New York City College of Technology – City University of New York
300 Jay Street, Brooklyn, New York 11201

<u>Department of Architectural Technology</u>

ARCH 3691	**Advanced Design and Computer Integration**
	1 classroom hour, 4 lab/studio hours, 3 credits

Course Description:
This course will focus on the use of BIM in the development of a building project and its application across the various phases of project development from Schematic Design & Design Development, to Construction Documents, to Construction Administration to the use post construction use of a BIM model for facilities management. Students will work both individually and as team members throughout the course with the option to pair the course project with work occurring in either a paired advanced building construction technology or design course.

Course Context: This course is intended to leverage the knowledge that students have gained in previous courses in building technology and construction and integrate it with the design process and the use of computer software and building information modeling (BIM) in a collaborative team based environment.

Prerequisites: ARCH 1291 & ARCH2430 or AAS degree in Architecture or equivalent.
Co-requisites: ARCH 3630 or ARCH 4830

Required Text:	<u>Autodesk Revit Architecture Essentials (Autodesk Official Training Guide)</u>
	Phil Read, Eddy Krygiel, James Vandezande
	Sybex ISBN-10: 1118016831 | ISBN-13: 978-1118016831

Attendance Policy: No more than 10% absences are permitted during the semester. For the purposes of record, two lateness are considered as one absence. Exceeding this limit will expose the student to failing at the discretion of the instructor.

Course Structure: This course is open to multidisciplinary students from various fields including Architecture, CMCE and Entertainment Technology provided they have either an AAS degree or required number of credits with prior experience with BIM software. Course meets twice weekly.

Grading:

Class participation	20%
Critical Path & Planning	20%
BIM model development	30%
Project drawing set development	30%

Academic Integrity: Students and all others who work with information, ideas, texts, images, music, inventions and other intellectual property owe their audience and sources accuracy and honesty in using, crediting and citation of sources. As a community of intellectual and professional workers, the college recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension and expulsion.

Learning Objectives: Upon successful completion of this course the student should be able to:

1. **Demonstrate** knowledge of professional construction documentation
2. **Develop** multiple schematic design level proposals

3. **Demonstrate** an understanding of the use of a BIM model during construction administration.
4. **Demonstrate** an understanding of a BIM model for construction and facilities management.
5. **Collaborate** on group projects and share project development and a common BIM model.
6. **Demonstrate** an understanding of critical path analysis and planning.
7. **Demonstrate** an understanding of mechanical and structural building systems.

Assessment:

To evaluate the students' achievement of the learning objectives, the professor will do the following:

1. **Review** students' creative process (initial sketches through to the final project)
2. **Assess** the students' use of professional vocabulary during oral presentations and written work.
3. **Review** students' ability to incorporate a research and their own creativity into their design work.
4. **Evaluate** students' participation in class discussions regarding students written and oral presentations**.**
5. **Review** of group projects will be based on the completeness of the work as well as the effectiveness of the group's team work and communication skills.
6. **Review** students and groups ability to develop a comprehensive and properly constructed collaborative BIM model.

Course Outline

Week 1:   Introduction & Course Overview
Introduction to course objectives. Overview of the semesters work including responsibilities for both individual and group work. Overview of the building project and phases of development from schematic design & design development to construction documents and administration to post construction facilities management. Discussion and comparison of traditional CAD vs. BIM based methodologies.

Assignment 1: Develop team presentations of proposed building projects for semesters work.

Team presentations of building project options based on either previous coursework or a paired design or building technology course. Teams to determine building project and begin exploration of schematic design options. Teams to determine working strategy and division of work assignments. Begin implementation of BIM based schematic design models.

Assignment 2: Develop schematic design options for chosen project.

Week 2:   Schematic Design:
Team presentation and discussion of Schematic Design options. Continued development of BIM models.

Assignment 3: Continued development of BIM models.

Teams to finalize schematic design option to be developed during design development process. Develop planning strategy for creation of Design Development BIM Model in a collaborative environment.

Assignment 4: Develop multiple options for how to approach development of project and BIM model.

Week 3:   Critical Path Analysis & Planning:
Teams to discuss and debate approaches to project completion including determination of goals, planning of projected schedule, estimation of tasks and consideration of time constraints. Planned approach to be presented and approved by instructor.

Development of mockup set and drawings list. Development of critical path schedule.

Assignment 5: Teams to test options and report back during next class meeting.

Week 4:   Design Development Begins:
Teams presentations of proposed methodologies & schedules. Finalization of approach .

Test alternate approaches and refine project development plan. Develop equitable distribution of tasks among team members and develop multiple options for how information will be shared and how BIM model is to be developed.

Assignment 6:   Begin implementation of BIM based Design Development Model.

Week 5:   Development of Plans and Code Compliance:
Evaluation and modification of project plans for code compliance and life safety. Calculation of all corridor and egress widths, setting of floor to floor and building heights to accommodate building codes.

Assignment 7   Continue development of BIM model and Project Drawing set.

Week 6:   Integration of Mechanical Systems and Development of Reflected Ceiling Plans
Development and modeling of Mechanical systems in BIM model and modifications to building details and dimensions as required.

Assignment 8   Modify BIM model and Project Drawing set to accommodate mechanical systems.

Week 7:   Development of Structural System and Building Materials:
Development and modeling of Structural Systems and selection of building materials in BIM model. Exploration of structural systems and construction methods appropriate to building design concept.
Assignment 9   Modify BIM model and Project Drawing set to accommodate structural systems.

Week 8:   Development Exterior Wall Systems:
Research and selection of appropriate project wall systems. Investigate use of pre-cast concrete, masonry and curtain wall systems. Integrate systems with design and aesthetics of building project. Develop exterior elevations iterations for each system type and develop integrated facade system.

Assignment 10 Modify BIM model and Project Drawing set to accommodate wall systems.

Integrate exterior wall systems with mechanical and structural systems. Develop wall sections and details and update BIM model accordingly. Modify/Update exterior elevations and interior public lobby spaces to accommodate systems.

Assignment 11 Modify BIM model and Project Drawing set to accommodate facade design & systems.

Week 9:   Development of Roof Systems and Roof Structure:
Investigate roof options and develop long span structural system. Develop roof details and sections and update BIM model accordingly.

Integrate Roof System with building structural and exterior wall systems.

Assignment 12 Modify BIM model and Project Drawing set to accommodate facade design & systems.

Week 10:   Integration and Development of Vertical Circulation Systems:
Integrate elevators, stairs, escalators and other forms of vertical circulation to include fire & egress stairs as well as public lobby or atrium stair .

Modify/Update exterior elevations and interior public lobby spaces to accommodate systems.

Assignment 13 Modify BIM model and Project Drawing set to accommodate vertical circulation.
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Week 11:   Development of Project Structural and Architectural Schedules:
Develop architectural door, window, furniture, finish and component schedules. Develop structural schedules. Add appropriate drawings to drawing set.

Assignment 14 Modify BIM model and Project Drawing set to accommodate schedules.
                  Print 80% set of drawings for review and critique during next class session.

Week 12:   Finalization of Project Drawings, Details, Plans, Sections and Elevation Sheets:
Review of 80% complete BIM models and Project Drawing set. Self critique and markup of project drawings and development of strategic plan for completion of final drawings due in week 15.

Assignment 15: Continue development of BIM models & Project Drawing Set towards 100% completion.

Week 13:   Construction Management and Facilities Management:
Develop understanding of how BIM models are applicable to the Construction Management and Facilities Management processes.

Assignment 16: Develop presentation & report that evaluates use of team BIM model from a construction Management and Facilities Management perspective.

Week 14:   Project Report and Presentation Mockup:
Team presentations of Construction Management and Facilities Management Reports.

Team discussions and preliminary mockup of project reports and final presentations. Self evaluation and analysis of relative success of project and process. Identification of areas for improvement of methods to be applied on future projects. Preparation of report and final presentation.

Assignment 17 100% Completion of all project drawings & self evaluation report .

Week 15:   Final Presentation of Projects: