FORM A
College of Engineering Technology

Revised 05/08/2009

PROPOSAL SUMMARY AND ROUTING FORM

Proposal Title: EEET 390 – ADVANCED ELECTRONICS

Initiating Unit or Individual: ROBERT MOST
Contact Person's Name: ROBERT MOST e-mail: MOSTR@FERRIS.EDU phone: X3044
Date or Term of Proposal Implementation: 201008

- ☐ **Group I - A – New degree/major or major, redirection of a current offering, or elimination of a degree, major or minor**
- ☐ **Group I - B – New minors or concentrations**
- ☐ **Group II - A – Minor curriculum clean-up and course changes**
- ☒ **Group II - B – New Course**
- ☐ **Group III - Certificates**
- ☐ **Group IV – Off-Campus Programs**

Group/Individual	Signature	Date	Vote/Action *
Program Faculty			____Support ____Support with Concerns ____Not Support
Department Faculty		3/31/10	✓ Support ____Support with Concerns ____Not Support
Department Head / Chair		3/31/10	✓ Support ____Support with Concerns ____Not Support
College Curriculum Committee			____Support ____Support with Concerns ____Not Support
Dean		4/5/10	____Support ____Support with Concerns ____Not Support
University Curriculum Committee			____Support ____Support with Concerns ____Not Support
Senate			____Support ____Support with Concerns ____Not Support
Academic Affairs		4/7/10	✓ Support ____Support with Concerns ____Not Support

* Support with Concerns or Not Support must include a list of specific concerns. Votes must be shown for faculty groups. Administrators check appropriate action taken.

To be completed by Academic Affairs

President (Date Approved) **Board of Trustees (Date Approved)** **President's Council (Date Approved)**

VPAA
APR 5 2010
PROVOST

1. Proposal Summary

(Summary is generally less than one page. Briefly: state what is proposed with a summary of rationale and highlights. Additional rationale may be attached.)

This is a new course being offered; it does not replace or modify any existing course. As a continuation of EEET 211, advanced concepts in electronics design will be explored. Specific topics include DC/DC conversion, AC inverters, H-Bridge applications, PWM design in amplifiers (Class-D), motor speed control, power LED circuits, energy conversion/photovoltaic applications. Course will be offered in the third year fall semesters for EEET and CNS students.

2. Summary of All Course Action Required*

a. Newly Created Courses to FSU:

Prefix	Number	Title
EEET	390	ADVANCED ELECTRONICS

b. Courses to be Deleted From FSU Catalog:

Prefix	Number	Title

c. Existing Course(s) to be Modified:

Prefix	Number	Title

d. Addition of existing FSU courses to program

Prefix	Number	Title

e. Removal of existing FSU courses from program

Prefix	Number	Title

3. Summary of All Consultations

Form Sent (B or C)	Date Sent	Responding Dept.	Date Received & by Whom

4. Will External Accreditation be Sought? (For new programs or certificates only)

_____ **Yes** _____ **No**

If yes, name the organization involved with accreditation for this program.

5. Program Checksheets affected by this proposal.

It affects both the EEET and ECNS check sheets for the third year fall semesters.

CREATE NEW COURSE
Course Data Entry Form

FORM F

Create New Course
Rev. 07/23/07

I. ACTION TO BE TAKEN: CREATE A NEW COURSE

Notes
1. Complete each item in Section I and Section II.
2. If this course is to be used as a prerequisite for other university courses, Form Fs that reflect the prerequisite change must be submitted for those courses as well.

Term Effective (6 digit code only): 201008 **Examples: 200801(Spring), 200805(Summer), 200808(Fall)**
Note: The first four digits indicate year, the next two digits indicate month in which term begins.

II. PROPOSED FOR NEW COURSE: Complete all sections a through r, See manual for clarification.

a. Course Prefix: EEET
b. Number: 390
c. Enter Contact Hours per week in boxes.
LECture 2 LAB 4 INDependent Study – Check (x) ☐
Practicum: ____ Seminar: ____

d. Course Title: **ADVANCED ELECTRONICS** (Limit to 30 characters/spaces.)

e. College Code: TE **f.** Department Code: EECN

Credit Hours: Check (x) type and enter maximum and minimum hours in boxes.

g. Type: ☐ Variable ☒ Fixed **h.** Minimum Credit Hours 3 **i.** Maximum Credit Hours 3

j. May Be Repeated for Added Credit: Check (x) ☐ Yes ☒ No

k. Levels: Check (x) ☒ Undergraduate ☐ Graduate ☐ Professional

l. Grade Method: Check (x) ☒ Normal Grading ☐ Credit/No Credit only (Pass/Fail)

m. Does proposed new course replace an equivalent course? Check (x) ☐ Yes ☒ No

n. Equivalent course: Prefix ____ Number ____ See instructions on Replacement courses.

o. CATALOG DESCRIPTION – Limit to 75 words – PLEASE BE CONCISE.
As a continuation of EEET 211, advanced concepts in electronics design will be explored. Specific topics include DC/DC conversion, AC inverters, H-Bridge applications, PWM design in amplifiers (Class-D), motor speed control, power LED circuits, energy conversion/photovoltaic applications.

p. Term(s) Offered: Fall (See instructions for listing.) **q.** Max. Section Enrollment: 16

r. Prerequisites/Co-requisites/Restrictions: (If none, leave blank.) Limited to 100 spaces. ____.

UCC Chair Signature/Date: ____ __/__/__

Academic Affairs Approval Signature/Date: [signature] 4/2/10

To be completed by Academic Affairs Office: - Standard & Measures Coding and General Education Code
☐ Basic Skill (BS) ☐ General Education (GE) ☐ Occupational Education (OC) ____ G.E. Codes

Office of the Registrar use ONLY

Date Rec'd: ____ **Date Completed:** ____ **Entered: SCACRSE** __ **SCADETL** __ **SCARRES** __ **SCAPREQ** __

Ferris State University
College of Technology

Course Outline

Last Revision Date:	03/15/10
Program Curriculum Committee Chair:	Ron Mehringer

Course: EEET 390 ADVANCED ELECTRONICS

Credits: 3

Contacts: 2 Lecture, 4 Lab Hours per Week

Course Description: *As a continuation of EEET 211, advanced concepts in electronics design will be explored. Specific topics include DC/DC conversion, AC inverters, H-Bridge applications, PWM design in amplifiers (Class-D), motor speed control, power LED circuits, energy conversion/photovoltaic applications.*

Course Prerequisites: EEET 211 and EEET 222 (minimum 70 required on all prerequisites)

Required Textbooks:

Required Materials:

Student Learning Outcomes

Students satisfactorily completing this course will achieve/complete/demonstrate...:

1. Understand DC/DC converter concepts
2. Understand the operation of switching power supplies
3. Understand the concepts of buck and boost converters
4. Apply current limiting strategies to various circuits
5. Understand how to design Norton amplifier circuits
6. Apply H-Bridge concepts to motor control
7. Apply H-Bridge concepts to PWM
8. Apply PWM concepts to Power LED Drive
9. Understand Class-D PWM amplification
10. Understand Photovoltaic cells
11. Understand application and integration of Photovoltaics in smart grids
12. Understand theory of AC inversion
13. Understand battery technologies and charging strategies

Instructional Unit Topic Descriptions and Time Allocations

NO.	UNIT TOPIC DESCRIPTION SUMMARY	LECTURE HOURS	LAB HOURS
1.	Buck/Boost Converter	3	4
2.	BJT Current Limit/Clipping Detector	3	4
3.	DC/DC Converters	3	4
4.	AC Inverters	3	4
5.	Norton Amplifier	2	4
6.	H-Bridge Analysis	4	8
7.	Class-D Amplifier	3	8
8.	Power LED Driver	2	8
9.	Battery Charging and Characterization	3	8
10.	Photovoltaic Analysis, Characterization and Integration	4	8
	Total	30	60

Learning Outcomes for Each Instructional Unit

Upon Completion of each instructional unit, the learner will be able to satisfactorily:

I.	Topic: Buck/Boost Converter A. Analyze buck boost circuits B. Design a buck boost circuit
II.	Topic: BJT Current Limit/Clipping Detector A. Formulate BJT current limiter B. Design BJT current limiter
III.	Topic: DC/DC Converters A. Analyze DC/DC converter B. Design a DC / DC converter
IV.	Topic: AC Inverters A. Calculate power loads with AC inversion B. Analyze AC single and three phase inverter
V.	Topic: Norton Amplifier A. Calculate gain and impedance of Norton amplifiers B. Design a Norton amplifier circuit
VI.	Topic: H-Bridge Analysis A. Analyze H-bridge circuit using mathematics B. Apply H-bridge principles in design
VII.	Topic: Class-D Amplifier A. Analyze class-D parameters B. Design a class-D amplifier
VIII.	Topic: Power LED Driver A. Apply PWM principles to LED drive B. Design a power LED driver
IX.	Topic: Battery Charging and Characterization A. Apply battery charging principles to different battery chemistries B. Design a battery charging circuit using specific strategies
X.	Topic: Photovoltaic Analysis, Characterization and Integration A. Apply photovoltaic parameters in characterization B. Design charging circuits using PV technology
-	Final Examination - Application of I-X above

Minimum Required Student Laboratory Activities

I.	Topic: Lab Safety Orientation A. Apply safety principles to lab B. Familiarization of safety features of lab
II.	Topic: Buck/Boost Converter A. Analyze Buck / Boost converters B. Design Buck / Boost converters
III.	Topic: BJT Current Limit/Clipping Detector A. Analyze BJT Current Limit/Clipping Detector B. Design BJT Current Limit/Clipping Detector
IV.	Topic: Norton Amplifier A. Analyze Norton Amplifiers B. Design Norton Amplifiers
V.	Topic: H-Bridge Analysis A. Analyze MOSFET H-bridges B. Analyze MOSFET H-bridges
VI.	Topic: MOSFET H-Bridge Motor Control Part I A. Motor control with 2-N channel / 2 – P channel MOSFETS B. Design with 2-N channel / 2 – P channel MOSFETS
VII.	Topic: MOSFET H-Bridge Motor Control Part II A. Motor control with 4-N channel MOSFETS B. Design with 4-N channel MOSFETS
VIII.	Topic: Class-D Amplifier Part I A. Design of Class-D front end B. Analysis of Class-D front end
IX.	Topic: Class-D Amplifier Part II A. Design of Class-D PWM power stage B. Analysis of Class-D PWM power stage
	Topic: Power LED Driver A. Design of LED PWM power stage B. Analysis of LED PWM power stage
	Topic: Battery Charging and Characterization Part I A. Lead-Acid battery charging analysis B. Lead-Acid battery charging design
	Topic: Battery Charging and Characterization Part II A. Lithium-Ion battery charging analysis B. Lithium-Ion battery charging design

	Topic: Photovoltaic Analysis A. Analysis of silicon based PV circuits B. Design of silicon based PV circuits
	Topic: Photovoltaic Integration A. Integration of silicon based PV circuits B. Smartgrid applicatons