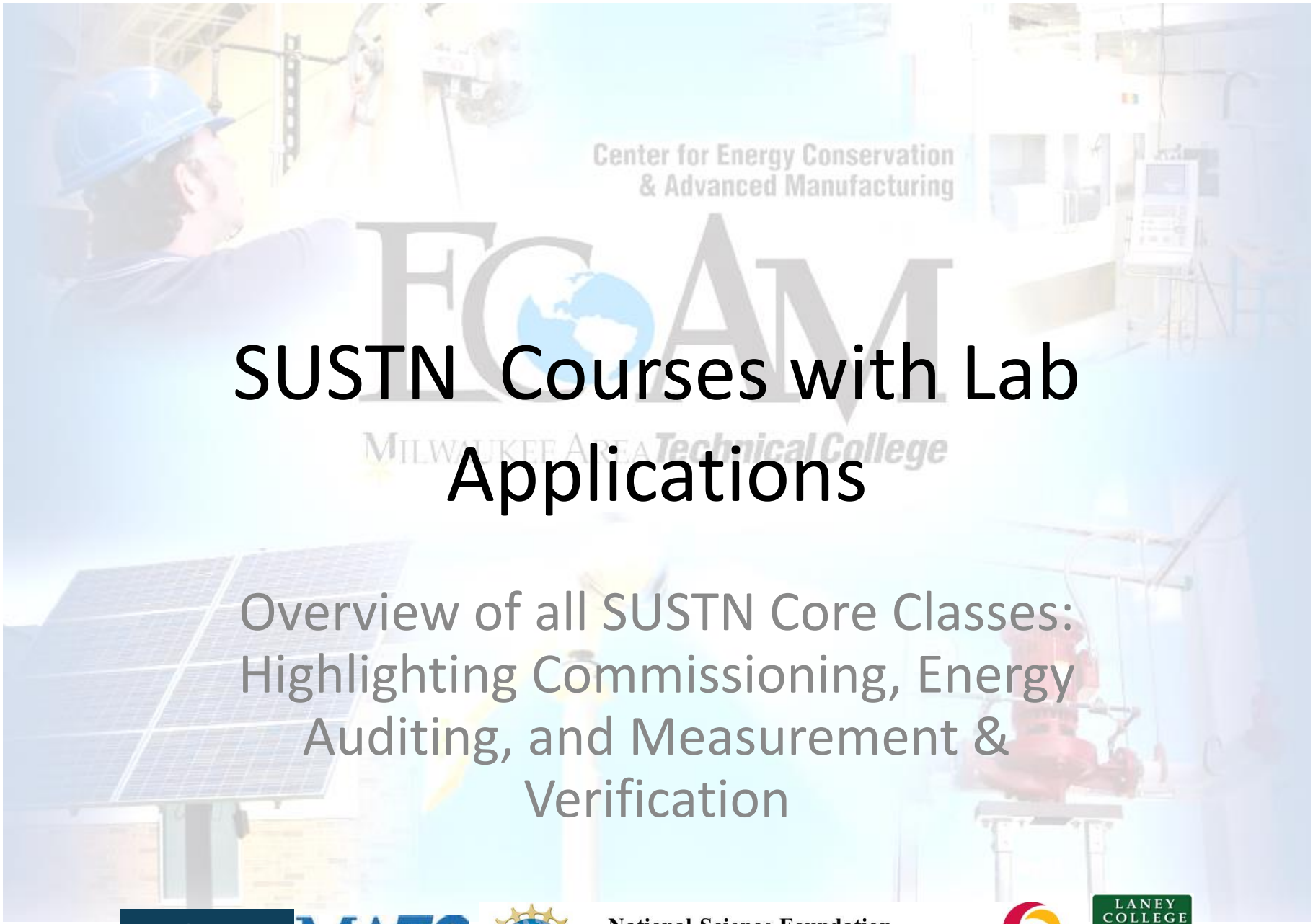

SUSTN Courses with Lab Applications

Overview of all SUSTN Core Classes: Highlighting Commissioning, Energy Auditing, and Measurement & Verification

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Program Layout Review

- Associates Degree
  - Core Courses (covered in this presentation)
  - Electives
- Certificates
  - Built into Associates Degree
    - Sustainable Operations
    - Energy Engineering Technology
  - Electives
    - Energy Modeling
    - Intelligent Lighting Systems (future)

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Associates Degree Curriculum

Semester	Credits	Course
1	3	**SUSTN102** - Reporting and Presenting Systems Performance
1	4	HVAC2132 - Architectural and Mechanical Fundamentals
1	3	**NATSCI169** - Energy in Nature, Technology and Society
1	3	MATH113 - Technical Math 1A
1	3	ENG151 - Communication Skills 1
2	3	**SUSTN100** - Sustainable Facilities Operations
2	3	**SUSTN105** - The LEED Rating System
2	3	RBUS111 - Business Communications
2	3	INDES100 - Introduction to Interior Design
2	3	ENG152 - Communication Skills 2
2	3	ECON195 - Economics
3	3	**SUSTN101** - Environmental Control Technician
3	3	*ELECTIVE* - Suggest SUSTN109 - Intelligent Lighting Systems
3	3	**SUSTN104** - Energy Auditing and Managing
3	3	NATSCI167 - Science of Technology
3	3	PSYCH199 - Psychology of Human Relations
4	3	**SUSTN103** - Commissioning for New Construction, Retro and Continuous
4	3	*ELECTIVE* - Suggest SUSTN108 - Energy Modeling w/ EQuest
4	2	HVAC2146 - Digital Energy Management Systems - METASYS
4	3	**SUSTN106** - Measurement and Verification
4	3	SOCSCI197 - Contemporary American Society
	63	TOTAL Credits

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Basic Format

- Courses are
  - An accelerated 8 week format
  - 3 Credits
  - 3 hours one day a week
  - Expect students to put in 12 to 15 hours outside of class
    - Some of that may be onsite work such as for Energy Auditing
  - In process of going to 1x/yr

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Core Course Preferred Order

SUSTN102 - Reporting & Presenting Systems Performance
NATSCI169 - Energy in Nature, Technology & Society
SUSTN100 - Sustainable Facilities Operations
SUSTN105 - The LEED Rating System
SUSTN101 - Environmental Control Technician
SUSTN106 - Measurement and Verification
SUSTN104 - Energy Auditing and Managing
SUSTN103 - Commissioning
ELECTIVE - SUSTN109 - Intelligent Lighting Systems
ELECTIVE - SUSTN108 - Energy Modeling w/ EQuest*

* *Considering switching from EQuest to Energy Plus*

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Typical Labs

- Commissioning
  - E113 – RTU & GEO Thermal Heat Pump
- Energy Auditing
  - Walk ECAM and MATC South
  - Arrange for audits of buildings around town (student interests)

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Typical Labs (cont)

- M & V
  - Reading Of Meters (Gas / Elect / Water)
  - Use of Plug Load Meter
  - Use of HOBO TRH Data Loggers

- Energy in Nature, Technology and Society
  - Tour of Solar and Wind
    - Solar PV on roof and pole mounts
    - Wind Turbine in parking lot

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Tools On Loan

- Students check tools out of MATC Library
  - Light Meter (Extech)
  - Kill A Watt plug load meter
  - HOBO TRH loggers

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SUSTN103 Commissioning Course

Follows *ASHRAE Guideline 0-2005 The Commissioning Process*

Week	Topic
Week 1 ..... Tuesday, October 30	Course Overview BCA Introduction to LEED NC Building Commissioning Review Project Site
Week 2 ..... Tuesday, November 6	Pre-Design Phase
Week 3 ..... Tuesday, November 13	OPR Workshop
Week 4 ..... Tuesday, November 20	Design Phase
Week 5 ..... Tuesday, November 27	Construction Phase
Week 6 ..... Tuesday, December 4	Functional Performance Testing
Week 7 ..... Tuesday, December 11	Occupancy Phase
Week 8 ..... Tuesday, December 18	Tying It All Together – Wrap Up / Presentations

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SUSTN103 Course Potential Homework / Project Ideas

- HW01: Intro: Readings, OPR and SM listings, OPR Qs for Owner, Equip PDFs, Equip Number Meaning
- HW02: Follow Up from OPR Workshop in Class
- HW03: Draft OPR for class project based on workshop
- HW04: Schematic of System
- HW05: Cx Plan Development
- HW06: Construction Checklist Development
- HW07: Functional Performance Test Development
- HW08: Systems Manual Development

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Commissioning "LABS"

- Filing Out Construction Check Lists (developed as part of homework)
- Conducting Functional Performance Test
  - Air Flow Temperature measurement (RA, DA)
  - Electrical Measurement (by instructor for safety)
- Verifying Design Drawings with installation

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Future

- To add in the future – coordination with TABB HVAC & EST courses/students

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Georgia Piedmont Technical College
Laney College

SUSTN104 Energy Auditing Course

Follows *ASHRAE Procedures for Commercial Building Energy Audits*

Week	Topic
1.	Introduction Overview ASHRAE
2.	Energy Star Lighting Survey *Potential Walk-Through of Facility (different day of week)*
3.	Utility Analysis Star Class Project Discussion – Energy Audit / Report *Potential Walk-Through of Facility (different day of week)*
4.	ECM Discussion *Potential Walk-Through of Facility (different day of week)*
5.	End Use Breakdowns *Potential Walk-Through of Facility (different day of week)*
6.	Conservation Measures *Potential Walk-Through of Facility (different day of week)*
7.	Conservation Measures Report Writing / Wrap up
8.	Project Reports due and Presentations (potentially)

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SUSTN104 Course Potential Homework

- HW01: Register for and energy building data into Energy Star Portfolio Manager
- HW02: Enter Building energy data into spreadsheets for analysis
- HW03: Energy Conservation Measure Analysis

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Energy Auditing "LABS"

- MATC ECAM and other parts of South Campus
- Buildings students arrange to audit
- Lighting "lab"
- ENERGY AUDIT & Report
  - Buildings students arrange to audit
  - Past audits done on Office buildings, Schools (including ECAM), Ice Rink, Construction Firm, retail space, church, day care facility, city hall/police and facilities

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SUSTN103 M&V

Follows IPMVP

Tentative Schedule:

WEEK	Lecture	Due (*night before class & in Blackboard unless noted*)[1]
01	Course Introduction Chapter 1: Introduction To IPMVP	
02	Chapter 2: Def & Purposes of M&V	Chapter Reviews: CH01 & CH02
03	Chapter 3: Principles of M&V	Chapter Review: CH03
04	Chapter 4: IPMVP Framework & Opts	Chapter Reviews: CH04
05	Chapter 5: M&V Plan Contents	Chapter Reviews: CH05
06	Chapter 6: M&V Reporting	Chapter Reviews: CH06
07	Chapter 7: Adherence with IPMVP Chapter 8: Common M&V Issues	Chapter Reviews: CH07 & 08
08	Project Discussions & course wrap up	

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SUSTN103 Course Some Potential Homework

- HW01 Utility Meter Readings
- HW02 Utility Meter Readings Log
- HW03 Kill A Watt, using the meter
- HW04 Kill A Watt Long Term Metering
- HW05 M&V Plan
- HW06 Baseline Case
- HW07 Reporting Case

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M & V "LABS"

- Daily Utility Meter Readings
  - One Time Measurement
  - Longer Term (21 days)

- Use of Plug Load Meter
  - Spot Measurement
  - Longer Term (minimum of 24 hour)

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M & V “Labs” (continued)

- HOBO TRH Data Loggers
  - Students take these home
  - Monitor items of interest such as space temps for set back effectiveness

NATSCI – Solar Tour

DATA FROM TOUR:

What is the total kW size of the collectors? __21 _kW = 216 watts/panel x 97 panels 20,952 watts

Collector Width: _3.25_ft

Collector Length: __5.375_in/ft

Number of collectors panels: __25 + 25 + 31=81_ on roof
_8__ fixed ground mount
__8__ tracking ground mount
__*97*__ *Total*

From display in hallway: http://www.we-energies.com/residential/energyeff/active_installdata.htm
http://view2.fatspaniel.net/WEEnergies/matcMequon/HostedAdminView.html?&eid=131470

Month	kWh/month
Mar 2013	_1704_
Apr	_2718____
May	_2788____
Jun	_2870____
Jul	_2720____
Aug	_2452____
Sep	_2317____
Oct	_1572____
Nov	_1265____
Dec	_ 732____
Jan	__1394__
Feb	__1036___
TOTAL	_23568__kWh for the year (**METERED kWh from the kiosk or web site**)

BEST Center Curricula, Resources & Recordings

Academic Programs
Georgia Piedmont Technical College - Building Automation Systems
Milwaukee Area Technical College - Sustainable Facilities Operations
Laney College - Commercial HVAC Systems
City College San Francisco - Commercial Building Energy Analysis & Audits

Professional Development Materials, Presentations & Videos
National Institutes
Building Automation Systems Instructor Workshops
Webinars (e.g., BEST Talks)

Faculty Profile Videos
Reports & Case Studies
Marketing Resources

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