TO: The Engineering Faculty

FROM: The Faculty of the School of Engineering Education

RE: New Degree Requirements for Multidisciplinary Engineering program

The Faculty of the School of Engineering Education has approved the attached new degree requirements and one new course in the companion EFD 24-12. This action is now submitted to the Engineering Faculty with a recommendation for approval.

SUMMARY OF PROPOSED CHANGES: The following changes in the current BSE degree requirements are made: credit hours for the degree are reduced to 120 from 124, the credit hours for engineering courses at the 200+ level are reduced to 45 from 47, credit hours in mathematics and basic sciences are reduced to 30 from 31, and credit hours of elective courses are reduced by one. In addition, an accreditation requirement concerning approved ABET basic science courses is added, the communications selective is changed to COM 11400 or equivalent, both statics and dynamics are required in the engineering core, and alternate methods to satisfy the major design experience are delineated including the addition of new one credit design seminar IDE 48700.

NEW COURSE: IDE 48700, Multidisciplinary Engineering Senior Professional Design Seminar.

DETAILED DEGREE REQUIREMENTS: See attachment 2.

CURRENT REQUIREMENTS: See attachment 1.

EFFECTIVE DATE: The reduction in credit hours will be effective immediately since students following the old plan of study also satisfy the new plan of study. Since the requirement for both statics and dynamics in the core has been included in all the specific plans of study for several years and followed by all students for four years, they will be effective immediately. The communications selective change and the alternate methods to satisfy the major design experience will be effective immediately since students have the option of following the old graduation rules. The accreditation requirement in mathematics and basic sciences has been included in student advising for the past two years and thus is effective for students who started at Purdue in August 2010.

REASONS: Based on the charges from the President and Dean Jamieson, the number of credit hours for graduation is reduced to 120 from the current 124. This was done by reducing the credit hours of engineering at the 200+ level from 47 to 45, reducing the number of required mathematics and basic science courses from 31 to 30, and removing a credit of elective in the Area. Since ABET no longer considers computer science courses as mathematics or basic science, an accreditation requirement in mathematics and basic sciences was added. Because all current students have selected COM 11400 instead of the other options, which require COM 11400 or equivalent as a prerequisite, the wording for the communications selective was changed. Because both statics and dynamics are covered on the Fundamentals of Engineering exam and typically are required as prerequisites for fluids, both are now required in the engineering core. Since students in the Multidisciplinary Engineering program have a variety of concentrations, a more appropriate major design experience other than IDE 48500 or EPICS 41100/41200 is now allowed. For example, students in the Acoustical Engineering concentration may use ECE 40020 or THTR 59700 as alternate major design experiences. With prior approval, THTR 59700 is allowed to substitute for 3 credits of engineering. [In October 2007 the ABET PEV reviewed

THTR 59700 work of one student and stated "This is engineering." Also, ABET requirement of 45 credits of engineering are still met since there are 49 credits of engineering including ENGR 131 and 132]. To assess the Multidisciplinary Engineering professional outcomes a new one credit course, IDE 48700, Multidisciplinary Engineering Senior Professional Design Seminar is required for students using these alternate major design experience courses. Since IDE 48700 will meet one day a week with IDE 48500, teaching loads are not increased. All existing multidisciplinary engineering concentrations can be easily adjusted to 120 credit hours following the incorporation of these changes.

Radcliffe

David Radcliffe, Professor and Kamyar Haghighi Head
School of Engineering Education

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes 3/8/12

Date 5-25-2012

Chairman ECC R. Cipra

Attachment 1

Current Degree Requirements for Bachelor of Science in Engineering (BSE) Degree in Multidisciplinary Engineering based on EFD 36-06 and 38-06 (124 credits)

Credits

First Year Engineering Program: **29-33**
If the common first year program in engineering is changed, the BSE requirements will be changed to reflect these changes.
Communications Selective: One of the following: Com 114*, Com 315, Com 320, Com 325 or equivalent. These courses can count towards the first year program, towards the general education program, or towards the Area requirements. (3 – counted elsewhere)
*Com 114 during the first year program is recommended as normal course.
Required sophomore mathematics: Multivariate calculus (MA 261), and linear algebra & differential equations, MA 262 or (MA 265 & 266), or equivalent, 8-10
Sophomore Science selective: One of the following: Phys 241, Phys 272, Biol 121, Biol 230, organic chemistry or equivalent. May be specified in individual plan of study. 3-4
Note: If MA 165 and 166 and 262 are taken, science selectives must add to at least 7 credits, or an area course must be math or science.
Probability or Statistics selective: One of the following: IE 230*, IE 330, ChE 320, STAT 350, STAT 511 or equivalent. The engineering courses count towards the required 47 credits in engineering. The Statistics courses count towards the Area requirements. (3 – counted elsewhere)
* IE 230 is recommended as normal course.
General Education: Follows Engineering's General Education Program requirements. 18
Note: Individual plans of study may recommend particular general education courses.
Engineering: Minimum 47 credits at 200+ levels, of which at least 18 credits are at 300 + levels and at least 6 credits are at 400 + levels. Maximum number of credits in any one engineering discipline is 24. No substitution is allowed for major design experience courses or IDE 301.
Note: It is the student's responsibility to see that all prerequisites are met.
Required Engineering Core:

Topic:	**Example Courses:**	**Credits**
Electrical circuits	ECE 201 or equivalent	3
Statics and Dynamics	ME 270, A&AE 203, (CE 297 + 298) or equivalent	3 or 6
Thermodynamics	ME 200, ABE 210, ChE 211 or equivalent	3
Engineering Economics	IE 343 or equivalent	3
Fluid mechanics	ME 309 (1 cr. counts as lab), CE 340, ChE 377 or equivalent	3
Major design experience	EPICS (senior design option) or IDE 485	3
Professional Preparation	IDE 301	1
	Typical Engineering Core total credits	19-22

Engineering Selectives: Do parts a, b, and c.

a. Three additional credits of engineering design. Must be approved by School of Engineering Education. Example courses: ABE 325, ABE 330, ABE 435, ABE 527, A&AE 251, CE 453, CE 470, IE 486, ME 263, ME 413, or EPICS (300 level or above). [A total of 6 credits of EPICS is required if EPICS is used as both the engineering design selective and the major design experience course.] Should be completed before taking major design experience course(s). 3
b. Three credits of hands-on (not computer) laboratory. At least 2 credits must be in engineering (Example courses: A&AE 204L, A&AE 352L, A&AE 364L, ECE 207, ECE 208, CE 343, CE 344, and the following count for 1 credit of laboratory each: ABE 305, ECE 270, CE 352, CE 353, IE 386, ME 309, MSE 235, MSE 335, MSE 367, NUCL 205). One credit of hands-on lab (not computer) may be in other disciplines (e.g., science) but courses cannot be one of the required courses in the First Year Engineering Program. (Note: Since CHEM 116 is a selective, it satisfies the requirement of one credit of lab, but the credit cannot be double counted.) Only the credits assigned to lab can be included in this category.

1 cr lab (may be counted elsewhere) + 2 engr lab

Note: The lecture credits of engineering courses with 1 or 2 credits of lab can be included in engineering electives, and the lecture credit for courses in other disciplines can be included in Area except for CHEM 116 where all 4 credits are included in the First Year Engineering Program.

c. Engineering course in materials or strength of materials. (Example courses: MSE 230, A&AE 204, NUCL 273, or ME 323) 3

Total credits engineering selectives: 8 engr + 1 cr lab

Engineering area: For each plan of study may include required, selectives and/or electives (may include extra engineering laboratory or design credits). These courses are chosen to meet the student's educational objectives. Engineering course taken as Statistics Selective counts as engineering area course. Typically 15-20

Minimum Engineering credits @ 200+ level 47

Area: Chosen to satisfy educational objectives. For each plan of study may include required courses, selectives and/or electives. Statistics course taken as Statistics Selective counts as area course. There is no minimum in the Area since more than 47 credits of engineering courses may be taken. Typically 9-16

Minimum required for graduation 124

Other Graduation Requirements: All plans of study must be approved by the School of Engineering Education. Unique plans of study developed by students must be approved by ENE with the advice of the IDE Council. Standard, pre-approved plans of study require approval by the student's advisor. An overall Graduation Index of 2.0 or higher and a minimum GPA of 2.0 in the engineering courses at the 200 level and higher included in the plan of study are required. All other Purdue University graduation requirements must be satisfied.

Attachment 2.
Proposed 120 credit Degree Requirements for Bachelor of Science in Engineering (BSE) Degree in Multidisciplinary Engineering.

Credits

First year Engineering Program. If the common first year program in engineering is changed, the BSE requirements will be changed to reflect these changes. 29-36

Required sophomore mathematics: Multivariate calculus (MA 26100), and linear algebra & differential equations, MA 26200 or (MA 26500 & 26600), or equivalent 8-10

Sophomore Science selective. ENE approved selective. (May not be the same course used as FYE Science Selective.) 3-4

Statistics selective. ENE approved statistics course from the Department of Statistics or approved engineering statistics course. The engineering statistics courses count towards the engineering requirements. If used, statistics courses from the Department of Statistics count towards the Area requirements and help fill the accreditation requirement for Math and basic sciences. (3 – counted elsewhere)

Accreditation Requirement for Mathematics and Basic Sciences. There must be a minimum of 30 credits of ENE approved mathematics and basic sciences (biological, chemical and physical). Students who take MA 16500, 16600, 26100, 26200, Chem 11500, Chem 11600, Phys 17200, and a 3 credit sophomore science selective meet this requirement with 31 credits. Students who take this sequence with CS 15900 (3 cr, which counts in the FYE program) in the first year instead of Chem 11600 are 3 credits short and must take an additional 3 credits of ENE approved mathematics and basic sciences. Credits are counted either in FYE program or in non-engineering area electives.

Communications. Com 11400 or equivalent. These courses can count towards the first year program, towards the general education program, or towards the Area requirements. Recommendation is to take Com 11400 as part of the FYE program. (3 – counted elsewhere)

General Education: Follow Engineering's General Education Program requirements. 18
Note: Individual plans of study may recommend particular general education courses.

Engineering: Minimum 45* credits at 200+ levels, of which at least 18 credits are at 300+ levels and 6 credits of the 18 must be at 400+ level. Maximum number of credits in any engineering discipline is 24. *Note: It is the student's responsibility to see that all prerequisites are met.*
*With prior approval from the Director of the Multidisciplinary Engineering program and the professor teaching THTR 597, 3 credits of THTR 597 may substitute for 3 credits of engineering.

Required Engineering Core: (Can substitute or transfer equivalent courses except for IDE 30100 and major design experience courses, which must be taken at Purdue-West Lafayette.)

Topic:	**Example Courses:**	**Credits**
Electrical circuits	ECE 20100 or equivalent	3
Statics and Dynamics	(ME 27000 + 27400), A&AE 20300, (CE 29700 + 29800) or equiv	3/6
Fluid mechanics	ME 30900 (1 cr. counts as lab), CE 34000, A&AE 33300 & 33300L (1 cr. Counts as lab), ChE 37700 (1 cr. Counts as lab) or equivalent	3
Thermodynamics	ME 20000, ABE 21000, ChE 21100 or equivalent	3 or 4
Engineering Economics	IE 34300 or equivalent	3

Major design experience	EPCS 41100 & 41200, IDE 48500, or other approved major design experience courses [e.g., ECE 40020 plus IDE 48700 or THTR 59700 (prior approval required) plus IDE 48700]	3 or 4
Professional Preparation	IDE 30100	1
	Typical Engineering Core total credits	19-24
	Most common core	22

Engineering Selectives: Do parts a, b, and c.

a. Three additional credits of engineering design. Must be approved by School of Engineering Education. Should be completed before taking major design experience course(s). 3

b. Three credits of ENE approved hands-on (not computer) laboratory. At least 2 credits must be in engineering One credit of hands-on lab (not computer) may be in other disciplines (e.g., science, THTR, A&D) but courses cannot be one of the required courses in the First Year Engineering Program. (Note: Since CHEM 11600 or BIOL 11000 may be used as a science selective for students in FYE, it satisfies the requirement of one credit of lab, but the credit cannot be double counted.) Only the credits assigned to lab can be included in this category.
1 cr lab (may be counted elsewhere) + 2 engr lab

Note: The lecture credits of engineering courses with 1 or 2 credits of lab can be included in engineering electives, and the lecture credit for courses in other disciplines can be in area.

c. ENE approved engineering course in materials or strength of materials. 3

Total credits engineering selectives: 8 engr + 1 cr lab

Engineering area: For each plan of study may include required, selectives and/or electives (may include extra engineering laboratory or design credits). Engineering course taken as Statistics Selective counts as engineering area course. Typically 11-18

Minimum Engineering credits @ 200+ level 45

Area: Chosen to satisfy educational objectives. For each plan of study may include required courses, selectives and/or electives. Statistics course taken as Statistics Selective counts as area course. If needed for accreditation math and basic science requirement, a 3 credit math or basic science course may be counted here. Typically 7-16

Minimum required for graduation 120

Other Graduation Requirements: Plans of study for all concentrations must be approved by the School of Engineering Education. All concentrations must be sufficiently different from plans of study in the Schools of Engineering (other than ENE) so that the student's educational goals could not be met in one of those Schools. An overall Graduation Index of 2.0 or higher and a minimum GPA of 2.0 in the engineering courses at the 200 level and higher included in the plan of study are required. All other Purdue University graduation requirements must be satisfied including the requirement of at least 32 credits at the 300 level or above.

SUPPLEMENTAL MATERIAL: ATTACHMENT 3.
ECE 495M (now ECE 40020) – Sound Reinforcement System Design
Prof. David G. Meyer

ECE 495M *Sound Reinforcement System Design*

Fall 2011 Syllabus

Course Description: An introduction to computational tools used in the measurement and analysis of electro-acoustic systems, and their application to sound reinforcement system engineering. Service learning based projects, serving the needs of community clients, provide the context for application of sound reinforcement system design principles and practices.
Course web site: https://engineering.purdue.edu/ece495m
Instructor: Prof. David G. Meyer, meyer@purdue.edu, Office: MSEE 238, Phone: 494-3476
Office Hours: Tuesdays and Thursdays, 1:00-2:30 PM
Required Text: *Sound Systems: Design and Optimization – 2nd Ed.*, Bob McCarthy, Focal Press, 2010, ISBN 978-0-240-52156-5
Reference: *Sound System Engineering – 3rd Edition*, Don Davis and Eugene Patronis, Focal Press, 2006, ISBN 978-0-240-80830-7
Prerequisite: ECE 255 or consent of instructor
Pre- or Co-requisite: ECE 301 or consent of instructor
Prerequisites by topic: Basic electronic components and circuit design principles
Co-requisites by topic: Basic understanding of signals and systems
Sound Reinforcement Design Project: Working in teams of three or four, students will design a complete sound reinforcement system for a specified application, including: simulation of loudspeaker coverage; determination of fill and delay zones (if required); estimation of gain before feedback and system intelligibility; power amplifier choice based on headroom, SPL, and zone-related requirements; specification of the signal processing chain (including EQ, delay, and feedback suppression); design/layout of the equipment rack(s); choice of mixing console based on I/O specifications; selection of microphones (both wired and wireless); and total system cost estimate. Each team will present their results to the class and submit a final written report documenting their completed design.
Service Learning Audio Project: Working either individually or in teams of two, students will complete an audio-related project for a not-for-profit community client. Examples include performing measurements and equalizing/calibrating an existing sound reinforcement system, setting up and running sound for a community event, redesigning an existing systems and writing up a quote for the proposed upgrades, etc. Each student/team will document their service learning activity with both a presentation to the class and a written report.
Engineering Design Content: Elements of the engineering design process addressed in this course include testing, measurement, analysis, and synthesis.
Engineering Design Considerations: The primary engineering design considerations addressed in this course include economic, safety, reliability, social, and ethical.

ECE 495M *Sound Reinforcement System Design* Fall 2011
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Course Grade:

Your grade for this course will be based on the following:
Sound Reinforcement Design Project (team)
Report (20%)
Presentation (20%)
Exams/Service Learning
Exam 1 over Chapters 1-3 (15%)
Exam 2 over Chapters 4-9 (15%)
Service Learning Project/Report over Chapters 10-13 (15%)
Homework (15%)

Course Outcomes:

A student who successfully fulfills the course requirements will have demonstrated:
i. an ability to apply knowledge obtained in earlier coursework and to obtain new knowledge necessary to design a sound reinforcement system [1,2,3,4,5; a,b,c,e,i,j,k]
ii. an understanding of the engineering design process [4,6,7; b,c,e,f,h]
iii. an ability to function on a multidisciplinary team [6,7; d,h,j]
iv. an awareness of professional and ethical responsibility [6,7; f,h,j]
v. an ability to communicate effectively, in both oral and written form [6; g]

The following instruments will be used to assess the extent to which these outcomes are demonstrated (the forms used to "score" each item are available on the course web site):

Outcome Evaluation Instrument(s) Used
(i) Sound Reinforcement System Design Project
(ii) Hourly Exams
(iii) Confidential Peer Reviews and Project Activity Logs
(iv) Service Learning Audio Project
(v) Project Presentations and Reports

The threshold for successfully demonstrating each course outcome is 60%.

Course Outline:

Week(s)	*Lecture Topics*
1-4	Sound systems: transmission, summation, reception
5	Exam 1 over Chapters 1-3
5-9	Design: evaluation, prediction, variation, combination, cancellation, specification
10	Exam 2 over Chapters 4-9
11-13	Optimization: examination, verification, calibration, application
14-15	Equipment selection: loudspeakers, power amplifiers, signal processing, mixing consoles, microphones, racks, cabling
16	Service learning project/report over Chapters 10-13 Design project presentations

SUPPLEMENTAL MATERIAL: ATTACHMENT 4:
MUEN Acoustical Engineering Concentration
Guidelines for Capstone Design in Theatre Production Sound Engineering

Prof. Richard Thomas

1 Introduction

The Capstone Design in Theatre Production Sound Engineering (THTR 597) represents the culmination of your studies in the Multidisciplinary Engineering Acoustical Engineering Concentration with the Sound System Engineering option. As such, it provides you with an opportunity to assimilate the knowledge and experience you have gained in your coursework and practical experience into a cumulative project with a singular objective: the design, installation, calibration and verification of a large scale theatre sound system in real-world test conditions. The project will be divided in five phases that roughly correlate to the normal phases involved in the design and execution of a sound system for a professional theatrical production:

1. Design and Prediction;
2. Specification, budgeting and shop order;
3. Installation and Examination;
4. Verification and Calibration;
5. Operation and Maintenance

After the completion of this project, you should be able to:

1. Discuss current audio technology and equipment available for a sound reinforcement system for a major theatre production;
2. More intelligently choose appropriate equipment for a sound system for a major theatre production.
3. Predict with reasonable accuracy the performance of the sound system for a major theatre production in an acoustic space.
4. Design, install, examine, verify, and calibrate a typical sound reinforcement system that would be used in a major regional or Broadway theatre installation.
5. Demonstrate your ability to work as an engineer effectively within a collaborative environment to support a team of artists, technicians and engineers in a very complex and sophisticated working environment;
6. Document your work in a comprehensive documented record of your experiences in the design.

These guidelines are intended to help you prepare for both the execution of the design and the written documentation for this class and your portfolio.

Capstone Design Timeline

The production to which you have been assigned is titled:

____

And will have its first performance on: ______________________

The production run will be from ____________ until ____________.

The corresponding dates of the five phases of the production are:

Design and Prediction:

a. First Design Meeting: ______________________

b. Preliminary Block Diagram: ______________________

c. Preliminary Speaker Plot: ______________________

d. Predictive Model: ______________________

2. Specification, budgeting and shop order:

a. Final Designs: ______________________

b. Speaker Plot: ______________________

c. Final Revisions: ______________________

3. Installation and Examination: ______________________

4. Verification and Calibration: ______________________

5. Operation and Maintenance:

a. Production Meetings: ______________________

b. Level Set ______________________

c. Technical/Dress Rehearsals ______________________

d. Opening Night ______________________

e. Performances ______________________

f. Strike ______________________

2 Guidelines for Each of the Five Phases of the Capstone Design

2.1 Design and Prediction

In the Design and Prediction phase, you will determine the needs of the sound system from the sound score designer, composer, director and production team. You will meet as a part of this team in a series of meetings that will help you more fully understand the requirements of the system. You will develop the design of the sound system, and ensure that the design will meet the needs of the production.

From the very beginning of this phase, you should be assembling and fully digesting the cut sheets and equipment manuals for all equipment to be used in the production.

2.1.1 Preparatory Work:

Prior to the first meeting you will:

1. Read and take notes on the technical requirements for the sound system specified in the script.
2. Meet with your advisor regarding deadlines and work schedules. Continue meeting with advisor throughout process.

2.1.2 First Design Meeting (DMTG 1):

Confirm dates on production calendars and amounts of budgets.

2.1.2.1 Preliminary Block Diagram (DMTG 3):

At this meeting you will present a draft of the equipment you propose to use in the production, which shows how the signal flows from input to output. See the Power Point presentation, "Block Diagrams and Speaker Plots" in the "All Theatre Courses-Support Documents" and current USITT Sound Graphics Standards available from:

http://www.usitt.org/commissions/sound/Sound_Comm_Graphics_Project.html).

Provide one copy of the preliminary block diagram to the Production Manager and upload one copy of the preliminary block diagram to the Theatre Division's Web Callboard before the due date.

2.1.3 Preliminary Speaker Plot (Due at Design Meeting, DMTG 4):

Obtain a copy of the preliminary floor plan and section from the scene designer at the Preliminary Design Meeting. Meet with the scene designer to collaborate on how to integrate loudspeakers into the visual design, and then provide a rough sketch on this floor plan and section that indicates where and how you intend to locate loudspeakers in the scenery and theatre at the budget meeting.

Create any working drawings showing the integration of the sound system into the production necessary to prepare a budget of time and material expenses for the production, and to determine who will undertake the work necessary to implement the parts of the system that overlap multiple disciplines (i.e., scenery and sound);

2.1.4 Predictive Models (Due at Design Meeting 5, DMTG 5):

Develop an Ease plot from the speaker plot that accurately shows the predicted performance of the sound system in the performance space. Include plots from each loudspeaker where appropriate, and specific subsystem, e.g., mains, stage, front fills, surrounds, subwoofers.

2.2 Specifications, Budgeting and Shop Order

In the Design and Prediction phase, you will determine the needs of the sound system from the sound score designer, composer, director and production team. You will meet as a part of this team in a series of meetings that will help you more fully understand the requirements of the system. From the very beginning of this phase, you should be assembling and fully digesting the cut sheets and equipment manuals for all equipment to be used in the production.

2.2.1 Final Designs (Due at Design Meeting 6, DMTG 6):

2.2.1.1 Final Block Diagram:

A finished diagram of the equipment you propose to use in the production, showing signal flow from input to output drawn in accordance with current USITT Sound Graphics Standards available from:

http://www.usitt.org/commissions/sound/Sound_Comm_Graphics_Project.html).

2.2.1.2 Shop Order

A list of ALL equipment to be used in the production must be presented, including Manufacturer, Make and Model Number, quantity, actual and extended prices (used to determine the rental budget),

2.2.1.3 Hook up List

Provide an Excel Spreadsheet showing all microphone, line level and speaker patches to be used in connecting the components of the system together.

2.2.1.4 Distribution:

Provide one copy of the block diagram and speaker plots (both ground plan and section) to the Production Manager and upload one copy of the final block diagram, speaker plots (both ground plan and section), Shop Order, and Hook up List to the Theatre Division's Web Callboard before the due date.

2.2.2 Speaker Plot (Due at the Budget Meeting, BMTG):

Attend the Budget Meeting to present the working drawings and sound requirements to the rest of the production team and negotiate their implementation into the production process. Submit a CAD drawing that includes the basic outline of the set and the specified sound equipment according to the guidelines, "Block Diagrams and Speaker Plots" in the "All Theatre Courses-Support Documents" folder. Consult with the director, scene designer, lighting designer, and stage manager regarding the placement of any speakers, cables, sound effects devices, etc. Ensure that the proposed sound system meets the budget and other requirements of the producer, director, and production team. Resolve conflicts, budget issues, etc., and then revise all drawings and documents accordingly.

If you know that you will need additional equipment, begin planning for acquisition as soon as possible to guarantee arrival by sound load in.

2.2.3 Final Revisions (Due at the Design Meeting 8, DMTG 8):

Provide revisions of all materials submitted at DMTG 6 and BMTG, reflecting changes to the sound system as agreed upon by the director, the technical director, and the rest of the artistic team, made to bring the project into alignment with available labor and materials.

Attend other meetings outside of formal meetings as necessary in order to properly prepare proposals at the formal meetings;

2.3 Installation and Examination

In the Installation and Examination phase, you will be responsible for installing the sound system and communications system that you have designed, and examine them to ensure that they are properly installed, and that all the components are working together correctly. You will also be responsible for installing and testing the Production Communications System as specified by the Stage Manager, testing the House Communications System and Infrared Listening System and implementing any specific needs of the production as requested by the Production Manager, House Manager, or Producer.

2.3.1 Production Sound System

Communicate with the sound score designer and composer prior to sound load in to ensure a smooth sound system load in process. Work closely with them to understand how the equipment will be used to implement the Sound Score.

Manage the "Sound Load In" and ensure that the sound system is completely installed and tested for the first "Sound Priority" time (you will negotiate the exact time for this with the designer and the Production Manager at production meetings). Examine every signal path to ensure that there are no technical difficulties that will appear during the verification and calibration process. Determine the schedule of receiving props that need to be modified for sound so that they will be completed by first technical rehearsals. Determine the consumables required for the show and place order with the Grad Assistant in charge of the theatre area allowing plenty of time for ordering through the university system and delivery.

2.3.2 Production Communication System

You will communicate directly with the stage manager and production team prior to tech rehearsals to assess communication system needs, and then install and test the technical equipment necessary for the production team to communicate effectively during the technical rehearsals and performances. Manage the communication system setup and have the communication system setup and tested before the first tech rehearsal (or as requested by the stage manger). Test the Program System, and BOH paging systems to ensure they are fully functional for the first technical rehearsal.

Test the Assisted Listening System (both infrared headsets and induction loops—get a test hearing aid from the Grad Assistant in Theatre Sound) at every seating area in the house, and FOH Program System, to ensure they are fully functional for the first preview.

2.4 Verification and Calibration

In the Verification and Calibration phase, you will verify that all of the equipment is performing to specification, and then calibrate the equipment to perform as a cohesive system. Verification and Calibration takes place during the "Sound Only" time, usually during the week following the "Sound Load In." It is your responsibility to arrange for sufficient time with the production manager to complete the verification and calibration procedures detailed below in a timely manner.

2.4.1 Verification

Using the appropriate tools in the Calibration Toolbox (e.g., SMAART, etc.) verify that every channel of the sound system is passing audio at the appropriate level from source through to the loudspeaker output, and that each piece of equipment meets its specifications for hum and noise, distortion, and maximum output level. Aim each loudspeaker according to the speaker plot, verifying the on axis (ONAX), off axis (OFFAX), and crossover (XOVER) locations match the focus detailed in the speaker and EASE plots.

2.4.2 Calibration

Using the appropriate tools in the Calibration Toolbox, calibrate every channel in the system so that every component in the signal chain overloads at the same time. Calibrate each loudspeaker output so that its on-axis response equals the desired nominal sound pressure level (e.g., 75 dBLp). Verify the maximum long term sound pressure level and headroom, i.e., that the sound system can produce the maximum sound pressure level, without distorting or endangering any components in the signal chain. Verify even coverage throughout the audience, and that comb filtering effects occur as predicted in the Ease plots.

2.5 Operation and Maintenance:

In the Operation and Maintenance Phase, you will represent the sound team in all communications with the rest of the production team, be responsible for training the sound board operators, resolve technical issues as they arise during both the technical rehearsals and performances.

Represent the sound team at all production meetings, and work to resolve any problems that arise in the course of mounting the production.

Train the sound mixer, playback operator, and any other sound personnel for the show.

Familiarize the Production Sound Mixer and the Sound Playback Operator with the sound equipment used in the production, and make sure that they are comfortable with any equipment they need to use for the production; ensure that they know what to do in an emergency, and how to contact you.

As Production Sound Engineer for a production, you must also realize that you provide a vital link in the training and development of assistant production sound engineers and board operators. By the time your show closes, your assistant production sound engineer should be capable of engineering a show to the standards of Purdue University Theatre. In order to accomplish this, you must actively involve them in every aspect of your work, and actively embrace supporting the knowledge and experience they must acquire in order to become effective production sound engineers themselves.

Setup rehearsal sound equipment as requested by the sound designer or stage manager;

Attend the "Level Set" and "10 out of 12" Technical Rehearsal to ensure that both the sound and communication systems are functioning properly, and to resolve any problems that arise. You will attend the beginning of the remaining technical and dress rehearsals to ensure that both the sound and communication systems are functioning properly and then remain nearby and "on call" for the rest of the rehearsal period. You will ensure that the sound board operators and the stage manager have emergency phone numbers for the sound team and a schedule in place as to who is covering which performances. You will verify that there are sufficient consumables in place for the run of the show.

Attend the Opening Night performance. During the run of the show, you will respond promptly to any problems in the sound, communication, or assisted listening systems noted in the stage manager's daily show notes or as directed by the Sound Designer, Sound System Supervisor, etc. You will respond in writing to the Stage Manager, copying all communications to the Production Manager, Sound System Supervisor, Faculty sound mentor, and others, as appropriate.

You are not responsible for either maintenance or repair of the theatre sound systems; that responsibility lies with the graduate and undergraduate assistants in the Theatre Division. You are responsible for ensuring that the graduate assistant in charge of the theatre spaces is immediately informed in writing (with a copy to the faculty mentor) about any problems you uncover in the sound system. Under no circumstances are you allowed to enter the rear racks of theatre equipment with the exception of setting the amplifier levels during the calibration process. If you feel you need to rewire or otherwise make new connections or changes in a rack, you must request permission from the graduate assistant (and copy the faculty mentor) in writing

Attend the Strike Meeting to organize the manner in which the sound installation will be removed from the production especially as it relates to other disciplines. You will manage the sound load out process, and insure that all the Sound Mix Positions, SVC Room, Amp Room, and Storage

Closets are returned to their neutral status. You will schedule a meeting with the Sound Supervisor to review the sound facilities and discuss any problems that occurred during the production process. You will put all broken equipment in the Sound Storage Room on the "Sick Bay" shelf; tag it with a description of the problem and include your name and email on the tag. You will also report the problem to the Grad Assistant that supervises the theatre sound equipment;

2.6 Documentation

At the conclusion of your project you will present your Capstone Design Project Book. It should include the following:

1. Introduction, detailing the components of this project;
2. Production Processes including:
    1. This document;
    2. A copy of the Production Calendar;
    3. A copy of the script with your notes;
    4. Any research you did for the production;
    5. The final cue sheets for the production;
    6. Notes from each Design Meeting;
    7. Notes from each Production Meeting;
    8. Rehearsal notes, your emailed responses, and details regarding how each note was resolved;
    9. Reconciliation Report (e.g., Strike, etc.)
3. Sound System Design and Prediction:
    1. Sound Reinforcement System Components:
        1. Introduction (Program of uses)
        2. System Block Diagram;
        3. System Speaker Plot;
        4. Loudspeaker Rigging;
        5. FOH Layout;
        6. Orchestra Pit Layout (if applicable);
        7. EASE Plots for the Direct Sound Field;
        8. Narrative describing all of the above.
    2. Show Operation
        1. Console Assigns;
        2. RF Mike Assigns (if applicable);
        3. Perishables Order;
        4. Narrative describing all of the above.
4. Specification, budgeting and shop order (Continued from above, including):
    1. Preliminary/Final Shop Order including:
        1. Equipment make, model, amounts, description;
        2. Rack Elevations
        3. Mult Plot/List
    2. System Specifications including:
        1. Cost Analysis and Budget;
        2. Shop Order
    3. Cut sheets for equipment specified for system
5. Installation and Examination:

1. Notes detailing any problems encountered in the installation of the system, and how they were resolved;

6. Verification and Calibration:
    1. Documentation of measurements of sound system performance, including
        a. hum and noise floor;
        b. distortion;
        c. system levels;
        d. loudspeaker nominal and maximum sound pressure levels;
        e. notes detailing where any measurements deviated from the predictions.
7. Conclusion, reporting on:
    1. Aspects of the project that proceeded according to plan,
    2. Variances from the plan and how they were resolved,
    3. Recommendations for self-improvement that manifested themselves as a result of the project, and

       Recommendations