COLLEGE OF DESIGN, CONSTRUCTION AND PLANNING UNIVERSITY OF FLORIDA

Advanced Construction Technology

COURSE NUMBER: BCN5905

TERM: Fall 2023
NUMBER OF CREDIT HOURS: 3
CLASS LOCATION: Rinker 220
INSTRUCTIONAL METHODS: The class meets three lecture hours per week.
CLASS MEETING TIMES: Tuesday   Period 8 - 9 (3:00 PM - 4:55 PM)
                            Thursday   Period 9 (4:05 PM - 4:55 PM)
INSTRUCTOR: Dr. Aladdin Alwisy, Dr. Chaofeng Wang
OFFICE HOURS: Dr. Aladdin Alwisy - Tuesday (1:00 PM – 3:00 PM)

COURSE DESCRIPTION:

This course focuses on the integration of advanced construction technologies and processes. Specifically, the students will learn about the innovative industrialized construction processes and techniques, as well as cutting-edge technologies in 3D printing. The students will learn the tasks and processes followed by construction professionals in each stage. In addition, the definition of industrialized construction subsystems, including modular, panelized, and manufactured construction will be presented. A high-level description of the advanced technologies and emerging trends, specifically Industry 4.0 & Industry 5.0, utilized during the design, manufacturing, and installation of construction systems will be presented. The students will (1) acquire the essential knowledge of design for manufacturing and assembly in industrialized construction, (2) understand the guiding design principles of prefabricated MEP assemblies, (3) gain first-hand experience in manufacturing technologies and onsite collaboration strategies, and (4) explore the future of construction prefabrication and 3D printing.

COURSE OBJECTIVES:

- Identify the different tasks, processes, prefabrication levels, and installation strategies followed during the three stages of industrialized construction.
- Learn collaboration strategies among the key project participants in construction prefabrication during the different types of project delivery methods.
- Recognize the key criteria of a good design for architectural, structural, and MEP assemblies.
- Learn the state-of-the-art and state-of-the-practice technologies for offsite manufacturing and onsite assembly.
- Understand advanced construction technologies, including artificial intelligence, and digital tools, and their applications in the construction industry.
- Develop students' skills in integrating and applying emerging technologies, such as building information modeling (BIM), robotics, in construction planning, management, and execution.
- Expose students to sustainable construction practices and encourage them to incorporate these methods into their projects, contributing to a more environmentally responsible construction industry.
- Prepare students for future challenges and trends in construction technology by offering insights into the latest research, developments, and innovations, ultimately fostering a growth mindset and adaptability in their careers.

Recommended Text:

Design in Modular Construction, Mark Lawson, Ray Ogden, Chris Goodier; Prefab Architecture: A Guide to Modular Design and Construction, Ryan E. Smith, James Timberlake; Components and Systems: Modular Construction – Design, Structure, New Technologies, Gerald Staib , Andreas Dörrhöfer and Markus Rosenthal.

In-Class Group Assignments:

In-class assignments are group assignments that must be solved during the class (lab sessions) by everyone in the group.

COURSE POLICIES:

ATTENDANCE POLICY:

Attendance and participation in the class activities are required. Attendance and participation grade will be computed in proportion to the number of presences on the days the rolls were taken and participation on a given topic in the class forum. Requirements for class attendance and make-up quizzes, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

COURSE EVALUATION

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/

UF POLICIES:

UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES:

Students requesting accommodation for disabilities must first register with the Dean of Students Office (https://disability.ufl.edu/). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive; therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

UNIVERSITY POLICY ON ACADEMIC MISCONDUCT:

Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/ . Although joint work on assignments may be acceptable in some cases, duplication of an assignment, both manually or by computer will be considered an act of academic dishonesty and dealt with accordingly. On all work submitted for credit by students at the university, the following pledge is either required or implied**: "On my honor, I have neither given nor received unauthorized aid in doing this assignment.**"

GETTING HELP:

For issues with technical difficulties for E-learning in Canvas, please contact the UF Help Desk:
- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- https://lss.at.ufl.edu/help.shtml

GRADING POLICIES:

Assignment	Points
Module Assignments	300
Course Project #1	300
Course Project #2	300
Attendance and Participation	100
Total	**1000**

GRADING SCALE:

Divide the total points you earn by **the total possible points**. Grades will be given according to the following scale.

A=93-100; A- =90-92.9; B+ =87-89.9; B=83-86.9; B- =80-82.9; C+ = 77-79.9; C=73-76.9; C- =70-72.9; D+ =67-69.9; D=63-66.9; D- =60-62.9; E<60.

- Attendance grade will be computed in proportion to the number of presences on the days the rolls were taken and participation grade is based on responding to a given discussion topic in the class forum.

- Individual and group assignments will be given that covers topics that were discussed in that module. Specific evaluation criteria will be provided for each assignment.

- A final group project will be assigned that requires implementing existing AI algorithms in a project in the built environment, to facilitate planning, design and construction strategies.

COURSE SCHEDULE:

Module	Topic	Class Content
Module 1	Industrialized Construction Fundamentals (2 Wks - Dr. Alwisy)	Introduction to Industrialized Construction stages, Modular Construction, Panelized Construction, and Manufactured Homes.
Module 2	Offsite Design and Construction Digitalization Technologies (4 Wks - Dr. Alwisy)	Introduction to Building Information Modeling for Industrialized Construction Design for Manufacturing and Assembly (DfMA) for Panelization of Industrialized Construction & MEPs Introduction to Virtual/Augmented Reality in the Design of Industrialized Construction Lean Manufacturing; Production Line Simulation; Cloud-based collaboration (Forge); Digital Twins
Module 3	Construction Automation & Robotics (1 Wks - Dr. Alwisy) (1 Wks - Dr. Wang)	Industrial Robotics for Assembly-based Manufacturing Collaborative Robotics for Human-Robot Collaboration
Module 4	Advanced Construction Materials and Techniques (3D printing and materials) (5 Wks - Dr. Wang)	Innovative construction materials and their properties 3D printing in construction Self-healing and smart materials Sustainable construction practices and materials
Module 5	AI (1 Wks - Dr. Wang)	Introduction to artificial intelligence (AI) and machine learning (ML) AI and ML techniques in construction planning and management AI-driven design and optimization AI and ML applications in construction safety, quality control, and risk management

Disclaimer: This syllabus represents the current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.