEC 3.0)
Classical earth pressure theories. Analysis of shallow and deep foundations to include bearing capacity and settlement of footings, rafts, piles, and drilled piers. Analysis of stability and design of retaining walls and anchored bulkheads. Prerequisites: Civ Eng 4729 with a grade of "C" or better. (Co-listed with Civ Eng 5729).

ARCH ENG 5820 Building Lighting Systems (LEC 3.0)
Design and specifications for interior and exterior building illumination systems. Work includes study of applicable NFPA 70 (NEC) and related building codes. Prerequisites: Senior standing and Physics 2135.

ARCH ENG 5850 Renewable Energy -PV Fundamentals (LEC 3.0)
Applying the fundamentals of photovoltaic will be covered, including identifying key components and functions, comparing various types incentives, selecting and sizing various photovoltaic systems and performing a cost benefits analysis. Prerequisites: Mech Eng 2527.