



Department of Electrical Engineering  
College of Engineering  
**CENTRAL MINDANAO UNIVERSITY**

**OBE-FL COURSE SYLLABUS IN EE – 67**  
(Electrical Systems & Illumination Engineering Design)  
First Semester, S.Y. 2022-2023

Prepared by:

**ROGER C. FLORES**

Date: August 3, 2022

Reviewed by:

**ROGER J. TAN**

Chair, Department of Electrical Engineering

Date: August 5, 2022

Approved by:

**CHERYL F. DALEON**

Dean, College of Engineering

Date: August 8, 2022

Revised: August 2022

<b>VISION</b>	<b>MISSION</b>
A leading ASEAN University actively committed to the total development of people for a globally sustainable environment and humane society.	To advance the frontier of knowledge through internationalization of education and equitable access to quality instruction, research, extension, and production for economic prosperity, moral integrity, social and cultural sensitivity, and environmental consciousness through equitable access to quality instruction, research, extension, and production.

**COLLEGE GOALS**

- a. Continuous provision of comprehensive, dynamic, relevant and development-oriented instructions in agricultural, civil, mechanical and electrical engineering and closely related disciplines.
- b. Development and promotion of locally appropriate engineering technologies and information systems needed by the agricultural fishery, industrial and manufacturing sectors.
- c. Evaluation, packaging and dissemination of mature engineering technologies to stimulate agro-industrial activities in Mindanao.

**PROGRAM INFORMATION**

**Name of Program** : Bachelor of Science in Electrical Engineering  
**CHED CMO Reference** : CMO 88 s. 2017  
**BOR Approval** : BOR Res No. 10 s. 2018

<b>PROGRAM OUTCOMES</b>		<b>Program Educational Objectives</b>			
		1	2	3	4
a	Articulate and discuss the latest developments in the field of electrical engineering;		✓	✓	✓
b	Effectively communicate orally and in writing;	✓		✓	✓
c	Work effectively and independently in multi-disciplinary and multi-cultural teams;	✓		✓	
d	Act in recognition of professional, social, and ethical responsibilities;		✓		✓
e	Preserve and promote “Filipino historical and cultural heritage”;	✓	✓	✓	
f	Apply knowledge of mathematics and sciences to solve engineering problems;		✓	✓	
g	Design and conduct experiments, as well as to analyze and interpret data;	✓		✓	
h	Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability, in accordance with standards;	✓		✓	✓
i	Identify, formulate and solve engineering problems;	✓	✓	✓	
j	Understand the impact of engineering solutions in a global, economic, environmental, and societal context;		✓	✓	✓
k	Recognize the need for and engage in life-long learning;	✓		✓	
l	Apply techniques, skills, and modern engineering tools necessary for engineering practice; and	✓	✓		✓
m	Know and understand engineering and management principles as a member and/or leader in a team to manage projects in multidisciplinary		✓	✓	✓

	environments;				
n	Assess and evaluate power systems operations under normal and abnormal conditions; and		✓	✓	✓
o	Analyze the operating principles related to power generation from non-conventional sources of energy.	✓		✓	✓

COURSE INFORMATION														
<b>Course Name</b>	Electrical System & Illumination Engineering Design							<b>Course Code</b>	EE – 67					
<b>Pre-requisite Subject</b>	EE – 64 (Electrical Machines II)							<b>Course Credit</b>	3 units lecture and 2 units laboratory					
<b>Course Description</b>														
The course provides knowledge, understanding and skills in designing electrical wiring system for residential, commercial buildings, and industrial facilities through the specifications and standards mandated by the Philippine Electrical code and provisions from the Local Government on Electrical Wiring Installation. The course includes illumination design and cost estimation; energy-efficient lighting systems for residential, commercial, and industrial establishments; roadway lighting, and lighting maintenance.														
<b>Course Learning Outcomes</b>														
Program Outcomes Code														
a b c d e f g h i j k l m n o														
Program Outcomes (PO) addressed by the course														
I I E E D D D I E I I I I I E														
Program Outcomes addressed by the Course Outcomes:														
Program Outcomes Code														
a b c d e f g h i j k l m n o														
After completing this course, the student must be able to perform the following COs:														
CO1. Serve as an introductory major professional course for electrical engineering students.														
E I D E E D D D E D I D E I I														
CO2. Develop the students' skills in electrical system design and specifications.														
I D I E D E E I E I I E I D E														
CO3. Stimulate the students' motivation and appreciation to design residential, industrial and commercial establishments.														
D I D E D D D I D I D D I D E														
*Level: I – Introductory E – Enabling D - Demonstrative														

FLEXIBLE LEARNING PLAN							
Time Allotment (Week)	Course Learning Outcomes (CLOs)	Intended Learning Outcomes (ILOs)	Learning Content/Topics	Teaching and Learning Activities		Assessment Tasks	References
				Teaching Activities	Learning Activities		
1 week	CO1	<ol style="list-style-type: none"> <li>1. Familiarized with CMU mission and vision, course context, grading system, and classroom policies</li> <li>2. Explained the goals of the college and objectives of the department</li> <li>3. Acquainted with each other and level off expectations</li> </ol>	Course Orientation Course Syllabus Class Policies	Online Activities	Online Discussion	Getting to know more about each other	Course Syllabus CMU Code
1 week	CO1	<ol style="list-style-type: none"> <li>1. Estimate the illumination and brightness of the lamp</li> <li>2. Familiarized the coefficient utilization and maintenance</li> <li>3. Solve the footcandle of the lights</li> <li>4. Familiarize the Spacing and mounting height of the lamps</li> <li>5. Enumerate the classification of lighting system</li> </ol>	CHAPTER 1. PRINCIPLES OF ILLUMINATION <ol style="list-style-type: none"> <li>a. Introduction</li> <li>b. Estimating Illumination and Brightness</li> <li>c. Coefficient of Utilization &amp; Maintenance Factor</li> <li>d. Measuring Footcandle</li> <li>e. Uniformity of Light</li> <li>f. Spacing and Mounting Height Ratio</li> <li>g. Classification of Lighting System</li> </ol>	Online Activities	Online Discussion	Online Chapter Quiz	1 2 3
1 week	CO1	<ol style="list-style-type: none"> <li>1. Distinguish the different types of lamps</li> <li>2. Determine the characteristics of each type</li> <li>3. Familiarize the different lamp fixtures</li> <li>4. Solve the energy efficiency of the different type of lamps</li> </ol>	CHAPTER 2. ELECTRICAL LIGHTING MATERIALS <ol style="list-style-type: none"> <li>a. Incandescent Lamp</li> <li>b. Fluorescent Lamps</li> <li>c. Mercury Lamps</li> <li>d. Metal Halide Lamps</li> <li>e. High Pressure Sodium Lamps</li> <li>f. Tungsten – Halogen Lamps</li> <li>g. Compact Fluorescent Lamp</li> <li>h. Lighting Fixtures</li> <li>i. Energy Efficiency</li> </ol>	Online Activities	Online Discussion	Online Chapter Quiz	1 2 3

1 week	CO1	<ol style="list-style-type: none"> <li>1. Familiarize the Certificates of Permits and Inspection</li> <li>2. Draw the Electrical Plans and Specifications</li> <li>3. Enumerate the Requirements for Electrical Installations</li> </ol>	<p>CHAPTER 3. GENERAL PROVISIONS</p> <ol style="list-style-type: none"> <li>h. Introduction</li> <li>i. Definitions</li> <li>j. Permits and Inspection Certificates</li> <li>k. Electrical Plans and Specifications</li> <li>l. Requirements for Electrical Installations</li> </ol>	Online Activities	Online Discussion	Online Chapter Quiz	2 3
1 week	CO1	<ol style="list-style-type: none"> <li>1. Identify grounding conductors</li> <li>2. Familiarize protective devices</li> <li>3. Enumerate different surge protection devices</li> </ol>	<p>CHAPTER 4. WIRING AND PROTECTIONS</p> <ol style="list-style-type: none"> <li>a. Use and Identification of Grounded Conductors</li> <li>b. Branch Circuits</li> <li>c. Feeders</li> <li>d. Branch Circuits, Feeders, and Service Calculations</li> <li>e. Outside Branch Circuits and Feeders</li> <li>f. Services</li> <li>g. Overcurrent Protections</li> <li>h. Grounding and Bonding</li> <li>i. Surge Arresters, Over 1,000 Volts</li> <li><b>j.</b> Surge – Protective Devices (SPDs), 1,000 Volts or Less</li> <li><b>k.</b> Protection Against Lighting</li> </ol>	Online Activities	Online Discussion	Online Chapter Quiz	2 3
2 weeks	CO1	<ol style="list-style-type: none"> <li>1. Enumerate different wiring materials</li> <li>2. Discuss the importance of cabinets, boxes, fittings and enclosures</li> <li>3. Identify the types of cables and its usage</li> <li>4. Familiarize the different types of busways and trays</li> </ol>	<p>CHAPTER 5. WIRING METHODS AND MATERIALS</p> <ol style="list-style-type: none"> <li>a. General Wiring Requirements for Wiring Methods</li> <li>b. Conductors for General Wiring</li> <li>c. Cabinets, Cutout Boxes, Meter Socket Enclosures</li> <li>d. Outlet, Device, Pull and Junction Boxes; Conduit Bodies; Fittings and Handhole Enclosures</li> <li>e. Armored Cable: Type AC</li> <li>f. Flat Cable Assemblies: Type FC</li> <li>g. Flat Conductor Cable: Type FCC</li> </ol>	Online Activities	Online Discussion	Online Chapter Quiz	2 3

			<ul style="list-style-type: none"> <li>h. Integrated Gas Spacer Cable: Type IGS</li> <li>i. Medium Voltage Cable: Type MV</li> <li>j. Metal-Clad Cable: Type MC</li> <li>k. Mineral-Insulated, Metal-Sheathed Cable: Type MI</li> <li>l. Nonmetallic-Sheathed Cable: Types NM, NMC, and NMS</li> <li>m. Power and Control Tray Cable: Type TC</li> <li>n. Service-Entrance Cable: Type SE and USE</li> <li>o. Underground Feeder and Branch Circuit Cable: Type UF</li> <li>p. Intermediate Metal Conduit: Type IMC</li> <li>q. Rigid Metal Conduit: Type RMC</li> <li>r. Flexible Metal Conduit: Type FMC</li> <li>s. Liquidtight Flexible Metal Conduit: Type LFMC</li> <li>t. Rigid Polyvinyl Chloride Conduit: Type PVC</li> <li>u. High Density Polyethylene Conduit: Type HDPE Conduit</li> <li>v. Nonmetallic Underground Conduit with Conductors: Type NUCC</li> <li>w. Reinforced Thermosetting Resin Conduit: Type RTRC</li> <li>x. Liquidtight Flexible Nonmetallic Conduit: Type LFNC</li> <li>y. Electrical Metallic Tubing: Type EMT</li> <li>z. Flexible Metallic Tubing: Type FMT</li> <li>aa. Electrical Nonmetallic Tubing: Type EMT</li> <li>bb. Auxiliary Gutters</li> <li>cc. Busways</li> <li>dd. Cablebus</li> <li>ee. Cellular Concrete Floor Raceways</li> <li>ff. Cellular Metal Floor Raceways</li> <li>gg. Metal Wireways</li> <li>hh. Multioutlet Assembly</li> </ul>				
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			<ul style="list-style-type: none"> <li>ii. Nonmetallic Extensions</li> <li>jj. Strut-Type Channel Raceways</li> <li>kk. Surface Metal Raceways</li> <li>ll. Surface Nonmetallic Raceways</li> <li>mm. Underfloor Raceways</li> <li>nn. Cable Trays</li> <li>oo. Low-Voltage Suspended Ceiling Power Distribution System</li> <li>pp. Concealed Knob-and-Tube Wiring</li> <li>qq. Messenger-Supported Wiring</li> <li><b>rr.</b> Open Wiring on Insulators</li> <li><b>ss.</b> Outdoor Overhead Conductors Over 1,000 Volts</li> </ul>				
1 week	CO2	<ol style="list-style-type: none"> <li>1. Identify the different types of flexible cords and cables</li> <li>2. Pinpoint the locations of the receptacles, switchboards, panelboards, lampholders</li> <li>3. Determine the motor circuits and controllers for industrial and residential</li> <li>4. Specify the transformer ratings and protection</li> </ol>	<p>CHAPTER 6. EQUIPMENT FOR GENERAL USE</p> <ul style="list-style-type: none"> <li>a. Flexibles Cords and Flexible Cables</li> <li>b. Fixture Wires</li> <li>c. Switches</li> <li>d. Receptacles, Cord Connectors, and Attachment Plugs (Caps)</li> <li>e. Switchboards, Switchgear and Panelboards</li> <li>f. Industrial Control Panel</li> <li>g. Luminaires, Lampholders, and Lamps</li> <li>h. Low-Voltage Lighting</li> <li>i. Appliances</li> <li>j. Fixed Electric Space-Heating Equipment</li> <li>k. Fixed Resistance and Electrode Industrial Process Heating Equipment</li> <li>l. Fixed Electric Heating Equipment for Pipelines and Vessels</li> <li>m. Motors, Motor Circuits and Controllers</li> <li>n. Air-Conditioning and Refrigerating Equipment</li> <li>o. Generators</li> <li>p. Transformers and Transformer Vaults</li> </ul>	Online Activities	Online Discussion	Online Chapter Quiz	2 3

			(Including Secondary Ties) q. Phase Converters r. Capacitors s. Resistors and Reactors t. Storage Batteries u. Equipment Over 1,000 Volts Nominal				
<b>MIDTERM WEEK</b>							
1 week	CO2	1. Identify hazardous locations 2. Familiarize the different occupancies and facilities 3. Specify protections and electrical system of the different special occupancies	CHAPTER 7. SPECIAL OCCUPANCIES a. Hazardous (Classified) Locations, Class I, II and III, Divisions 1 and 2 b. Class I Locations c. Class II Locations d. Class III Locations e. Intrinsically Safe System f. Zone 0, 1 and 2 Locations g. Zone 20, 21 and 22 Locations for Combustible Dusts or Ignitable Fibers/Flyings h. Hazardous (Classified) Locations - Specific i. Commercial Garages, Repair and Storage j. Aircraft Hangars k. Motor Fuel Dispensing Facilities l. Bulk Storage Plants m. Spray Application, Dipping, Coating and Printing Processes Using Flammable or Combustible Materials n. Health Care Facilities o. Assembly Occupancies p. Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas and Similar Locations q. Control Systems for Permanent Amusement Attractions r. Carnivals, Circuses, Fairs and Similar	Online Activities	Online Discussion	Online Chapter Quiz	2 3



			<ul style="list-style-type: none"> <li>Events</li> <li>s. Motion Picture and Television Studios and Similar Locations</li> <li>t. Motion Picture Projection Rooms</li> <li>u. Manufactures Buildings</li> <li>v. Agricultural Buildings</li> <li>w. Mobile Homes, Manufactured Homes, and Mobile Homes Park</li> <li>x. Recreational Vehicles and Recreational Vehicles Parks</li> <li>y. Park Trailers</li> <li>z. Floating Buildings</li> <li>aa. Marinas, Boatyards and Commercial and Noncommercial Docking Facilities</li> <li>bb. Temporary Installations</li> </ul>				
1 week	CO2	<ol style="list-style-type: none"> <li>1. Familiarize special equipment use in industrial, constructions and other installations</li> <li>2. Specify types of cables and protections and grounding systems for special equipment</li> <li>3. Enumerate some electrical production systems and facilities</li> </ol>	<p>CHAPTER 8. SPECIAL EQUIPMENT</p> <ul style="list-style-type: none"> <li>a. Electric Signs and Outline Lighting</li> <li>b. Manufactured Wiring Systems</li> <li>c. Office Furnishing</li> <li>d. Cranes and Hoists</li> <li>e. Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts and Stairway Chairlifts</li> <li>f. Electric Vehicle Charging System</li> <li>g. Electrified Truck Parking Spaces</li> <li>h. Electric Welders</li> <li>i. Audio Signal Processing, Amplification and Reproduction Equipment</li> <li>j. Information Technology Equipment</li> <li>k. Modular Data Centers</li> <li>l. Sensitive Electronic Equipment</li> <li>m. Pipe Organs</li> <li>n. X-ray Equipment</li> <li>o. Induction and Dielectric Heating Equipment</li> <li>p. Electrolytic Cells</li> </ul>	Online Activities	Online Discussion	Online Chapter Quiz	2 3

			<ul style="list-style-type: none"> <li>q. Electroplating</li> <li>r. Industrial Machinery</li> <li>s. Electrically Driven or Controlled Irrigation Machines</li> <li>t. Swimming Pools, Fountains and Similar Installation</li> <li>u. Natural and Artificially Made Bodies of Water</li> <li>v. Integrated Electrical Systems</li> <li>w. Solar Photovoltaic (PV) Systems</li> <li>x. Large-Scale Photovoltaic (PV) Electric Power Production Facility</li> <li>y. Fuel Cells Systems</li> <li>z. Wind Electric Systems</li> <li>aa. Fire Pumps</li> </ul>				
1 week	CO3	<ol style="list-style-type: none"> <li>1. Identify different electrical systems installations</li> <li>2. Familiarize the class category of remote-control, signaling and power-limited circuits, fire alarm systems and types of optical fiber cables</li> </ol>	<p>CHAPTER 9. SPECIAL CONDITIONS</p> <ul style="list-style-type: none"> <li>a. Emergency Systems</li> <li>b. Legally Required Standby Systems</li> <li>c. Optional Standby Systems</li> <li>d. Interconnected Electrical Power Production Sources</li> <li>e. Energy Storage Systems</li> <li>f. Critical Operations Power Systems (COPS)</li> <li>g. Stand-Alone Systems</li> <li>h. Direct Current Microgrids</li> <li>i. Circuits and Equipment Operating at Less than 50 Volts</li> <li>j. Class 1, Class 2 and Class 3 Remote-Control, Signaling, and Power-Limited Circuits</li> <li>k. Instrumentation Tray Cable: Type ITC</li> <li>l. Fire-Resistive Cable Systems</li> <li>m. Energy Management Systems</li> <li>n. Fire Alarm Systems</li> <li>o. Optical Fiber Cables</li> </ul>	Online Activities	Online Discussion	Online Chapter Quiz	2 3

1 week	CO3	<ol style="list-style-type: none"> <li>1. Identified different communications systems</li> <li>2. Familiarize the different antenna for televisions and radio distribution systems</li> <li>3. Enumerate the types of network-powered broadband communications systems.</li> </ol>	<p>CHAPTER 10. COMMUNICATIONS SYSTEMS</p> <ol style="list-style-type: none"> <li>a. Communication Circuits</li> <li>b. Radio and Television Equipment</li> <li>c. Community Antenna Television and Radio Distribution Systems</li> <li>d. Network-Powered Broadband Communication Systems</li> <li>e. Premises-Powered Broadband Communications Systems</li> </ol>	Online Activities	Online Discussion	Online Chapter Quiz	2 3
1 week	CO3	<ol style="list-style-type: none"> <li>1. Enumerate the general conditions and requirements for watercrafts</li> <li>2. Locate the grounding and other protection systems of the watercrafts</li> <li>3. Specify the lighting fittings, heating appliances, switchboards and sources of electric powers such as transformers, batteries and other associated equipment</li> </ol>	<p>CHAPTER 11. WATERCRAFTS</p> <ol style="list-style-type: none"> <li>a. General Conditions and Requirements</li> <li>b. Special Requirements for Certain Locations and Systems</li> <li>c. Systems of Supply and Distribution</li> <li>d. Grounding System</li> <li>e. Lightning Protection System</li> <li>f. Distribution System Protection</li> <li>g. Lightning Fittings, Heating Appliances and Wiring Accessories</li> <li>h. Switchboards, Section and Distribution Boards</li> <li>i. Sources of Electric Power</li> <li>j. Generators</li> <li>k. Transformers</li> <li>l. Storage Batteries, Batter Rooms and Associated Equipment</li> <li>m. Motors, Motor Circuits and Controllers</li> <li>n. Permanent Water-Tight Fixtures, Portable Equipment, Plugs, Receptacles and other Similar Apparatus</li> <li>o. Fuses, Circuit-Breakers and Magnetic Contactors</li> <li>p. Semiconductor Rectifier for Power</li> <li>q. Control Gears</li> </ol>	Online Activities	Online Discussion	Online Chapter Quiz	2 3

			<ul style="list-style-type: none"> <li>r. Electric Propulsion Plant</li> <li>s. Explosion-Proof Electrical Equipment</li> <li>t. Special Requirements for Watercraft's Certified for Carriage in Bulk Flammable Liquids and Liquefied Flammable Gases</li> <li>u. Watercraft Carrying Liquefied Gases in Bulk</li> <li>v. Electrical Equipment of Tankers</li> <li>w. Watercraft Carrying Liquefied Gases at or Near Atmospheric Pressure and at Temperature Below Atmospheric</li> <li>x. Watercraft Carrying Vehicles with Fuel in the Tanks</li> <li>y. Electrical Equipment of Motor Vehicle Carriers and Coal Carriers</li> <li>z. Electric and Electrohydraulic Steering Gears</li> <li>aa. Mobile Offshore Oil Drilling Rig/Production Platform and Habitat Unit</li> <li>bb. Emergency Electrical Systems</li> <li>cc. High Voltage Electrical Installations</li> <li>dd. Shipboard Automatic and Remote Electrical/Electronic Control Systems</li> <li>ee. Navigation, Communications, Signaling and Alarm Equipment</li> <li>ff. Shipboard Wiring Systems</li> <li>gg. Additional Requirements for Watercraft Carrying Hazardous Cargoes</li> <li>hh. Additional Requirement for RO/RO Watercraft</li> </ul>			
<b>INTEGRATION PERIOD</b>						
<b>FINAL TERM WEEK</b>						

<b>No.</b>		<b>RESOURCE MATERIAL</b>			
1	Laptop		3	Lecture Video	
2	Lecture Notes		4	Internet Connection	

LIST OF REFERENCES	
1	Electrical Lay-out and Estimates by Max B. Fajardo Jr. and Leo R. Fajardo
2	Philippine Electrical Code. 2017 Edition
3	National Electrical Code

SUPPLEMENTARY READINGS	
1	Central Mindanao University Code. 2015 Revision
2	Subject Updated Syllabus

### Evaluation Guide and Grading System

COs	Assessment Tasks	Weight in Percent	*Minimum Average for Satisfactory Rating	*Target and Standards
CO 1-3	Class Standing	40	50%	70% of students got at least 50% rating
	Term Examination	60		
Midterm Grade		100%		
CO 1-3	Class Standing	40	50%	70% of students got at least 50% rating
	Term Examination	60		
Final-term Grade		100%		
<b>TOTAL</b>		<b>100%</b>		
<b>Passing Percentage</b>			<b>50%</b>	

#### Breakdown of assessment task weights per term:

Class Standing (Average Quizzes)	= 40%
Term Examination	= <u>60%</u>
	<b>100%</b>

#### The Grade Computation for Lecture:

- A. Computation of Term Grade (%): Term Grade (MTG or FTG) = (40%) [Class Standing] + (60%) [Term Examination]  
 B. Computation of Final Grade (%): Final Grade (FG) = (1/3) [Midterm Grade] + (2/3) [Final Term Grade]

#### The Grade Computation for Laboratory:

- A. Computation of Final Grade (%): Final Grade (FG) = (40%) Average Rating of the Activities + (60%) Average Quiz Ratings

#### The final grade will be computed as shown below:

- A. Computation of the Final Grade of the Subject: FINAL GRADE = (1/3) Final Laboratory Grade (%) + (2/3) Final Lecture Grade (%)  
 B. Removal Examination Passing = 70%

<b>Range</b>	93.5-100	87.5-93.4	81.5-87.4	75.5-81.4	69.5-75.4	63.5-69.4	57.5-63.4	51.5-57.4	49.5-51.4	29.5-49.4	29.5 below	Incomplete
<b>Grade</b>	1.0	1.25	1.50	1.75	2.0	2.25	2.50	2.75	3.0	4.0 (removal)	5.0	INC

### Revision History

Revision number	Date of Revision	Date of implementation	Highlights of Revision
1	August 3, 2022	August 8, 2022	Revision of syllabus format to harmonize CMO 88 s. 2017 sample format and CMU prescribed format

### Preparation and Review

	Name	Signature	Date Signed
Prepared by	<b>ROGER C. FLORES</b> Faculty in-charge		
Reviewed by	<b>ROGER J. TAN</b> Chair, Department of EE		

### Approval

Approved by:	<b>CHERYL F. DALEON</b> Dean		
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