

Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

> Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Continuing Education

This course is registered with AIA CES for continuing professional

education. As such, it does not

include content that may be

or any method or manner of

handling, using, distributing, or dealing in any material or product.

deemed or construed to be an approval or endorsement by the AIA of any material of construction

2

Course Description

This course is an overview of emerging information and communications technologies: networks, personal computers, information appliances, digital video, audio, and graphics, virtual reality and skills simulation and the role they will play on the campus of the 21st century.



Learning Objectives

- Learn about emerging information and communications technologies
- Discuss innovations in networks, personal computers, information appliances, and digital video
- Learn how to use virtual reality and skills simulation
- Discuss how technologies are changing the 21st century campuses

AIA Continuing Education Provider

4

Agenda • Emerging Technologies • Smaller, lighter, faster, cheaper, smarter, more connected ... way more better • Trends and Developments in Learning Space • Planning for Transformation model (briefly) • Detailed process review in the elective course (#548) Discussion throughout, please

A few comments about the slides ...





_













X Make final product decisions at "last responsible moment" PHASE SCHEDULE Technology Plan & Program Conceptual Designs / Layouts Audiovisual Infrastructure Construction Documents Base Building Bid Construction Final Systems Design Audiovisual Systems Bid Shop Drawing Review: TSG only Shop Drawing Review: All 3 parties Installation / Integration Punchlist / Move In

11

MAIN MENU

- Workshop Questions ...
- AR/VR/MR = XR
- Intelligent Buildings
- Computing
- Tech Systems Control / Mgmt.
- Voice Control
- Telecommunications
- Safety & Security
- Lighting

.

X

- Light Broadcast
- Displays
- Visualization Walls
- Collaboration
- Showcase Displays
- Classrooms
- Virtual Classrooms
- Staff Development
- Miscellaneous Cool Schtuff













































-	
2	1
~	
-	-













































































_

_

64





























What is an Intelligent Building on a Higher Ed campus? A facility which optimizes the following elements ... Occupant comfort & convenience • Energy • Occupant productivity • Environment Safety & Security Costs Communications • Flexibility Culture • Building Systems

X

... and which utilizes the proper technology, people and procedures to maximize the interrelationships amongst those elements to support effective monitoring, management and operations over the long-term.

77

Systems that may be	included in an Intelligent Building 🛛 🛛 🏹
Access Control Acoustics - Physically Adjustable Annbient Light Asset Tracking Audiorival Systems Autonomous Vehicles Background Music System (BGM) Building Management/ Automation Broadcast Cellular Reinforcement Closed Circuit TV (CCTV) Data Network Digital Signage Distributed Antenna Systems (DAS) Betrutive Weicle (RV) Charging Electric Vehicle (RV) Charging Electronic Concienge Services Fin/cLife Safety Guest Services	Hearing Impaired/Interpreter Systems HVAC Systems HourAC Systems HourAC Systems HourAC Systems Houraction Integrated Control Interface Integrated Control Interface Integrated Control Interface Integrated Control Interface Intrusion Detection System Visitor Management System Parking Management System Parise System (PMS) Real-Inter Intercription Systems Real-Inter Intercription Systems Real-Inter Intercription Systems Stem











	Daily Utilities	Below B		netine		Abov	Above		100112100	21/05/2011 23	D F		
BATA MARAN BURNAL BURNAL BURNAL BURN	MAIN CAMPUS (EAST)		Consumed.		settin per k fog fr.				Dellara		Tet	Tetal	
	helding Name	Toro Hours	mandfile	KW-	Fair Minary	manditu	#W/	Taxe Manuto	manafria	NW I	\$/Mry	S/heig Ft	
	DUER JOURNALISM AND MASS COMMU-		42.83	1,882,944	of Description of Line	833	100.00	COLUMN TO A DESCRIPTION OF	2012.01	1201100	Contract of the local division of the local		
	ECKER COMMUNICATION STUDIES BUIL		1.2.2.4	313.6	A CONTRACTOR OF		12.47		\$106.65	\$55.10			
	OLOGICAL SOENCES LIBRARY		8.77	2.28.96	And in case of the local division of the loc		100			\$17.00			
	DLOGY BUILDING		74.13	8.357.85		0.73	84.55	11.22	21.113.00	2000.10	CONTRACTOR OF		
	OLOGY BUILDING EAST		43.872		the second se		and the second second	30.14	5548.53	10.00	1000		
	LANK HONORS CENTER		18.44	1476.75			17.0	80.00	EPHELIA I	10101-00	SHOLMS		
	GROE HALL		201.74	11397.57	2.84	244	38.96	101.77		2524.86			
	ALVIN MALL		11.30	383.52		6.4	81.75	10.00	5286.01	525.02	\$251.00	12.2	
	HEMISTRY, RUILDING		101.70	19.043.12			64.07			\$1,468.39			
	DVMUNICATIONS CENTER		25.78	214.45	-	1144	14.85	- 30.00	\$218.51	541.25	1018.00	117	
	DERCER HALL		8.00	1.453.00		0.01		30.24	\$45.72	1 1 1 1 1 1	2458.00		
	AUM HALL		38.19	1.834.67	100000000000000000000000000000000000000	0.00		10.11	1000	Title at	C		
	CY HOUSE		ATE	-		Distant St.			\$10.01	31.00	205.01		
	NO NETRING RESEARCH FACILITY					11.15	-	10.00	111.00	10.00			
	NOLISH PHRIOSCIPHY BUILDING		25.8%	711.00	and the owner with	A.15	258	1948	2.549.00	557.04	246122		
	LANDER MALL	10.41		1.0000.00	6.61		11.25		2240.00	\$20.54	\$178.70	24.5	
	ALSEY MALA		26.63	\$24.95		1.41	2.50	30.03	Distant All	\$15.07	2-679-819		
	YORAUUCS WIND TUNNELANNER		0.00	1000000		0.00	100 C 100 C		\$6.01	1000	50.01		
	IWA ADVANCED TECHNOLOGY LABORA		04.50	14,211,17	6.26	0.66	79.82	3119.22	21.258.45	\$261.76	100 ball		
	INA MEMORIAL UNION	832.41	108.4.1		5.24			201.27	11347.00	5540.34	and the second second		
	NA MINORAL UNION PARKING SAM	_	1.94	1.12.11		0.04			110.14	\$74.00	1158.05		
	VE'S HALL	416.61	18.31	1484.51	5.75		12.81	147.75	1201100	141101			
	KUNDRY WALDING FOLD		_	-	and the owner where the		-		111		10.01		
	REARY (MAIN)		108.61	10,745,46	1.95			- ELISSE	Trans. In	E1.244.34	1101030		
	NEGOTICINE	110032		7.767.79	6.71		41.81	1000			Contraction of the		
ALLANSING AN DEC DEC <thdec< th=""> DEC <thdec< th=""> <thdec< <="" td=""><td>ACERIDE MAIL</td><td></td><td>- 24.11</td><td>1.341.14</td><td>1175</td><td></td><td></td><td>11.5</td><td>-</td><td>- E1011-14</td><td>-</td><td></td></thdec<></thdec<></thdec<>	ACERIDE MAIL		- 24.11	1.341.14	1175			11.5	-	- E1011-14	-		
	INCLUMENT MALL	and the second s	11.10	1.000.11	and the second second		- 11.4	1000	1000				
	C C ADDON	100					-				The second s		
Control Control <t< td=""><td>D CAPITOL</td><td></td><td>-</td><td>1.420.93</td><td>-</td><td>010</td><td>10.51</td><td></td><td>200410</td><td></td><td>- Alterna</td><td></td></t<>	D CAPITOL		-	1.420.93	-	010	10.51		200410		- Alterna		
	LO MURIS, ROLLOND	and the second second					_	and the second s	141.14		541.04		
	CONCERN EDVICES EDUCTION	100.00	-	1.511.43							100000000000000000000000000000000000000		
Control Control <t< td=""><td>111P3 P001</td><td></td><td>31.34</td><td>A STORE</td><td></td><td></td><td>11.11</td><td></td><td>a desired at</td><td>Case of the</td><td></td><td></td></t<>	111P3 P001		31.34	A STORE			11.11		a desired at	Case of the			
	AND ADD C LEADER		10.00		and the owner where the owner w		_		100011		-	110	
	Contraction of the Design Proc.		-		the second se				a contraction	100	10.60		
	Contract of the second	Contract of	201.04	111143				-			-		
	SOARD LUNCER			14.849.10	1.0		48.05	1000.01	E1.081.74	5794.47	ALCOLUMN .		
	ASHIDAR HALL	111.57	100.00	1400.24			11.7	the second se	141118		_		





























X

"Smart Mobility & Transportation Hub" by Continental in Auburn Hills, MI

91



Telecommunications











Wi Fi 6 is not the same as 5G !!!

Wi-Fi 6

- Wireless networking
- Local area connection
- Primarily indoors
- Typically free for end user, but the site owner ultimate pays for Interest service it is connected to
- Should be 4x faster than Wi Fi 5
- Will be implemented quickly

X

Mobile phones

5G Cellular

- Wide area connection, deployed across cities, towns and rural areas
- Primarily outdoors
- AT&T, Verizon ,etc.
 Individuals pay for each connected device
- Should be 10x faster than 4G
- Will take many years to build out the network



5G

- 5G uses "high spectrum" or "high band" or "millimeter wave" signals
 - Superior performance
- Do not travel far indoors
- Do not penetrate materials well (even treated windows)
- Requires significantly more nodes in a DAS (Distributed Antenna System)
 DAS uses fiber (ideally) not coax
- Higher Ed cannot be limited to a single

carrier

- · Complicates the options
- · Very early in product development cycle
- · Expect issues and messiness



101











104

The Lighting Revolution

- Several developments expand the role of lighting:

 integral to Intelligent Building Systems
- indicate occupancy
- adjust color temperature to fit the event
- adjust color temperature to match circadian rhythms
- conserve energy
- remote control
- wireless data coverage
- Continue to blur the line between "Facilities" and "IT"



https://www.usa.lighting.philips.com

The Lighting Revolution: Power over Ethernet (PoE) Lighting

X

https://www.usa.lighting.philips.com

- Power and control over the same CAT cable
 Line voltage connects to Power Sourcing Equipment (PSE) device in rack or above ceiling
- PSE connects to lighting fixtures via low voltage cable
- No conduit to each fixture, no licensed electrician to install each fixture
- "Higher Power PoE" standard (2018): • 100 watts
 - $\circ\,$ Plenty for LED in most applications
- Two-way data flow enables simple control to advanced, cloud-based analytics

106





The Lighting Revolution: Smart Streetlights

- Adapt to movement by vehicles and pedestrians
- Dims when no movement nearby, brightens when needed
 Manufacturer claims of 50% energy savings
- and 20% operational savings
- Tie to security cameras, weather sensors, etc. – for centralized monitoring and control, real-time alerts, etc.
- Install base estimated at over 10 millionLeaders: Philips, Itron, Telensa, Signify,
- Sensus, others



109













Wearable Computers

- Glasses, watches ...
- Future: Smart Clothing
- "Invisible" sensors
 Washable, stretchable
- Some printed with 3D printers
- Teslasuit* full-body XR suit
- Haptic Feedback
- Climate Control
- Motion Capture
- Biometrics
- * No relation to Tesla Motors



... "accelerates the improvement of movement, reflexes and instincts, allowing faster, better improvement of the human mind and body."



Artificial Intelligence (AI)/ Video Analytics

- More sophisticated, higher resolution cameras with advanced audio
- Complex analytic algorithms run directly onboard camera, higher efficiency
- Network-based
- Set alerts on pre-defined conditions
 - Person or vehicle detection, unusual activity, license plate recognition, weapons detection
 - $^{\circ}\,$ Identify/ track person by analyzing gender, height, gate, clothing colors
 - · Audio gunshot detection, scream detection



X

118



119



Univ., others









Virtual Team Room



Virtual Team Room

X

- Promotes online interaction between teachers, students, and staff
 Distance education courses
- Collaboration
- Image: VirBELA

Campus: Davenport University

124

































Active Learning Decisions

- Number of students per group
- Define the flexibility needed
- Define the adaptability needed
- Students at tables, armchairs or hybrid
- Size / shape /configuration of furnishings
- Space for instructor at each student groupCampus-provided tools per student group
- Writing surfaces per student group
- Role of lecture component
- Location of instructor "home base"
 Dele of Teaching Assistants
- Role of Teaching Assistants

X









Developments at Apple ... top secret

- Recent acquisitions:
- Video projection company (Akonia Holographics)
- 3D depth sensor developer (PrimeSense)
- Computer vision company (Regaind)
- AR headset maker (Vrvana)
- Eye-tracking firm (SensoMotoric Instruments)
- Satellite technology to beam internet services directly to devices, bypassing carriers and wireless networks
- Key: bundle standalone capabilities for integrated experiences.



142



143

° Playlists, FM radio, BlueTooth, etc. • Emergency communication, paging

X













