



## NC State Learning Spaces: Standard Technological Functionality

The following technology planning and implementation documents outline functionality that may be made available in learning spaces on the NC State campus. They are provided to assist users in identifying functionality needed for a given space. Additional information is included for the design team to reference. This information goes hand-in-hand with the Classroom Construction Standards that are a part of the University's Construction Guidelines online at [http://www.ncsu.edu/facilities/con\\_guidelines](http://www.ncsu.edu/facilities/con_guidelines).

The first section provides a list of the functionality normally provided in new and renovated "110" general purpose classrooms. These have traditionally been lecture-style classroom spaces. A list of the equipment most commonly used to provide that functionality is included. A Technology Needs Assessment shall be completed for each space with the results incorporated into the overall design to ensure anticipated teaching and learning goals will be met. While most general purpose classrooms will have standard functionality, special needs may exist because of anticipated teaching methodologies. Variations of the space or budget may dictate how the functionality is provided.

The current technology package and product descriptions (See Appendices A & B) are included to assist in defining and illustrating the functionality of potential devices for use in these learning spaces. The drawings and equipment lists provide a detailed illustration of how this technology has been implemented in a typical lecture-style classroom. This template should be used to create design packages for any space in which AV/IT will be implemented.

Please direct all inquiries concerning this document to [classtech@ncsu.edu](mailto:classtech@ncsu.edu).



## **A word about process**

The process for planning, designing and constructing buildings at NC State is well established within the Facilities Division. Extensive documentation outlining this process is available from the Office of University Architect. Planning for extensive AV/IT in a new building or renovation project is relatively new and is still being incorporated into the larger process.

Insofar as possible, spaces that may need AV/IT should be identified from the outset of every project. Identifying the rooms during the programming phase of a project will allow the spaces to be designed so that they can fully provide the functionality intended. As the project progresses, users must define more specifically the functionality required for each space. The overall room design and the actual technology to be included will follow this specification. Once the general design of the room has been established, it will be possible to talk more specifically about components and specific solutions for accomplishing the desired functionality of the space. This process will generate the detailed drawings, design specifications, and infrastructure requirements for each learning space.

By definition “110” classrooms all have similar characteristics. UNC-GA’s definition of a “110” classroom describes it as a basic lecture-style classroom having no equipment, furnishings, or configuration that are particular to teaching any one discipline. This allows many of the design characteristics for “110” classrooms to be predetermined. However, it is still important to guide the users through the process so that they understand why things are done in a particular way as well as insure any special requirements can be addressed.

Designs for non “110” spaces will need to be considered on a case by case basis depending on the needs of the user group, as these spaces are as varied as “110” classrooms are standard.



## The Template

The next page is an example of what an AV/IT needs assessment might look like. Following these is the blank form that should be completed for each space that may require technology. There are other functionalities about the space beyond the AV/IT that will need to be identified and addressed if they have not been already. It is vital that the spatial and technological functionalities are considered together as they depend on each other for their success.

## Example Learning Space AV/IT Needs Assessment

Bldg: \_\_\_ Classroom Building \_\_\_\_\_ Room(s): \_\_\_ 100, 101, 102 \_\_\_\_\_

What is the primary intended use of this space? \_\_\_\_\_ teaching and learning \_\_\_\_\_

Are there other intended uses for this space? \_\_\_ conferences and departmental meetings

What are the anticipated configurations that will be needed? \_\_\_\_\_ rows, groups of 5 \_\_\_\_\_

## Typical “110” Classroom AV/IT Functionality

### Functionality for Computing

- ✓ Standard campus computing environment
- ✓ Ability to bring in external media (e.g. CDs DVDs, USB devices)
- ✓ Ability to browse the internet
- ✓ Ability to show streaming media
- ✓ Access to network file space
- ✓ Convenience of in-room computing
- ✓ Ability to display digital slideshows
- ✓ Access to productivity software (e.g. Word, Excel)
- ✓ Access to common set of specialized software
- ✓ Ability to display remote computing devices (e.g. Remote Desktop)
- ✓ Access to email

### Functionality for Ad Hoc Notation and Display

- ✓ Ability to display and manipulate books, 3D objects, transparencies or other hard copy material in color and high resolution (e.g. document camera)
- ✓ Ability for impromptu writing while simultaneously projecting material (e.g. whiteboard)

### Functionality for User-Provided Devices

- ✓ Ability to utilize external computing devices (power, data, audio, video connectivity)
- ✓ Ability to connect external AV devices

### Functionality for AV media

- ✓ Ability to display VHS media
- ✓ Ability to display DVD media

### Functionality for Technology Usability and Support

- ✓ Speech amplification (when necessary)
- ✓ Reliability of secure technology in a controlled environment
- ✓ Capability to comply with Section 508 accommodation regulations
- ✓ Remote management of classroom equipment
- ✓ Standard user interface
- ✓ Fixed installation
- ✓ Rapid access to technical support

### Nonstandard Functionality

- Mobile installation
- Ability to display high resolution graphics (>1024 x 768)
- Ability to project material from multiple sources simultaneously
- Ability to capture data from in-class experiments
- Ability to audio conference with remote sites
- Ability to capture written material
- Ability to integrate students from remote locations into the classroom
- Ability to capture class proceedings
- Ability to video conference with remote sites
- Ability to display and capture student work from in class exercises
- Ability to electronically collect feedback from the students
- Ability to project 35mm slides
- Ability to digitally annotate computer display
- Ability to install software for in class use

## Learning Space AV/IT Needs Assessment Form

Bldg: \_\_\_\_\_

Room(s): \_\_\_\_\_

What is the primary intended use of this space? \_\_\_\_\_

Are there other intended uses for this space? \_\_\_\_\_

What are the anticipated configurations that will be needed? \_\_\_\_\_

\_\_\_\_\_

## Learning Space AV/IT Functionality

### Functionality for Computing

- Standard campus computing environment
- Ability to bring in external media (e.g. CDs, DVDs, USB devices)
- Ability to browse the internet
- Ability to show streaming media
- Access to network file space
- Convenience of in-room computing
- Ability to display digital slideshows
- Access to productivity software (e.g. Word, Excel)
- Access to common set of specialized software
- Ability to display remote computing devices
- Access to email

### Functionality for Ad Hoc Notation and Display

- Ability to display and manipulate books, 3D objects, transparencies or other hard copy material in color and high resolution (e.g. document camera)
- Ability for impromptu writing while simultaneously projecting material (e.g. whiteboard)

### Functionality for User-Provided Devices

- Ability to utilize external computing devices (power, data, audio, video connectivity)
- Ability to connect external AV devices

### Functionality for AV media

- Ability to display VHS media
- Ability to display DVD media

### Notes or Other Requirements:

### Functionality for Technology Usability and Support

- Speech amplification (when necessary)
- Reliability of secure technology in a controlled environment
- Capability to comply with Section 508 accommodation regulations
- Remote management of classroom equipment
- Standard user interface
- Fixed installation
- Rapid access to technical support

### Nonstandard Functionality

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- Ability to display high resolution graphics (>1024 x 768)
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- Ability to install software for in class use

## Typical “110” Classroom AV/IT Design Criteria

Decibel level range for Program Audio at furthest listener:	70-85 dbSPL
Decibel level range for Speech Reinforcement Audio at furthest listener:	55-70 dbSPL
Task lighting level without AV:	540 lux
Task lighting level with AV:	325 lux
Image brightness on the screen:	1500 lux
Contrast ratio on the screen:	20:1
Minimum font size for viewable presentation for furthest viewer:	24 point
Maximum vertical angle of view for closest viewer (from top of the screen)	<30 degrees
Max Viewing angle for off axis viewer (from the center of each screen)	<45 degrees

For more information, <http://www.ncsu.edu/facilities/univ-arch/4-construction.htm>

## Learning Space AV/IT Design Criteria

Decibel level range for Program Audio at furthest listener:	____dbSPL
Decibel level range for Speech Reinforcement Audio at furthest listener:	____ dbSPL
Task lighting level without AV:	____ lux
Task lighting level with AV:	____ lux
Image brightness on the screen:	____ lux
Contrast ratio on the screen:	____:1
Minimum font size for viewable presentation for furthest viewer:	____ point
Maximum vertical angle of view for closest viewer (from top of the screen)	<30 degrees
Max Viewing angle for off axis viewer (from the center of each screen)	<45 degrees



## Appendix A

### Current NC State Technology Package for “110” Classrooms: Equipment components that meet the typical functional requirements

In room computer

Table Top Document Camera

VCR/DVD combo

Auxiliary Connection Panel

(Includes VGA, audio, network and power)

Programmable AV Control System

Small Touch Panel

Wireless Keyboard and Mouse

LCD Projector

LCD monitor on Articulating Arm

Stereo Speaker System

Telephone

Projection Screen

Overhead Transparency Projector

Wireless Microphone and Speech Reinforcement System (when required by code)

All equipment is secured and user equipment is located in a teaching lectern.

See <http://www.ncsu.edu/classtech/standards> for typical system design, rack layout, and wire labeling specifications.

## Appendix B

### Technology Product Descriptions

Item	Description
Computer	Small form factor desktop computer. Refer to <a href="http://www.ncsu.edu/it/essentials/your_computer/">http://www.ncsu.edu/it/essentials/your_computer/</a> for recommended specifications.
Auxiliary Connection Panel	1 set of laptop connections (includes VGA, audio, Internet, and power) 1 S-video and 1 composite with audio
Programmable Control System	Virtually unlimited functionality and flexibility for expansion for control of nearly any device or system. Includes remote management capabilities. (Requires extensive programming and a touch panel)
Small Touch Panel	Small color touch panel. Sufficient for most classrooms. Small buttons and limited real estate for expansion. Video preview is available for composite sources
Medium Touch Panel	Medium color touch panel. Provides more room for buttons and expansion. Video preview is available for composite sources only.
Large Touch Panel	Large color touch panel. Provides ample room for buttons expansion. Video preview is available for any analog video source. Able to be used as the computer monitor.
Wireless Keyboard and Mouse	Provides instructor the flexibility to operate the computer away from the lectern location. Increases support costs.
Interactive Graphics Tablet	Provides the instructor the ability to annotate a computer source and save those annotations in various formats. Can be used as a "digital whiteboard". Increases learning curve for instructors.
Integrated Lighting Control	Individual lighting zone control from the touch panel for added environmental flexibility. Allows for preset scenes to be activated upon selection of sources. Lights can also be controlled remotely for energy savings.
Integrated Screen Control	Localized integrated control of projection screen(s). Provides remote control of screens.
Integrated Shade Control	Localized integrated control of motorized shades. Provides remote control of shades.
LCD Projector	Minimum 3500 lumen LCD projector with RS 232 capabilities
Large Flat Screen	Minimum 30" diagonal LCD flat panel for small seminar or conference rooms only. Must provide RS 232 capabilities.
VCR	Plays back S-VHS tapes (multi-standard may be necessary)
DVD player	Plays back DVD, DVD-R/-RW, DVD+R/+RW, VCD, SVCD, CD, CD-R/RW, MP3, WMA and Picture/JPEG-CD

Item	Description
VCR/DVD/CD combo	Combination VCR/DVD/CD player
Table Top Document Camera	Able to display paper, transparencies, or three-dimensional objects in color in at least XGA resolution.
Ceiling Mounted Document Camera	Able to display paper, transparencies, or three-dimensional objects in color and at least XGA resolution. Must be RS 232 controllable. (Requires Programmable Control System)
LCD monitor for PC	17" LCD display for computer preview
Stereo Speaker System	2 wall mounted speakers with amplifier for basic classroom audio. Volume must be controlled through the control system.
Ceiling Speaker System	Required in larger spaces where speech reinforcement is required. Can be used in place of or in addition to stereo speaker system. Requires separate amplifier from stereo speaker system. Volume must be controlled through the control system.
Surround Sound Speaker System	Multiple wall mounted speakers and a separate processor/amplifier are required. Must be separate from speech reinforcement system. Volume must be controlled through the control system.
Wireless Microphone	Wireless Lavalier Microphone for the instructor
Wireless Assisted Listening System	Required if voice amplification system is installed
Articulating Arm	Table top mounted arm for LCD monitor or the large touch panel for improved flexibility of use.
Closed Captioning Device	Device adds closed captioning information to video output if the video source has been captioned (Recommend Programmable Control System)
Security Hardware	Includes NCSU standard security screws, cables, and locks for cables and doors.
Telephone	Basic NCSU standard telephone for immediate Help Desk support
Classroom Response System	Collects and assimilates input data from audience hand held input devices
Classroom Capture System	Records and saves lectures into digital formats for distribution to students
Lectern	Work surface for instructor as well as location for most AV equipment
Slide To Video Converter	Converts 35mm slides into a video signal that can be displayed through the LCD projector
Overhead Transparency Projector	Locate overhead transparency projector on moveable cart
35mm Slide Projector(s)	(If requested by dept. or college)



Sign in sheet for Technical Functionality Needs Analysis meetings:

Representatives from the following should be included in meetings to establish the A/V needs and assessment for classrooms in new or renovated buildings on NC State's campus.

Office of the University Architect:  
Design and Construction Services:  
College or Departmental Faculty/User:  
College or Departmental IT support:

ITD/ClassTech:  
Designer:  
Engineer:

Name	Dept/College/Co	Phone No	Email address
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