Chair: Tracy Christofero | **GC#7: Course Change**

Request for Graduate Course Change

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE Dept/Division: Weisberg Division of Current Alpha Designator/Number: EE639

Contact Person: Tarek Masaud Phone: 3046966487

CURRENT COURSE DATA:

Course Title: Distributed Power Systems

Alpha Designator/Number: EE639 EE639

Title Abbreviation: DISTRIBUTED POWER SYSTEMS

1. Complete this **five** page form in its entirety and route through the departments/committees below for changes to a course involving: course title, alpha designator, course number, course content, credit hours, or catalog description.
2. If this change will affect other departments that require this course, please send a memo to the affected department and include it with this packet, as well as the response received from the affected department.
3. If the changes made to this course will make the course similar in title or content to another department's courses, please send a memo to the affected department and include it with this packet as well as the response received from the affected department.
4. List courses, if any, that will be deleted because of this change (*must submit course deletion form).*
5. If the faculty requirements and/or equipment need to be changed upon approval of this proposal, attach a written estimate of additional needs.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10-2-17
Registrar 141001	Date 10-2-17
College Curriculum Chair	Date 10/18/17
Graduate Council Chair	Date 1-25-18

Request for Graduate Course Change - Page 2

College: CITE | Department/Division: Weisberg Division of Engine | Alpha Designator/Number: EE639

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☒ YES ☐ NO

From: Distributedpowersystems (limited to 30 characters and spaces)

To: Renewable Energy and Distributed Generation

If Yes, Rationale: The new course title will be "Renewable Energy and Distributed Generation". Distributed generation is a small power generation sources that are integrated at the distribution level. they are generation sources not power systems. Therefore, the new course title would be more accurate in representing the course description. Many universities across U.S offer the same course under the title of renewable energy and distributed generation.

Change in COURSE ALPHA DESIGNATOR:

From: ____ To: ____ ☐ YES ☒ NO

If Yes, Rationale:

Change in COURSE NUMBER: ☐ YES ☒ NO

From: ____ To: ____

If Yes, Rationale:

Change in COURSE GRADING

From ☐ Grade To ☐ Credit/No Credit

Rationale:

Change in CATALOG DESCRIPTION: ☐ YES ☒ NO IF YES, fill in below:

From:

To:

If Yes Rationale:

Change in COURSE CREDIT HOURS: ☐ YES ☒ NO If YES, fill in below:

NOTE: If credit hours increase/decrease, please provide documentation that specifies the adjusted work requirements.

From

To

Change in COURSE CONTENT: ☐ YES ☒ NO

From

To

Rationale

Request for Graduate Course Change-Page 4

College: CITE

Department: Weisberg Division of Engineering

Course Number/Title EE639 Distributed Power Systems

1. REQUIRED COURSE: If this course is required by another department(s), identify it/them by name and attach the written notification you sent to them announcing to them the proposed change and any response received. Enter NOT APPLICABLE if not applicable.

2. COURSE DELETION: List any courses that will be deleted because of this change. A *Course Deletion* form is also required. Enter NOT APPLICABLE if not applicable.

3. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials as a result of this change, attach an estimate of the time and cost etc. required to secure these items. (NOTE: approval of this form does not imply approval for additional resources. Enter NOT APPLICABLE if not applicable.

Request for Graduate Course Change - Page 5

Please insert in the text box below your course change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings) based on the appropriate change:

COURSE DESCRIPTION CHANGE	COURSE NUMBER CHANGE	COURSE TITLE CHANGE
Department:	Department:	Department:
Course Number and Title:	Current Course Number/Title:	Current Course Number/Title:
Rationale:	New Course Number:	New Course Title:
Course Description (old)	Rationale:	Rationale:
Course Description: (new)	Catalog Description:	Catalog Description:
Catalog Description:	Credit hours:	

Course Title Change
Department: Weisberg Division of Engineering/ Electrical Engineering Program
Current Course Number/Title: EE639: Distributed Power Systems
New Course Title: Renewable Energy and Distributed Generation
Rationale:
The new course title will be "Renewable Energy and Distributed Generation". Distributed generation is a small power generation sources that are integrated at the distribution level. they are generation sources not power systems. Therefore, the new course title would be more accurate in representing the course description. Many universities across U.S offer the same course under the title of renewable energy and distributed generation.
Course Description:
One of the main objectives of this course is to focus on the inter-disciplinary aspects of integration of renewable energy resources which will include most common and also promising types of renewable energy sources: Wind, Solar, and Hydro, with the integration to the electric grid.

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: College of Busines | Dept/Division: Management | Alpha Designator/Number: MGT 677 | (•) Graded ( ) CR/NC

Contact Person: Deepak Subedi | Phone: 304-696-2676

NEW COURSE DATA:

New Course Title: Design and Management of Supply Chains

Alpha Designator/Number: MGT 677

Title Abbreviation: SUPPLY CHAIN MANAGEMENT

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
This course is a study of efforts to optimize actions of manufacturers, suppliers, distributors, retailers and other selected modes in their endeavor to serve the ultimate customers.

Co-requisite(s): None | First Term to be Offered: Spring 2018

Prerequisite(s): Graduate status | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): None

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head: Dooheon Lee	Date: 8-17-17
Registrar: Sonja A Cantrell 52 0201	Date: 10/27/17
College Curriculum Chair: DALLAS BROZIK	Date: 10-18-17
Graduate Council Chair: Christofero	Date: 1-25-18

Request for Graduate Course Addition - Page 2

College: College of Business | Department/Division: Management | Alpha Designator/Number: MGT 677

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Deepak Subedi

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

Not applicable

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

Not applicable

6. COURSE OBJECTIVES: (May be submitted as a separate document)

Attached paper

7. COURSE OUTLINE (May be submitted as a separate document)

A recent syllabus of the course, which was taught as a special topic is attached.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

1. Matching Supply with Demand: An introduction to Operations Management, by Gerad Cachon and Christian Terwiesch, 3rd edt. McGraw-Hill.

2. Designing and Managing the Supply Chain, 3e with student CD, 3rd edt. by David Simchi-Levi (Author) Philip Kaminsky (Author), Edith Simchi-Levi. McGraw-Hill.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Class lecture
Case analysis
Some simulations

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Exam - 25%
Case Analysis - 75%

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

None

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Separate document attached.

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Management

Course Number and Title: MGT 677 Design and Management of Supply Chain

Catalog Description: This course is a study of efforts to optimize actions of manufacturers, suppliers, retailers, and other related modes in their endeavor to serve the ultimate customers.

Prerequisites: Graduate Status

First Term Offered: Spring 2018

Credit Hours: 3

Marshall University

College of Business

DIVISION OF MANAGEMENT AND MARKETING

MGT 650-SUPPLY CHAIN MAMAGEMENT

SPRING-2017

DR. DEEPAK SUBEDI
Phone: 696-2676
email: subedi@marshall.edu
Class: CH 463

Class Time: 6:30 to 9:00 PM

Office hours: M W- 11:15 AM to 1:00 PM.
W- 4:00 PM to 6:30PM

My Introduction: I am a professor of quantitative methods and supply chain management. I have Ph.D. in manufacturing management and engineering from University of Toledo. Besides, I have Master in Finance from University of Lancaster and MBA from International University of Japan. My undergraduate degree is in engineering from IIT (India).
Communication: I will communicate you through my office email address (subedi@marshall.edu) or through internal email at Homepage of this course at Muonline. Please use official Marshall email (@marshall.edu) or the internal mail in the homepage of this course (MUOnline) to communicate with me a well. Please note that I do not like to answer academic issues in emails other than those with official Marshall address.

If you need quick reply, please email at subedi@marshall.edu. I check that every day except for some weekends or vacations (such as spring breaks). Leaving exceptions apart I will try to respond to you within 24 hours. If you need that email to be on record (to be access later by me for grading or other purpose), please email inside the homepage of this course at MUOnline.

Some times when the issue you emailed is the concern of multiple students, I use group email or announcements for everyone in the class to see. In such cases, I do not need to respond to the individual emails.

Class Schedule: This course starts in Jan 9, 2017 and ends in May 6, 2017. All the times in this syllabus is Eastern Standard Time.

Course Description: This is a course on supply chain Supply chain management, is a study of efforts to integrate and optimize actions of manufacturers, suppliers, distributors, retailers and other related nodes in order to efficiently and effectively provide the ultimate customers with the good (and services) of their choice.

The topics dealt here are relevant to managers in manufacturing and service settings. These chapters teach students on aspects of managing and designing business process.

Course Objectives: After the completion of the course, the students should be able to understand/ analyze/ design:

- inventory management and control
- flexibility, mass customization and postponement strategy
- role of information system and communication networks in supply chain
- supply chain risk
- understand both benefits and the limitations of these methods

Technical Requirements:
MINIMUM COMPUTER SYSTEM REQUIREMENTS:

Each student will need to have (or to have access to) a computer system with the following minimum specifications:

- A communications infrastructure (e.g., modem, phone / cable lines, & internet Service Provider) capable of accessing the Internet in a stable fashion.
- A Pentium-level microprocessor.
- Microsoft Office 2007 Professional or higher versions
- I need you to have at least MS words and MS Excel.
- You can have remote access to Marshall University through MUremote.
- A Marshall University computer account. If you do not have a MU computer account, you will need to contact the Computer Services at (304) 696-3200.
- Inter Explorer software (version 5.0 or higher) OR Firefox OR Chrome
- Be sure to run the free web browser tune-up.
- If you have technical problems, please go to the Help Desk:
  http://www.marshall.edu/muonline/technicalfaq.asp
  HELP DESK PHONE NUMBERS:
  (304) 696-3200 (Huntington, WV)
  (304) 746-1969 (Charleston, WV)
  (877) 689-8638 (Toll free)

Required Course Materials:

You are required to have text book as well as three cases to complete this course.

Textbook- Matching Supply with Demand: An Introduction to Operations Management, by Gerad Cachon and Christian Terwiesch, Third Edition, MCGraw-Hill Irwin.
This book can be ordered online at any bookstore of your choice or at The Marshall University Bookstore.

Please note: This text book is required. The PowerPoint presentations, solutions to problems and cases are copy righted materials, authorized to be used when the text is adopted.

Cases:

#1 **Forecasting and Procurement at Le Club Français du Vin**

#2 HEWLETT-PACKARD CO.: DESKJET PRINTER SUPPLY CHAIN (A)
Laura Rock Kopczak; Hau Lee
Product #: GS3A-PDF-ENG

 # 3 SUPPLY CHAIN CLOSE-UP: THE VIDEO VAULT
V.G. Narayanan; Lisa Brem
Product #: 102070-PDF-ENG

 # 4 Where in the World is Timbuk2? Outsourcing, Offshoring and Mass Customization

Please note: These cases are required. And, they are copy righted materials. Cases #1 and 4 come with the text book. You have to purchase your own copy of cases #2 and 3. For detail visit the website https://hbr.org/.

Details of Grading Schemes: In this course:

- you will analyze four cases, related to supply chain, mass customization, postponement, and revenue sharing contacts
- there is one exam, the fourth case is in lieu of the final exam
- all cases are individual and have to be submitted as required by the instructor
- format of exam can be objective multiple choice or subjective or any other as decided by the instructor

Case 1 **Forecasting and Procurement at Le Club Français du Vin**	100
Case 2 **Hewlett Packard**	100
Case **3** **Video Vault**	100
Exam 1	100
Case 4 **Where in the World is Timbuk2? Outsourcing, Offshoring and Mass Customization**	100
	500

Grade

450 and above	A
400 to below 400	B
350 to below 400	C
300 to below 350	D
Less than 300	F

Technical skills required: Ability to use the Excel spreadsheet and MS words and some (very) basic algebraic, probability, statistical skills are very useful for the success of this course. Beside familiarity with MUOnline and marshall's email system is expected.

Make-up Exams: Students who miss exams should email me will the relevant details.
They are required to contact the office of Dean of Student affairs (@ MSC 2W38, phone 304 696 6423) to get the official excuse for the absence. I will take Makeup exams for all the excused absence. I will send email setting the date once I get the communications from the deans of student's office. Concerned students are required to come and take the test at that date, time and venue. Original excuse cannot be used as the justification for missing the rescheduled appointment for the exam. Make-up exam will have the same course content as the original one; however it can be totally different in style, questions and other details from the original ones.

Academic Dishonesty: All the works such as exams and case analysis you submit should be your work. You are bound by honor neither to seek, take nor provide any help in completing these works. If the instructor suspects any foul play, he has right to revoke the exam or case analysis you submit and take necessary action. Then you may have to take all the exams in campus proctored to the satisfaction of the instructor.

Prerequisite: It is the student's responsibility to be aware of and meet all prerequisites for LCOB courses. By remaining in the course beyond the regular registration period, the student certifies that he/she has met all prerequisites. Please contact the associate director of MBA Mr. Wes Spradlin (Spradlin2@marshall.edu) if you have any question regarding this issue. Students registered for courses without having met prerequisites will be considered to have committed **Academic Dishonesty** as defined by the Marshall University Student Handbook. Sanctions may include a grade of "F" in the course for which the student has not met the prerequisite or suspension from the university. The dean's office reserves the right to administratively withdraw students from courses if the prerequisite(s) have not been met. As a result, students who have not met all prerequisites shall be dismissed from the class.

Policy for Students with Disabilities: Marshall University is committed to equal opportunity in education for all students, including those with physical, learning and psychological disabilities. University policy states that it is the responsibility of students with disabilities to contact the Office of Disabled Student Services (DSS) in Prichard Hall 117, phone 304 696-2271 to provide documentation of their disability. Following this, the DSS Coordinator will send a letter to each of the student's instructors outlining the academic accommodation he/she will need to ensure equality in classroom experiences, outside assignment, testing and grading. The instructor and student will meet to discuss how the accommodation(s) requested will be provided. For more information, please visit http://www.marshall.edu/disabled or contact Disabled Student Services Office at Prichard Hall 11, phone 304-696-2271.

Course Schedule: Below is a tentative schedule. We will make a reasonable effort to adhere to this schedule, but during the course of the semester changes may be necessary.

Tentative Schedule:

Week	Date	Topic	Chapters
I	Jan 11	Course Introduction, Introduction to supply chain	
II	Jan 18	Betting on uncertain Demand	Chapter 12
III	Jan 25	Assemble to Order Make to Order and Quick Response with Reactive capacity	Chapter 13
IV	Feb 1	Assemble to Order Make to Order and Quick Response with Reactive capacity (continue) **Case 1** **Forecasting and Procurement at Le Club Français du Vin**	Chapter 13
V	Feb 8	Service Levels, Lead times in supply chain: The order up-to model	Chapter 14
VI	Feb 15	Risk-Pooling strategy to reduce and hedge uncertainty	Chapter 15
VI	Feb 22	Risk-Pooling strategy to reduce and hedge uncertainty (continue)	Chapter 15
VII	March 1	**Review for Exam 1** **Case 2: Hewlett Packard**	
IX	**March 8**	**Exam 1**	**Chapters 12, 13, 14 and 15**
X	March 15	Revenue Management with Capacity controls	Chapter 16
XI	March 22	Spring Break	
XII	March 29	Revenue Management with Capacity controls	Chapter 16
XIII	**April 5**	**Case 3: Video Vault**	
XIV	April 12	Supply chain coordination	Chapter 17
XV	April 19	Supply chain coordination	Chapter 17
XVI	April 26	**Dead week**	
	May 3	**Case 4 due**	

- Instructor reserves right to make changes in syllabus if deemed necessary.
- Instructor's announcements (made in class or via emails or use the course home page of the MUOnline) should be considered as the part of the syllabus.
- Please see the University Academic Calendar for course withdrawal dates.

Course Objectives: After the completion of the course, the students should be able to understand/ manage/ analyze/ design:

- inventory management and control
- flexibility, mass customization and postponement strategy
- role of information system and communication networks in supply chain
- supply chain risk
- understand both benefits and the limitations of these methods

Bibliography:

Textbook-

Textbooks could be one of these two or other similar ones-

1. Matching Supply with Demand: An Introduction to Operations Management, by Gerad Cachon and Christian Terwiesch, Third Edition, MCGraw-Hill Irwin.
2. Designing and Managing the Supply Chain 3e with Student CD 3rd Edition by David Simchi-Levi (Author), Philip Kaminsky (Author), Edith Simchi-Levi

Cases:

Cases can be chose from the ones below or other with similar themes can be selected.;

1. Forecasting and Procurement at Le Club Français du Vin
2. HEWLETT-PACKARD CO.: DESKJET PRINTER SUPPLY CHAIN (A)
   Laura Rock Kopczak; Hau Lee
   Product #: GS3A-PDF-ENG
3. SUPPLY CHAIN CLOSE-UP: THE VIDEO VAULT
   V.G. Narayanan; Lisa Brem
   Product #: 102070-PDF-ENG
4. 4 Where in the World is Timbuk2? Outsourcing, Offshoring and Mass Customization
5. Barilla Case Harvard Business School by Janice H Hammond, case number # 9-694-046, Rev March 25, 2008
6. Sport Obermeyer Harvard Business School

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Business | Dept/Division: Maketing/MIS and E | Alpha Designator/Number: 650-651 | (•) Graded ( ) CR/NC

Contact Person: Dr. Liz Alexander | Phone: x62686

NEW COURSE DATA:

New Course Title: Special Topics MIS

Alpha Designator/Number: MIS 6501-651

Title Abbreviation: Special Topics (Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)
(PR): permission of the division head and full M.B.A. admission

Co-requisite(s):

First Term to be Offered: Spring 2018

Prerequisite(s): PErmision of division head a

Credit Hours: ~~3~~ 1-4 ssc

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head E Alexander	Date Oct 16 2017
Registrar Sonya L C 11 0501	Date 10-17-17
College Curriculum Chair	Date 26 OCT 17
Graduate Council Chair T Christofero	Date 1-25-18

Request for Graduate Course Addition - Page 2

College: Business Department/Division: Marketing, MIS and Entrepre Alpha Designator/Number: 650-651

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

any graduate faculty qualified

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

N/A

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

N/A

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

N/A

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

N/A

6. COURSE OBJECTIVES: (May be submitted as a separate document)

will be specific to the special topic addressed

7. COURSE OUTLINE (May be submitted as a separate document)

To be determined (Special Topics course)

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

To be determined

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

To be determined

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

To be determined

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

None

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

To be determined

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Marketing, MIS and Entrepreneurship
Course Number and Title: MIS 650-651 Special Topics
Catalog Description: (PR: permission of the division head and full M.B.A. admission)
First Term Offered: Spring 2018
Credit Hours: ~~3~~ 1 - 4 SSC

✓

Chair: Tracy Christofero | **GC#4: Major or Degree**

Request for Graduate Addition, Deletion, or Change of a Major or Degree

NOTE: Before you submit a request for a new Major or Degree, you must submit an INTENT TO PLAN form. Only after the INTENT TO PLAN goes through the approval process are you ready to submit this request for a new Major or Degree. For detailed information on new programs please see: http://wvhepcdoc.wvnet.edu/resources/133-11.pdf.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy without signatures to the Graduate Council Chair.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: College of Liberal Arts

Dept/Division: Humanities

Contact Person: John Vielkind

Phone: 6-4640

Degree Program: MA Latin

Check action requested: ☐ Addition ☒ Deletion ☐ Change

Effective Term/Year: Fall 20 17 Spring 20 ☐ Summer 20 ☐

Information on the following pages must be completed before signatures are obtained.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head John N. Vielkind	Date 9-28-17
College Curriculum Chair [signature]	Date 10/23/17
College Dean R B Bookwalter	Date 10/25/17
Graduate Council Chair T Christofero	Date 1-25-18
Provost/VP Academic Affairs	Date
Presidential Approval	Date
Board of Governors Approval	Date

Form updated 3/2012

Rec'd In COLA Office
Date: 10/25/17

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 2

Please provide a rationale for addition, deletion, change: (May attach separate page if needed)

Enrollment in the program has been very small for many years. There have been no majors enrolled in the program since Fall 2014 and the program has not produced any graduates since 2012.

Please describe any changes in curriculum:
List course number, title, credit hours. Note whether each course is required or optional. Enter NONE if no change. (May attach separate page if needed)

N/A

1. ADDITIONAL RESOURCE REQUIREMENTS: If your program requires additional faculty, equipment or specialized materials to ADD or CHANGE this major or degree, attach an estimate of the time and money required to secure these items.
NOTE: Approval of this form does not imply approval for additional resources. Enter NONE if not applicable.

N/A

2. NON-DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the request and any response received from them. Enter NONE if not applicable.

N/A

For catalog changes as a result of the above actions, please fill in the following pages.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 3

3. *Current* Catalog Description

Insert the *Current* Catalog Description and page number from the latest catalog for entries you would like to change. (May attach separate page if needed)

N/A

4. *Edits* to the Current Description

Attach a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 4

5. *New* Catalog Description

Insert a 'clean' copy of your proposed description, i.e., no strikethroughs or highlighting included. This should be what you are proposing for the new description. (May attach separate page if needed)

N/A

Request for Graduate Addition, Deletion, or Change of a Major or Degree-Page 5

Please insert in the text box below your change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Major or Degree:
Type of Change: *(addition, deletion, change)*
Rationale:

Humanities
Latin MA
Deletion
Lack of enrollment since 2014 and no graduates since 2012

Request for Graduate Non-Curricular Changes

PLEASE USE THIS FORM FOR ALL NON-CURRICULAR CHANGE REQUESTS (changes in admission requirements or requirements for graduation, changes in existing or new policies/procedures, changes in program descriptions in catalog, general language changes in catalog).

SIGNATURES may not be required, depending on the nature of the request and from where it originates. Consult Graduate Council Chair.

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.**

College: Liberal Arts Dept/Division: Political Science

Contact Person: Marybeth Beller Phone: X62763

Rationale for Request:

Standardized tests (GRE, GMAT and MAT) are often cost prohibitive for students. Our Admissions Committee believes that the other applications documents required for consideration to enter our program are sufficient and that eliminating the requirement of the standardized test will enable more students to apply to the MPA program.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.
NOTE: all requests may not require all signatures.

Department/Division Chair _____ Date 10/9/2017

Registrar _____ 440501 Date Fall 2018

College Curriculum Committee Chair _____ Date 10/10/17
(or Dean if no college curriculum committee)

Graduate Council Chair _____ Date 10/18/17

NOTE: please complete information required on the following pages before obtaining signatures above.

1-25-18

Request for Graduate Non-Curricular Changes – Page 2

1. **Current Catalog Description (if applicable)**: Please insert the catalog description from the current catalog for entries you would like to change.

Admission Requirements

Applicants should follow the admissions process outlined in the Graduate Catalog or at the Graduate College website at HYPERLINK "http://www.marshall.edu/graduate/admissions/how-to-apply-for-admission" **www.marshall.edu/graduate/admissions/how-to-apply-for-admission.**

In addition, applicants must have:

Standardized test scores (GRE, GMAT, or MAT) from exams completed no more than five years prior to the application submission to the program. Recommended minimum scores are: GRE, combined 800 on Verbal and Quantitative, or 286 on current combined score; GMAT, 500; OR MAT, 392. Please note that the MAT can be taken, by appointment, on the South Charleston campus. Standardized test scores are waived for applicants with a graduate degree from an accredited university.

A current resume or curriculum vitae.

A personal statement describing the applicant' s interest in the program and goals from program completion.

For non-native English speakers, minimum TOEFL scores of 550 (paper-based exam), 213 (computer-based exam), and 79 (Internet-based exam) are required. TOEFL exam must be completed no more than two years prior to the application submission for the program. Graduates of English speaking universities will have TOEFL requirements waived. Minimum undergraduate GPA scores and standardized test scores will be waived for applicants who have previously earned degrees above the baccalaureate level from accredited institutions.

2. **Edits to current description**: Attach or insert a PDF copy of the current catalog description prepared in MS WORD with strikethroughs to mark proposed deletions and use the highlight function to indicate proposed new text.

Admission Requirements

Applicants should follow the admissions process outlined in the Graduate Catalog or at the Graduate College website at *www.marshall.edu/graduate/admissions/how-to-apply-for-admission.*

In addition, applicants must have:

~~• Standardized test scores (GRE, GMAT, or MAT) from exams completed no more than five years prior to the application submission to the program. Recommended minimum scores are: GRE, combined 800 on Verbal and Quantitative, or 286 on current combined score; GMAT, 500; OR MAT, 392. Please note that the MAT can be taken, by appointment, on the South Charleston campus. Standardized test scores are waived for applicants with a graduate degree from an accredited university.~~

• A current resume or curriculum vitae.

• A personal statement describing the applicant's interest in the program and goals from program completion.

• For non-native English speakers, minimum TOEFL scores of 550 (paper-based exam), 213 (computer-based exam),and 79 (Internet-based exam) are required. TOEFL exam must be completed no more than two years prior to the application submission for the program. Graduates of English speaking universities will have TOEFL requirements waived. Minimum undergraduate GPA scores and standardized test scores will be waived for applicants who have previously earned degrees above the baccalaureate level from accredited institutions.

3. **New Catalog Description**: Provide a "clean" copy of your proposed description without strikethroughs or highlighting. This should be what you are proposing for the new description.

Admission Requirements

Applicants should follow the admissions process outlined in the Graduate Catalog or at the Graduate College website at *www.marshall.edu/graduate/admissions/how-to-apply-for-admission.*

In addition, applicants must have:

- A current resume or curriculum vitae.
- A personal statement describing the applicant's interest in the program and goals from program completion.
- For non-native English speakers, minimum TOEFL scores of 550 (paper-based exam), 213 (computer-based exam),and 79 (Internet-based exam) are required. TOEFL exam must be completed no more than two years prior to the application submission for the program. Graduates of English speaking universities will have TOEFL requirements waived. Minimum undergraduate GPA scores and standardized test scores will be waived for applicants who have previously earned degrees above the baccalaureate level from accredited institutions.

Request for Graduate Non-Curricular Changes – Page 5

Please insert below your proposed change information for the Graduate Council agenda.

Type of change request: Change in Admission Requirements

Department: Political Science

Degree program: Masters in Public Administration

Effective date (fall/spring/summer, year): Fall 2018

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Science | Dept/Division: Physics | Alpha Designator/Number: PHY 544 | (•) Graded ( ) CR/NC

Contact Person: Thomas E. Wilson, Sean McBride | Phone: 304-696-2752

NEW COURSE DATA:

New Course Title: Advanced Laboratory

Alpha Designator/Number: P H Y 5 4 4

Title Abbreviation: A d v a n c e d L a b

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

Developments in producing and detecting correlated photon pairs has enabled implementation of undergraduate laboratories demonstrating fundamental quantum mechanical principles. This laboratory also incorporates fundamental solid state and materials science experiments.

Co-requisite(s): PHY 525, 542 | First Term to be Offered: Spring 2018

Prerequisite(s): PHY 525, 542 | Credit Hours: 2

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/05/2017
Registrar 400801	Date 10/23/17
College Curriculum Chair	Date 10/30/17
Graduate Council Chair	Date 1-25-18

Request for Graduate Course Addition - Page 2

College: Science | Department/Division: Physics | Alpha Designator/Number: PHY 544

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Thomas E. Wilson, Curt Foltz, Judy Fan, Sean McBride

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

Not Applicable

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

We have ordered all of the necessary equipment.

6. COURSE OBJECTIVES: (May be submitted as a separate document)

At this end of this course, students will:

have performed laboratories that allow them to observe experimental confirmation of aspects of the theory of quantum mechanics and solid state physics. The experiments include" "Proving" that light contains photons, single-photon interference, test of local realism, and the macroscopic properties of solids inherently depends upon the smallest constituents that make up that solid.

7. COURSE OUTLINE (May be submitted as a separate document)

(See https://spie.org/etop/2007/etop07expX.pdf)

Developments in the technology for producing and detecting correlated photon pairs via parametric down conversion have enabled the implementation of undergraduate-level laboratories for demonstrating fundamental quantum mechanical principles, such as superposition and entanglement.

Laboratories with correlated photons are important because they underscore fundamental concepts of quantum mechanics. They allow students to learn quantum mechanics via experimentation and thus start their quantum physics education from a position where they can gain valuable physical intuition. Experiments on interference of light at the single-photon limit serve as exercises in quantum mechanical concepts and algebra. Thus they constitute direct applications of a topic that is otherwise purely theoretical and abstract. An interesting feature of these types of experiments is that they give the instructor the flexibility to tailor the explanation of the results to his or her quantum mechanical formalism.

We use an increasingly popular source of correlated photons: spontaneous parametric down conversion. It consists of sending a pump laser beam to a nonlinear crystal to produce photon pairs that are correlated in time, energy, momentum and polarization. The pairs can be used as a source of non-classical light. In some cases one photon of a pair heralds the other one going through an interferometer, and in other cases both photons go through the interferometer for demonstrating richer quantum mechanical effects. Many experiments with correlated photons, in particular the ones we shall consider, cannot be reproduced by an attenuated source of light. With special modifications the source can produce photon pairs entangled in polarization, and thus enabling tests of Bell's inequalities.

This laboratory also incorporates several fundamental solid state and materials science experiments such as determining the transition temperature of a high-temperature superconductor, the Meissner - Ochsenfeld effect for a high-temperature superconductor, investigating magnetic properties of materials (dia-, para-, ferro- magnetism), the Hall Effect in silver, investigating the anomalous Hall effect in tungsten, the Seebeck effect - determining the thermoelectric voltage as a function of a temperature differential, and Young's Modulus of metallic wires. Below is a brief summary of each experiment. A more in depth discussion on each topic can be found in the supplemental texts listed at the end of this syllabus or on typical physics websites such as HyperPhysics under the subject heading Condensed Matter.

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Not Applicable

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Laboratory

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Laboratory Reports

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

For graduate students: These students will develop a new lab for PHY 444/544. By developing a lab from start to finish, including a cost budget for implementation or revision of an existing lab; including the lab manual component, complete with questions for students, students will hopefully gain a deeper understanding of the material for the lab they design. Graduate students will be encouraged to meet frequently with faculty to discuss the realistic implementation and budgetary concerns of their experiment (see syllabus for details).

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

See https://spie.org/etop/2007/etop07expX.pdf

and the text "Quantum Mechanics: Theory and Experiment" by Mark Beck (Oxford University Press 2012) ISBN 978-0-19-97812-4

University Physics with Modern Physics. Young and Freedman. 14th Ed. ISBN: 0-321-97361-5 (Sections 11.4 and 11.5)
Thermal Physics. Kittel and Kroemer. 2nd Ed. ISBN: 0-7167-1088-9 (Ch.8:pg 252-256)
Introduction to Solid State Physics. Kittel. 7th Ed. ISBN: 0-471-11181-3 (Ch. 6: pg 163-169, Ch. 8:pg 227-228, Ch. 12:pg 335-377, Ch. 14:pg 415-442, and Ch15:pg 434-484)

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Physics

Course Number and Title: PHY544 - Advanced Laboratory

Catalog Description: Developments in producing and detecting correlated photon pairs has enabled implementation of undergraduate laboratories demonstrating fundamental quantum mechanical principles. This laboratory also incorporates fundamental solid state and materials science experiments.

Prerequisites/Co-Requisite: PHY442 - Quantum Mechanics
Prerequisite/Co-Requisite: PHY425 - Solid State Physics
Prerequisite: PHY 446 - Math Methods 2

First Term Offered: Spring 2018

Credit Hours: 2.0

PHY 444/544 SYLLABUS

Course Title/Number	Advanced Lab PHYS 444/544
Semester/Year	Spring 2018
Days/Time	TBD
Location	S 180
Instructor	Dr. Tom Wilson & Dr. Sean P. McBride
Office	S 153 & S 152
Phone	62752 & 62758
E-Mail	wilsont@marshall.edu and mcbrides@marshall.edu
Office/Hours	TBD & TBD
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description: From Catalog

Developments in producing and detecting correlated photon pairs has enabled implementation of undergraduate laboratories demonstrating fundamental quantum mechanical principles. This laboratory also incorporates fundamental solid state and materials science experiments.

Goals & Outcomes:

Course Student Learning Outcomes	**How students will practice each outcome in this Course**	**How student achievement of each outcome will be assessed in this Course**
Students will learn the historical and theoretical background of each experiment and experimentally collect data that correlates with the experiment being taught each week.	Students will carry out these experiments in the laboratory setting after receiving a small lecture before the start of each lab. Methods, theories, and pitfalls of each experiment will be discussed prior to the start of each lab in this short lecture.	At the end of each lab, there will be questions students will have to answer. Additionally, students must write a formal lab report for each experiment.
Students will gain hands-on experience and know-how for setting up experiments.	Students will do this each week.	Quality of the lab reports easily gauges student abilities regarding proper set-up.

Required Texts, Additional Reading, and Other Materials

1. Required Textbook: An in-house laboratory style manual will be made available in the bookstore.

Course Requirements / Due Dates

There will be approximately 11 experiments spaced over 15 weeks. Due Dates: TBD

Grading Policy

For undergraduate students:	
Laboratory Reports (can drop lowest score, each lab is 10%):	100%
For graduate students:	
Laboratory Reports (can drop lowest score, each lab is 8%):	80%
Developing a new lab or significantly adding material to a current lab for next time course is offered	20%

Attendance Policy

Students are expected to attend all scheduled labs and be on time. Short lectures in the beginning of the lab will be vital in getting the student set and on the right track for the duration of the lab. Group discussions are critical for learning and understanding, thus it is undesirable to miss labs. Any absence can be excused only if the instructor is informed well in advance with a reasonable qualified and legitimate excuse. See University policy above.

Course Schedule

1. The Seebeck effect - determining the thermoelectric voltage as a function of a temperature differential.
2. Proof of the Existence of Photons (the Grangier Experiment)
3. Single Photon Interference
4. The Meissner-Ochsenfeld effect for a high-temperature superconductor and determining the transition temperature of a high-temperature superconductor.
5. Bell Inequalities
6. Quantum Eraser with Polarization Entangled Photons
7. Investigating magnetic properties of materials (dia-, para-, ferro- magnetism).
8. Hardy's Test of Local Realism
9. The Hall Effect in silver and investigating the anomalous Hall effect in tungsten.
10. EPR Steering Entanglement Witness
11. Young's Modulus in metallic wires.

Chair: Tracy Christofero | **GC#8: Course Deletion**

Request for Graduate Course Deletion

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy (without signatures), to the Graduate Council Chair. If attachments included, merge into a single file.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and signed hard copy.**
4. Additionally, attach a copy of your written notification and any response(s) regarding this course deletion to other Departments/Divisions which advise students to enroll in this course as a prerequisite, co-requisite, or as an approved elective.

College: College of Science | Dept/Div.: Physics/Physical Sciences

Contact Person: Huong Nguyen, Maria Babiuc Hamilton | Phone: x6-2754

Current Course Number and Title: PHY 562 Nuclear Chemistry and Physics

Rationale for Course Deletion: This course is not offered any more by the Department of Physics, because there is no faculty available to teach it.

Final term and year this course is to be offered: Fall 20 ☐ Spring 20 ☐ Summer 20 ☐

Course being ADDED in place of this DELETION. NOTE: A course ADDITION request form is also required.

Course Number and Title: | Credit Hrs. ☐

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____ Date 10/30/2017

Registrar _____ 400801 Date 10/31/17

College Curriculum Chair _____ Date 10/30/17

Graduate Council Chair _____ Date 1-25-18

Request for Graduate Course Deletion-Page 2

Please insert in the text box below your course deletion summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Rationale for deletion:
Final Term Offered:
Courses added *(if any)*:

Department: Physics
Course Number and Title: PHY 562 Nuclear Chemistry and Physics
Rationale for deletion: This course is not offered any more by the Department of Physics
Final Term Offered: N/A

REGISTRAR'S OFFICE
31 OCT '17 AM10:54

REGISTRAR'S OFFICE
31 OCT '17 PM3:06

Chair: Tracy Christofero | **GC#8: Course Deletion**

Request for Graduate Course Deletion

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy (without signatures), to the Graduate Council Chair. If attachments included, merge into a single file.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and signed hard copy.**
4. Additionally, attach a copy of your written notification and any response(s) regarding this course deletion to other Departments/Divisions which advise students to enroll in this course as a prerequisite, co-requisite, or as an approved elective.

College: College of Science | Dept/Div.: Physics/Physical Sciences

Contact Person: Huong Nguyen, Maria Babiuc Hamilton | Phone: x6-2754

Current Course Number and Title: PHY 563 Nuclear Physics Lab

Rationale for Course Deletion: This course is not offered any more by the Department of Physics, because there is no faculty available to teach it.

Final term and year this course is to be offered: Fall 20 ☐ Spring 20 ☐ Summer 20 ☐

Course being ADDED in place of this DELETION. NOTE: A course ADDITION request form is also required.

Course Number and Title: | Credit Hrs. ☐

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____ Date 10/30/2017

Registrar _____ 400801 Date 10/31/17

College Curriculum Chair _____ Date 10/30/17

Graduate Council Chair _____ Date 1-25-18

Request for Graduate Course Deletion-Page 2

Please insert in the text box below your course deletion summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Rationale for deletion:
Final Term Offered:
Courses added *(if any)*:

Department: Physics
Course Number and Title: PHY 562 Nuclear Physics Lab
Rationale for deletion: This course is not offered any more by the Department of Physics
Final Term Offered: N/A

REGISTRAR'S OFFICE
31 OCT '17 AM10:54

REGISTRAR'S OFFICE
31 OCT '17 PM3:06

Chair: Tracy Christofero | **GC#7: Course Change**

Request for Graduate Course Change

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: College of Science Dept/Division: Physics Current Alpha Designator/Number: PHY 600

Contact Person: Huong Nguyen, Wilson Thomas Phone: x6-2754

CURRENT COURSE DATA:

Course Title: Electricity and Magnetism

Alpha Designator/Number: P H Y 6 0 0

Title Abbreviation: ELECTRICITY & MAGNETISM

1. Complete this **five** page form in its entirety and route through the departments/committees below for changes to a course involving: course title, alpha designator, course number, course content, credit hours, or catalog description.
2. If this change will affect other departments that require this course, please send a memo to the affected department and include it with this packet, as well as the response received from the affected department.
3. If the changes made to this course will make the course similar in title or content to another department's courses, please send a memo to the affected department and include it with this packet as well as the response received from the affected department.
4. List courses, if any, that will be deleted because of this change (*must submit course deletion form).*
5. If the faculty requirements and/or equipment need to be changed upon approval of this proposal, attach a written estimate of additional needs.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head Huongnguyen	Date 10/20/2017
Registrar Sonya M C 400801	Date 10/23/17
College Curriculum Chair L R Mann	Date 10/30/17
Graduate Council Chair Christofero	Date 1-25-18

Request for Graduate Course Change - Page 2

College: College of Science | Department/Division: Department of Physics | Alpha Designator/Number: PHY 600

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☐ YES ☒ NO

From [ ] (limited to 30 characters and spaces)

To [ ]

If Yes, Rationale

Change in COURSE ALPHA DESIGNATOR:

From: [ ] To [ ] ☐ YES ☒ NO

If Yes, Rationale

Change in COURSE NUMBER: ☐ YES ☒ NO

From: [ ] To: [ ]

If Yes, Rationale

Change in COURSE GRADING

From ☐ Grade To ☐ Credit/No Credit

Rationale

Change in CATALOG DESCRIPTION: ☐ YES ☒ NO IF YES, fill in below:

From

To

If Yes Rationale

Request for Graduate Course Change - Page 3

Change in COURSE CREDIT HOURS: ☒ YES ☐ NO If YES, fill in below:

NOTE: If credit hours increase/decrease, please provide documentation that specifies the adjusted work requirements.

From 3
In the time allotted for the course, only 2/3 of Electrodynamics (Third Edition) by J. D. Jackson could be covered

To 4
This will allow students to cover the remaining part from the textbook, thus providing students with a more in-depth knowledge of Electrodynamics at the graduate level.

Change in COURSE CONTENT: ☒ YES ☐ NO

From Chapters 1 through 12 from the textbook Electrodynamics (Third Edition), by J.D. Jackson.

To Chapters 1 through 16 from the textbook Electrodynamics by J.D. Jackson

Rationale In a one-semester 3-hour sequence, time does not usually allow for an introduction to Collision and Radiation of Moving Charges and other radiation problems . Increasing the lecture time by 33% (3 to 4 hours) should now allow for these topics to be included and considered in some depth.

Request for Graduate Course Change-Page 4

College: College of Science

Department: Department of Physics

Course Number/Title PHY 600

1. REQUIRED COURSE: If this course is required by another department(s), identify it/them by name and attach the written notification you sent to them announcing to them the proposed change and any response received. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

2. COURSE DELETION: List any courses that will be deleted because of this change. A *Course Deletion* form is also required. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

3. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials as a result of this change, attach an estimate of the time and cost etc. required to secure these items. (NOTE: approval of this form does not imply approval for additional resources. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

Request for Graduate Course Change - Page 5

Please insert in the text box below your course change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings) based on the appropriate change:

COURSE DESCRIPTION CHANGE	COURSE NUMBER CHANGE	COURSE TITLE CHANGE
Department:	Department:	Department:
Course Number and Title:	Current Course Number/Title:	Current Course Number/Title:
Rationale:	New Course Number:	New Course Title:
Course Description (old)	Rationale:	Rationale:
Course Description: (new)	Catalog Description:	Catalog Description:
Catalog Description:	Credit hours:	

COURSE CREDIT HOURS CHANGE
Department: Physics
Current Course Credit Hours: 3
Current Course Credit Hours: 4
Rationale: In a one-semester 3-hour sequence, time does not usually allow for an introduction to Collission and readiation of moving charges and other radiation problems. Increasing the lecture time by 33% (3 to 4 hours) should now allow for these topics to be included and considered in some depth.
Catalog Description: A study of electrodynamics and associated boundary-value problems, electric multipoles and macroscopic media, dielectrics, magnetostatics, tyme-varying field, Maxwell equations and conservation laws, plane elecrromagnetic waves and wave propagation.

Chair: Tracy Christofero | **GC#7: Course Change**

Request for Graduate Course Change

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: College of Science Dept/Division: Physics Current Alpha Designator/Number: PHY 608

Contact Person: Huong Nguen, Maria Babiuc Hamilton Phone: x6-2754

CURRENT COURSE DATA:

Course Title: Statistical Mechanics

Alpha Designator/Number: P H Y 6 0 8

Title Abbreviation: STATISTICAL MECHANICS

1. Complete this **five** page form in its entirety and route through the departments/committees below for changes to a course involving: course title, alpha designator, course number, course content, credit hours, or catalog description.
2. If this change will affect other departments that require this course, please send a memo to the affected department and include it with this packet, as well as the response received from the affected department.
3. If the changes made to this course will make the course similar in title or content to another department's courses, please send a memo to the affected department and include it with this packet as well as the response received from the affected department.
4. List courses, if any, that will be deleted because of this change (*must submit course deletion form).*
5. If the faculty requirements and/or equipment need to be changed upon approval of this proposal, attach a written estimate of additional needs.

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/24/2017
Registrar 400 801	Date 10/24/17
College Curriculum Chair	Date 10/30/17
Graduate Council Chair J Christofero	Date 1-25-18

Request for Graduate Course Change - Page 2

College: College of Science | Department/Division: Department of Physics | Alpha Designator/Number: PHY 608

Provide complete information regarding the course change for each topic listed below.

Change in CATALOG TITLE: ☐ YES ☒ NO

From [ ] (limited to 30 characters and spaces)

To [ ]

If Yes, Rationale [ ]

Change in COURSE ALPHA DESIGNATOR:

From: [ ] To [ ] ☐ YES ☒ NO

If Yes, Rationale [ ]

Change in COURSE NUMBER: ☐ YES ☒ NO

From: [ ] To: [ ]

If Yes, Rationale [ ]

Change in COURSE GRADING

From ☐ Grade To ☐ Credit/No Credit

Rationale [ ]

Change in CATALOG DESCRIPTION: ☐ YES ☒ NO IF YES, fill in below:

From [ ]

To [ ]

If Yes Rationale [ ]

Change in COURSE CREDIT HOURS: ☒ YES ☐ NO If YES, fill in below:

NOTE: If credit hours increase/decrease, please provide documentation that specifies the adjusted work requirements.

From 3
In the time allotted for the course, only 2/3 of Electrodynamics (Third Edition) by J. D. Jackson could be covered.

To 4
This will allow students to cover the remaining part from the textbook, thus providing them with a more in-depth knowledge of Electrodynamics at the graduate level.

Change in COURSE CONTENT: ☐ YES ☒ NO

From Chapters 1 through 15 from the textbook Introduction to Statistical Physics (Second Edition), by Kelson Huang.

To Chapters 1 through 21 from the textbook Introduction to Statistical Physics (Second Edition), by Kelson Huang.

Rationale In a one-semester 3-hour sequence, time does not usually allow for an introduction to Bose Gas, Bose Condensation and Superfluid problems. Increasing the lecture time by 33% (from 3 to 4 hours) should now allow for these topics to be included and considered in some depth.

Request for Graduate Course Change-Page 4

College: College of Science

Department: Department of Physics

Course Number/Title PHY 608

1. REQUIRED COURSE: If this course is required by another department(s), identify it/them by name and attach the written notification you sent to them announcing to them the proposed change and any response received. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

2. COURSE DELETION: List any courses that will be deleted because of this change. A *Course Deletion* form is also required. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

3. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials as a result of this change, attach an estimate of the time and cost etc. required to secure these items. (NOTE: approval of this form does not imply approval for additional resources. Enter NOT APPLICABLE if not applicable.

NOT APPLICABLE

Request for Graduate Course Change - Page 5

Please insert in the text box below your course change summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings) based on the appropriate change:

COURSE DESCRIPTION CHANGE	COURSE NUMBER CHANGE	COURSE TITLE CHANGE
Department:	Department:	Department:
Course Number and Title:	Current Course Number/Title:	Current Course Number/Title:
Rationale:	New Course Number:	New Course Title:
Course Description (old)	Rationale:	Rationale:
Course Description: (new)	Catalog Description:	Catalog Description:
Catalog Description:	Credit hours:	

COURSE CREDIT HOURS CHANGE
Department: Physics
Current Course Credit Hours: 3
Current Course Credit Hours: 4
Rationale: In a one-semester 3-hour sequence, time does not usually allow for an introduction to Bose Gas, Bose Condensation and Superfluid problems. Increasing the lecture time by 33% (from 3 to 4 hours) should now allow for these topics to be included and considered in some depth.
Catalog Description: The course introduces thermodynamics and statistical mechanics to graduate students of physics and other science and engineering disciplines as two complimentary approaches to study physical properties of systems in equilibrium.

Chair: Tracy Christofero | **GC#8: Course Deletion**

Request for Graduate Course Deletion

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy (without signatures), to the Graduate Council Chair. If attachments included, merge into a single file.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and signed hard copy.**
4. Additionally, attach a copy of your written notification and any response(s) regarding this course deletion to other Departments/Divisions which advise students to enroll in this course as a prerequisite, co-requisite, or as an approved elective.

College: College of Science | Dept/Div.: Physics/Physical Sciences

Contact Person: Huong Ngyuen, Maria Babiuc Hamilton | Phone: x6-2754

Current Course Number and Title: PHY 616 X-ray Diffraction

Rationale for Course Deletion: This course is not offered any more by the Department of Physics, because there is no faculty available to teach it.

Final term and year this course is to be offered: Fall 20 ☐ Spring 20 ☐ Summer 20 ☐

Course being ADDED in place of this DELETION. NOTE: A course ADDITION request form is also required.

Course Number and Title: | Credit Hrs. ☐

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____ Date 10/30/2017

Registrar _____ 400801 Date 10/31/17

College Curriculum Chair _____ Date 10/30/17

Graduate Council Chair _____ Date 1-25-18

Request for Graduate Course Deletion-Page 2

Please insert in the text box below your course deletion summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Rationale for deletion:
Final Term Offered:
Courses added *(if any)*:

Department: Physics
Course Number and Title: PHY 616 X-ray Diffraction
Rationale for deletion: This course is not offered any more by the Department of Physics
Final Term Offered: N/A

REGISTRAR'S OFFICE
31 OCT '17 AM10:54

REGISTRAR'S OFFICE
31 OCT '17 PM3:06

Chair: Tracy Christofero | **GC#8: Course Deletion**

Request for Graduate Course Deletion

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one PDF copy (without signatures), to the Graduate Council Chair. If attachments included, merge into a single file.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and signed hard copy.**
4. Additionally, attach a copy of your written notification and any response(s) regarding this course deletion to other Departments/Divisions which advise students to enroll in this course as a prerequisite, co-requisite, or as an approved elective.

College: College of Science | Dept/Div.: Physics/Physical Sciences

Contact Person: Huong Nguyen, Maria Babiuc Hamilton | Phone: x6-2754

Current Course Number and Title: PHY 644 Atomic Physics

Rationale for Course Deletion: This course is not offered any more by the Department of Physics, because there is no faculty available to teach it.

Final term and year this course is to be offered: Fall 20 ☐ Spring 20 ☐ Summer 20 ☐

Course being ADDED in place of this DELETION. NOTE: A course ADDITION request form is also required.

Course Number and Title: | Credit Hrs.:

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____ Date 10/30/2017

Registrar _____ 4003801 Date 10/31/17

College Curriculum Chair _____ Date 10/30/17

Graduate Council Chair _____ Date 1-25-18

Request for Graduate Course Deletion-Page 2

Please insert in the text box below your course deletion summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Rationale for deletion:
Final Term Offered:
Courses added *(if any)*:

Department: Physics
Course Number and Title: PHY 644 Atomic Physics
Rationale for deletion: This course is not offered any more by the Department of Physics
Final Term Offered: N/A

REGISTRAR'S OFFICE
31 OCT '17 AM10:54

REGISTRAR'S OFFICE
31 OCT '17 PM3:06

Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: College of Science | Dept/Division: Physics | Alpha Designator/Number: PHY 645 | (•) Graded ( ) CR/NC

Contact Person: Huong Nguen, Maria Babiuc Hamilton | Phone: x6-2754

NEW COURSE DATA:

New Course Title: Methods of Mathematical Physics

Alpha Designator/Number: PHY 645

Title Abbreviation: Methods of Math. Phys.

(Limit of 25 characters and spaces)

Course Catalog Description (Limit of 30 words): This course will review and develop theories of real and complex analysis, group theory, tensors, special functions, differential and integral transforms, emphasizing their application to electrodynamics, quantum, statistical mechanics, etc.

Co-requisite(s):

First Term to be Offered: Fall 2019

Prerequisite(s): ~~BS in Physics or Mathematics~~

Credit Hours: 4

Course(s) being deleted in place of this addition (*must submit course deletion form*): Not Applicable

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head	Date 10/30/2017
Registrar 400801	Date 10/31/17
College Curriculum Chair	Date 10/30/17
Graduate Council Chair	Date 1-25-18

Request for Graduate Course Addition - Page 2

College: College of Science | Department/Division: Department of Physics | Alpha Designator/Number: PHY 645

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Huong Nguen
Maria Babiuc Hamilton

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

Not Applicable

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

Not Applicable

6. COURSE OBJECTIVES: (May be submitted as a separate document)

The main objective of this course is to provide students with a variety of mathematical methods directly applicable to physics, which are deemed essential in solving advanced problems in physics. This course is intended to offer physicists the necessary mathematical tools and techniques that are required in advanced courses offered in the graduate program in physics. Please see the Syllabus for a presentation of the course material.

7. COURSE OUTLINE (May be submitted as a separate document)

1. Curved coordinates and Tensors: differential vector operators, special coordinate systems, tensor analysis, pseudo-tensors, general tensors
2. Determinants and Matrices: determinants, matrices, Hermitian matrices, unitary matrices, normal matrices
3. Group Theory: generators of continuous groups, angular momentum, Lorentz group and covariance, discrete groups, differential forms
4. Infinite Series: convergence, algebra of series, series of functions, Taylors expansion, power series, asymptotic series, infinite products
5. Complex Functions: complex algebra, Cauchy-Riemann conditions, Cauchy integral, Laurent expansion, singularities
6. Differential Equations: partial differential equations, separations of variables, singular points, series solution, Green's function, heat flow
7. Orthogonal Functions: self-adjoing PDE, Hermitian operators, Gram-Schmidt orthogonalization, eigenfunctions
8. More Special Functions: Bessel functions, Neumann functions, Hankel functions, Legendre functions, Spherical harmonics, Hermite functions, Laguerre functions, Chebyshev, Transfer functions, Mathiew functions, Hypergeometric functions
9. Fourier Series: general properties, applications, Gibbs phenomenon, discrete Fourier transform
10. Integral Transforms and equations: Fourier integral, Fourier transform, convolution theorem, Laplace transform, integral transform, Neumann series, Hilbert-Schmidt theory

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Essential Mathematical Methods for Physicists (1st edition), by H.J. Weber and G.B. Arfken (Harcourt Academic Press, 2003)

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

The course material will be covered using a variety of teaching methods, from traditional lecture, in-class group work, independent homework, to projects using the Mathematica software, a powerful symbolic manipulator which provides useful tools for solving physics problems.

Request for Graduate Course Addition - Page 4

10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

The student work will be weighted 10% for group work, 20% for homework, 20% for midterm, 20% for the final exam, and 30% for the final project.

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

Not Applicable

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

1. Mathematical Methods for Physicists sixth edition), by G.B. Arfken and H.J. Weber (Harcourt Academic Press, 2005)
2. Complex Variables and Applications, by R.V. Churchill, J.W. Brown, and R.F. Verhey (McGraw-Hill, 1974)
3. Mathematics for Physicists, by S.M. Lea (Brooks/Cole, 2004)
4. Mathematical Methods of Physics, by J. Matthews and R.L. Walker (Benjamin, 1970)
5. Numerical Recipes, by W.H. Press, B.P. Flannery, S.A. Teukolsky, and W.T. Vetterling (Cambridge University Press)
6. Mathematics for Physics: A guided tour for graduate students, by M. Stone and P. Goldbart (Cambridge University Press, 2009)

Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Department of Physics
Course Number: PHY 645
Course Title: Methods of Mathematical Physics
Catalog Description: This course will review and develop theories of real and complex analysis, group theory, tensors, special functions, differential and integral transforms, emphasizing their application to electrodynamics, quantum, statistical mechanics, etc.
Prerequisites: ~~BS in Physics or Mathemati~~cs
First Term Offered: N/A
Credit Hours: 4

Marshall University
PHY 645 Syllabus
Methods of Mathematical Physics

Course Title/Number	Mathematical Methods for Physicists
Semester/Year	Fall 2018
Days/Time	TBA
Location	TBA
Instructor	TBA
Office	TBA
Phone	TBA
E-Mail	TBA
Office/Hours	TBA
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description: From Catalog

This course will review and develop theories of real and complex analysis, group theory, tensors, special functions, differential and integral transforms, emphasizing their application to electrodynamics, quantum, statistical mechanics, etc.

The table below shows the following relationships: How each student learning outcomes will be practiced and assessed in the course.

Course Student Learning Outcomes	**How students will practice each outcome in this Course**	**How student achievement of each outcome will be assessed in this Course**
Students will learn the mathematical methods needed to solve advanced physics problems.	Understanding concepts of curved coordinates and tensors, determinants and matrices, group theory, infinite series, Complex functions, differential equations, orthogonal and special functions, Fourier series, integral transforms and equations.	Attendance to lecture homework, examinations and project.
Students will demonstrate fluency in comprehending various methods in mathematical physics.	Interpret the mathematical methods found in the textbook, and properly chose the correct mathematical methods to solve complex physical problems.	Attendance to lecture homework, examinations and project.

Students will apply the mathematical methods to physics problems at a level commensurate with graduate level standards.	Apply varied mathematical methods to physics problems, and employ critical thinking skills to find specific solutions.	Attendance to lecture homework, examinations and project.
Students will conduct primary research literature in physics and identify the mathematical methods used.	Explore the scientific literature, choose a paper and summarize the mathematical methods used to solve specific physics problems.	Attendance to lecture homework, examinations and project.
Students will apply theoretical and experimental tools, as appropriate, to make progress in solving a complex physics problem.	Demonstrate the ability to work effectively with Mathematica, and develop solutions to solve problems.	Attendance to lecture homework, examinations and project.

Required Texts, Additional Reading, and Other Materials

1. *Essential Mathematical Methods for Physicists (1st edition)*, by H.J. Weber and G.B. Arfken (Harcourt Academic Press, 2003)
2. Mathematical Methods for Physicists (sixth edition), by G.B. Arfken and H.J. Weber (Harcourt Academic Press, 2005)
3. Mathematics for Physicists, by S.M. Lea (Brooks/Cole, 2004)
4. Numerical Recipes, by W.H. Press, B.P. Flannery, S.A. Teukolsky, and W.T. Vetterling (Cambridge University Press)
5. Mathematics for Physics: A guided tour for graduate students, by M. Stone and P. Goldbart (Cambridge University Press, 2009)
6. The homepage of Mathematica (http://www.wolfram.com)

Course Requirements / Due Dates

1. **Group Work:** students are expected to come to class and get involved in group work Students will receive 10% of the grade for keeping a notebook documenting in-class note taking and group work.
2. **Homework:** will be assigned weekly and collected in class. Homework is an important component of the course and must be completed as close to the due date as possible. Late homework will be accepted within one week, with a penalty of 25%, until grading of the current assignment has been completed.
3. **Exams:** there will be two exams, one midterm and a final exam. The date and time of the final exam will be announced when available. Make-up exams will be given only when pre-arranged with the instructor or for unavoidable absences.
4. **Project:** the project will consist in writing a paper documenting an interesting physics problem that illustrate a variety of mathematical methods, and using Mathematica in order to solve the problem.

Grading Policy

The grade will be weighted using the following scale: 10% for Group Work, 20% for Homework, 20% for each exam, and 30% for the project. Letter grades are based upon the distribution of numerical scores.

Attendance Policy

All students are expected to attend classes and to actively participate.
Five unmotivated absences will be sanctioned with -1% of your final grade!

Course Outline

1. Curved coordinates and Tensors: differential vector operators, special coordinate sysypems, tensor analysis, pseudotensors, general tensors
2. Determinants and Matrices: determinants, matrices, Hermitian matrices, unitary matrices, normal matrices
3. Group Theory: generators of continuous groups, angular momentum, Lorentz group and covariance, discrete groups, differential forms
4. Infinite Series: convergence, algebra of series, series of functions, Taylors expansion, power series, asymptotic series, infinite products
5. Complex Functions: complex algebra, Cauchy-Riemann conditions, Cauchy integral, Laurent expansion, singularities
6. Differential Equations: partial differential equations, separations of variables, singular points, series solution, Green's function, heat flow
7. Orthogonal Functions: self-adjoing PDE, Hermitian operators, Gram-Schmidt orthogonalization, eigenfunctions
8. More Special Functions: Bessel functions, Neumann functions, Hankel functions, Legendre functions, Spherical harmonics, Hermite functions, Laguerre functions, Chebyshev, transfer functions, Mathiew functions, Hypergeometric functions
9. Fourier Series: general properties, applications, Gibbs phenomenon, discrete Fourier transform
10. Integral Transforms and equations: Fourier integral, Fourier transform, convolution theorem, Laplace transform, integral transform, Neumann series, Hilbert-Schmidt theory