CLASSROOM AND LECTURE HALL DESIGN GUIDELINES

**University Planning, Design and Construction
& Classroom Management Committee
Established: May 2015**

Revision #4 | December 2021

TABLE OF CONTENT

1 INTRODUCTION

The information represented within are additions to the general standards for buildings as a whole and is provided in other sections of the Design Standards. The Designer is responsible for incorporating, when applicable, any Design Standards contained within the suite of the University Design Standards documents.

Classrooms should be developed and designed from the "inside out". Optimum orientation should be determined by the primary expected teaching style, the capacity of the room and the level of mediation. Throughout this document there are specific design criteria which adds to what is currently outlined in these classroom design standards.

Please also refer to Appendix VII Accessibility Guidelines for further elective accessibility requirements and an emphasis on certain ADA and ANSI Standards as they relate holistically with new construction and renovations. Design all classrooms to comply with the most current versions of the Americans with Disabilities Act (ADA) Standards for Accessible Design and ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities.

2 Design Considerations

2.1 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.

2.2 Classroom Size

The total square footage of each room is to be based on the type of classroom, the specific capacity and the type of seating. The more square footage allotted to each student, the greater the opportunity for flexibility. Provide at least one accessible seat per 40 students with companion seating next to each.

Generally, classrooms should be sized in a 2:3 or 3:4 width to length ratio. Long, narrow, style rooms are not acceptable. A curved configuration improves visibility and student/instructor connectivity. 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.

Classroom Location

Classrooms shall be located on the lower floors of a multi-story building, with larger capacity classrooms located closest to a building entrance. Avoid designing classrooms near noisy areas.

Hallways and Corridors

2.3 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 2.4 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.

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 2.5 or any other architectural opportunities that might be present.

Study Areas

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

2.7   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 windows and be equipped with a 2.8 storeroom function lock. Classroom storage should be accessible from outside the classroom.

Room Access and Identification

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 on side walls and as far from the presentation area as possible while still meeting current building codes.   Occupancy within the classroom should be clearly (but discretely) visible from the hallway.

Each door leaf to be a minimum of 36" wide, including those used in pairs at double doors. Double doors should have no strike mullion.   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. Specify door silencers to muffle the noise of the door closing. Specify concave wall bumpers to protect the wall from damage.

Signage – Room Identification, Emergency Egress and Occupancy Limits
Each door way to a room will have a standard emergency egress sign mounted on the interior side of the space, mounted at a height per code. Such sign shall be 6 ½ "x 9".   Each door way leading into a space shall have a standard room identification sign. Interior way finding sign standards are defined within Volume One of the University Design Standards

An electronic schedule tablet, 10"±, PoE capable, shall be specified and located at the rear entrance into each classroom. Mounting bracket and ethernet connection is required to support these tablets. Software license is required for each tablet.

An acceptable manufacturer of good quality and performance the University expects for a scheduling system is: Mimo Adapt-IQV 10.1" digital signage tablet, Android 6.0 – RK3288 Processor and Peerless SF 630 mounting bracket or approved equal. Software license must be Moki (parent company Dura Holdings.

Windows

Daylight is an important part of most learning environments. Windows should be included in classrooms whenever possible.   If relatively easily accessible, specified window coverings shall be manually operable.   Motorized window coverings are discouraged, but if necessary, the controls shall be located next to the lighting controls on an adjacent wall nearest the instructor's workstation. Where applicable, the depth of the window should be designed to allow for the installation of motorized shade tracks. Vertical blinds and drapes are not desired. If necessary, they are to have non-plastic, heavy-duty operating components. Use of a light diffusing roller shade in conjunction with a room darkening roller shade is required such as Draper Dual Roller Flexshade. 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.

Floors

Seminar, Collaborative and Traditional classrooms shall have flat level floors throughout. Lecture halls and Auditoria rooms shall have tiered floors.

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 flooring (tile or sheet goods) is also an acceptable flooring finish in order to meet budgetary constraints.

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 acoustics section.

2.11
Specify highly durable finishes that are easy to maintain.   Walls to be painted in an eggshell finish with no or low VOC.   Wallcoverings shall not be specified.   Accent walls are desired, however avoid using accent colors on front wall or walls that might reflect onto the projection screen.

Specify chair rails on the rear and side walls of classrooms that are non-masonry and will contain 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 by the University. 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.

Vertical Writing Surfaces or Smart Walls

2.12
Specify fixed-height whiteboards with the bottom edge at 36 inches above the floor.   Each whiteboard should have a continuous marker tray below each marker board. Do not specify separately mounted marker holders. At the top of the whiteboard, a tack board strip and clips for display materials is 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.

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
75-10	30 ft wide x 4 ft. high – may be tiered
Lecture hall	Determined based on space available at least 3 sections of 12 ft. x 4 ft. with tiers

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

Ceilings

To accommodate classroom lighting and technology requirements, the ceiling height of all classrooms should be as high as possible. Ten to twelve (10-12) feet above the finished floor is desired, however no classroom ceiling height shall be below 9'-0". 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 nine (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 sized in standard 24" x 24" or 24" x 48" drop in panels. Access for the maintenance of technology, power, etc. must be included where applicable.

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.

2.14

Minimum Noise Coefficient (NC) ratings by number of seats:
- 0-59 seats: NC30-35 or less
- 60 to 149 seats: NC 25-30 or less
- 150+ seats: NC20-25 or less.

Walls in classrooms shall have a minimum sound transmission class (STC) of 50 per: ANSI S1.4-1983 (R 2006).

Mechanical equipment such as fans, ductwork and diffusers in or running through classrooms shall have ratings not exceeding NC 25 throughout the load range per: ANSI S12.60-2002.

2.15

Finishes, Colors and Reflectance Values

Accent walls are desired, however not on the front wall or walls that will affect the projection screen.

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 have reflectance values - between 40% and 60%. Follow the Engineering Society of North American for appropriate reflectance values for ceilings, non-accent walls and floors.

Specify high durable finishes that are easy to maintain requiring only "green" products without special conditions.

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.

Security

2.16 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 **2.17** a card access reader 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.

Classroom doors shall have the ability to be locked and secured from the inside of the classroom.

Lighting, Zones and Electrical Requirements

Classroom lighting should include day lighting, multi-modal lighting, controllability, and optimize **2.18** energy performance. Motion sensors are preferred in all rooms. Ensure the sensor timer is set to maximum to avoid light shut off during low-motion activities such as test taking.

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. These zones can be combined and dimmed to create any number of different lighting scenarios and controls shall be on located on an adjacent wall nearest the instructor's station and at the entrance doors. Isolate emergency light radiation away from the projection screen.

The lighting 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

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.

Electrical Outlets
Place wall outlets in classrooms at no more than 6' intervals or as necessary to allow for 30% coverage. Lecture halls are not as critical when consideration is given to power within the fixed seating. Consideration must be taken when laptops are a requirement for learning. Coordinate with the data requirements.

Ceiling Outlets
Ensure the following electrical requirements are specified at a minimum:
- Data projector – specify one AC power duplex outlet attached by flexible conduit to a J-box located in the suspended ceiling. This duplex should be sited 12'-15' from the center of the screen for future installation.
- Motorized screen controller – specify 120V power capped and switched at a J-box located at the front of room above the suspended ceiling for future installation.

2.19

Furniture Room Layout
The layout of the classroom is essential to the success of the teaching environment.   Tables can be for 1, 2, or 3 students allowing a minimum of 30" per student 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.

The number of students per table is flexible and is determined by the type of classroom and the configuration of the classroom.
- Widths between aisles of tables to range from 30" – 36" depending on room layout and number of students serviced per aisle.
- To ensure adequate circulation through the learning spaces, minimum clearances must be maintained. Insure that 36" clearance is maintained behind a chair for access.

- 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 for 200 and more seat auditoria
- 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.
- 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

2.20   **Furnishings and Accessories**
The appearance shall be coordinated with the interior of the classroom and meet the acoustical requirements for the space. Light colors are discouraged. The construction and materials should be selected so that their color and surface are consistent with the other furnishing within the classroom. 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%.

Product specified 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. Specify furnishings and their finishes of high quality, good warranty and excellent price point. Finishes shall be non-glare to reduce eye strain, vandal resistant and require minimum maintenance requiring only "green" products without special conditions. Specify furnishings that facilitate cleaning of the floor surface, and

Any product specified shall have at a minimum 5 year warranty on all components, however we prefer 10 years or longer.

Working Surfaces
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.

Tablets

Tablet arms should be considered only in theatre seating applications. 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 left-handed orientation.

Tables
Fixed tables with cantilevered pivot arm seats are not allowed. If fixed tables are installed, provide loose seating with casters. 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. Modesty panels are allowed for tiered rooms

Table edges are to be of 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.

Seating
Seating should be selected that will meet minimum comfort standards and still satisfy cost, durability, functional comfort, appearance/finish and performance over time. 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. Other important elements to consider are versatility of seating, appearance, replacement availability/ease of maintenance and cost. Typically non-upholstered seating is preferred.

Large auditoriums or lecture halls only where reverberation of sound is a problem, fixed upholstered seating shall be specified constructed of cast iron or steel frames bolted to the floor. Auditorium seating shall have retractable tablet arms. Programming needs may require electrical/data outlet integration.

Free standing seating should provide good ergonomics through a 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.).   Lecture rooms where programs will typically exceed 2 hours, padded seats and backs should be selected.

All seating shall have proper lumbar support with a backrest that conforms to the natural curvature of the spine. The front edge of seats should have a waterfall profile that slopes downwards. When casters are specified on free standing seating, insure that the casters are the correct type of the floor finish (carpet, VCT, etc.)

Accessories
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".

The University's wall-mount Emergency Response Guide's location shall be in the front of all classrooms near the instructor's station. Designer is responsible to coordinate the location of this

display with fire life safety, light switches and white/smart boards with the projection screen locations.

Lecterns and Podiums

Teaching classrooms should be equipped with a teaching station which includes 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. Instructor consoles should be located so as not to obscure the students' sight line of the projection screen(s) and marker board(s).

Teaching Stations (Lecterns)

Seminar	Classroom	Lecture	Auditorium
P	F	F	F

P - Portable table type   F - Floor type

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

A - Acceptable   X - Preferred

Lecterns are designed to house AV racks to hold controllers and switches to support the AV equipment and lighting controls.

- Classrooms with less than 35 seats: provide a 25-inch lectern with 13 space AV rack and small storage space.
- Classrooms with less than 100 seats: provide a table with detachable 33 inch lectern with 13 space AV rack and separate computer bay and a stool to be placed at the front of the room.
- 2.21 Classrooms with more than 100 seats: provide a 43 inch instructor's podium with space for two 33 inch AV racks and availability of a seminar table with lectern and stool.

Telecommunications

The University's classroom design continues to evolve as teaching and learning methods evolve. We strive to ensure proper infrastructure is provided for classroom technologies in order to alleviate future construction costs.

When programming the needs of the space, consideration should include assistive technology for individuals with hearing and visual impairments and voice input technology for those with disabilities impacting the ability to use a keyboard or write long hand.

Refer to Appendix IV Telecommunications Design Standards

Wireless Access Point
Wireless networks are considered a supplement to the classroom network. Ensure that there is sufficient coverage that exists with existing rooms being renovated. Data connections should be specified with ceiling or wall mounted enclosure dependent upon room layout and ceiling height access.

Teaching Stations
Generally, two (2) telecommunications data connections are needed at the teaching station. They 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 (lectern) 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.

Projectors
Generally, one (1) telecommunications data connection is needed at the ceiling where the projector will be positioned.

Schedule Monitors
Classrooms, Conference Room and Lecture Hall's shall have an electronic schedule monitor at the entrance of every door entry. See audio visual design standards for details on data and electrical requirements.

> 2.22

> ### Audio Visual

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. University's Audio/Visual Technologies department provides a detailed document identifying room layouts, power locations, data locations, and standardized AV systems. This document provides general information when planning an educational space.

Contact Information
The University provides an informational document on how to report problems with physical facilities and A/V equipment. A chart that illustrates basic instructions on how to use the A/V equipment is also provided by the University to post near the equipment. The Designer shall designate and coordinate a location nearest the entrance door to post the informational document.

Projection Screens
Ceiling height is also critical when planning the layout of a classroom. The University recommends a minimum of 12 ft finished ceiling height to accommodate both lighting and technology. The higher the ceiling, the larger the screen and image size it can accommodate.

Multiple screens may be required based on the type of seating, seating capacity, the configuration of the room, and the primary instruction style. Where possible in the 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. If angle-mounting the screen is not feasible, 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).

Size and Automation of Projector Screens
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
- All projection screens must be tab-tensioned with aspect ratios of 16:10 to accommodate high definition format.

Incorporate the projection screen location and mounting requirements while detailing the reflected ceiling plan to address ceiling grid layout, locations of sprinklers, smoke detectors, wireless access points and lighting and sensor locations. Screens should drop no lower than 48 inches from the floor. The Designer shall detail and specify an appropriate mounting bracket to ensure the screen when fully extended does not interfere with any white/smart boards and their trays that may be designated on the wall carrying the screen.
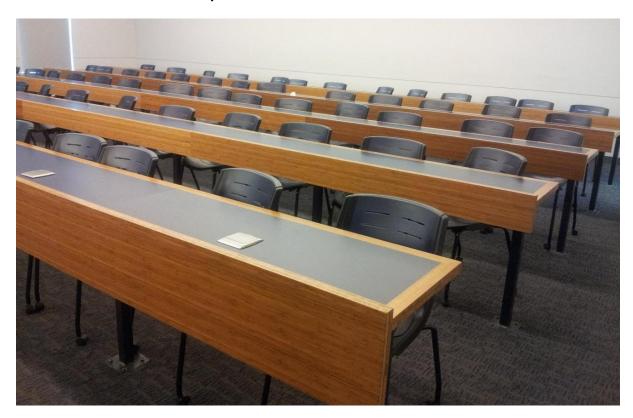
See Appendix VIII AV Equipment Standards for further information on Audio Visual requirements.

3   Layout examples of existing classrooms

1.1 Seminar/collaborative classrooms

1.2 Traditional Classroom layouts

1.3 Lecture Halls

1.4 Auditoria