Senate Reference No. 12-5

To: IPFW Senate

From: Ann Livschiz, Chair
Curriculum Review Subcommittee

Date: September 26, 2012

Re: Proposal for the Bachelor of Science in Physics, with a Concentration in Optoelectronics.

The Curriculum Review Subcommittee supports the proposal for the Bachelor of Science in Physics with a Concentration in Optoelectronics, and finds that the proposal requires no Senate review.

Approving:	Not Approving	Absent
Ronald Duchovic		Becky Salmon
Craig Hill		Myeong Hwan Kim
Nancy Jackson		
Il-Hee Kim		
Joseph Khamalah (*ex officio)*		
Ann Livschiz		
Susan Skekloff		
Lubomir Stanchev		

TO: Deans, Division Directors and Department Chairs
FROM: Steven T. Sarratore (for the Curriculum Review Subcommittee)
Associate Vice Chancellor for Academic Programs
DATE: 6/1/2012
SUBJECT: Request for Comments

When the Curriculum Review Subcommittee receives a proposal, the Office of Academic Affairs distributes it, on behalf of the Subcommittee, to all deans and division directors and department chairs for comment.

The purpose of this memo is to solicit your comments on the proposal to Concentration in Optoelectronics, which is enclosed.

The Subcommittee especially invites comments on (1) the rationale for the proposed program; (2) the use of IPFW resources; (3) the relationship among proposed and existing programs; and (4) other effects on IPFW and on IPFW's constituencies.

A comment sheet is enclosed.

For the Curriculum Review Subcommittee to conduct its review in a timely manner, it is essential that you reply to Steven T. Sarratore by 7/1/2012.

encs. Proposal Concentration in Optoelectronics
Comment Sheet

Comment Sheet
Proposal: Concentration in Optoelectronics
Name of Dean, Division Director, or Department Chair:

1. The rationale for the proposed program

2. The use of IPFW resources

3. The relationship among proposed and existing programs

4. Other effects on IPFW and on IPFW's constituencies

5. Other comments

The _____
Unit Name

- ☐ has no objections to the proposal.
- ☐ endorses the proposal.
- ☐ has minor objections to the proposal which can be dealt with through revision.
- ☐ has major objections to the proposal and recommends that the CRS postpone review.

Send comments to Steven T. Sarratore by 7/1/2012.

A&SCCD#11-25

Proposal for a Concentration in Optoelectronics
Indiana University - Purdue University Fort Wayne
April 6, 2012

prepared by Mark F. Masters, Ph.D., Department of Physics

1. Name of proposed new program

Bachelor of Science in Physics with a concentration in Optoelectronics

2. Title of degree to be conferred

Bachelor of Science

3. Field of study, department, and school involved

Optoelectronics/Physics, Department of Physics, COAS

4. Objectives of the proposed concentration

There are several objectives for this concentration:

a. The IPFW Physics Department has a majority of faculty members with research in optics. The department has developed a reputation for optics education. This concentration is an effort to provide students with recognition of increased educational experience in optics differentiating them from the straight physics major.

b. Optics is a very important sub-field within physics. Nationwide, optoelectonics is a growth field with applications ranging from biomedical to astronomical. Optical systems are used extensively in the communication industry. As will be described in section 10, there is significant photonics work in local companies.

c. Within physics, it is critical to provide students with more options than just simply physics as is recommended by the SPIN-UP report and our last program review. SPIN-UP was a National Science Foundation sponsored project that investigated qualities that make a successful, thriving physics department. (http://www.aps.org/programs/education/undergrad/faculty/spinup/upload/SPIN-UP-Report.pdf) In this project, it was found that having one or more concentrations is extremely beneficial to the physics program, helping to attract more majors.

5. Proposed date of initiation of the new program

Fall 2012

6. A statement describing the relationship of the proposed program to the mission and scope of the campus

Department Mission: The relevant part of the Department of Physics Mission Statement is "producing well prepared graduates who are confident in their abilities and understanding of physics," and "Physics Majors will gain a strong working knowledge of basic science and physics."

The proposed concentration is clearly within this mission. Optoelectronics is an important sub-field within physics (optics and optical instrumentation) and the department believes that the students would benefit from a concentration in these areas rather than the straight physics degree.

College Mission: "...the college provides students with a breadth of knowledge about the global environment and fosters an appreciation and respect for diversity. The College of Arts and Sciences equips students to think critically, communicate effectively, and develop creative solutions to future challenges."

This proposed concentration is directly related to the college mission statement, in particular, the breadth of knowledge and creative solutions to future challenges. It does so by providing a concentration that is of growing importance.

IPFW Mission: "We offer a broad range of high-quality undergraduate, graduate, and continuing education programs that meet regional needs ..." The proposed concentration builds upon departmental strengths in optics and will be of high quality and provide a unique opportunity for Northeast Indiana.

7. **A statement describing the relationship of the proposed program to already existing programs at the campus.**

There are no optics or optoelectronics programs at IPFW besides the optics within the department of physics. This type of concentration could provide collaboration with other departments working on subjects as diverse as mechanical engineering to improving virtual reality in Computer Science and way finding in psychology.

8. **A statement describing the relationship of this program to similar programs in other regional and Indiana post-secondary educational institutions.**

The only optics related degrees in Indiana are at Purdue University, West Lafayette and Rose Hulman in Terre Haute. Therefore, this concentration will be independent.

9. **A statement describing cooperative endeavors explored and/or intended with other institutions particularly those located in the same geographic region.**

There are no other institutions in the region with an optics program.

10. **A statement indicating need for the concentration in terms of manpower supply and demand.**

This concentration adds courses, specialization and focus to a physics degree which is inherently a general program. Looking at www.hoosierdata.in.gov, it is clear that there will be significant demand for physical scientists in the next 4 years. However, this data does not provide fine details about physical scientists nor does it provide information about educational levels of these scientists.

However, there are a number of companies that have an interest in optics and photonics. These include ITT Exelis (formerly ITT Aerospace), in which there is significant involvement in optical measurements and interferometry; Northrop Grumman, with work in optical atmospheric effects, Fort Wayne Laser Die in which they use lasers to create wire dies, and SWS-Trimac, which does laser machining. Because of the use of the fiber optic network, Frontier needs employees that can work in optical calibration.

11. A statement describing resources over and above present levels required to initiate the program

Physics already offers these courses as electives, so it will not make any difference in terms of load. A statement about library resources is attached.

12. Proposed Curriculum

The proposed curriculum starts with the basic physics degree and then adds 4 optics courses and an electronic instrumentation course.
Please see attached draft Bingo sheet for details.

Meeting IPFW General education requirements: 24 credit hours (some of the General Education Requirements are met by courses listed below such as MA 16500 meeting the Area I quantitative reasoning requirements).

COAS Requirements: 11 credit hours.
Writing 3 ch
Foreign Language 8 ch
General Education: 24 credit hours
Chemistry requirements: 8 credit hours
Core Physics courses: 42 credit hours
PHYS 15200 – Mechanics 5 ch
PHYS 25100 – Heat, Electricity and Optics 5 ch
PHYS 31000 – Intermediate Mechanics 4 ch
PHYS 31200 - Intermediate Electricity and Magnetism 3 ch
PHYS 31300 - Intermediate Electricity and Magnetism II 3 ch
PHYS 32200 – Optics. 3 ch
PHYS 34500 – Optics Laboratory 1 ch
PHYS 34200 - Modern Physics 3 ch
PHYS 34300 – Modern Physics Laboratory 1 ch
PHYS 34600 – Advanced Laboratory 1 ch
PHYS 36100 – Electronics 4 ch
PHYS 51500 – Statistical Mechanics 3 ch
PHYS 52000 - Mathematical Methods for physicists 3 ch
PHYS 55000 – Quantum Mechanics 3 ch
Core Optics Courses: 20 credit hours
PHYS 47000 Research 3 ch
PHYS 51100 Laser Physics 3 ch
PHYS 52200 coherent optics 3 ch
PHYS 52400 physical optics and spectroscopy 4 ch
PHYS 53600 electronic instrumentation 4ch
PHYS 57000 Special topics, optics only. 3 ch
Core Math Courses: 18 credit hours
MA 16500 Calculus I 4 ch
MA 16600 Calculus II 4 ch
MA 26100 Calculus III 4 ch
MA 35100 Linear Algebra 3 ch
MA 36300 Differential Equations 3 ch

Total required courses 123 credit hours.

Walter E. Helmke Library
Indiana University-Purdue University Fort Wayne

Resources in Support of Proposed Concentration in Optoelectronics

January 10, 2012

This review provides an overview of the Helmke Library resources available to students and faculty in the proposed Optoelectronics concentration.

The combined physical and electronic collection at the Helmke Library that covers the subject area of Optoelectronics is satisfactory. As a result it will be essential to increase and strengthen the collection in order to build an excellent core collection that adequately supports the concentration. To augment resources available to IPFW students, staff and faculty the library uses the Document Delivery Service to borrow materials from other libraries and institutions as well.

I. Monographic Materials (print and electronic)

Optics, Optoelectronics, Light, Spectroscopy, Photonics and laser subjects in Physics	296

In addition general Physics subject has about 1900 titles in Helmke library IUCAT holdings. The library collection also has many resources in optics, optoelectronics, light, spectroscopy, laser and photonics in related fields such as Chemistry, Electrical Engineering, Nuclear Engineering, General Engineering and General Civil Engineering.

II. Journals and Databases

Helmke Library offers a strong selection of databases and indexes providing access to full text journals, including the major databases of *Web of Science*, *Physical Review Online Archive (PROLA), MathSciNet, Academic Search Premier,* and the *Wiley Online Library.* Additional broader subject coverage needed to support the needs of faculty and students is provided through databases such as *IEE Xplore, Compendex, ACM Digital Library, Dissertations and Theses* and *Conference Papers Index.*

A search in Journal Citation Reports (JCR) 2010 Science edition for journals in Optics and Applied Physics yields 175 journal titles. Of the 175 titles, Helmke library owns 81 journals. These 81 journals are among the top notch journals in the field. Journal ranking is by impact factor.

III. Professional Support

The subject liaison librarian will continue to provide research advice and assistance to students and faculty. The liaison librarian can provide support through involvement in Blackboard-supported classes, individual research consultations, in-class instructional sessions on selecting and searching databases, or tailored course guides to guide students through particular research assignments and resources. However, in the future, it may be necessary to support library efforts to recruit a librarian with a strong science background.

Compiled by Florence Mugambi, MLIS, IPFW Helmke Library

PHYSICS Concentration in Optics

BACHELOR OF SCIENCE – 124 CREDITS

IPFW GENERAL EDUCATION REQUIREMENT

I. LING & NUM FOUNDATIONS

ENG W131	3	
COM 11400	3	
MA 16500	X	
PHYS 15200	X	

II. NAT & PHYS SCIENCES

CHM 11500	X	
PHYS 15200	X	

III. THE IND, CULT, & SOC

	3	
	3	

IV. HUMANISTIC THOUGHT

	3	
	3	

V. CREATIVE & ARTISTIC EXPRESS

	3	

VI. INQUIRY & ANALYSIS

	3	

COAS REQUIREMENTS

WRITING

ENG W 140/W233	3	

FOREIGN LANGUAGE

	4	
	4	

MATHEMATICAL SCIENCES

MA 16500	4	
MA 16600	4	
MA 26100	4	
MA 35100	3	
MA 36300	3	

CHEMISTRY

CHM 11500	4	
CHM 11600	4	

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PHYSICS CORE

PHYS 15200	5	
PHYS 25100	5	
PHYS 31000	4	
PHYS 31200	3	
PHYS 31300	3	
PHYS 32200	3	
PHYS 34200	3	
PHYS 34300	1	
PHYS 34500	1	
PHYS 34600	1	
PHYS 36100	4	
PHYS 51500	3	
PHYS 52000	3	
PHYS 55000	3	

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OPTICS CONCENTRATION

PHYS 47000 (Optics Research)	3	
PHYS 51100 (Laser Physics)	3	
PHYS 52200 (Coherent Optics)	3	
PHYS 52400 (Physical Optics)	4	
PHYS 53600 (Electronic Instrum)	4	
PHYS 57000 (Variable Title, Optics related)	3	

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Sample Four Year Plan for a Bachelor of Science in Physics with Optoelectronics Concentration

Freshman Fall MA 16500 – Calculus I (4) PHYS 17000 – Freshman Seminar (1 – not req) COM 11400 – Communication (3) CHM 11500 – General Chemistry I (4) General Education Area III (3)	Freshman Spring MA 16600 – Calculus II (4) PHYS 15200 – Mechanics (5) CHM 11600- General Chemistry II (4) ENG W131 – Elementary Composition (3)
Total Credit Hours (15)[15]	Total Credit Hours (16) [31]
Sophomore Fall MA 26100 – Multivariate Calculus (4) PHYS 25100 – Heat, Electricity and Optics (5) COAS Req. ENG W140 (3) General Education Area V (3)	Sophomore Spring MA 35100 – Linear Algebra (3) PHYS 34200 – Modern Physics (3) PHYS 34300 – Modern Physics Lab (1) PHYS 31200 – Electricity and Magnetism I (3) General Education IV (3) General Education III (3)
Total Credit Hours (15)[46]	Total Credit Hours (16)[62]
Junior Fall MA 36300 – Differential Equations (3) PHYS 31300 – Electricity and Magnetism II (3) PHYS 36100 – Electronics for Scientists (4) Elective(3) General Education IV (3)	Junior Spring PHYS 51500 – Statistical Mechanics (3) PHYS 52000 – Mathematical Methods for Physicists (3) PHYS 32200 – Optics (3) PHYS 34500 – Optics Lab (1) PHYS 47000 - Optics Research (2) PHYS 53600 – Electronic instrumentation (4)
Total Credit Hours (16)[78]	Total Credit Hours (16)[94]
Senior Fall COAS Req. Foreign Language (4) PHYS 55000 – Introduction to Quantum Mechanics (3) PHYS 51100 – Laser Physics (3) PHYS 52400 – Physical Optics (4) PHYS 47000 – Optics Research (1)	Senior Spring PHYS 310 – Inter. Mech. (4) General Education VI (3) PHYS 52200 - Coherent Optics (3) PHYS 57000 – Variable Title Optics related (3) COAS Req. Foreign Language (4)
Total Credit Hours (15)[108]	Total Credit Hours (17)[125]