**PURDUE UNIVERSITY**

**REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE**

(50000-60000 LEVEL)

DEPARTMENT: Engineering

EFFECTIVE SESSION: Spring 2010

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [x] New course with supporting documents (complete proposal form)
- 
- [ ] Add existing course offered at another campus
- 
- [ ] Expiration of a course
- 
- [x] Change in course number
- 
- [ ] Change in course title
- 
- [x] Change in course credit/type
- 
- [ ] Change in course attributes
- 
- [x] Change in instructional hours
- 
- [ ] Change in course description
- 
- [ ] Change in course requisites/restrictions
- 
- [ ] Change in semesters offered
- 
- [ ] Transfer from one department to another

**PROPOSED:**

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th>Microwave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>ECE 58100</td>
</tr>
<tr>
<td>Long Title</td>
<td>Microwave Engineering</td>
</tr>
<tr>
<td>Short Title</td>
<td>Microwave Engineering</td>
</tr>
</tbody>
</table>

Abbreviated title will be entered by the Office of the Registrar if omitted. (50 CHARACTERS ONLY)

**CREDIT TYPE**

1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range: Minimum Cr. Hrs. (Check One) To Or
   - [ ] Or
   - [x] 3. Repeatable

**Course Number**

- ECE 58100

**Course Description**

COURSE ATTRIBUTES: Check All That Apply

- [x] Pass/Not Pass Only
- [ ] Satisfactory/Unsatisfactory Only
- [ ] Repeatable
- [ ] Maximum Repeatable Credit:
- [ ] Credit by Examination
- [x] Full Time Privilege
- [ ] Off Campus Experience

**Schedule Type**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Recitation</th>
<th>Presentation</th>
<th>Laboratory</th>
<th>Lab Prep</th>
<th>Studio</th>
<th>Distance</th>
<th>Clinic</th>
<th>Experiential</th>
<th>Research</th>
<th>Ind Study</th>
<th>Pract/Observ</th>
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</thead>
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**Real-Listed Courses**

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS): Prerequisites: ECE 255 and ECE 311.

In this course, analysis of microwave components and circuits in terms of scattering parameters, determination of electrical characteristics of waveguides and transmission lines through electromagnetic field analysis, design of microwave amplifiers and based on stability, bandwidth, gain, and noise figure criteria, generating layouts and measurement of these devices, fundamentals of antennas, and use of CAD tools in RF/Microwave circuit design will be discussed.

**Signatures**

- Calumet Department Head
- Fort Wayne Department Head
- Indianapolis Department Head
- North Central Faculty Senate Chair
- West Lafayette Department Head
- Graduate Area Committee Convener

**Date**

- 3/25/11
- 5/28/11
- 5/28/11

**Office of the Registrar**
Supporting Document for a New Graduate Course

To: Purdue University Graduate Council
From: Faculty Member: Abdullah Eroglu
       Department: Engineering
       Campus: Fort Wayne
Date: 10/11/2010
Subject: Proposal for New Graduate Course-Documentation Required by the Graduate Council to Accompany Registrar's Form 40G

Contact for information if questions arise:
Name: Abdullah Eroglu
Phone Number: 260-481 0273
E-mail: eroglua@ipfw.edu
Campus Address: 2101 E. Coliseum Blvd., Fort Wayne, IN 46805

Course Subject Abbreviation and Number: Microwave Engineering, BCE 58100
Course Title: Microwave Engineering

For Reviewer's comments only (Select One)

Reviewer:
Comments:
Supporting Documents

A. Justification of The Course

This course is a fundamental course for graduate students who will conduct their research in the area of applied electromagnetics including RF/Microwave circuit design. It complements nicely the courses that are offered at the Department of Engineering at the graduate level and gives students depth in knowledge in engineering applications.

This course is designed to be offered for Master students with the course number: ECE 58100. The expected enrollment for the course is 20.

B. Learning Outcomes and Method of Evaluation or Assessment

Course Objectives:

- Analyze microwave components and circuits in terms of scattering parameters.
- Determine the electrical characteristics of waveguides and transmission lines through electromagnetic field analysis.
- Design of microwave amplifiers based on stability, bandwidth, power gain and noise figure criteria.
- Fundamentals of antennas
- Use of CAD tools in RF/Microwave circuit design.

Grading:

- Assignments: 20%
- Midterm Exam: 25%
- Final Exam: 25%
- Project: 30%

Student Learning Outcomes

A student who successfully fulfills the course requirements will have demonstrated:

1. a basic knowledge of microwave circuits, components.
2. an understanding of waveguides and transmission lines
3. an understanding of two-port networks and S-parameters
4. an understanding of RF power amplifiers
5. an understanding of fundamentals of antennas
6. an ability to use CAD tools in RF circuit design

Method of Instruction

- Lecture

C. Prerequisites

ECE 311 Electric and Magnetic Field
ECE 255 Introduction to Electronic Analysis and Design
D. Course Instructor:

Abdullah Eroglu, Assistant Professor of Electrical Engineering

Department of Engineering, IPFW

Instructor is the Graduate Faculty.

E. Course Outline

<table>
<thead>
<tr>
<th>Topic</th>
<th>Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Microwave Components and Circuits</td>
<td>1</td>
</tr>
<tr>
<td>2. Two Port Networks</td>
<td>3</td>
</tr>
<tr>
<td>3. Scattering Parameters</td>
<td>2</td>
</tr>
<tr>
<td>4. Smith Chart and Its Applications</td>
<td>2</td>
</tr>
<tr>
<td>5. Transmission Lines</td>
<td>2</td>
</tr>
<tr>
<td>6. Waveguides</td>
<td>3</td>
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<tr>
<td>7. CAD Tools</td>
<td>1</td>
</tr>
<tr>
<td>8. Planar Circuits</td>
<td>2</td>
</tr>
<tr>
<td>9. Passive Circuits</td>
<td>2</td>
</tr>
<tr>
<td>10. Design of Amplifiers</td>
<td>4</td>
</tr>
<tr>
<td>11. Antennas</td>
<td>3</td>
</tr>
<tr>
<td>12. Reviews</td>
<td>2</td>
</tr>
<tr>
<td>13. Exams</td>
<td>2</td>
</tr>
</tbody>
</table>

F. Reading List

Textbook:

D.M. Pozar, Microwave Engineering, Addison-Wesley, Reading, MA, 3rd edition, 2005

References:


G. Library Resources


H. Course Syllabus

Please see next page.
ECE 58100 Microwave Engineering

Course Information:

Course Number and Title: ECE 58100 Microwave Engineering
Credit Hours: 3

Course Description:

In this course, analysis of microwave components and circuits in terms of scattering parameters, determination of electrical characteristics of waveguides and transmission lines through electromagnetic field analysis, design of microwave amplifiers and based on stability, bandwidth, gain, and noise figure criteria, generating layouts and measurement of these devices, fundamentals of antennas, and use of CAD tools in RF/Microwave circuit design will be discussed.

Prerequisites:

ECE 311 Electric and Magnetic Field
ECE 255 Introduction to Electronic Analysis and Design

Textbook:

D.M. Pozar, Microwave Engineering, Addison-Wesley, Reading, MA, 3rd edition, 2005

References:


Coordinator:

Abdullah Eroglu, Assistant Professor of Electrical Engineering

Schedule:

Two 75-minute lectures per week

<table>
<thead>
<tr>
<th>Topic</th>
<th>Lecture</th>
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<tbody>
<tr>
<td>14. Microwave Components and Circuits</td>
<td>1</td>
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<td>15. Two Port Networks</td>
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<td>16. Scattering Parameters</td>
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<td>17. Smith Chart and Its Applications</td>
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</table>
18. Transmission Lines 2
19. Waveguides 3
20. CAD Tools 1
21. Planar Circuits 2
22. Passive Circuits 2
23. Design of Amplifiers 4
24. Antennas 3
25. Reviews 2
26. Exams 2

Grading Distribution:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>25%</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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<tr>
<td>Project</td>
<td>30%</td>
</tr>
</tbody>
</table>

Grading Scale:

93-100 % = A
90-92 % = A-
87-89 % = B+
83-86 % = B
80-82 % = B-
77-79 % = C+
73-76 % = C
70-72 % = C-
60-69 % = D
< 60% = F

Course Objectives:

To have fundamental understanding of microwave components and circuits in terms of scattering parameters, electrical characteristics of waveguides and transmission lines through electromagnetic field analysis, design of microwave amplifiers based on stability, bandwidth, gain, and noise figure criteria, generating layouts and measurement of these devices, use of CAD tools in RF/Microwave circuit design.

Course Outcomes:

A student who successfully fulfills the course requirements will have demonstrated:

7. a basic knowledge of microwave circuits, components.
8. an understanding of waveguides and transmission lines
9. an understanding of two port networks and S-parameters
10. an understanding of RF power amplifiers
11. an understanding of fundamentals of antennas
12. an ability to use CAD tools in RF circuit design
**ABET Category:**

- Engineering science: 2 credits or 75%
- Engineering design project: 1 credits or 25%

**Course Policies:**

**Homework:**

Homework is due before the start of the following class one week after it's assigned. Credit for late homework will diminish at the rate of 10% per day.

**Attendance:**

Regular attendance is critical for the successful completion of the course work. Attendance will be recorded.

**Student Dishonesty:**

Student dishonesty (cheating or plagiarizing) will not be tolerated. Students are encouraged to inform their academic advisors of instances of cheating or plagiarizing.

Plagiarism is another form of cheating. Students are guilty of plagiarism when they present someone else's work as their own. Examples are: asking a friend to write an assignment paper for you, or including portions of material from a books, journal, or computer file, without giving appropriate credit to the author.

**Penalties** for student dishonesty can include a grade of "F" in the course. However, if a student believes she/he has been unjustly accused of dishonesty, he or she may follow the Grade Appeal Procedure to request a review of the case.

**Policy Concerning Students with Disabilities:**

If you have a disability and need assistance, special arrangements can be made to accommodate most needs. Contact the Director of Services for Students with Disabilities (Walb Union, Room 113, telephone number 481-6658) as soon as possible to work out the details. Once the Director has provided you with a letter attesting to your needs for modification, bring the letter to me. For more information, please visit the web site for SSD at http://www.ipfw.edu/ssd/.
EXPERTISE

Applied Electromagnetics - RF/Microwave Engineering

- Microwave/RF amplifier design
  - Design, simulation and testing of power amplifiers from very low frequency to microwave ranges
- Wireless Sensors
  - Use of wireless sensors in health monitoring systems
- RFID Systems
  - Development of active and passive RFID systems
- Microwave/RF oscillator design
  - Design, simulation and testing of microwave oscillators.
- Microstrip circuit design
  - Design, simulation and testing of microstrip structures including directional couplers, filters, circulators, combiners, splitters, etc.
- Stripline circuit design.
  - Design, simulation and testing stripline structures including stripline filters.
- Planar passive component design using composite materials.
  - Use of composite structures in the design of passive components including couplers.
- Microwave/RF matching network design
  - Design, simulation, and testing matching networks for high power applications.
- Characterization of power devices.
  - Device analysis and characterization of MOSFETs, BJTs, IGBTs, GTOs, and MCTs.
- Switch-mode power amplifiers
  - Development, design, simulation of new topologies for switch-mode power supplies
- Microwave/RF power measurement metrology.
  - Development of measurement metrology for RF systems including improved calibration methods.
- Medical Resonance Imaging (MRI)
  - Development, design, and simulation of RF power devices for MRI applications
- Semiconductor Wafer Processing
  - Improvement of semiconductor wafer processing using RF pulsing and modulation
- Packaging of Microwave Devices
  - Design, simulation and development of packages for microwave devices
- Waveguides
  - Design, simulation of waveguides for industrial and military applications
- Antennas
  - Design and simulation of antennas for communications systems
- Electromagnetic wave propagation in complex media
  - Anisotropic medium, gyrotrropic medium, and metamaterials
- Radiation and scattering from complex media.
  - Anisotropic medium, gyrotrropic medium, and metamaterials
- Development of nonreciprocal devices at microwave frequencies.
  - Power dividers, couplers, circulators, phase shifters, etc.
- Antenna design and its applications.
  - Unbounded and layered media
- Dyadic Green’s functions and their applications for complex media.
  - Anisotropic medium, gyrotrropic medium, and metamaterials
  - Radiation, and scattering problems
- Composite materials
  - Device development for energy efficiency
PATENT


PUBLICATIONS

BOOKS


PEER-REVIEWED JOURNALS UNDER REVIEW


PUBLISHED PEER-REVIEWED JOURNAL PAPERS


GRANTS / PROPOSALS

1. Material Development for RF/Microwave Applications Using Thin Film Technology, PI: Abdullah Eroglu, Year: 2010, Submitted to: National Science Foundation, Amount: $655072. Pending

INVITED TALKS / SEMINARS

A. Eroglu, "DGFs and their application in gyrotropic and anisotropic media," The Electronic Science and Technology Division, Naval Research Laboratory, October 23, 2009, Washington DC 20375-5347.

SUPERVISED MASTER THESES

1. UHF RFID Systems, Student: Nathan Reynolds, Ongoing
2. RF Power Amplifier Linearization Techniques, Student: Robert Smith, Ongoing

SUPERVISED SENIOR DESIGN PROJECTS

1. Porcelain Mug Warmer for Restaurant Chain, Students: Megan Olinger, Bryan Hossman, Jeremy Brickey
2. Wireless Data Acquisition System Using Labview, Students: Todd Hauer, Anish Mathew, Barell McCellan, Geoffrey Mungai

EDUCATION

Ph.D
Electrical Engineering and Computer Science Department
Syracuse University, Syracuse, NY
GPA: 3.93/4
Award: Outstanding Graduate Student Award in Electrical Engineering
Thesis Title: "Electromagnetic Wave Propagation and Radiation in Gyrotropic Medium"

MSEE
Electrical Engineering and Computer Science Department
Syracuse University, Syracuse, NY
Thesis Title: "Microwave connectors"

BSEE
Electrical and Electronics Engineering Department (Instruction is in English)
University of Gaziantep, Gaziantep, Turkey
Graduated with High Honors

August 04
August 99
June 96
WORK HISTORY

Assistant Professor of Electrical Engineering
Engineering Department, Indiana University – Purdue University at Fort Wayne
August 2008 – Present

COURSES TAUGHT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
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<tbody>
<tr>
<td>ECE/ME 293</td>
<td>Measurement and Instrumentation</td>
<td>Fall 08/09, Spring 09/10</td>
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<tr>
<td>ENGR 121</td>
<td>Computer Tools for Engineers</td>
<td>Fall 08</td>
</tr>
<tr>
<td>ECE 460</td>
<td>Power Electronics</td>
<td>Spring 09</td>
</tr>
<tr>
<td>ECE 495</td>
<td>RF Circuits</td>
<td>Fall 09</td>
</tr>
<tr>
<td>ECE 311</td>
<td>Electric and Magnetic Fields</td>
<td>Spring 10</td>
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<tr>
<td>ECE 474</td>
<td>Introduction to RF Circuit Design</td>
<td>Fall 10</td>
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Courses Developed

- ECE 474 Introduction to RF Circuit Design
- ECE 581 Microwave Engineering

Laboratory Establishment

- RF/Microwave Research and Teaching Laboratory  November 2009

Summer Faculty Fellow
Oak Ridge National Lab, ORNL, Fusion Energy Division
Summer 2009

Senior RF Design Engineer
MKS Instruments, ENI Products, Rochester, NY
2006-2008

- Developed and designed switchmode RF power amplifiers with pulsed capability at high frequency (HF) range.
- Developed and designed Class E RF power amplifiers at HF range with 5% bandwidth using inductive clamp topology.
- Developed and designed high directivity directional couplers at HF range using microstrip technology.
- Developed and designed planar inductors using composite materials such as Ferrite and Alumina at HF range.

RF Design Engineer
MKS Instruments, ENI Products, Rochester, NY
2003-2006

- Designed 5kW and 1kW Class E RF amplifier modules at HF range.
- Developed simulation technique to extract the parasitics of high power devices such as MOSFET.
- Developed and designed diode stabilization network for high power RF amplifiers.
- Modeled and simulated spiral inductors for a four way microstrip power combiner at HF range.

RF Product Engineer
MKS Instruments, ENI Products, Rochester, NY
2000-2003

- Product support for a compact system which includes RF power generators, matching network, power supply and V/I probe.
- Improved existing designs for RF power systems for a better performance per customer request.
- Introduced and implemented test procedures currently practiced throughout field offices in USA, Korea and Japan.
- Designed test fixtures and assemblies for RF products.
- Analyzed and identified product specifications.
- Identified and qualified the replacement components for the obsoleted components.
- Implemented engineering change orders and design deviations.
Teaching Assistant
Electrical Engineering and Computer Science Department, Syracuse University
August 98 – June 00

Recitation Instructor for the following courses
- ELE231 – Electrical Engineering Fundamentals I, DC-AC Analysis of Electrical Circuits
- ELE232 – Electrical Engineering Fundamentals II, Digital and Analog Circuits Analysis

Research Assistant
Electrical and Electronics Engineering Dept., Osmangazi University, Turkey
August 97 – Jan 98

Recitation Instructor for the following course
- Introduction to Microprocessors

Teaching Assistant
Electrical and Electronics Engineering Dept., University of Gaziantep, Turkey
July 96 – August 97

Lab Instructor for the following courses
- EEE201 – Circuit Analysis I
- EEE202 – Circuit Analysis II
- EEE321 – Electromechanical Energy Conversion I
- EEE322 – Electromechanical Energy Conversion II

Intern Engineer
Turkish Siemens Cable Factory, Mudanya, Bursa, Turkey
June 95 – Sept. 95

Fiber Optics Cable Unit

Intern Engineer
Profilo Telra TV Production Factory, Corlu, Tekirdag, Turkey
June 94 – Sept. 94

Research and Development Group

HONORS and AWARDS

- Fellowship, U.S Department of Energy, Oak Ridge National Laboratory, Oak Ridge, TN, USA Summer 09
- Outstanding Graduate Student Award in Electrical Engineering, EECS, Syracuse University, USA May 04
- Graduate Assistantship, EECS, Syracuse University, USA Augt 98 – June 00
- Honored by Phi Beta Delta Honor Society April 99
- Turkish Higher Education Council Award to pursue a Ph.D degree in USA Sept 97
- Graduated with High Honors In Major, University of Gaziantep June 96

EDITORIAL BOARD
- Recent Patents on Electrical Engineering, Bentham Science Publishers

PROFESSIONAL MEMBERSHIPS

- Institute of Electrical and Electronics Engineers, IEEE (Member)
- - Antennas and Propagation Society
- - Geoscience and Remote Sensing Society
- - Microwave Theory and Techniques Society
- - Solid State Circuits Society

JOURNAL REVIEWER
- IEEE Transactions on Antennas and Propagation
- IEEE Transactions on Geoscience and Remote Sensing
- IEEE Transactions on Magnetics
- IEE Microwaves, Antennas, and Propagation
- IEE Science, Measurement, and Technology

SKILLS

Electromagnetic Simulation Tools
- Ansoft HFSS 3-D Electromagnetic Filed Simulator.
- Maxwell 3D Simulator
- CST 3D Electromagnetic Simulator
- Ansoft Designer 2½-D Electromagnetic Field Simulator.
- Sonnet 2½-D Electromagnetic Field Simulator.
- Puff

Nonlinear/Linear Circuit Simulation Tools
- Orcad / Microsim Pspice
- Ansoft Nексим
- Ansoft Serenade
- Applac

Programming Languages
- C/C++
- Fortran
- Matlab

DAQ Systems
- LABVIEW

COMMUNITY SERVICES

- Invited IPFW Scientist at Science Central for presenting lecture hands on lecture on Nanotechnology: “Great big science in a teeny-tiny world,” March 2009.
- Participant for IPFW, Careers In Engineering Night, 2010.

UNIVERSITY SERVICES

- Vice-Chair of ETCS Assembly, 2009, 2010.
- Member of Special Committee for ETCS Mission Statement Revision Committee, 2010
- Chair of Special Committee for Evaluation of ETCS Technical Support Team

DEPARTMENT SERVICES

- Member Engineering Department Laboratory Committee, 2009, 2010.