Office of the Registrar
FORM 40 REV.5/11

PURDUE UNIVERSITY

REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF AN UNDERGRADUATE COURSE
(10000-40000 LEVEL)

Print Form

EFD 11-12 (201310)

DEPARTMENT Civil Engineering

EFFECTIVE SESSION Fall 2012

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [X] 1. New course with supporting documents
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit/type
- [ ] 7. Change in course attributes (department head signature only)
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

PROPOSED:		EXISTING:	
Subject Abbreviation	CE	Subject Abbreviation	
Course Number	31100	Course Number	
Long Title	Architectural Engineering		
Short Title	Architectural Engr		

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
[X] Fall [X] Spring [ ] Summer

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [X] W. Lafayette
[ ] Indianapolis

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range:
Minimum Cr. Hrs
(Check One) To [ ] Or [ ]
Maximum Cr. Hrs.
3. Equivalent Credit: Yes [ ] No [ ]

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Fees: [ ] Coop [ ] Lab [ ] Rate Request
Include comment to explain fee
6. Registration Approval Type
Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

ScheduleType	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
ture	50	3	16	100
citation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

RECEIVED
2012 JAN 23 AM 10:02

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):
Restriction: Sophomore status in the College of Engineering;
Prerequisite: ME 20000 Thermodynamics;
Concurrent Prerequisite: CE 34000 Hydraulics or ME 30900 Fluid Mechanics or instructor permission.

See Attachment for Course Description

*COURSE LEARNING OUTCOMES:

See Attachment for Course Learning Outcomes

Calumet Department Head	Date	Calumet School Dean	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date
Central Faculty Senate Chair	Date	Vice Chancellor for Academic Affairs	Date
West Lafayette Department Head	Date	West Lafayette College/School Dean	Date
		West Lafayette Registrar	Date

MK Bernhard 11/18/11
1/18/12
1/27/12

OFFICE OF THE REGISTRAR

LD 1/25/12

FORM 40 Attachment 1 for **CE 31100**

CE 31100 ARCHITECTURAL ENGINEERING

Course Description (Include Requisites/Restrictions):
Restriction: Sophomore status in the College of Engineering;
Prerequisite: ME 20000;
Concurrent Prerequisite: CE 34000 or ME 30900 or instructor permission.

This course introduces energy efficiency, thermal comfort, indoor environmental quality and green building design concepts. The course covers engineering fundamentals required for the design and analysis of building systems such as thermodynamics, fluid mechanics, heat and mass transfer, light and sound transmission. The course presents engineering principles and selected applications related to hygrothermal analysis of building enclosures, air conditioning processes in Heating Ventilating and Air Conditioning Systems, building illumination, and building acoustics.

Course Learning Outcomes:

Upon completion of this course, students will be able to:

- Identify and analyze the characteristics of building environmental loads, building construction, and building operations as they define the requirements for a comfortable and healthy indoor environment.
- Demonstrate knowledge of thermodynamics, fluid mechanics, heat and mass transfer, photometric quantities and sound transmission for use in building design
- Identify, formulate and solve realistic Architectural Engineering problems related to hygrothermal analysis of building enclosures, air conditioning processes in Heating Ventilating and Air Conditioning Systems, pipe and duct flow, building illumination and building acoustics.
- Demonstrate an understanding of building systems integration to achieve efficient operation.

TO: The Faculty of the College of Engineering

FROM: The Faculty of the School of Civil Engineering

RE: New Undergraduate Course: CE 31100 Architectural Engineering

The faculty of the School of Civil Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

CE 31100 **Architectural Engineering**
Sem. 1 and 2, Lecture 3, Cr. 3.
Restrictions: Sophomore status in the College of Engineering;
Prerequisite: ME 20000 Thermodynamics;
Concurrent Prerequisite: CE 34000 Hydraulics or ME 30900 Fluid Mechanics or instructor permission.

Description: This course introduces building energy efficiency, thermal comfort, indoor environmental quality, and green building design concepts. The course covers engineering fundamentals required for the design and analysis of building systems such as thermodynamics, fluid mechanics, heat and mass transfer, and light and sound transmission. The course presents engineering principles and selected applications related to hygrothermal analysis of building enclosures, air conditioning processes in heating, ventilating and air-conditioning systems, building illumination, and building acoustics.

Reason: This course will be the breadth Architectural Engineering course for students in Civil Engineering. It provides an overview of basic Architectural Engineering concepts and covers engineering fundamentals required for design courses in the Architectural Engineering emphasis area – it will be a prerequisite for higher level courses. The course was taught as CE497XX in Spring 2009, 2010, 2011 and Fall 2009, 2010, 2011 with enrollments between 50 and 65 students.

M.K. Banks
Bowen Engineering Head and Professor
Jack and Kay Hockema Professor of Civil Engineering

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes #9

Date 1-17-2012

Chairman ECC R. Cipra

CE 31100 ARCHITECTURAL ENGINEERING

Course Instructors: Panagiota Karava, Ming Qu

Level: Undergraduate Level

Restrictions: Sophomore status in the College of Engineering.
Prerequisites: ME 20000 Thermodynamics;
Concurrent Prerequisite: CE34000 Hydraulics or ME 30900 Fluid Mechanics or permission from the instructor

Course Outcomes: Upon completion of this course, the students will be able to:

- Identify and analyze the characteristics of building environmental loads, building construction, and building operations as they define the requirements for a comfortable and healthy indoor environment.
- Demonstrate knowledge of thermodynamics, fluid mechanics, heat and mass transfer, photometric quantities and sound transmission for use in building design
- Identify, formulate and solve realistic Architectural Engineering problems related to hygrothermal analysis of building enclosures, air conditioning processes in heating ventilating and air-conditioning systems, pipe and duct flow, building illumination and building acoustics.
- Demonstrate an understanding of building systems integration to achieve efficient operation.

Course Outline:

- **Introduction to building environmental loads and building environmental systems:** building function, building enclosure, heating ventilating and air-conditioning systems, weather and climate, heating, cooling and moisture loads, building energy efficiency, occupant thermal comfort, indoor environmental quality, green building design. (1 week)
- **Thermodynamics fundamentals for buildings:** thermodynamic properties of air, ideal gas law, gas-vapor mixtures, water vapor, dry and atmospheric air, psychrometric properties, psychrometric processes, psychrometric chart, human comfort and air conditioning, principles of the conservation of mass and energy to various air conditioning processes. (3 weeks)
- **Fluid mechanics fundamentals for buildings:** fluid properties, fluid flow through pipes and ducts, fluid friction, Moody Diagram, pressure drop and head loss calculation, parallel flow over flat plates. (1 week)

- **Heat transfer fundamentals for buildings:** Mechanisms of heat transfer, thermal conductivity, steady state heat conduction in plane walls, thermal resistance, physical mechanisms of forced convection, thermal boundary layer, forced convection over flat plates and inside pipes, natural convection over surfaces, natural convection inside enclosures, electromagnetic spectrum and thermal radiation, blackbody radiation, radiative properties of materials, view factors, radiation heat transfer. (3 weeks)
- **Mass transfer fundamentals for buildings:** Diffusion mass transport, mass diffusivity. (1 week)
- **Hygrothermal analysis of Buildings**: Heat flow and thermal gradients in simple wall assemblies, solar geometry, windows, vapor permeance, one-dimensional steady state vapor flow in wall assemblies, interstitial condensation (occurrence and quantity), moisture control. (2 weeks)
- **Heating Ventilating and Air Conditioning (HVAC) Systems**: Types of HVAC systems, air handling Units, HVAC distribution components, principles and calculation methods for simple Variable-Air-Volume systems (1 week)
- **Building illumination:** Physics of light, photometric quantities, lamps, electric lighting calculation methods. (1 week)
- **Building acoustics:** Physics of sound, room acoustics, noise criteria, sound transmission class of wall assemblies, calculation methods for sound absorption and transmission in buildings, sound isolation and control. (2 weeks).

Total =15 weeks

Course website: Purdue Blackboard

Textbook: Architectural Engineering, custom-made book, McGraw Hill (available in campus bookstore or online bookstore)

Grading:

Homework – 20%
Project – 10%
Mid-term exams – 30%
Final Exam – 40%

The most recent course syllabus is presented in the following pages.

COURSE SYLLABUS

CE 49700 Architectural Engineering

Course Objectives

The objective of this course is to introduce engineering fundamentals required for the design and analysis of building systems such as thermodynamics, fluid mechanics, heat and mass transfer, light and sound transmission. The course also presents engineering principles and selected applications related to hygrothermal analysis of building enclosures, air conditioning processes in Heating Ventilating and Air Conditioning Systems, building illumination, and building acoustics.

Course Outcomes:

After completion of this course, the students will be able to:

Identify and analyze the characteristics of building environmental loads, building construction, and building operations as they define the requirements for a comfortable and healthy indoor environment.

Demonstrate knowledge of thermodynamics, fluid mechanics, heat and mass transfer, photometric quantities and sound transmission for use in building design

Identify, formulate and solve realistic Architectural Engineering problems related to hygrothermal analysis of building enclosures, air conditioning processes in Heating Ventilating and Air Conditioning Systems, pipe and duct flow, building illumination and building acoustics.

Demonstrate an understanding of building systems integration to achieve efficient operation.

Course Instructors: Panagiota Karava, Ming Qu

Restriction: Sophomore status in the College of Engineering.
Prerequisite: ME 20000 Thermodynamics
Concurrent Prerequisite: CE34000 Hydraulics or ME 30900 Fluid Mechanics or permission from the instructor

Website: Purdue Blackboard

Textbook:

Architectural Engineering, custom-made book, McGraw Hill (available in campus bookstore or online bookstore). The book includes parts of the following textbooks:

- Fundamental of Thermal Fluid Sciences, by Y.A. Fengel, R.H. Turner, G.M. Cimbala, 3rd edition (2010) McGraw-Hill.
- Thermodynamics: an engineering approach, by Y.A. Fengel, M.A. Boles, 7th edition (2011), McGraw-Hill

Building acoustics and illumination handouts are provided in class

Grading:

Homework – 20%
Project – 10%
Mid-term exams – 30%
Final Exam – 40%

Course Outline:

Introduction to building environmental loads and building environmental systems: building function, building enclosure, heating ventilating and air conditioning systems, weather and climate, heating, cooling and moisture loads, building energy efficiency, occupant thermal comfort, indoor environmental quality, green building design. (1 week)

Thermodynamics fundamentals for buildings: thermodynamic properties of air, ideal gas law, gas-vapor mixtures, water vapor, dry and atmospheric air, psychrometric properties, psychrometric processes, psychrometric chart, human comfort and air conditioning, principles of the conservation of mass and energy to various air conditioning processes. (3 weeks)

Fluid mechanics fundamentals for buildings: fluid properties, fluid flow through pipes and ducts, fluid friction, Moody Diagram, pressure drop and head loss calculation, parallel flow over flat plates. (1 week)

Heat transfer fundamentals for buildings: Mechanisms of heat transfer, thermal conductivity, steady state heat conduction in plane walls, thermal resistance concept, physical mechanism of forced convection, thermal boundary layer, forced convection over flat plates and inside pipes, physical mechanism of natural convection, natural convection over surfaces, natural convection inside enclosures, electromagnetic spectrum and thermal radiation, blackbody radiation, radiative properties, view factors, radiation hear transfer. (3 weeks)

Mass transfer fundamentals for buildings: Diffusion mass transport, mass diffusivity. (1 week)

Hygrothermal analysis of Buildings: Heat flow and thermal gradients in simple wall assemblies, solar geometry, windows, vapor permeance, one-dimensional steady state vapor flow in wall assemblies, interstitial condensation (occurrence and quantity), moisture control. (2 weeks)

Heating Ventilating and Air Conditioning (HVAC) Systems: Types of HVAC systems, air handling Units, HVAC distribution components, principles and calculation methods for simple Variable-Air-Volume systems (1 week)

Building illumination: Physics of light, photometric quantities, lamps, electric lighting calculation methods. (1 week)

Building acoustics: Physics of sound, room acoustics, noise criteria, sound transmission class of wall assemblies, calculation methods for sound absorption and transmission in buildings, sound isolation and control. (2 weeks).