LBST → 04/21/10

LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No.	UWUCC Action-Date:	Senate Action Date:
		10-25b	App - 10/12/10	App 11/2/10

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person	Email Address
Feng Zhou	fzhou@iup.edu
Proposing Department/Unit: Physics/Electro-Optics	Phone: 724-294-3300 (ext: 27)

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

1. Course Proposals (check all that apply)

X New Course ____ Course Prefix Change ____ Course Deletion

____ Course Revision ____ Course Number and/or Title Change ____ Catalog Description Change

	EOPT 126-Electronics II for Electro-Optics
Current Course prefix, number and full title	*Proposed course prefix, number and full title, if changing*

2. Additional Course Designations: check if appropriate

____ This course is also proposed as a Liberal Studies Course.

____ This course is also proposed as an Honors College Course.

____ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

____ Catalog Description Change ____ Program Revision

____ New Degree Program ____ Program Title Change ____ Other

____ New Minor Program ____ New Track

Current program name	*Proposed program name, if changing*

4. Approvals		**Date**
Department Curriculum Committee Chair(s)	S L Sobolewski	4/20/10
Department Chair(s)	[signature]	4/20/10
College Curriculum Committee Chair	Anne Kade	4/21/10
College Dean	Mary Lou Zeeman	4/21/10
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	Gail S Sechrist	10/12/10

* where applicable

Received OCT 2 0 2010 Liberal Studies

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Syllabus of Record

I. Catalog Description.

EOPT 126 Electronics II for Electro-Optics **(2c-1l-3cr)**

Prerequisites: EOPT 125 or permission of instructor
Introduces the student to a variety of digital and advanced analog circuits and components commonly used in electro-optic systems. Students will learn basic working principles of circuits utilizing operational amplifiers, gates, and flip-flops and will apply this knowledge toward constructing and trouble-shooting these circuits.

II. Course Outcomes.

After successfully completing the course, the student will be able to:

1. Sketch, construct, and trouble-shoot basic op amp filter and oscillator and amplifier circuits and explain principles of operation
2. Convert between decimal, binary, BCD, and hexadecimal number systems
3. Sketch, construct, and trouble-shoot circuits containing gates and flip-flops and explain principles of operation
4. Apply gates and flip-flops to construct basic counter and register circuits
5. Interface TTL and CMOS logic families
6. Use tri-state gates to properly interface a circuit with a high current or high voltage circuit
7. Explain how serial data is transferred and how USB ports function
8. Calculate parameters necessary to construct clock oscillators of a specified frequency

III. Detailed Course Outline (28 academic hours plus 3 lab hours/week for 14 weeks).

A. Operational Amplifier Circuits in Electro-Optics (4 academic hours+2 labs)
   1. Op Amp Review
   2. Op Amp Filter Circuits
   3. Photodetector Amplifiers
   4. Schmidt Triggers

B. Oscillators and Multivibrators (2 academic hours + 1 lab)
   1. Wien-Bridge Oscillator
   2. 555 Astable Multi-vibrator

C. Silicon-Controlled Rectifiers (2 academic hours + 1 lab)
   1. SCRs in DC Circuits
   2. SCRs in AC Circuits

D. Number Systems (2 academic hours)

1. Binary, BCD, and Hexidecimal Number Systems
2. Conversion between the Number Systems

E. Logic Gates and Boolean Algebra (3 academic hours + 1 lab)
1. Logic Gates (AND, NAND, OR, NOR)
2. Boolean Algebra
3. DeMorgan's Theorems
4. Using Gates for Enable/Inhibit Functions

F. Logic Families and Characteristics (2 academic hours + 1 lab)
1. TTL and CMOS Subfamilies
2. Emitter-Coupled Logic
3. Interfacing TTL and CMOS

Midterm Exam (1academic hour)

G. Flip-Flops (2 academic hours + 2 labs)
1. Crossed Flip-Flops
2. Master-Slave Flip-Flops
3. JK Flip-Flops

H. Shift Registers (2 academic hours + 1 lab)
1. Parallel and Serial Registers
2. Serial Data Standards
3. ASCII Code
4. USB Ports

I. Counters (2 academic hours + 1 lab)
1. Ripple and Synchronous Counters
2. Counter Applications
3. Trouble-Shooting Counters

J. Schmidt Trigger Inputs and Clocks (2 academic hours + 2 labs)
1. Schmidt-Trigger Clocks
2. Crystal Oscillators
3. Pulse-Stretching and One-Shots

K. Decoders, Multiplexers, and Displays (2 academic hours + 1 lab)
1. Decoder Circuits
2. Multiplexers and Demultiplexers
3. LEDs and 7-Segment Displays
4. Liquid Crystal Displays

L. Tri-State Gates and Interfacing to High Current (2 academic hours + 1 lab)
1. Tri-State Gates
2. Buffering to High Current and High Voltage
3. Opto-coupler Isolation
4. Insulated Gate Bipolar Transistors

M. Memory and Microprocessors (2 academic hours)
1. Elements of a Computer
2. Microprocessors
3. Memory Types
4. Input/Output Devices

Final Exam (to be held during finals week)

List of lab experiments:

Lab 1 Operational Amplifiers and Filter Circuits
Lab 2 Photodetector Amplifier Circuits and Schmidt Triggers
Lab 3 Oscillators and Multivibrators
Lab4 Silicon-Controlled Rectifiers DC and AC Circuits
Lab 5 Logic Gates
Lab 6 Logic Families and Characteristics
Lab 7 Crossed Flip-Flops
Lab 8 Master-Slave Flip-Flops and JK Flip-Flop
Lab 9 Shift Registers
Lab 10 Counters
Lab 11 Schmidt Trigger Inputs and Clocks
Lab 12 Crystal Oscillators
Lab 13 Decoders, Multiplexers, and Displays
Lab 14 Tri-State Gates and Interfacing to High Current

IV. **Evaluation Methods.**

The final grade will be determined as follows:

Exams (25%): 25% for both midterm exam and final exam. Each exam will consist of multiple-choice questions, circuit sketches and calculations, and a circuit design and construction problem. The final exam will be cumulative and require the student to integrate knowledge acquired throughout the course.

Quizzes (25%): Two quizzes will be administered during the semester.

Lab Reports (25%): Students will turn in lab reports weekly (due one week after the laboratory exercise). Grading will be based on quality of laboratory participation, quality and completeness of report, and neatness.

Homework (25%) Students will be assigned approximately 10 homework problem sets, entailing circuit design and calculations, internet searches and reports, and questions based on chapter reading material.

V. **Example Grading Scale.**

Grading Scale: A: $\geq$90% B: 80-89% C: 70-79% D: 60-69% F: <60%

VI. **Undergraduate Course Attendance Policy.**

Attendance and enforcement thereof shall be in accord with the general guidelines provided in the official university "Undergraduate Course Attendance Policy".

VII. **Required Textbook(s), Supplemental Books and Readings.**

1. Digital Electronics-by James Bignell and Robert Donovan (5th Edition), Thomson Delmar Learning Publishers, New York (2007)
2. Lab Manual to Accompany Digital Electronics- by James Bignell and Robert Donovan (5th Ed), Thomson Delmar Learning Publishers, New York (2007)

VIII. **Special Resource Requirements.** None

IX. **Bibliography.**

1. Meade, Russell, *Foundations of Electronics 5th Edition*. Thomson Delmar Learning Publishers, New York (2007)
2. Carr, Joseph, *Electronic Circuit Guidebook-Volume 4-Electro-Optics*, Prompt Publications (1997)
3. Sinclair, Ian, *Digital Logic Gates and Flip-Flops*, PC Publishing (1989)
4. *Electronics for Engineers: An Introduction*, Cambridge University Press (1984)
5. DeMassa, T.A. and Z. Ciccone, *Digital Integrated Circuits*, Wiley Interscience Publishing (1992)
6. Horowitz, Paul and Winfred Hill, *The Art of Electronics, -2nd Edition*, Cambridge University Press (1989)
7. Tokheim, Roger, *Digital Electronics-4th Edition* , McGraw-Hill Publishing (1993)
8. Kleitz, William, Digital Electronics-A Practical Approach-6th Edition, Prentice-Hall Publishing (1995)

Course Analysis Questionnaire

Section A: Details of the Course

A1 How does this course fit into the programs of the department? For what students is the course designed? (majors, students in other majors, liberal studies). Explain why this content cannot be incorporated into an existing course.

The course will be mandatory for electro-optics degree candidates. Students from other departments may also enroll in the course if prerequisites are met and transportation issues resolved. Currently Electro-Optics students only enroll in one electronics course dealing with analog electronics. Five years of experience with the program has revealed that students leaving the program are woefully deficient in electronics, which constitutes half of the job description for many electro-optics graduates. To remedy this, we have tried to add some digital electronics and analog electronics topics to other courses, resulting in less coverage of course topics. Most electro-optics programs require 2-3 electronics courses, including a full course in digital electronics. A 2nd course is absolutely necessary in order to provide our graduates with skills necessary in the electro-optics workplace.

A2 Does this course require changes in the content of existing courses or requirements for a program? If catalog descriptions of other courses or department programs must be changed as a result of the adoption of this course, please submit as separate proposals all other changes in courses and/or program requirements.

The course will be added to the list of course requirements leading to AAS-Electro-Optics, the AS-Electro-Optics and BS in Applied Physics Electro-Optics degrees.

A3 Has this course ever been offered at IUP on a trial basis (e.g. as a special topic) If so, explain the details of the offering (semester/year and number of students).

There is considerable overlap between the content of this course and COSC 105 and COSC *300.* However this course will be offered at the Northpointe campus since that is where the EO program resides.

A4 Is this course to be a dual-level course? If so, please note that the graduate approval occurs after the undergraduate.

The course will not be a dual-level course.

A5 If this course may be taken for variable credit, what criteria will be used to relate the credits to the learning experience of each student? Who will make this determination and by what procedures?

The course is a fixed credit course

A6 Do other higher education institutions currently offer this course? If so, please list examples (institution, course title).

Several other universities and community colleges offer the course, which is either Electronics II or Digital Electronics. Examples of community colleges include

- *Camden Community college*
- *Texas State Technical College.*

Virtually every electrical engineering-related university in the U.S requires 2 semesters of electronics.

A7 Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency? If so, please provide documentation.

The skills emphasized in the proposed course are included in the Photonics Skills standard for technicians, developed by CORD (Center for Occupational Research and Development). This standard was compiled by industry to meet the needs of the 21st century photonics workplace.

Section B: Interdisciplinary Implications

B1 Will this course be taught by instructors from more than one department? If so, explain the teaching plan, its rationale, and how the team will adhere to the syllabus of record.

The course will be taught by physics/electro-optics faculty only.

B2 What is the relationship between the content of this course and the content of courses offered by other departments? Summarize your discussions (with other departments) concerning the proposed changes and indicate how any conflicts have been resolved. Please attach relevant memoranda from these departments that clarify their attitudes toward the proposed change(s).

Some of the topics in this class are similar to those offered by the Computer Science. Attached is e-mail from the computer science department granting permission to offer this class at Northpointe.

B3 Will this course be cross-listed with other departments? If so, please summarize the department representatives' discussions concerning the course and indicate how consistency will be maintained across departments.

The course will not be cross-listed with other departments.

Section C: Implementation

C1 Are faculty resources adequate? If you are not requesting or have not been authorized to hire additional faculty, demonstrate how this course will fit into the schedule(s) of current faculty. What will be taught less frequently or in fewer sections to make this possible? Please specify how preparation and equated workload will be assigned for this course.

An additional faculty member will not be needed when the course is added. The enrollment patterns for the EOPT classes have been adequate. The pattern has been to offer five classes per semester. With the rotation plan, only four classes need to be offered every semester. However, if additional faculty resources are necessary, they will be provided by the Physics Department

C2 What other resources will be needed to teach this course and how adequate are the current resources? If not adequate, what plans exist for achieving adequacy? Reply in terms of the following:

*Space
*Equipment
*Laboratory Supplies and other Consumable Goods
*Library Materials
*Travel Funds

Laboratory facilities and space are more than adequate. The only other necessary resource needed for course implementation is lab supplies and other consumable goods (electronics components), which can be covered from the operating budget. No library and travel funds will be required for course implementation.

C3 Are any of the resources for this course funded by a grant? If so, what provisions have been made to continue support for this course once the grant has expired? (Attach letters of support from Dean, Provost, etc.)

No resources are funded by a grant.

C4 How frequently do you expect this course to be offered? Is this course particularly

designed for or restricted to certain seasonal semesters?

This course will be offered once a year to the electro-optics students.

C5 How many sections of this course do you anticipate offering in any single semester?

One section of the course will be offered.

C6 How many students do you plan to accommodate in a section of this course? What is the justification for this planned number of students?

Current lab facilities and equipment can accommodate approximately 16 students in a course. This is equivalent to 8 laboratory groups of 2 members.

C7 Does any professional society recommend enrollment limits or parameters for a course of this nature? If they do, please quote from the appropriate documents.

No recommended enrollment limits exist for courses of this nature. Enrollment limitations are nearly always dependent on the laboratory facilities at the offering institution.

C8 If this course is a distance education course, see the Implementation of Distance Education Agreement and the Undergraduate Distance Education Review Form in Appendix D and respond to the questions listed.

The proposed course is not a distance education course.

Section D: Miscellaneous

Include any additional information valuable to those reviewing this new course proposal.

Experience obtained during five years of instruction in the new IUP Electro-Optics program has been used to identify curriculum changes necessary for EO graduates to succeed in the workplace. Our program is strong in optics but very weak in electronics. Insufficient depth and breadth of topics is possible in a single electronics course. These topics are required in later courses. In these courses, we currently must spend a few weeks on electronics topics to bring students up to speed for the course. This has resulted in incomplete coverage of topics in these courses and some student frustration. Nearly all programs dealing with electro-optics (or similar fields) offer a 2-course electronics sequence.

E mail received from Charles Shubra, Chair of the Computer Science Department

----- Original Message -----
From: Waleed Farag <mailto:farag@iup.edu>
To: Feng Zhou <mailto:fzhou@iup.edu>
Cc: Stanley Sobolewski <mailto:sobolews@iup.edu> ; Charles Shubra <mailto:cjshubra@iup.edu> ; Farag, Waleed Ezzat <mailto:Waleed.Farag@iup.edu>
Sent: Tuesday, April 06, 2010 4:46 PM

Subject: Re: New Course Proposal: EOPT 126 Electronics II for Electro Optics

Hello All,
I believe this will be a convenience justification to the CCC and to our department. Regards.

On 4/6/2010 2:03 PM, Feng Zhou wrote:

Hi Stan,

Yes, I agree to a change in that paragraph. Because the EO program is located at the northpointe campus, the students take courses that are offered at the Northpointe campus. Also the course requirement is different too since it is an associate degree program.

From: Stanley Sobolewski <mailto:sobolews@iup.edu>

To: Charles Shubra <mailto:cjshubra@iup.edu>

Cc: Feng Zhou <mailto:fzhou@iup.edu> ; Farag, Waleed Ezzat <mailto:Waleed.Farag@iup.edu>

Sent: Tuesday, April 06, 2010 1:41 PM

Subject: Re: New Course Proposal: EOPT 126 Electronics II for Electro Optics

Dr. Shubra,
I am sure that Dr. Zhou would agree to a change in that paragraph.
Stan.

On 4/6/10 1:36 PM, "Charles Shubra" <cjshubra@iup.edu> wrote:
Hi Stanley,
Here is the response from the computer science curriculum committee. Dr. Farag is a member of the NS&M curriculum committee and he will be present to explain the position of the computer science dcc.

From: Waleed Farag <mailto:farag@iup.edu>
Sent: Thursday 1 April 2010 10:17 AM
To: Charles Shubra <mailto:cjshubra@iup.edu>
Subject: Re: New Course Proposal: EOPT 126 Electronics II for Electro Optics
Dr. Shubra,
The Computer Science DCC has met yesterday and discussed EOPT. We agreed that there are considerable overlap between the content of this course any our 105 and 300 course. I believe that physics needs to clearly justify this in the course proposal and not say that the contents are not offered in any other courses at IUP. Regards.