



MODEL CLASSROOM DESCRIPTION AND REQUIREMENTS INDIANA UNIVERSITY, BLOOMINGTON

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OVERVIEW

A comfortable, well-designed classroom invites student learning. Classrooms are intended to provide a good learning environment, encouraging collaborative work and incorporating the use of multimedia.

Instructor/student interaction is important and is facilitated by good eye contact, type of seating, large aisles, and good acoustics. Technology available may include installed presentation technology, analog and digital storage devices, computer network connections, and touch screen systems controller. All new classrooms are designed to include installed presentation technology.

INTRODUCTION TO CLASSROOM CONSIDERATIONS

Two major trends in teaching and learning will affect the design of classrooms and lecture halls for some time to come: group collaboration and the use of technology. A third major change affecting space needs in the classroom involves students' increasing demand for more comfortable surroundings, including furniture that is larger, flexible, and reconfigurable.

Increasingly, instructors are developing new ways to promote active learning, in which the lecturer periodically becomes a "guide on the side" rather than a "sage on the stage." In addition to the traditional lecture with passive listening and note taking, instructors are introducing collaborative and interactive formats. Students are broken up into small work groups, given a task to perform, and perhaps asked to report back to the class as a whole.

The current teaching/learning process exploits a broad range of classroom technologies: PowerPoint presentations, Web-based modules, DVDs, audience-response systems, wireless microphones, annotation devices, application sharing, and use of student laptops. These pedagogical trends are likely to continue into the future, and the design of an effective classroom must provide for them. In all of the classrooms below, with the possible exception of the seminar rooms of the smaller size, lecturers will rely heavily on the use of technology to present their material. Therefore good sightlines and acoustics in the room become of paramount importance.

Classroom types and furniture considerations:

There are four major general purpose classroom categories, each of which may have several subcategories to accommodate different learning environments.

- Seminar Rooms (up to 24 students),
- General Classrooms (25-49 students),
- Lecture Halls (50-100 students),
- Auditoriums (101 or more students)

The Seminar Room: Up to 24 stations, with a flat floor and movable tables and chairs. This room accommodates small classes with an emphasis on the exchange of ideas between and among students and instructor. Generally, these have a capacity no greater than 24. A conference table or tables in an open square is used to promote face-to-face interaction.

The General Classroom: Between 25 and 49 stations, with a flat floor. These classrooms will combine lecture with group work and discussion. The preferred furniture is movable tables and chairs to optimize flexibility and provide break out space for group work. If movable tablet arm student desks are used, they should be chosen

with good seating ergonomics and generous writing/laptop surfaces. There should be multiple presentation display possibilities and writing surfaces on the walls.

The Lecture Hall: Between 50 and 100 stations with a flat or stepped/sloped floor, depending on room dimensions. The preferred furniture arrangement in these rooms is fixed tables and moveable chairs. These classes will accommodate group work as well as lectures. To facilitate group work, each tier of steps should hold two rows of seats, allowing students to turn around and work as a team with students in the row behind them. Rows should have an even number of seats to avoid orphan seats. Multiple writing surfaces should be available on as many walls as possible. Acoustics and sound amplification should allow students and instructors to be heard without strain. A reverb time less than 1/2 second is desirable.

The Auditorium: Over 100 stations, stepped or sloped floor, with fixed auditorium style seating. Although lecture enhanced with presentation technology will be the primary teaching method, there should be as many features as possible promoting interaction between and among students and faculty. These can include grouping seats in clusters to facilitate multiple in-room breakout areas as well as more and larger aisles to allow instructors to easily circulate among students. Since it is often difficult to hear and be heard in larger classrooms, a sufficient number of wireless microphones should be available for faculty and student use. Multiple writing surfaces should be available whenever feasible.

Room configuration and features: Rooms should be configured to accommodate use of multimedia and to enhance interaction between instructors and students, as well as between the students themselves.

The shape of the room is very important, as it affects both sight lines and acoustics. In general, a room that is slightly deeper than it is wide provides better eye contact opportunities for the instructor and optimum viewing angles for students, and a room with a trapezoidal shape aids acoustics. Ceiling heights can make a room feel oppressive or light and airy. A stepped or sloped floor is generally required if the capacity is greater than 80 or if the primary use of the room requires it. Finding the appropriate rake of floor is important, both for viewing and improved ingress and egress.

The front of the room, including the teaching station, technology podium, and projection screen(s), will be much deeper than in older traditional classrooms to accommodate sight lines, and a table and chairs for demonstrations. Space may be required for a media equipment closet if there are extensive equipment needs.

Architectural features which interfere with the learning experience should be avoided. In general, all classrooms should be free of unnecessary angles, notches, or protrusions. It should go without saying that columns that limit viewing and prosceniums that limit screen placement are unacceptable.

Flooring and finishes should be durable, easy to clean and maintain; in all room finishes, durability and ease of maintenance are generally more important than aesthetic considerations. Wall and furniture surfaces should be such that they discourage graffiti and vandalism, with any soft acoustic material placed out of easy reach of students.

Lighting and Acoustics: Good lighting and acoustics, enhancing the ability to see and hear presentations, will have a major effect on learning in the classroom.

Room lighting should accommodate several different functions: audience participation and listening to a lecture, viewing projected material, and note-taking during each type of presentation. It is very important to control lighting for screen viewing, with adequate blackout capability of ambient light from any windows. Room lights must be easily dimmed, and zoned on separate controls to eliminate light wash over projection area. Video conferencing will require additional lighting design considerations, possibly including supplemental lighting reinforcement at the front of the room and at audience response locations.

Acceptable acoustics in the classroom are also of major importance, both in controlling ambient noise and in the clear distribution of sound to all parts of the room. Consideration should be given to the shape of the room, acoustical treatments, and control of ambient noise from HVAC and exterior sources such as hallways. An adequate audio system is crucial to learning in large classrooms and will consist of a program sound system, voice amplification system, and assistive listening devices. Do not rely on the sound system to overcome poor acoustics or inadequate noise control.

HVAC, Electrical/Mechanical, and Technology requirements:

The HVAC system should function effectively and quietly, maintaining human comfort levels. Any value engineering of HVAC which results in increased noise in the classroom must be avoided.

Use of technology will require dedicated power circuits along with specific integrated wiring, connections, and controls. Increased electrical and communications outlets will be needed; if laptops are to be used at each student desk, the room must have wireless Internet access and provision for power outlets at each desk.

A media equipment closet or rack may be needed at the front of lecture halls and auditoriums, along with a projection booth at the rear.

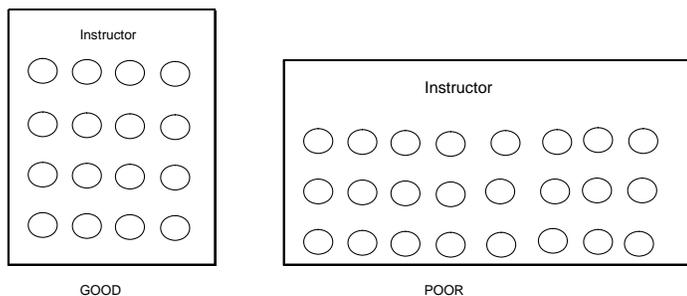
Location requirements: Locate on lower levels of building, away from noisy building features, vending areas, or major electrical equipment items.

ROOM CONFIGURATION AND FEATURES

Room Configuration

Group work should be accommodated whenever possible. Therefore, provisions should be made for large aisles, moveable furniture, and chalk/marker boards throughout the room.

- Width and length of room will depend on viewing angles and room capacity. The ratio of length to width is extremely important for optimum viewing angles.
 - The length of the room should be approximately one and a half times the width.
 - Rooms which are wider than they are deep normally present unacceptable viewing angles for projected material and chalk/marker board use.
 - A square or very narrow room should also be avoided.
 - Auditoriums are generally fan shaped.



- The floor configuration – flat, sloped, or stepped – should allow for clear lines of sight between students and instructor so that no riser or stage is required at the front of the room.
 - Flat floored classrooms provide greater flexibility.
 - Sloped or stepped floors may provide better sight lines in larger classrooms (60+ seats, depending on room configuration), or when proposed use of the room requires it.
 - Provide a stepped floor if the rake is greater than 1:14. The rake of floor can vary at different levels from front to back, but a rake of three steps per tier is too steep and is not acceptable.

- Rows in stepped classrooms should be a minimum 40” from seat-back to seat-back. Rows in sloped classrooms should be a minimum 36” from seat-back to seat-back. Seats in rows should be staggered, e.g., not directly behind each other, especially where floor rake is minimal.
- Stair treads should not have curved risers. Install full double tread riser.
- Floor and wall features such as coverings and finishes should be carefully chosen.
 - Provide durable floor covering (15-20 year life), which is anti-static, easy to clean, and cost effective to maintain. If acoustics allow, hard surface flooring is preferred.
 - Floor boxes for power and data should be chosen carefully. (See Electrical: Power Requirements section)
 - If using fixed auditorium seating, VCT or carpet tiles may be used for aisles and concrete under seats.
 - Wall surfaces below shoulder height should be easy to maintain and difficult to mark or scar as they will be marked, gouged, or written upon. Hard surfaces are preferred, such as fluted CMU, if acoustics allow.
 - Painted drywall, wallpaper, cloth covering, or acoustical materials should be a minimum of five feet above finished floor.
 - Install chair rail if loose seating is used or where deemed appropriate because of room use.
- Other room features such as aisles, entrances, and architectural features should enhance, not detract from, the learning process.
 - Aisles should be well distributed and wide enough to allow instructors to easily circulate among students. If room will be used primarily for group work, consider providing side aisles wide enough to allow students to work in groups at chalk/marker boards on side walls. In large lecture halls and auditoriums consider providing cross aisles to facilitate circulation and interaction.
 - Locate main entrance(s) at the back of the room so late arriving students do not cause a distraction.
 - Avoid wall protrusions into the room, notches, columns, or angled walls which may interfere with sight lines (unless needed to accommodate specific seating patterns).
 - No balconies.
 - Avoid rows with “orphan”, e.g. no partner, seats.
 - Program speakers should be wall mounted, not inset in walls.

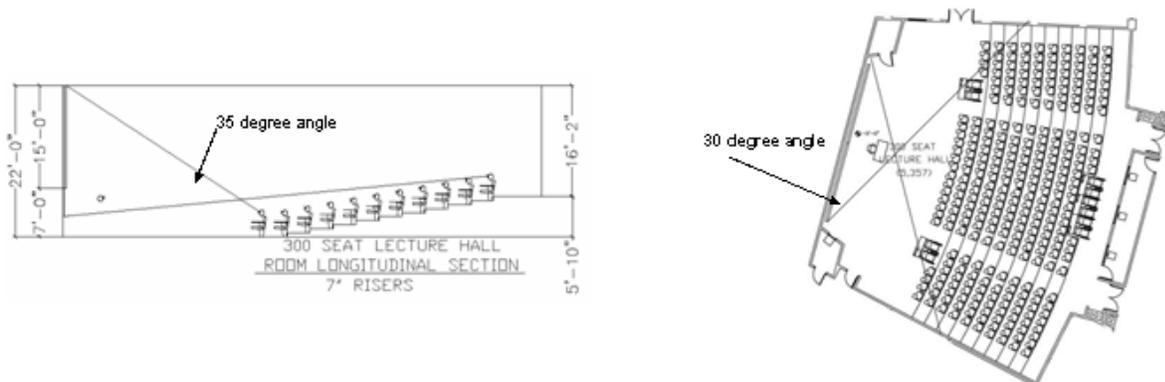
Projection Screens

- Faculty want access to chalk/marker boards and projection screens at the same time, and generally they want to project two different images of the same size at the same time.
- Projection screens should be mounted so lecturer does not block view.
- Consider offsetting the screen and marker board so that a significant portion of the markerboard is exposed with the screen down.
- When possible in large lecture halls or auditoriums, consider using a fixed wall surface located above the chalk/marker board that is suitable for projection. Projection surface must not be behind chalk/marker board.
- If projection screens are used, in addition to two side-by-side projection screens, consider adding a third center-mounted screen to allow for projection of a single large image.
- Projection screens should be white matte. Projection surfaces over the chalk/marker board can be a smooth wall surface painted flat white.
- Projection screens should be installed to hang as close as possible to the wall, but at least 6” (six inches) out from the wall.
- If the ceiling is lower than 9.5 feet (9’6”), the projection screen should be recessed into the ceiling.
- Install motorized projection screens if screen size is 10 feet wide or larger, or if ceiling height prohibits using a manual screen. Consider using a tensioned screen for an extra-flat screen surface.
 - If motorized projection screens are installed, use low voltage (5 to 24 Volt) controls specified by the screen manufacturer with up, down, stop switch. Keyed switches are not acceptable.

Front of Room/Ceiling Height

- Front of room space is important and will be determined by required size of projected image(s), viewing angles, and other uses.
- Ceiling heights will vary depending on the size of the room. Front wall overhangs and prosceniums must be high enough for projection screens or surfaces to accommodate properly sized projected images.
- Front of room space should also accommodate long tables and chairs for demonstrations, with in-room or adjacent storage for this equipment.
- Projected image size **height** is determined by calculating the distance from the furthest viewer to the projection screen and dividing by 6. If projecting above chalk/marker board, compute ceiling height by adding 7 feet to the screen height required for the projected image.
- If not able to project above chalk/marker board, compute ceiling height by adding 4 feet to the height required for the projected image. To allow unrestricted lines of sight the minimum distance from the bottom of the projected image to the floor is 42 inches.
- Width and curve of room are dictated by the angle from the furthest edge of screen (maximum 30°) and the angle from the first row of seats to the top of the screen (maximum 35°). This will define the area of student seating with good viewing angles.

ILLUSTRATIVE EXAMPLE of sight line calculations:



Windows

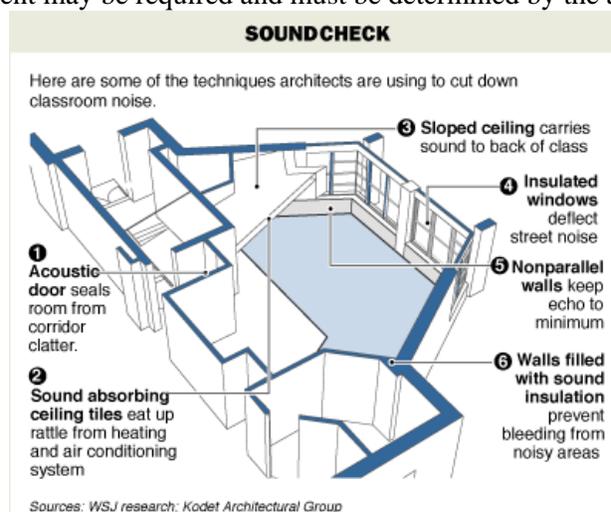
- Windows should not interfere with multiple chalk/marker board placement or allow light to bleed onto the projection surface.
 - If windows are included they should be concentrated in the back half of the room and adequate blackout capability must be provided.
 - There should be no windows in the front of the room.
- If motorized blackout shades are installed, use low voltage (5 to 24 Volt) controls specified by the shade manufacturer.
- It must be possible to control shades and screens by means of switches located near the instructor station. In some situations it must also be possible to control shades and screens by means of the technology control system. Keyed switches are not acceptable.

Acoustics

See also Electrical: Audio Requirements section

Good acoustics are of primary importance, both in controlling ambient noise and providing sound attenuation from outside the classroom. Do not rely on a sound system to overcome poor acoustics or inadequate noise control. It is understood that it is very unlikely that all of the techniques below will be feasible or even appropriate for use; however, as many as possible should be considered and implemented.

- HVAC: Reducing or eliminating noise from the HVAC system is of primary importance to good classroom acoustics; specify low-noise components.
 - HVAC systems and components should not exceed NC35.
 - Locate HVAC fans and motors outside of classrooms in hallways, etc.
- Ceiling:
 - Use acoustic ceiling tile over audience area, but not over lecturer, and sound absorptive materials on the back wall of the room.
 - A hard, sloped front section of the ceiling over the instructor's area will help instructor's voice reach back of room.
- Walls:
 - Acoustic panels on side and back walls should be a minimum of 5 feet above floor level to minimize damage from vandalism.
 - Non-parallel walls will reduce acoustic problems; acoustically treat 50% of non-parallel walls.
 - Consider specifying soundproof caulk along seams between drywall and the floor and adding sound-attenuation blankets in the walls.
 - Walls should be thicker near noisy areas outside of room.
 - Walls should run from floor to deck.
 - Further techniques include using different drywall thicknesses – one of them five-eighths of an inch, the other three-quarters of an inch – on either side of a wall. The two widths absorb different sound frequencies and together prevent a wider range of frequencies from getting through.
- Doors:
 - Stagger placement of classroom doors in the hallway so entrances aren't directly across from each other.
 - Doors should have acoustic door seals including sound-blocking bottom sweeps
- Windows:
 - Insulated windows will deaden sound from outside.
 - If blackout window shades are used, consider sound attenuating material, if available.
- Floors:
 - Use noise-deadening floor surfaces, however, use carpet only when room's other acoustical treatments may be insufficient.
- Communication exchange is important in large lecture halls. Multiple wireless microphone systems will facilitate communication exchange in conjunction with well-designed acoustics.
- Additional treatment may be required and must be determined by the acoustical consultant.



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General Lighting Requirements

- Evaluate need for light over chalk/marker board; board lights should have their own on/off switch at presentation station.
- Provide occupancy sensor(s). Units shall be dual technology type using both infrared and ultrasonic sensing. Install an adequate number of sensors to provide coverage of entire space including aisles.
- Lighting system shall be capable of providing a minimum of 50 foot-candles maintained over the instructor's station and seating area.
- Design lighting control so that it is zoned from front to back with a minimum of two zones. Additional zones may be required depending on the size of the room and type of lighting installed. Zone 1 should control the lights within 8 ft. of the projection screen; zone 2 (and other zones if applicable) the remaining lights. In some cases multi-level switching may be required. If multi-level switching is used, the switches shall be organized front-to-back by zone.
- In small classrooms, a separate switch for the lights nearest the screen is all that is required.
- In medium sized classrooms, a multi-level switching system should be used. In all cases full control of all lighting zones shall be installed near the instructor's station.
- In auditoriums and large lecture halls, provide either a multi-level switching or dimmable fluorescent system. Locate control stations in classroom for ease of use. In all cases, full control of all lighting zones shall be installed near the instructor's station. Simplicity is preferred.

Lighting Controls

- Provide manual light controls at presentation station. Provide on/off switch at each door.
- Lighting design for classrooms should use fluorescent fixtures for general seating area (preferred). For any direct lighting use low brightness, directional lighting fixtures and lenses; the luminaires shall be capable of 10% minimum light output (consult recommendations of Illuminating Engineering Society and IU Engineering Standards).
- If indirect lighting is used, then:
 - The lights cannot block pathway of projector(s) to screen.
 - Fixtures need to have both down light and up light; up light must be able to be switched independently.
- Control locations shall include:
 - Single scene controller at each door
 - Multi-scene controller at presentation station; must be accessible at all times
 - Multi-scene controller in Projection Booth, if applicable.
 - Label all controls clearly with engraved two-color plastic equipment labels
 - Manual sliders only; no LCD panels
- Serial (RS-232) type audio visual interface for communication with technology controller shall be located in Media Equipment Closet.
- If the master programming controller and the dimming panel are integrated, then the unit shall not be located in the Media Equipment Closet or Projection Booth. The programming control panel may be located in the Media Equipment Closet or Projection Booth if it is separate from the dimming control panel. The dimming control panel shall be located remotely, preferably in a location close to the classroom.
- If video conferencing is likely in the future, provide infrastructure for installation of supplementary light reinforcement for the front of the room and any audience response locations. (See Video Conferencing Addendum)
- In all cases, the switching system shall be as simple and intuitive as possible.

Chalk/Marker Boards

The Classroom Committee on each campus has a preference as to whether writing surfaces in classrooms should be chalkboards or marker boards and must be consulted by design consultants before any selection is made.

- Minimum 18 lf of chalk/marker board; chalk/marker rail three feet above finished floor; board size four feet high; depending on room configuration, side walls may require boards as well.
- Consider installing some boards at 32" above finished floor to accommodate instructors and students in wheelchairs.
- Provide chalk/marker boards below screen as far as possible across front of room. Board trays should have backstops and moveable boards should be gravity action, not motorized. Some chalk/marker board space should be available when projection screens are in use. In rooms emphasizing group work, place chalk/marker boards wherever feasible on walls; in a stepped room, they should articulate or step down the wall, not slant down the wall.

Media Equipment Closet/Projection Booth

- In large lecture halls and auditoriums, construct in a corner near instructor station a securable Media Equipment Closet (MEC) (4' w x 6' d x 8' h minimum) for equipment rack(s). Door opening to be tight to AV rack, normally approximately a 24" opening. Coordinate in field on rack size. Front of equipment rack should not face the audience; an opening perpendicular to the audience is preferred. *See Media Equipment Closet specifications.*
- In large lecture halls or auditoriums, a projection booth(s) is preferred, with projector(s) mounted inside projection booth. *See Projection Booth requirements.*
- Install unistrut at appropriate location(s) for installation of projector(s) so that projector location does not interfere with image path of film or slide projection. *See Projector Mounting Detail specifications.*

IU ENGINEERING STANDARDS

Mechanical

- HVAC system capable of maintaining human comfort conditions summer and winter; 60% rh maximum in summer. Temperature ranges are 68 deg F winter; 78 deg F summer.
- For rooms with outside wall exposure with heat loss in excess of 200 BTU/ft of wall, provide a "skin" heating system, preferably radiant fin tube controlled inversely with outside temperature
- Provide 15 cfm/person of conditioned outside air; for variable air volume systems, ensure outside air provision is maintained.
- HVAC system and components shall not exceed NC35.
- HVAC shall be extended to the Projection Booth. Projection Booth should have independent temperature control (thermostat). Install return duct in MEC.

Electrical: Conduit Requirements

The following installation of junction boxes and conduit will provide the connectivity among equipment items and locations described by this program. There are three basic configuration models: media equipment closet and technology lectern/desk, free-standing equipment rack and technology lectern/desk, and integrated rack and lectern/desk. In each configuration the technology lectern/desk may be fixed or tethered. Occasionally there may also be a projection booth(s). If there is a media equipment closet install a conduit rack. If there is a free standing rack or integrated rack/lectern, the Technology Interface and Exchange (TIE) box location(s) may refer to a junction box or raceway entrance. See also Media Equipment Closet (MEC)

Depending on the room configuration used, any or all of these conduits may be required. Labeled pull strings are required in each conduit. Junction box refers to the junction box/conduit rack in the MEC or the TIE box.

- ¾" from junction box to motorized screen controller if used
- ¾" from junction box to motorized shades controller if used

- 1 1/2" from junction box to each projector location
- 3/4" from junction box to nearest program speaker. All program speakers to be connected with 3/4" conduit
- 3/4" from junction box to each microphone input
- 3/4" from junction box to dimming system controller if used
- 1 1/2" from a 2 gang box at each camera position to the junction box
 - Shop drawings for audio system must include speaker layout, conduit routing, and wire fill and be reviewed by the technology specialists
 - See audio requirements for additional conduits needed
- (2) 1 1/2" from junction box to Projection Booth, landed in a series of (2) 3 gang junction boxes (minimum 3 1/2" deep) mounted vertically on the wall of the booth above the projection shelf. See attached schematic diagram for layout of boxes in projection booth.
- 3/4" from junction box to Projection Booth, landed in a separate single gang box for slide projector controls (optional)

Electrical: Power Requirements

- Provide dedicated circuitry for classroom AV system.
- Separate all power cabling from low voltage wiring.
- Consider provision of power outlets to each student station (optional).
- All electrical power for media equipment (i.e., media equipment closet receptacles or receptacles dedicated to media equipment, projector(s), projection booth receptacles) shall be on dedicated circuits on the same phase from the same electrical panel.
- Motorized items, such as projector screen(s), shades, and chalk/marker boards shall be on separate circuits on a different phase from those dedicated for media equipment (e.g., rack(s) or other audio-visual technology circuits).
- Provide low voltage (5 to 24 Volt) circuitry for control of selected classroom systems (e.g., media, lights, screen, chalk or marker board).
- Provide 2-3 duplex power outlets on each wall (very large rooms may require more). These can not share electrical circuits with media equipment.
- In large lecture halls and auditoriums, provide three duplex power receptacles in floor boxes at front of classroom. Receptacles shall be flush with the floor and easily accessible. Location shall be a minimum of 5' forward of the first row of seating. (optional)
- Floor boxes for power and data should be chosen carefully. They should not require tools to open. If the room is uncarpeted, the boxes should prevent water infiltration when floors are mopped. Power cords should not snake across floor, causing a hazard.

Electrical: Audio Requirements

- Ground audio components to a common ground.
- All audio system power from the same electrical phase and the same electrical panel.
- Install program sound system.
- Install voice amplification system (optional).
- In large lecture halls and auditoriums install assistive listening devices.
- If distributed sound system is installed, minimum requirement shall be separate home runs for each time delay zone. Where audio mics are to be installed, consult with technology specialists.
- Provide microphone inputs at front of room (number depends on size of room).

IU TELECOMMUNICATIONS STANDARD

Telecommunications

- Install pathway according to IU Telecommunications Standard and campus specific addendums to bring IU Standard Information Outlet from IDF closet to the following locations:
 - Two ports in Media Equipment Closet or media connectivity location

- One port at each projector location
- One port in projection booth, if applicable
- One port in center front wall (optional)
- Two ports at podium location (2 - 4 ports at each floor location, generally left, center, right) (optional)
- Install pathway according to IU Telecommunications Standard to bring a 1-port Information Outlet to the security panel in Media Equipment Closet or other identified location (IUB Security)
- Provide wireless data access according to IU Telecommunications Standards
- Provide low voltage pathway for a 1-port Information Outlet at each student station. (optional)
- Install wall mounted phone by Media Equipment Closet per IU Telecommunication Standards. (optional)

Furniture

Consult Interiors Department of University Architect's Office for verification of all furniture selections.

Uncomfortable or cramped seating arrangements are distracting to students and result in shorter attention spans and poor academic performance. As the student population continues to increase in physical size, wider seats as well as more room between the edge of the table/tablet and the seat back are required. Row width between seats will also increase in size. Choose all seating with consideration for ergonomic principles and durability.

In general, a table/chair configuration, whether with fixed or movable tables, is preferred to tablet arm desks or tablet arm fixed auditorium seats. In smaller classrooms, movable tables and chairs which can be reconfigured for group work are preferred. For larger classrooms, fixed tables and movable chairs are preferred. However, it should be noted that the choice of a table/chair configuration over tablet-arm desks will result in a reduction of classroom capacity by *at least 25%*, and possibly more, depending on ADA stations, technology equipment, etc.

Due to space constraints and retro-fitting, it may be necessary to continue furnishing some classrooms with tablet-arm desks and with tablet-arm fixed seating in auditoriums. Every effort should be made to increase the comfort and usability of this arrangement. Instead of using one piece tablet-arm desks, consider using separate individual student desk/tables and chairs.

Classroom Seating

All upholstered seating should be anti-static.

Movable tables and chairs

- Table width may vary from 18" to 24", depending on the arrangement of seating around it.
 - A minimum 18" width, in general, is satisfactory for arrangements with seating on only one side of the table.
 - If occasional seating on both sides of table is desired for forming temporary collaborative groups, then minimum table width is 24".
- Preferred allowance of table length per person is 2.5 feet (30").
- Placement of table legs should allow maximum leg room under table.
- If a classroom is expected to accommodate a large amount of collaborative work, provide tables which can be easily rearranged to enhance communication.
- Chairs should be armless.
- Consider individual table/chair combinations if space constraints warrant.

Fixed tables and movable chairs

- Tables should be a minimum width of 20" with modesty panels on front.

- If tables will be used for group collaborative work, there should be two rows per tier if floor is stepped, so students in one row can turn around and work with students on the same level in the row behind them. The first (lowest) row of tables should be 18” wide, while the second row should have tables 24” wide.
- The front part of the table on the second row(s) could overhang the modesty panel by 6” or so to allow chairs to be pulled up to the tabletop on that side.
- Placement of table legs should allow maximum leg room under table.
- Preferred allowance of table length per person is 2.5 feet (30”).
- Spacing between rows of tables will vary from a minimum of 36” to 44” according to the number of seats in a row, with more seats requiring more space.
 - Rows having 4 seats or fewer before reaching an aisle should be at least 36”.
 - 4 - 6 seat rows should have at least 42” wide rows.
 - Over 6 seat rows should have at least 44” wide rows.
 - Rows should not be more than 8 seats before an aisle access.
- Provide power outlets for each seat. Data ports are optional.
- Avoid movable chairs with legs that may cause a tripping hazard.
- Chairs should be armless.
- Fixed chairs should not be used in classrooms.

Tablet arm desks

- Provide more generous seat size – at least 18” wide – ideally with a padded seat and articulated back rest.
- Provide the largest tablets possible for more work area, especially for use of laptops.
- Consider writing surfaces that are equally usable by both right and left handed individuals. If this is not possible, then a minimum of 10% of all seating shall be appropriate for left-handed individuals.

Auditorium fixed seating

- Seat size should be 24” from center-to-center of arm rests. (To accommodate differences in aisle width, seats may be a minimum of 22” and a maximum of 26”.)
- Tablet arm surface shall be large enough to accommodate a laptop computer, preferably larger than the current 10” x 12.5” size.

Wheelchair sites – wheelchair users should be accommodated according to the following ratio:

- 1 location for 4 to 25 station capacity
- 2 locations for 26 – 50 station capacity
- 4 locations for 51 – 300 station capacity
- 6 locations for 301 – 500 station capacity
- These ratios represent the minimum number of stations under ADAAG. Additional stations should be considered whenever possible. In larger classrooms, wheelchair accessible seating should be dispersed throughout to facilitate choice of seating.
- Note that stations for wheelchair users shall be marked to prevent their being pushed aside or otherwise be made unavailable for the intended user. In rooms with fixed seating, accessible tables should be fixed but with stackable chairs so stations may be used as regular seating when not in use by individuals using wheelchairs.

Other classroom furnishings

- Teaching station should be a table with modesty panel, finishes to match building standards. If tables and stackable chairs are chosen for classroom seating, teacher’s station will match student tables.
- Provide a table lectern in natural oak or stained to match architectural wood in building
- Provide a full-height lectern with reading light for large auditorium classrooms
- A technology lectern may also be sited in the front of the room, connected to the technology equipment rack

- In larger lecture rooms, a table and chairs may be needed in the front of the room for panel discussions, demonstrations, etc. There should be a storage area for these when not in use.
- Provide alphabetized “sorting rack” for student papers at rear of large auditoriums.
- 1 pencil sharpener at back of room (mounted securely, not on drywall partition)
- Battery-operated clock(s) with large, easy-to-read numerals and sweep second hand. Locate clocks such that they are visible to students and instructor; clocks must be secured to prevent theft and tampering.
- In large lecture halls and auditoriums, provide built-in recycling and trash receptacles inside and outside of room, and near all classroom entrances. Provide recessed recycling areas in all hallways. Height and diameter of opening should match the dimensions of the receptacles used by building services on each campus.

Technology Equipment

Some or all of the following source equipment may be installed. Technology components change continuously. The campus Technology Design Team will specify the equipment to be installed.

- Overhead transparency projector
- Data/video projectors
- VCR
- DVD/BLuRay
- Cable TV
- Digital document camera
- PC
- Mac
- Codec for video conferencing
- Video cameras
- Interactive boards and tablets
- Crestron touch screen control system
- Auxiliary inputs for laptop, audio, video
- Other specialized or legacy equipment

LOCATION REQUIREMENTS

Locate on lower levels of building; locate away from noise generating or noise conducting building features such as elevators, toilet rooms, machine rooms, service shafts, dock areas; locate away from vending areas (to discourage bringing food items into instructional areas); locate carefully in relation to major electric equipment items. Student congregation areas should be located near classrooms but not directly outside of entrance doors.