UCONN
UNIVERSITY OF CONNECTICUT

Classroom Design Guidelines

Planning Architectural and Engineering Services &

Classroom Management Committee
Revision 1: February 2016

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Introduction

The Classroom design guidelines were developed for the design of learning environments at the University of Connecticut (the University) by a team that included campus planners, architects, UITS, , Registrar Office representatives, Institute for Teaching and Learning staff, Facilities and Operations engineers, Disability, Procurement, EHS, and Fire Marshalls staff. The team solicited input from faculty and vice provosts.

These guidelines are intended to serve as a guide for future construction and renovations.

University of Connecticut Design Guidelines and Performance Standards are a roadmap to planning, designing and constructing the University facilities. The *Classroom Design Guidelines is an appendix* to the *University of Connecticut Design Guidelines and Performance Standards.*   The *Classroom Design Guidelines* are overarching principles to create functional, flexible and aesthetically pleasing classrooms. The University also has a set of policies and standards for measuring classroom utilization. These standards are contained the *Classroom Space Utilization Guidelines*, a reporting tool and a planning tool for determining the efficiency of classroom use.

The Classroom Design Guidelines are modeled after other universities, for example Stanford University, Arizona University, Oregon State University, University of Oklahoma, Minnesota State Colleges & Universities, University of Cincinnati, University of Maryland, and Utah System of Higher Education. This planning guide also references the Postsecondary Education Facilities Inventory and Classification Manual (FICM): 2006 Edition, classification names and numbers and to the Council of Educational Facility Planners International (CEFPI).

Classroom Space Utilization Policies and Guidelines
The purpose of *Classroom Space Utilization Guidelines* is to estimate the overall amount of classroom space that may be needed by an institution to meet the current or projected conditions for each type of room. These Guidelines are global in nature, institution-wide, and typically used in the preparation of facilities master plans, for setting capital project priorities, and for reporting utilization rates. The estimated amount of classroom space is compared to the actual inventory of classrooms on campus to determine need.

These *Classroom Space Utilization Guidelines* are not to be taken as absolute standards and, as such, there may be times when exceptions must be made. They are to be used in programming specific classrooms. When modifications are made to the Classroom Space Utilization Guidelines the University Classroom Management Committee will review and make recommendations.

University classrooms are rooms used for scheduled classes that are not limited in their use to a specific subject or discipline. University classrooms include general purpose/traditional classrooms, lecture halls, seminar rooms, and auditoria. In the calculation of space utilization, classroom space is defined as the square footage within the walls including the seating area, the circulation space, and any instructor/demonstration area. The storage/service area associated with the room is calculated separate.

According to The Council of Educational Facility Planners (**CEFPI**), utilization of classrooms is defined by the student station size, room use in terms of hours, and station/seat occupancy rate. The room use is the number of hours a room is in use or planned for use for scheduled classes, it is expressed as a percentage of the number of hours available in which to schedule classes. Station utilization rate is the percentage of seats/stations occupied or planned to be occupied during scheduled classes.

Spaces can vary by institution or campus, depending upon the existing or desired mix of classroom capacities, size of the institution, hours of use and types of programs. The station/seat space factor includes an allowance for students, instructor, and internal circulation. It can vary by room subtypes and type of seating, and depends upon the desired mix of room capacities. Architects should take into consideration the geometry of the room, since form can also impact the capacity of the room creating a less efficient space. The section below provides recommended space factors based on the various types of seating and room configuration.

Room type	Weekly Room Usage	Station Utilization	Station Size
Classrooms	35	70%	18-30 square feet
Lecture rooms	35	75%	16-22 square feet
Auditoria	35	75%	12-20 square feet
Collaborative/seminar	35	70%	25-30 square feet

Source: *'Space Planning Guidelines for Institutions of Higher Learning'* published in 2006 by the Council of Educational Facility Planners International *(CEFPI).*

Pedagogy and the Learning Environment
The University classroom continues to evolve and has, over the last decade, become a more active environment for engaging in learning. As we address these changes in learning environments, we need to consider the physical spaces in which we teach. The traditional classroom, one in which the instructor sits or stands at the front of the room and the students sit passively in rows, is no longer the primary space in which learning takes place. Flexibility, in both layout and technology, is essential in addressing the needs of both our faculty and students.

The University seeks to develop and foster a cooperative learning environment as one way to create more active student engagement in the classroom. Faculty and students want the ability to use portable and mobile technologies to facilitate collaboration and active learning. The cost and ease of use of new technologies and methods for engagement and problem solving require access to wireless access at a minimum as well as space for group work, problem solving and active discussions. Portable classroom hardware and furniture will enable us to adapt the classroom t to accommodate various styles of teaching and learning including discussion, group work, and problem-based learning opportunities, in addition to lectures.

Recent programming exercises for new buildings and subsequent feedback on the use of the current classrooms have resulted in the following common points of information:

- Faculty requests for flexible space in classrooms
- Faculty and student need for collaborative workspaces
- Faculty and student desire for mediated classrooms
- Ever increasing demand for special needs and accessible student furnishings.

The incorporation of web and interactive distance learning technologies has also prompted the reconsideration and design of learning spaces. Students should not be limited to physical classroom space and every opportunity to plan and install the infrastructure to support these technologies should be made for future learning opportunities across all of our campuses.

2. Review and Approval

2.1. Approvals

All proposed changes to the Classroom Design Guide shall be reviewed by the University Representative in conjunction with the University's Classroom Management Committee.

2.2. Discrepancies

Any discrepancies between these Classroom Design Guidelines and the *UConn Design Guidelines and Performance Standards*, *UConn's Accessibility Standards*, or the *ADA Standards for Accessible Design*, shall be resolved by the Office of Planning, Architecture and Engineering Services (PAES)

3. Room Definitions

Different pedagogical teaching styles require different types of learning spaces. The University's Classroom Management Committee has defined 4 basic classroom types that are prevalent on its campuses.

1. *Seminar/Collaborative Classrooms with movable tables and chairs which provide the instructor flexibility to arrange the class in small discussion teams or meet with the class as a whole. The category includes seminar rooms, which are typically small rooms, less than 30 stations, with conference style seating.*

2. *Traditional Classrooms: Classrooms are defined as having both traditional tablet arm chair configuration or narrow table and movable chair configuration. Room capacities typically range from 30 to75 stations.*

3. *Lecture rooms: Classrooms for large classes with either fixed table and chair seating or traditional theater type seating. Room capacities typically range from 75 to 150 seats.*

4. *Auditoria: Classrooms for large classes with fixed arm tablet chairs or traditional theater type seating. Room capacities typically exceed 150 seats.*

4. Room Characteristics

4.1. Seminar/collaborative classrooms

- Seminar/Collaborative classrooms are a subset of traditional classrooms in which the teaching methods require group work. The furniture is movable and flexible.
- Traditional/collaborative classrooms contain up to 30 non-fixed seats.
- Flat floors are required.
- 25 - 30 square feet per student accommodates flexibility in furniture arrangement to meet most types of pedagogy.

4.2. Traditional Classrooms

- Traditional classrooms are our most common learning spaces. They have movable furniture, and are

very flexible. Furniture can be rearranged to allow for lecture, seminar, group work, or anything else the instructor might require.

- Traditional classrooms contain 30 to 75 non-fixed seats.
- Flat floors are required.
- The first row of student seating should be a minimum of 1.5 times the width of the projection screen from the front of the room. Example: projection screen size 90"H x 120"W, first row of student seating would be 15'-0" from front of room. If not possible to maintain formula outcome, allow a minimum of 9 feet from the front of the room to the first row of seats.
- The instructor's station will require 10 square feet.
- 18-30 square feet per student accommodates some collaborative functions.

4.3. Lecture Halls

- Lecture halls are larger tiered classrooms, usually with either fixed seating or fixed tables and movable chairs.
- Lecture Halls contain 75 - 150 seats
- Tiered floors (aisles may be sloped but seating areas must be tiered)
- The dimensions of the seating tier or tray must easily accommodate movement behind seats
- Theater-style seating with attached tablets *or* fixed tables with free-standing chairs.
- A curved configuration is preferred where possible

4.4. Auditoria

- Auditoria are larger tiered classrooms, usually with fixed seating
- Auditoria contain more than 150 seats
- Aisles may be sloped but all seating areas must be tiered
- Theater-style seating with attached tablets are allowed
- A curved configuration is optimum
- The dimensions of the seating tier or tray must easily accommodate movement behind seats
- Primary entrances should be placed on the side walls rather than the rear wall whenever is possible to reduce the light reaching the projection screen when the doors are opened during the class.
- The auditoria should have double doors at each entrance
- Seats should have number plates

Note

The square feet per student ratio is proportionate to the space associated with the podium/front of room, and amount of circulation space required. If the function of the room requires a large stage area or specific circulation pattern, the overall square feet per student may be over guideline.

5. Design guidelines

5.1 General Applications

5.1.1 Locations

- Classrooms shall be located on the lower floors to minimize the amount of traffic that uses elevators or stairways. A building with mixed functions (classrooms, laboratories and offices) should separate the classrooms from other functions.
- Larger capacity classrooms should be located closest to the building entry.

- Building codes should provide criteria that would determine the numbers and locations of building entrances.
- The building design shall provide for ease of access and for convenient vertical mobility of students. In such cases, elevator studies must be provided to satisfy movement requirements especially between class changes.
- A directory that identifies classroom locations should be provided at each entrance along with a directory of other programs and activities located in the building
- Classrooms should be located away from noise generating areas such as mechanical rooms, elevators, vending machines, and restrooms. If physical separation is not feasible, increased acoustical treatments may be needed.

5.1.2   Interiors

- Every seat must have an unobstructed view of the teaching wall. No columns or other visual obstructions are allowed. As much as possible, the designer should avoid the placement of structural columns within the seating area.
- When movable seating is used, the capacity of the room should be posted within each room
- Ceiling height should be a minimum of nine (9) feet. The larger the room, the higher the ceiling should be.
- The design professional shall consult with the University's Representative on the choice of floor coverings and the color scheme used within the classrooms.
- A high-density plastic or wood chair rail shall be placed on the side walls surrounding the seating area.
- If windows are provided in the classroom, provide window shade system per section 6.3 of this standard document.
- Avoid placing fire-alarm enunciators in conflict with the dry-erase board.
- Projection screens mounted above the marker board must clear the board's marker (chalk) tray. Typically, provide 6"-8" clear from the face of the marker board to the back of the screen. The projection screen in its lowered position must not cover light switches and outlets.
- Ceiling-mounted or wall-mounted projection screens should not conflict with the lighting fixtures or access to lighting fixtures for changing lamps.
- Instructor consoles should be located so as not to obscure the students' sight line of the projection screen(s) and marker board(s).
- All classrooms with permanently installed multimedia equipment shall be connected to a security system in order to keep room(s) secure it is important to have adequate air flow, and possibly control of climate to avoid users opening windows and leaving them open. The security system shall include a card access reader; 1 accessible seat per 40 students. Some guidelines like this may be useful at the main entry door, door security contacts on each door and motion sensors in the room. Corridor walls (or common walls with other unsecured rooms) shall run from floor to underside of structure above. Special consideration should be given to wall or partition construction above the ceiling lines on the corridor side of the room.

5.2.   Hallways/Corridors

- Hallways should not only be part of the building design and aesthetics, but should also be viewed as an extension of the learning environment. They should always be as visually interesting as possible.
- Egress hallways should be sized to accommodate at least double the loads identified in code due

to the large number of students leaving and entering the rooms, and provide gathering space during class changes.
- Hallways should be viewed as an opportunity to improve classroom acoustics.
- Non-recessed doors that open into the hallways are to be avoided.

5.3. Informal Interaction Spaces

The design of adjunct teaching/learning space for small or one-on-one collaborative and instructional interaction is encouraged. Small spaces can be incorporated within lobbies, hallways or any other architectural opportunities that might be present.

5.4. ADA

Design all classrooms to comply with *ADA Standards for Accessible Design*
http://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm
and the University of Connecticut's Accessibility Checklist for Renovations and New Construction, which can be found at: http://www.csd.uconn.edu/docs
Any discrepancy between the ADA Standards and this document shall be resolved in design review.

5.5. Procurement Requirements

Classroom design services and/or the desired products must conform to guidelines established by the University and procured in accordance with established University policies and procedures through Procurement Services.

5.6. Classroom Storage

There is often a need for a small storage room for classroom supplies that is separate from the audio/visual storage. It should be approximately 100 square feet to store board supplies, movable lecterns and additional chairs. This space requires lighting, a lockable door, conditioned air, power, and a few shelving units for small supplies. It should have no window and needs to be equipped with a storeroom function lock. Classroom storage should be accessible from outside the classroom.

6. The Classroom Interiors

6.1. Design

Classrooms should be developed and designed from the "inside out". The following items should be considered when creating a new classroom:
- The optimum orientation and of the classroom should be determined by the primary expected teaching style, the capacity of the room, and the level of mediation.
- Generally, classrooms should be sized in a 2:3 or 3:4 width to length ratio. Long, narrow, style rooms are not acceptable.
- Lecture halls with capacities above 75 require tiered seating. A curved configuration improves visibility and student/instructor connectivity.
- Designing for the flexibility of room use is strongly encouraged. The more square footage allotted to each student, the greater the opportunity for flexibility.

- The total square footage of each room is to be based on the type of classroom, the specific capacity and the type of seating
- Classrooms with a capacity of 49 or less are to be as square as possible to allow for greater flexibility in furniture arrangement, and better sight lines.
- In classrooms where the instructor's workstation is movable, adequate space must be provided to allow the workstation to be positioned at least 3 feet away from the teaching wall.
- In classrooms with fixed tables and/or fixed seating, the front edge of the instructor's workstation must be at least six feet from the front row.

6.2. Door/Room Security and Emergency Evacuation

6.2.1. Door Hardware

- All classroom doors shall conform to *University of Connecticut Design Guidelines and Performance Standards*. Additionally, classroom doors should have the following:
- Concave wall bumpers installed at an appropriate height to assure wall protection.
- Door silencers to muffle the noise of the door closing.
- ADA accessible doors and hardware as specified in *ADA Standards for Accessible Design.*

6.2.2. Doors

- Doors should be located at the back of the classroom to ensure that students who are entering or exiting the space will not disrupt instruction. Exceptions include large tiered classrooms or auditoriums, since those kinds of spaces can require multiple doors. In rooms that require two or more egress points, the doors should be located as far from the presentation area as possible while still meeting current building codes.
- Each door leaf to be a minimum of 36" wide, including those used in pairs at double doors.
- No strike mullion on double doors.
- Door opening force, hardware, width, thresholds and maneuvering clearances should comply with ADA Standards.
- Occupancy within the classroom should be clearly (but discretely) visible from the hallway.
- Any viewing device must be positioned to meet ADA standards. Door shall be equipped with a vision panel made of shatterproof glass and tinted to reduce light transmission.
- The area of the glass shall not exceed 100 square inches and should be double-paned with acoustically rated seals. Doors without vision panels shall have either a viewer peep hole installed to provide a view into the room to check activity or have a separate sidelight.

6.3. Windows

- Daylight is an important part of most learning environments. Windows should be included in classrooms whenever possible.
- Design for easy accessibility. Window coverings shall be manually operable, chain driven roller shades. Where roller shades are not feasible, manually operated window treatments are acceptable. .
    - When necessary due to window height, a fixed valance or sun blocking panel can be hung at the top of the window, and an adjustable height, manually operated roller shade can be hung at the lower termination point of the fixed valance/panel
    - Use of a light diffusing roller shade in conjunction with a room darkening roller shade is recommended whenever possible. Percentages of light diffusion will be determined for

each window by evaluating the individual window's orientation and the intensity of the exposure.
- All window treatments are required to have a non-reflective matte finish and unless otherwise specified, the color selection should match or blend with the window frame. The blinds should be installed so they cover the window opening as completely as possible.
- Use of a light diffusing roller shade in conjunction with a room darkening roller shade is required. Percentages of light diffusion will be determined for each window by evaluating the individual window's orientation and the intensity of the exposure.
- All window treatments are required to have a non-reflective matte finish and unless otherwise specified, the color selection should match or blend with the window frame. The blinds should be installed so they cover the window opening as completely as possible.
  - Vertical blinds, drapes and motorized systems are not desired and discouraged. However, in instances where motorized is the only feasible solution because of access, the motorized mechanisms are to have non-plastic, heavy-duty operating components and the controls shall be located at the instructor's workstation on the AV touch panel. The Designer is responsible for
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6.4   Flooring

- Specify an anti-static, high traffic, commercial grade carpet tile. No solid or light colors are permitted.
- All carpet tile and broadloom must conform to the University's "green" guidelines. Carpet shall have a high recycled content. All demolished carpet to be recycled when renovations occur.
- A four-inch or six-inch cove base must be included when carpet is specified.
- If carpet cannot be installed underneath fixed seating, all aisles and other open areas must be carpeted.
- All aisle risers must be of contrasting color to the remaining floor to highlight level change.
- Aisle riser nosing we prefer to be metal. Vinyl and rubber nosing do not holdup in high traffic areas such as University Classrooms.
- Vinyl composite tile flooring is also an acceptable flooring finish in order to meet budgetary constraints.

6.5.   Walls and Ceilings

6.5.1.   Walls

- **Internal** classroom walls shall run deck-to-deck, with a Sound Transmission Coefficient (STC) rating of 50 minimum.
- Folding or moveable walls must meet the STC rating of 50 and should be specified for unique use only.
- Walls in lecture halls should be designed to provide the optimum acoustical environment. (See Acoustical Section 9)
- Walls to be painted in an eggshell finish. No wallcoverings should be used. No-VOC paint should be used to improve Indoor Air Quality (IAQ).

6.5.2.   Wall Protection

- Apply chair rail on the rear and side walls of University Classrooms that are non-masonry containing movable student furniture.
- Chair rail material should be wide enough to work with tables and chairs of varying proportions and must be mounted at a height that will prevent damage to wall surfaces. Typically, the chair-rail will be 6" – 10" wide and the bottom edge will start approximately twenty-five inches above the finished floor.
- Silhouette 8" wall guard or approved equal. Rails shall match the design of the room.
- Outside wall corners (such as entry recesses) shall receive corner guards 4'-0" A.F.F. applied so that students cannot work them loose.
- The finishes used in a classroom should be chosen with the room's acoustics in mind.

6.5.3. Ceilings

- To accommodate classroom lighting and technology requirements, the ceiling height of all classrooms should be as high as possible. Nine (9) feet shall be the minimum ceiling height, although Ten (10) to Twelve (12) feet above the finished floor is preferred.
- In large sloped or tiered classrooms, the ceiling height is directly related to the distance from the front of the room to the last row of seats. Ceilings in lecture halls should be at least 9 feet high at the rear, and the ceiling height at the front of the room must accommodate the appropriate screen size.
- The surface of the ceiling must be designed to accommodate the required acoustical properties of the room. Ceiling panels shall have a Noise Reducing Coefficient (NRC) between .65 and .85, and a STC of 50.
- The ceiling should act as a sound mirror, reflecting sound downward to blend with direct sound.
- Ceiling material to be non-sagging (humidity resistant) lay-in acoustical tile for most ceiling areas. Nominal size 24" x 24" or 24" x 48".
- Access for the maintenance of technology, power, etc. must be included where applicable.

6.5.4. Vertical Writing Surfaces. Include Smart Walls

- Fixed-height whiteboards should be mounted with the bottom edge at 36 inches above the floor.
- Each whiteboard should have a continuous marker tray below each marker board. Do not mount marker holder to wall due to marker bleed ruining wall finish.
- At the top of the whiteboard, a tack board strip and clips for display materials are required.
- Multiple boards may be required depending on programming.
- Boards should be located on at least two different walls. A board must always be installed on the front teaching wall; the other wall/walls should be selected as appropriate to the layout of the room.

Sizes

Capacity of room	Minimum Writing Surface Dimensions
0-25	12 ft. wide x 4 ft. high
25-75	20 ft wide x 4 ft. high
75-100	30 ft wide x 4 ft. high – may be tiered
Lecture hall	Determined based on space available but at least 3 sections of 12 ft. x 4 ft. with tiers

NOTE: Single boards may not be longer than 12 feet (accessibility to classrooms through doors and elevators)

6.6. Signage

6.6.1. Room Identification Sign

Each room will have a standard room identification sign mounted near the door on the lockset side (exterior of room), mounted at a height as indicated by *The ADA Standards for Accessible Design.* See Design Guidelines and Performance Standards for details relating to interior signs.

6.6.3. Maximum Occupancy Sign

Provide maximum occupancy sign to be mounted in rear of room at a height high enough to discourage students from removing it. See Design Guidelines and Performance Standards for details relating to interior signs.

6.7. Colors/Finishes

- Accent walls are desired. Avoid using accent color on front wall or walls that might reflect onto projection screen.
- Specify highly durable finishes that are easy to maintain.
Use of approved "green" products in all applications is required,

http://www.ecohusky.uconn.edu/living/cleaning.html

6.8. Reflectance Values

- The Engineering Society of North America recommends the following reflectance values for finish materials.
  o Ceilings – 80% or higher
  o Non-accent walls - between 50% and 70%
  o Floors - between 20% and 40%
- Reflectance values of paints, laminate and other finish materials should be selected to enhance ambient illumination and the illumination at the instructor's and student's work areas. Recommended value - between 40% and 60%.

7. Furniture

The University Representative is to be consulted regarding all current furnishing specifications and standards when department needs arise.

7.1. Tables/Work Surfaces

Typical work surfaces found in most teaching classrooms are inadequate for today's university student. The tablet-arm chairs used do not allow students to take notes while referencing textbooks or others materials. Also, without specially configured chairs, a left-handed student must contort themselves to utilize the tablet. Therefore, a much larger surface area must be provided to comfortably accommodate basic needs of left or right-handed students. Tables and work surfaces should be ergonomically functional and comfortable according to the application (e.g., standard versus technology classrooms). Adjustability and variety, particularly in height, should be provided to accommodate the broadest range of users.

7.1.1   Design Standard

- Tables can be for 1, 2, or 3 students allowing a minimum of 30" per student. The number of students per table is flexible and is determined by the type of classroom and the configuration of the classroom.
- To allow for note taking and reference materials the minimum work surface area should be 3.75 square feet per occupant.
- Depths of table vary from 18"-24" based on room layout, 18" wide tables are preferred with 3' space in front.
- Modesty panels are allowed for tiered rooms
- Fixed tables with cantilevered pivot arm seats are not allowed. If fixed tables are installed, provide loose seating with casters.
- Tablet arms should be considered only related with theatre seating.
- Provided tablet size should be equal to or larger than 12 inch x 15 inch (1.25 square feet).
- - 10% - 15% of the tablet work surfaces should have a left-handed orientation.
- Tables shall be selected that facilitate cleaning of the floor surface, and require minimum maintenance of the seat covering (if applicable).
- Provide written warranty for all proposed furniture. UConn requires a minimum of 5-year warranty and prefers a 10 year or longer warranty on all furniture items.
- When casters are specified on seating, insure that the casters are the correct type of the floor finish (carpet, VCT, etc.)
- Furniture must be able to interface with technology (i.e. pathway for power/data)

Matrix of types of seating in classrooms

	Tiered	Fixed Seat	Fixed Table	Moveable Seat	Moveable Table	Tablet
Seminar	N/A	N/A	N/A	X	X	N/A
Classroom	A	N/A	A	X	X	N/A
Lecture	X	A	X	A	N/A	A
Auditorium	X	X	N/A	N/A	N/A	A

X Preferred   A Acceptable   N/A Not Acceptable

7.1.2.   Construction/Fabrication

- Laminated work surfaces shall be constructed of high-pressure plastic laminate applied to solid wood or hardwood plywood. Tops shall have a non-glare. Medium tone surface to reduce eye strain.
- The legs of fixed tables should not block the student's knee space within the 30-inch work space allotment. Table legs should not impede configurations that allow additional students to work collaboratively.
- Table edge to be a heavy-duty extremely durable material. Edge banding can be T-mold or glued into place as long as the application is sufficient to prevent removal by a knife or other sharp object a student may have.

7.1.3. Clearances

Widths between aisles of tables to range from 32" – 36" depending on room layout and number of students serviced per aisle.

7.1.4. ADA

In cases where fixed tables and loose chairs are used or where fixed seating with tablet-arms is used, adjustable-height ADA tables must be provided. Insure that 36" clear behind table is maintained for access. Refer to the University's Division of Student Affair's accessibility checklist for additional requirements on renovations and new construction project designs.

7.1.5. Replacement Availability/Warranty

- Work surfaces/Tables shall be procured from "name brand" manufacturers that demonstrate proven track records in the marketplace, and maintain stock levels that insure replacement can be made without timely backorder delays.
- Provide written warranty for all proposed furniture. The University requires a minimum of a 5-year warranty and prefers 10 year or longer warranty on all furniture items.

7.2. Seating

Seating should be selected that will meet minimum comfort standards and still satisfy the requirements of Uniform Building/Fire Codes, cost, durability, functional comfort, appearance/finish, and performance over time. Chairs should provide good ergonomics through variety of seating or adjustability with the goal of being comfortable for use by people ranging in size from the 5th percentile (4'-11" tall, approximately 113 lbs.) to the 95th percentile male (6'-2" tall, approximately 246 lbs.).

7.2.1. Design Standard

When selecting seating in order to achieve minimum standards of ergonomics and comfort, aspects such as width, depth and height of seat, type of lumbar support, adjustability, and variety should be considered. Other important elements to consider are versatility of seating, appearance, replacement availability/ease of maintenance and cost.

7.2.2. Seating Ergonomics and Comfort

- To the extent possible, adjustable seating (e.g., in seat depth, width, height) or a variety of seating should be provided to accommodate the ergonomic needs of the broadest range of users.
- Auditorium fixed seat width to be at 24 inches unless restricted by row curve.
- Tablet arm seat size of 2'8" with 1'0" space in front with tablet arm in its usable position (per CT code), for 200 and more seat auditoria
- The front edge of seats should have a waterfall profile that slopes downwards.
- All seating shall have proper lumbar support to accommodate the broadest range of users, with a backrest that conforms to the natural curvature of the spine and allows for articulating movement.
- In areas of fixed seating, additional seating should be provided that provides flexibility for individuals who are unable to utilize the fixed seating. This seating should conform to the design of the fixed seats.

7.2.3. Seating Clearances

To ensure adequate circulation through the learning spaces, minimum clearances must be maintained.

7.2.4. Appearance

- The appearance shall be coordinated with the interior of the classroom and meet the acoustical requirements for the space. Light colors are discouraged.
- Upholstered seating shall be used in large auditoriums or lecture halls only where reverberation of sound is a problem. All other rooms to have non-upholstered seating.
- The construction and materials should be selected so that their color and surface are consistent with the other furnishing within the classroom.

7.2.5. Replacement Availability/Ease of Maintenance/Warranty

- Chairs shall be procured from "name brand" manufacturers that demonstrate proven track records in the marketplace, and maintain stock levels that insure replacement can be made without timely backorder delays.
- Chairs shall be selected that facilitate cleaning of the floor surface, and require minimum maintenance of the seat covering (if applicable).
- Provide written warranty for all proposed furniture. UConn requires a minimum of a 5-year warranty and prefers a 10 year or longer warranty on all furniture items.
- When casters are specified on seating, insure that the casters are the correct type of the floor finish (carpet, VCT, etc.)

7.2.6. Quality

High quality seating shall be purchased to minimize the long term life cycle costs since funding for equipment replacement, repair, and maintenance are becoming increasingly difficult to obtain.

7.2.7. ADA

ADA accessible seating in classrooms should comply with *UConn Accessibility Standards*.

7.2.8. Versatility

- Fixed seating shall be provided in all large lecture halls, and shall be constructed of cast iron or steel frames. Auditorium seating shall have retractable tablet arms.
- Non-theatre lecture seating requires free-standing, chairs with casters.
- In lecture rooms where programs will typically exceed 2 hours, padded seats and backs should be selected.
- Fixed auditorium seating may require electrical/data outlets, based on programming needs.

7.3. Instructor Classroom Furniture Accessories

Teaching classrooms should be equipped with proper lecterns, podiums, and tables. In providing this equipment, attempts should be made to maintain aesthetic and functional compatibility with the overall decor of the room.

7.3.1. Design Standard

- Small sized rooms with less than 35 seats. Provide a 25-inch lectern with 13 space Av equipment rack and small storage space.
- Medium sized rooms with less than 100 seats. Provide a table with detachable 33-inch lectern with 13 space rack and separate computer bay and a stool to be placed at the front of the room.
- Large rooms with more than 100 seats. Provide a 43-inch instructor's podium with space for two 33 inch AV equipment racks and availability of a seminar table with lectern and stool.

7.3.2. Teaching Stations (Lecterns)

Seminar	Classroom	Lecture	Auditorium
P	F	F	F

P Portable table type   **F Floor type**

Room	Table Top	Table with Lectern	Podium	Stage
Seminar	X	A		
Classroom	A	X	X	
Lecture		X	X	
Auditorium			X	A

A Acceptable   **X Preferred**

7.4. Types of Furniture to Avoid

- Tablet arm chairs in non-theatre style seating applications
- Pivot arm seats
- Pedestal seats that are bolted to the floor

7.5. Miscellaneous Classroom Items

- Clocks are required in each classroom. They should be large and easy to read with a simple black frame. It should be placed on the back or side wall in a location visible to the instructor. Never locate the clock at the front of the classroom. Battery clocks are required but must be "noise free".
- Recycling and trash receptacles are required in all rooms.
- Containers shall not encroach on circulation paths.

8.   ADA Classroom Guidelines
- Access for both students and faculty should be considered.
- Teaching areas must be accessible.
- Large classrooms should provide a choice of wheelchair accessible seating.
- Federal design standards specify requirements for new construction.

8.1.   Assembly Areas
- Auditoriums should provide access not only for those in the audience but for speakers, etc.
- Assembly areas that accommodate numerous public forums may be required to provide FM systems to accommodate hearing impairments (ADA design standards provide guidance on this).

8.2.   Study Areas
- A reasonable number of accessible carrel areas (if these are provided) and other comparable access should be available.
- Small study rooms for special uses such as exams should be considered in planning new space.

8.3.   Traffic Flow
- Thought should be given to how students, faculty, staff, and the public move about space in facilities.
- Restricted hours on weekends and other times should be considered.
- If certain entrances and exits are affected for security or other reasons, thought should be given to the impact on access to important areas of the facility, such as the library.
- Card access control systems or telephone access to secured areas after hours should be accessible to people with vision and learning impairments. These should also address the limits of people with mobility impairments.
- Thought should be given to emergency evacuation plans for individuals who cannot use stairs.

8.4   Other Issues
- Although physical plant access usually involves individuals with mobility impairments, having telephone facilities for individuals with hearing impairments and barriers affecting individuals with visual impairments should be taken into account in planning.
- The ADA regulations specify Telecommunication Device for the Deaf (TDD) requirements.

8.5   New Versus Existing Facilities
- ADA and Rehabilitation Act both have requirements relating to new versus existing facilities. The requirements are different, but some retrofitting is contemplated for existing facilities.
- All new buildings and alterations must meet applicable accessibility standards.
- Construction after June 3, 1977 is considered new construction under Section 504 of the Rehabilitation Act
- Construction after January 26, 1992 is considered new under the ADA
- New Construction - Specific design standards found in regulations.

8.5.1 Existing Facilities
- Title II (public institutions) - program, when viewed in its entirety, must be accessible. - 28 CFR Section 35.150; 56 Fed. Reg. 33708-710 (July 26, 1991).
- Title III (private institutions) - barriers must be removed to ensure access to extent it is readily achievable to do so. Readily achievable means easily accomplishable without much difficult or

expense. When not readily achievable, alternate methods of providing services must be implemented. 28 CFR Section 35.304; 56 Fed. Reg. 35568-571 (July 26, 1991).

8.6 Signage and Information Communication

The ADA and Rehabilitation Act design standards reference signage. These requirements refer to door numbering location and appearance and tactile requirements.
Student handbooks and information provided to the public should include information on access, parking, etc. Handbooks should include the following regarding physical plant issues:

8.7 Technology Issues

- Assistive technology for individuals with hearing and visual impairments should be considered.
- Assistive technology for students with learning disabilities impacting ability to use print should be considered as well.
- Voice input technology should be considered for those with disabilities impacting ability to keyboard or write long hand.

8.8 ADA Tables

All ADA tables must comply with the ADA Standards for Accessible Design
http://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm
and the University of Connecticut's Accessibility Checklist for Renovations and New Construction UCONN's Accessibility Standards, which can be found at
http://www.csd.uconn.edu/docs/ACCESSIBILITY_CHECKLIST_FOR_CONSTRUCTION_Spring_2011.pdf
in UCONN's Design Guidelines.

9. Lighting and Electrical

9.1. Lighting Zones

As a rule, all classroom spaces will have LED lighting organized into a number of zones and controlled from instructor's station through the AV control system and at the entrance doors. These zones can be combined and dimmed to create any number of different lighting scenarios. Classroom lighting should include day lighting, multi-modal lighting, controllability, and optimize energy performance. A room can be zoned based on the amount of day lighting available, with each fixture responding to the amount of light at any time and location.
The zones described below are functional zones. There are five functional lighting zones in most classrooms:

- Zone 1 – Main classroom lighting (student seating area) this zone services students and allows them to read and take notes in class. Use multi-directional recessed (lay-in) fixtures that cast a modest amount of light downward (35%) and a larger amount of light toward the ceiling (65%), provides a comfortable overall lighting with relatively high efficiency. Avoid pendant mount fixtures.
- Zone 2 – Instruction area (front of classroom and lectern area). Design whiteboard and demonstration table lighting to provide visibility when the room lights are at full intensity. The foot candles is this area should be consistent with the overall lighting of the room.
- Zone 3 – Non-projection white board (board that is not obscured by a lowered projection screen).

Lighting of white boards during concurrent AV presentations allows instructor to write on the board while in projection, without light bleeding over onto the projected image.

- ▪ Zone 4 – Projection white board (board that is obscured by a lowered projection screen) Use the same requirements as Zone 3 during non-projection mode.
- ▪ Zone 5 – Instructor workstation. The instructor should be able to read notes and use on-board AV equipment with low-light conditions of projection mode.

Foot Candle (fc) Guidelines*

	Day Lighting Mode	General Mode / Non-Day Lighting	AV Mode
Student desk	30 fc min 150-200 max	30 fc min 70 fc max	10 fc min
Whiteboard	30 fc vertical min	30 fc vertical min	na
Screen	na	na	8 fc vertical allow 8:1 video image with 3000 lumen projector
Walls	10 fc vertical	10 fc vertical	na

*Based on the *"IESNA Lighting Handbook Reference and Application"*, Ninth Edition

9.1.1. Emergency Lights

Isolate emergency light radiation away from the projection screen.

9.1.2. Color Temperature

The color temperature for all light fixtures should be the same. The color temperature goal is 3200 degree Kelvin. Color temperature range of 3000-3500 degree Kelvin is acceptable as long as all of the fixtures are the same.

9.1.3. Motion Sensors:

Motion sensors are preferred in all rooms. When installing motion sensors, be sure to set timer to maximum to avoid light shut off during low-motion activities such as test taking.

9.2. Electrical

9.2.1. Wall Outlets
- Place outlets on walls of the classrooms at 6' intervals or as necessary to allow for 30%
- Student utilization. How are student laptops and other charging stations to be considered? There could be a need for up to 100% of students needing access to power even in a lecture hall setting.
- Wall outlet intervals in the lecture halls are not as critical. Follow code to determine the appropriate number.

9.2.2. Ceiling Outlets
- Install one AC power duplex outlet attached by flexible conduit to a J-box located in the suspended ceiling to allow for the future installation of a data projector. AV design consultant shall identify exact location of power and data location needs based on the size of the room.
- Install one single-gang data outlet in the ceiling. Location of data shall be determined by the AV

design consultant based on the size of the room.

- Provide 120V power capped and switched at a J-box located at the front of room above the suspended ceiling to allow for the future installation of a low voltage motorized screen controller.

10. HVAC & Fire Prevention

- Classroom sound and lighting systems must be designed to accommodate emergency alarms (Fire) and alerts (Mass Notification). Override features should be included for sound controls and room lighting to be tied into alarm/security systems.
- AV design consultant shall adhere to all code requirements.

11. Acoustics

When classrooms are located within close proximity to functions that generate significant noise levels, higher STC ratings and special wall-construction details must be included for all interior walls, elevated slabs, floors and exterior walls (including doors and windows). Provide for sound attenuation to contain noise generated from adjacent locations and from both above and below the classroom location.

- The review of acoustical requirements for classrooms by an acoustical consultant is recommended whenever possible.
- Minimum NC ratings: 0-59 seats: NC30-35 or less; 60 to 149 seats: NC 25-30 or less; 150+ seats: NC20-25 or less.
- In all cases, walls in classrooms should have a minimum sound transmission class (STC) of 50 as recommended: ANSI S1.4-1983 (R 2006).
- Individual equipment such as fans, ductwork and diffusers shall have ratings not exceeding NC 25 throughout the load range as recommended: ANSI S12.60-2002.

12. High Tech Classroom Technology

The University of Connecticut classroom design continues to evolve as Teaching and Learning methods evolve. The University strives to ensure proper infrastructure is provided for classroom technologies in order to alleviate future construction costs.

Classroom designs should follow the criteria below, which are ranked by order of importance.

- Classroom technology design should allow for intuitive operation.
- AV systems should share a consistent look and feel throughout the University.
- The design should be cost effective and not overly complicated.
- Consideration must be given to ensure ease of support. Equipment standards are being formulated, please contact the University Representative in conjunction with UITS AV for a list of standard equipment.

12.1. Network Requirements

Wired data connections are needed at the teaching station area (6), the projector (1), and to the fixed computers if applicable. Wireless networks are considered a supplement to the classroom network. These connections should be consistent with the IT approved network architecture design.

12.2. Instructors Station / Podium

The teaching station can be wall fed or floor fed though a floor box depending on room size and requirements. When poke-thru devices are not feasible due to structural limitations or costly abatement, use low profile floor-mount raceway system. With the proper conduit infrastructure in place, the teaching station can range from a simple table housing a laptop connection to a permanent PC station offering rack mount equipment, microphone, document cameras, interactive monitor, audience response system, class capture (podcast), and videoconference gear. The University uses AMX control systems to standardize and simplify room control as well as provide network administrative functions such as equipment status.

12.3. AV Packages

The University strives to provide the basic mediation package in each classroom. The level of mediation provided is based on such variables as size and shape of the room, teaching style and discipline-based need.

Audio Visual package options:
- **"Tech Ready" Classroom Capabilities (1 to 35 students)**

  Instructors Station, 23" Podium with stool.
  Digital Video Projection, image size adequate for furthest viewing distance.
  Touch Panel control of AV equipment, lighting and projection screen, standardized GUI layout.
  Podium Computer with DVD/CD player, Microsoft Office suite, vPC for specialized software, Network connection and accessible USB ports.
  Preview Monitor/Annotation tablet, Smart Technologies.
  Auxiliary input cables for Analog VGA with audio, Digital HDMI, Network connection, analog video and stereo audio.
  Smart Board where requested, furthest viewing distance is 27 ft.

- **"High Tech" Classroom Capabilities (36 to 99 students)**

  Instructors Station 33" or 43" Podium, with goose neck light and gooseneck mic and stool.
  Digital Video Projection, image size adequate for furthest viewing distance.
  Touch Panel control of AV equipment, lighting and projection screen, Blu-Ray controls, standardized GUI layout.
  Podium Computer with *DVD/CD player, Microsoft Office suite, VPC for specialized software*, Network connection and accessible USB ports.
  Preview Monitor/Annotation tablet,
  Digital Document Camera.
  Blu-Ray Player.
  Wireless Microphone, lapel with body pack. *Users must provide their own batteries.*
  Auxiliary input cables for Analog VGA with audio, Digital HDMI, Network connection, analog video and stereo audio.

- **"Lecture Hall and Auditoria" Classroom Capabilities (100 and up, students)**

  Instructors Station 43" Podium with stool.
  Digital Video Projection, image size adequate for furthest viewing distance.
  Touch Panel control of AV equipment, lighting and projection screen, Blu-Ray controls with standardized GUI layout.

Podium Computer with *DVD/CD player, Microsoft Office suite, VPC for specialized software*, Network connection and accessible USB ports.

Preview Monitor/Annotation tablet, *Smart Technologies*.

Lecture capture VTC device capable of recording the instructor via HD camera and content capture with up to 1080 resolution. This system should be controllable through the touch panel to allow it to be an effective "teach from" video conference room.

Instructor confidence monitor/Instructor monitor (when in video conference mode) located toward the rear of the room, but viewable from the instructor podium.

Digital Document Camera.

Blu-Ray Player.

Support Monitors allowing for obstructed view seats, sized adequately for furthest viewing distance.

Wireless Microphone, lapel with body pack. _Users must provide their own batteries._

Assisted listening system.

Auxiliary input cables for Analog VGA with audio, Digital HDMI, Network connection, analog video and stereo audio.

- **Video Conferencing:**

  The standard iTV classroom will be an extension of a Tech Ready, High Tech Classroom, or Lecture Hall system with an addition of one or two (depending on room size and layout) flat panel displays on either side of the projection surface. A classroom camera will be mounted in-between the projected surface and the monitor on the instructor station side of the room. In rooms which do not use in-room microphone amplification, an automatic tracking camera will be used. There will be a flat panel monitor mounted at the rear of the room, this monitor will typically be larger than the front monitors to allow an instructor to identify remote students. Immediately next to the monitor will be a second camera pointed in the direction of the instructor station. Hanging ceiling microphones will be mounted in the ceiling to provide adequate room coverage, while being mounted away from noise generating sources (air handlers, etc.). An instructor microphone port will be provided at the teaching station, along with a wired lavaliere microphone. This microphone can also be used for in-room amplification, but must also be connected to a microphone input on the codec. The touch panel interface must be an approved design and will allow remote access for support staff.

12.4. Projection Screens

12.4.1. Location

Multiple screens may be required. The number of screens required is based on the type of seating, seating capacity, the configuration of the room, and the primary instruction style.

Where possible in the Tech Ready and High Tech style classrooms, the University recommends angling the screen in the corner of the classroom to both maximize the viewing angle to the audience and increase free whiteboard writing space. Angle-mounting the screen must typically addressed in building planning stages since it usually requires detailing reflected ceiling plan to address ceiling grid and lighting. If angle-mounting the screen is unfeasible, screen placement

should still remain opposite from the teaching station area on the teaching wall to maintain whiteboard surface. *(Please see Figures 1 and 2).* Ceiling height is also critical when planning the layout of a Classroom. The University recommends a minimum of nine (9) feet finished ceiling height to accommodate both lighting and technology.

The higher the ceiling, the larger the screen and image size it can accommodate. Screens should drop no lower than 48 inches from the floor.

12.4.2. Size and Automation

All projection screens must be 16:9 or 16:10 aspect to accommodate high definition format.

To calculate the distance from the projection screen to the seats the following formulas are adequate:

- Minimum distance to front row = 2x the image height
- Maximum distance to back row = 6x the image height

12.5. Wireless Access Point

Enclosure should be required within ceiling- or wall-mounted enclosure dependent upon room layout and ceiling height access. Category cabling and POE Ethernet according to University's UITS specifications.

12.6. Infrastructure

Please reference University's UITS design specifications.

12.7. Special Conditions

There may be rooms that will require discipline-based equipment or additional technology, such as media systems, not listed in these guidelines.

Appendix 1 - Layout examples of existing classrooms

1.1 Seminar/collaborative classrooms

1.2 Traditional Classroom layouts
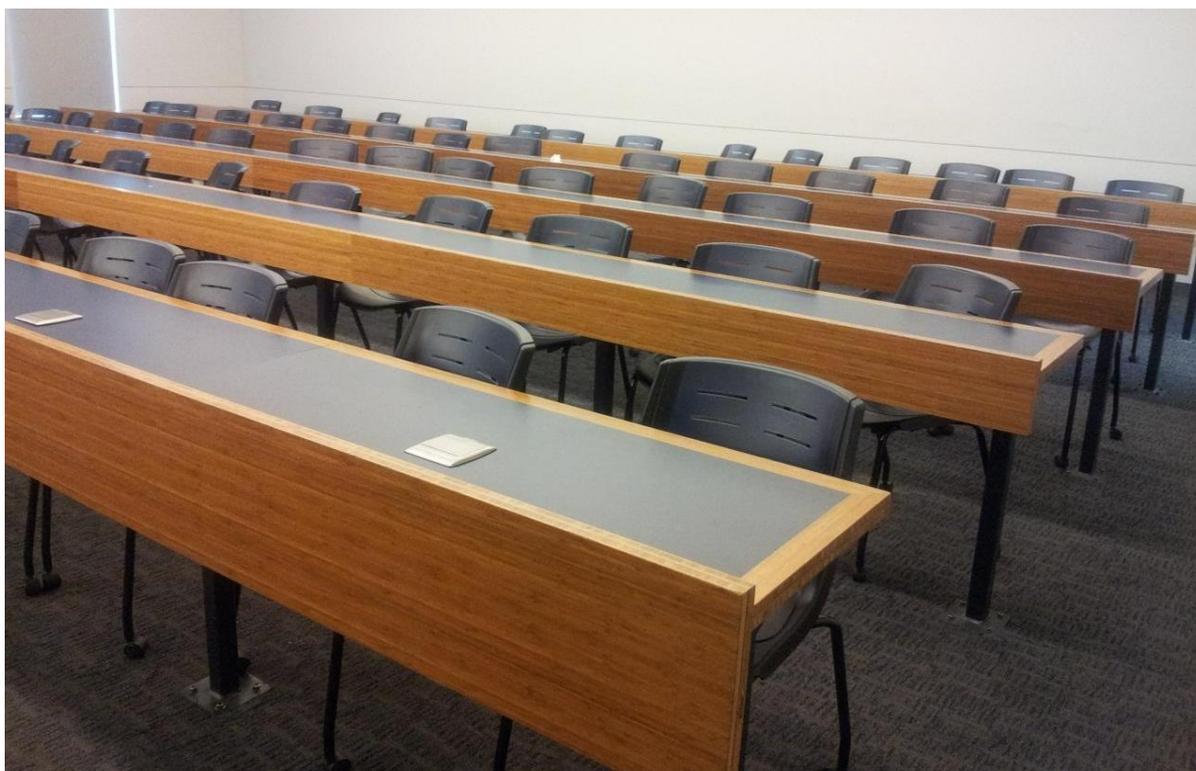
1.3 Lecture Halls

1.4 Auditoria