

# **The Graduate Curriculum Committee (GCC) - revised**

Meeting Minutes

Wednesday, October 17, 2012

## **Regular Members Present:**

Jim Decker (Chair)  
Carol Brown  
Amy Carr-Richardson  
Hamid Fonooni  
Will Forsythe  
Rich Franklin  
Linda Mayne  
Ravi Paul

## **Regular Members Excused:**

Bob Thompson (Vice-Chair)

## **Ex-Officio Members Present:**

Linner Griffin and Meaghan Johnson

## **Ex-Officio Members Absent/Excused:**

None

## **Academic Program Planning and Development:**

Kimberly Nicholson

## **Guests:**

College of Nursing: Linda Mayne and Jana Pressler

## **Actions of Committee:**

### **I. Call to Order**

#### **1. Report on Graduate Council (GC) Actions**

The GC has not met since the last GCC meeting.

#### **2. The 10-03-12 GCC minutes were approved electronically and forwarded to the Graduate Council for agenda placement.**

### **II. College of Nursing**

The unit was asked to revise the memorandum of request by adding the prerequisite revisions and the clinical nurse specialist post MSN certificate program revisions.

#### **Renumbering and Revision of Existing Course(s): NURS 6959 (to 6989)**

Approved as amended

- (1.) Revise justification
- (2.) Revise course description
- (3.) Revise anticipated annual student enrollment
- (4.) Revise course objectives
- (5.) Revise marked catalog copy

**Prerequisite Revision of Existing Course(s): NURS 6959, 6960, 6961, 6962**

Approved as amended

- (1.) Revise NURS 6959 prerequisite
- (2.) Underline blue text

**Revision of Existing Post MSN Certificate Program: Clinical Nurse Specialist**

Approved as amended

- (1.) Underline blue text

**III. College of Nursing – postponed until resubmission**

There were many issues identified in the catalog text for the BSN to PhD Nursing Education and BSN to PhD Nursing Leadership. As a result, the committee determined it would be best to postpone the entire package submission until the issues could be resolved and await resubmission for a future agenda.

**Proposal of New Course: NURS 6083**

Postponed

- (1.) Revise course objectives
- (2.) Revise course assignments and grading

**Renumbering and Revision of Existing Courses: NURS 6001 (to 6080), NURS 6002 (to 6082), NURS 6991 (to 6081)**

Postponed

- (1.) Revise expected future delivery method (NURS 6082)
- (2.) Revise course credit (NURS 6082)
- (3.) Revise course objectives (NURS 6080)
- (4.) Revise course assignments and grading (NURS 6080, 6081, 6082)

**Deletion of Existing Course: NURS 6992**

Postponed

**Revision of Existing Degrees: Master of Science in Nursing, BSN to PhD Nursing Education Course Requirements, BSN to PhD Nursing Leadership Course Requirements**

Postponed; recommended unit take this item back to their faculty for clarification and correction of catalog text

- (1.) It was identified that the concentration and degree total both in the existing catalog text, and in the proposed catalog text, did not add up correctly
- (2.) Unit was not sure what course or courses the “or COHE 6000, 6971” applied to
- (3.) Unit identified graduate statistics is not actually part of the curriculum, rather should be identified as a prerequisite of the program

**IV. Thomas Harriot College of Arts and Sciences, Department of Mathematics**

**Deletion of Existing Course: MATH 5270**

Approved

## **V. Courses Not Offered in 10+ Years Initial Catalog Cleanup – courses identified in yellow highlighted text below amended at the 11-19-12 Graduate Council meeting**

In response to the notice generated by Dean Gemperline regarding the intent of the GCC to delete courses identified as not being offered in 10+ years, units provided requests to retain or permission to delete the courses to the GCC mailbox. Courses for which no communication was received were considered for deletion. The agenda identifies the courses for each unit and provides links to communications that were received. Chair Decker confirmed at the meeting that HHP was fine with the deletion of HLTH 5345. Dr. Fonooni confirmed at the meeting that CTCS was fine with the deletion of SAFT 6500. Notification regarding this agenda was sent to Dean Thomas and all of the GCC resource persons that had courses from their colleges/schools represented for deletion.

**Delete:** ACCT 6811; ANTH 5065; ART 6300, 6553, 6902, 6910; **BIOL 5351, 5730, 5731, 5750, 5751, 6410, 6420, 6430**; CDFR 6380; CMGT 6662; COHE 6990; CSDI 5512; ECON 6125, 6172, 6335, 6353; EDTC 6110; EDUC 5001, 6415; ELEM 6410, 6416; ENGL 6520, 6540, 6541; ETHN 5000; GEOL 6300, 6301; HIST 5125, 5310, 5670; HLTH 5345; HPRO 5000; LIBS 6045; MATH 5601; MIDG 6240, 6245; MUSC 5647, 5967, 6346, 6436, 6885; PADM 6115, 6122, 6125; PSYC 6422, 6426, 6440, 6441, 6510, 6511; READ 5312, 5313, 6462; SAFT 6500; SCIE 5020; SOCW 6002, 6003, 6222, 6802, 6805, 6824

Approved

**Retain:** ADED 6462; **BIOL 5220, 5221, 5370, 6083, 6300, 6301, 6700**; CSDI 6520; ELEM 7000; ENGL 5275; FREN 6100; GEOG 5281, 5282, 5283, 5393; GEOL 6020, 6021, 6040, 6041, 6310, 6311, 6400; HIST 5122, 5300, 5440; 5450, 6045, 6180, 6370, 6450; LEED 6994; LIBS 6320, 6345; MATH 5551, 5581, 6601, 6805; MIDG 7000; MKTG 6642; MUSC 5336, 6895; PHLI 6730, 6735; PHYS 6810; SCIE 6501; SOCI 5335; SPAN 6100

Approved

## **VI. Old Business**

- 1. Update on Graduate Council recommendations regarding the plus/minus grading scale**  
The GC decided to hold this item on the table for one year to leave time to see how the implementation of the plus/minus grading systems works out at the undergraduate level.
- 2. Request for Inclusion Workshop, September 21, 2012**  
Chair Decker stated this was a very informative event.

## **VII. New Business**

- 1. Institutionalization of Annual Active Courses Not Offered in 10+ Years Action Plan**  
The committee reviewed the draft plan for institutionalization that was created last year. Discussion took place regarding the frequency that this process would need to take place. Dr. Griffin, with the assistance of Kimberly Nicholson and Diane Coltraine, will create a revised version for posting and discussion at the next GCC meeting.

## Marked Catalog Copy:

### II. College of Nursing

<http://www.ecu.edu/cs-acad/grcat/programNURS.cfm>

#### *College of Nursing*

*Sylvia Brown, Dean, 4205L Health Sciences Building*

*Martha Engelke, Associate Dean for Research and Scholarship, 4210C Health Sciences Building*

*Alta Andrews, Director for Community Partnerships and Practice, 4205H Health Sciences Building*

*Marie E. Pokorny, PhD Director, 4165S Health Sciences Building*

*Mary Ann Rose, Interim Associate Dean, Undergraduate Studies, 3166F Health Sciences Building*

*Carol Winters-Moorhead, Acting Chair, Department of Graduate Nursing Science, 3164 Health Sciences Building*

#### **Master of Science in Nursing**

The master of science in nursing program prepares graduates for advanced practice nursing and for leadership roles in a variety of community based or acute care provider agencies. The MSN program offers eight concentrations:

- Adult-Gerontology Nurse Practitioner (online)
- Clinical Nurse Specialist in Adult Health (online)
- Family Nurse Practitioner (online)
- Neonatal Nurse Practitioner (online)
- Nurse Anesthesia
- Nurse Midwifery (online)
- Nursing Education (online)
- Nursing Leadership (online)

Part-time study is available. Certificate programs are available for post-master's study in selected areas. The program is accredited by the National League for Nursing Accrediting Commission, 61 Broadway, New York, NY 10006; telephone 212-363-5555.

The nurse midwifery concentration is also accredited by the Accreditation Commission for Midwifery Education (ACME) formerly called the American College of Nurse-Midwives, Division of Accreditation, 8403 Colesville Road, Suite 1550, Silver Spring, MD 20910; phone 240-485-1802, fax 240-485-1818.

The nurse anesthesia program is accredited by the Council on Accreditation of Nurse Anesthesia Educational Programs, 222 South Prospect Avenue, Park Ridge, IL 60068; telephone 847-692-7050.

A RN/MSN option is available for registered nurses who do not have a baccalaureate degree in nursing.

The Alternate Entry (AE) MSN option is a plan of study leading to the MSN degree for individuals who have earned a baccalaureate degree in another field. The program is divided into 2 phases: Phase I (Pre licensure) includes graduate courses that include content and experiences that are required to take

the Registered Nurse Licensure examination (NCLEX-RN) and preparation for advanced study in nursing. Phase I only begins in fall semesters and full-time enrollment is required. Successful completion of the NCLEX-RN and licensure as a Registered Nurse is required prior to entering Phase II clinical concentration courses. Students may enroll in core classes during the first semester of Phase II, while obtaining credentials. Phase II will include courses in a selected clinical concentration.

## **Admission**

Admission to the master of science in nursing degree program requires the student to meet the minimum admission requirements for graduate study as established by the university and the following requirements established by the College of Nursing.

- a baccalaureate degree in nursing from an accredited program
- a minimum GPA of 2.7 in undergraduate studies and a minimum GPA of 3.0 in nursing major
- acceptable score on the Graduate Record Examinations (GRE) or Miller Analogies Test (MAT) within the past five years (GRE score required for nurse anesthesia and nurse midwifery concentration applicants.)
- currently hold a nonrestricted license to practice as a registered nurse (RN) in North Carolina or a NCSBN compact state (The out-of-state student must procure a North Carolina RN license before enrolling in clinical courses.)
- a statement describing the applicant's interest in graduate study, career goals, and the MSN degree's relationship to those goals
- three professional references
- a personal interview with a member of the graduate faculty

Due to the high demand of courses by our enrolled MSN students, the College of Nursing will not enroll nondegree graduate students at this time. Prospective students are encouraged to apply for full admission as soon as possible in order to be eligible for all College of Nursing course offerings.

Applicants for the nurse midwifery concentration, in addition to the general admission criteria, must have one year RN experience (labor and delivery preferred), demonstrate a commitment to practice with under-served populations, and one of the references should be from a health care provider knowledgeable about the applicant's nursing practice.

Applicants for the family nurse practitioner and adult-gerontology nurse practitioner concentrations, in addition to the general admission criteria, must have one year RN experience and provide a third reference from a health care provider knowledgeable about the applicant's nursing practice. The application deadline for both concentrations is January 2.

Applicants for the nurse anesthesia concentration, in addition to the general admission criteria, must have one-year adult critical care experience, completion of a supplemental nurse anesthesia admissions packet, a total of five professional references (two on forms provided in nurse anesthesia admissions packet), and an interview with the Nurse Anesthesia Admissions Committee. The application deadline for the nurse anesthesia concentration is May 31.

Applicants for the clinical nurse specialist concentration, in addition to the general admission criteria, must have one year of current practice experience and provide a third reference from a health care provider knowledgeable about the applicant's nursing practice.

Completed applications for the clinical nurse specialist concentration will be considered for fall and

spring admission. Applications must be received by October 1 for spring, June 1 for fall.

Applicants for the neonatal nurse practitioner concentration, in addition to the general admission criteria, must have two years of current practice experience in a critical-care environment for high risk neonatal care RN experience and provide a third reference from a health care provider knowledgeable about the applicant's nursing practice.

Applicants may take core courses while gaining the required RN experience for admission into selected concentrations.

Applicants for admission to the (AE) MSN option must meet general admission requirements with the exception of a valid RN license and baccalaureate degree in nursing. Applicants must have a baccalaureate degree in another field. Additional requirements include:

- Completion of prerequisite courses – chemistry, human anatomy and physiology, microbiology, human growth and development, nutrition, ethics, and statistics.
- A minimum 3.0 GPA in undergraduate major
- Current nonrestricted license to practice as a RN in NC or a NCSBN compact state prior to entering Phase II clinical concentration courses.

Application deadline for the (AE) MSN option is December 1.

Completed applications will be considered as they are received, with the exception of nurse anesthesia, family nurse practitioner, adult nurse practitioner, clinical nurse specialist, and the alternate entry master of science in nursing option.

Applicants for the nursing education, nursing leadership, and clinical nurse specialist concentrations must have a minimum of one year RN experience prior to enrolling in specialty courses.

Applicants for the nursing leadership concentration, in addition to the general admission criteria, must provide a third reference from a health care provider knowledgeable about the applicant's nursing practice.

Applicants for admission to the RN/MSN option will be evaluated using the following criteria.

- a minimum 3.0 GPA in undergraduate studies and a minimum 3.0 GPA in the nursing major in the previous nursing program
- one year RN experience
- an acceptable score on the GRE or the MAT within the past five years
- current nonrestricted license to practice as a RN in North Carolina or a NCSBN compact state
- a statement describing the applicant's interest in graduate study, career goals, and the MSN degree's relationship to those goals
- three professional references
- a personal interview with the director of RN/BSN studies and a member of the College of Nursing graduate faculty

## Program Prerequisites

A course in statistics with a grade of C or higher and basic computer skills with both applications software and the Internet are prerequisites for all concentrations. A course in basic accounting is a prerequisite for the nursing leadership concentration.

Students in the (AE) MSN option must complete all cognate requirements prior to beginning the program. Admission to the (AE) MSN option does not guarantee entry into a specific graduate concentration.

Students in the RN/MSN option must complete all general education and cognate requirements prior to beginning undergraduate nursing courses. Separate application is made to the graduate program in the first or second semester of study in the RN/MSN option. Students enrolled in the RN/MSN option must maintain a 3.0 GPA in the 15 s.h. of undergraduate nursing courses to be eligible to continue in this option. Admission to the RN/MSN option does not guarantee entry into a specific graduate concentration.

## Degree Requirements

Depending upon the concentration area chosen within the degree program, the master of science in nursing requires 36-68 s.h. credit as follows. Concentrations are clustered as administrative, clinical, and education.

### Administrative:

- Nursing Leadership – Acute Care Health Systems, 41 s.h.
- Nursing Leadership – Community Based Health Systems, 41 s.h.
- Nursing Leadership – Educational Systems, 41 s.h.

### Clinical:

- Adult Nurse Practitioner, 46 s.h.
- Clinical Nurse Specialist in Adult Health, 42 s.h.
- Family Nurse Practitioner, 50 s.h.
- Neonatal Nurse Practitioner, 41 s.h.
- Nurse Anesthesia, 68 s.h.
- Nurse Midwifery, 50 s.h.

### Education:

- Nursing Education, 36 s.h.

### Requirements:

1. Common core: NURS 6001, 6002, 6991, 6992, 6993 - 12 s.h.
2. Cluster core (Choose appropriate cluster for concentration.) - 9-20 s.h.

Adult Nurse Practitioner (9 s.h.): NURS 6050, 6610, 6611

Clinical Nurse Specialist in Adult Health (12 s.h.): NURS 6050, 6208, 6610, 6611

Family Nurse Practitioner (9 s.h.): NURS 6050, 6610, 6611

Neonatal Nurse Practitioner (9 s.h.): NURS 6417, 6418, 6419

Nurse Anesthesia (20 s.h.): NURS 6610, 6810, 6811, 6813; PTHE 8008

Nurse Midwifery (9 s.h.): NURS 6050, 6610, 6611

Nursing Education (9 s.h.): Select 9 s.h. of course work in consultation with advisor from such courses as: NURS 6050, 6110, 6611, 6035, 6208, 6214, 6224, 6984, 7271

Nursing Leadership: NURS (10 s.h.) NURS 6971, 6973, 6974, 6986

3. Concentration area (Choose one area.) - 15-36 s.h.

Administrative (19 s.h.):

Nursing Leadership – Acute Care Health Systems (19 s.h.): NURS 6977, 6978, 6983, 6984, 6985, 3 s.h. electives

Nursing Leadership – Community Based Health Systems (19 s.h.): NURS 6310, 6311, 6977, 6978, 6983, 6984

Nursing Leadership – Educational Health Systems (19 s.h.): NURS 6903, 6904, 6909, 6977, 6978, 6983

Clinical (18-36 s.h.):

Adult Nurse Practitioner (25 s.h.) 6612, 6613, 6614, 6615, 6618, 6621, 6622, 6623

Clinical Nurse Specialist in Adult Health (18s.h.): NURS 6958, 6959, 6960, 6961, 6962, 6989; 3 s.h. elective clinical specialty courses

Family Nurse Practitioner (29 s.h.): NURS 6612, 6613, 6614, 6615, 6616, 6617, 6618, 6619, 6620

Neonatal Nurse Practitioner (20 s.h.): NURS 6420, 6421, 6422, 6423, 6424, 6425

Nurse Anesthesia (36 s.h.): NURS 6805, 6806, 6812, 6814, 6815, 6816, 6817, 6818, 6819, 6820, 6821, 6822, 6823, 6824

Nurse Midwifery (29 s.h.): NURS 6109, 6110, 6112, 6113, 6115, 6116, 6117, 6118, 6119

Nursing Education (15 s.h.): NURS 6903, 6904, 6905; 6909; 3 s.h. elective or cognate

4. Students in the Nursing Education concentration who have limited teaching experience may be required to take NURS 6908.
5. Students in the Nursing Leadership concentration who have limited finance experience may be required to take NURS 6987.

Enrollment is necessary for continued research advisement. A comprehensive assessment is required for graduation for all MSN degree-seeking students.

Students in the RN/MSN option must complete the following undergraduate courses prior to enrolling in any graduate nursing courses–NURS 3020, 3021, 3510, 3900, 4210, 4211.

### **Post MSN Certificate Programs**

Eight post-MSN certificate options (adult nurse practitioner, clinical nurse specialist, family nurse practitioner, neonatal nurse practitioner, nurse-anesthesia, nurse midwifery, nursing leadership and nursing education) offer advanced practice education, qualifying those who complete the clinical options to take national certification exams. In addition, the nursing education post-master's certificate prepares nurses for beginning teaching roles in nursing education.

### **Admission Requirements**

- A master's degree in nursing from an accredited program
- A current non-restricted license to practice as a registered nurse (RN) in North Carolina or an NCSBN compact state. Individual advisement will be necessary for licensure regulations for online out-of-state students.

- A personal statement describing the applicant's interest in graduate study, career goals, and the certificate's relationship to those goals.
- Three professional references with one reference from an individual who is knowledgeable of the applicant's nursing practice
- One year clinical experience as an RN
- A personal interview with a member of the graduate faculty

Applicants for the nurse midwifery post-master's certificate, in addition to the general admission criteria, must have one year RN experience (labor and delivery preferred).

Applicants for the nurse anesthesia post-master's certificate, in addition to the general admission criteria, must have one year adult critical care experience as a RN, completion of a supplemental nurse anesthesia admission packet, a total of five professional references (two on forms provided in the nurse anesthesia admissions packet) and an interview with Nurse Anesthesia Admissions Committee. Courses in physiology and chemistry/biochemistry within five years are highly recommended. Acceptable score on GRE within past 5 years (GRE required).

Applicants for the neonatal post-master's certificate, in addition to the general admission criteria, must have two years of current practice experience as a RN in a critical care environment for high-risk neonatal care.

Applicants for the clinical nurse specialist post master's certificate, in addition to the general admission criteria, must have one year RN experience.

Applicants for the post-master's certificate options in adult nurse practitioner, clinical nurse specialist, family nurse practitioner, neonatal nurse practitioner, and nurse midwifery must have had graduate level courses in pathophysiology (reproductive physiology is an additional requirement for nurse midwifery), health assessment and pharmacology within the past five years or approval by the concentration director; otherwise, students will be required to take these courses as part of the post-master's certificate requirement.

**Adult Nurse Practitioner:** - 10-33 s.h.

NURS 6621,6622,6623. Depending on student's needs and past education, additional course work from the following may be required: NURS 6050, 6610, 6611, 6612, 6613, 6614, 6615, 6618, or equivalent clinical courses.

**Clinical Nurse Specialist:** - 12 15-30 s.h.

NURS 6958, 6959, 6960, 6961, 6962, 6989. Depending on student's needs and past education, additional course work from the following may be required: NURS 6050, 6208 6610, 6611, 6214, 6224 or equivalent clinical courses.

<http://www.ecu.edu/cs-acad/grcat/coursesNURS.cfm>

## **NURS: Nursing**

6908. Nursing Education Role Practicum II (3)

P: NURS 6905 or consent of instructor. Collaborative implementation and evaluation of comprehensive educational project.

6909. Evaluation in Nursing Education (3)  
P: NURS 6903 or consent of instructor; P/C: NURS 6904 or consent of instructor. Focuses on evaluation of students, faculty, curricula, and programs in nursing education.
6958. Clinical Practice for the CNS Across the Adult Lifespan (3)  
P: NURS 6959 NURS 6001 or 6002 and at least one of the following: NURS 6050, 6610, 6611 or 6208; or consent of director of clinical nurse specialist concentration. Role of the CNS in adult through geriatric practice in various care settings.
6959. Clinical Nurse Specialist Theory and Role Development (3)  
P: NURS 6958 6001 or 6002; NURS 6050 or 6610 or 6208. Core competencies, essential characteristics, and the conceptual model guiding CNS practice.
6960. Clinical Nurse Specialist Practicum I (3)  
P: NURS 6958, 6959, 6989 or consent of director of clinical nurse specialist concentration. Applies CNS knowledge and skills to specialty clinical practice. Supervised on-site practicum by clinical preceptor.
6961. Clinical Nurse Specialist Practicum II (3)  
P: NURS 6959, 6960, or consent of faculty. Applies CNS knowledge and skills to specialty clinical practice. Supervised on-site practicum by clinical preceptor.
6962. Clinical Nurse Specialist Practicum III (3)  
P: NURS 6959, 6960, 6961, or consent of faculty. Applies CNS knowledge and skills to specialty clinical practice. Students practice with increasing independence and with minimal consultation and collaboration with preceptor.
6971. Health Policy, Law, and Regulation (3) Same as COHE 6971 and PADM 6400  
P/C: NURS 6001, 6002, 6983. Overview of health policy, law and regulation which relate to the delivery of health care in the United States.
6973. Management of Human Resources and Professional Relationships in Health Systems (3)  
P/C: NURS 6001, 6002, or consent of instructor. Focuses on the theoretical, legal/ethical, and practical dimensions of human resources management in health systems.
6974. Financial Management and Decision-making in Nursing Leadership (3)  
P/C: NURS 6992 or consent of instructor. Focuses on practical applications of financial concepts in making nursing decisions and accomplishing service delivery goals in the current health system.
6977. Nursing Leadership Practicum I (3)  
P/C: NURS 6983, 6992, or consent of instructor. Application of organizational and administrative theory, ethics, and clinical service and outcome management concepts within nursing and health systems.
6978. Nursing Leadership Practicum II (4)  
P/C: NURS 6977 or consent of instructor. Application of organizational and administrative theory within nursing and health systems in a selected focus area.
6983. Administrative and Organizational Theory and Ethics: Applications in Nursing and Health Systems (3)  
P/C: NURS 6001, 6002, 6986, or consent of instructor. Examines organizational, administrative, and ethical theory that relate to the leadership of nursing and health systems.
6984. Informatics for Advanced Nursing Practice (3)  
Application of informatics systems to practice, research, education, and administration of nursing.
6985. Management of Clinical Services Delivery and Outcomes (3)  
P/C: NURS 6001, 6002, 6992, or consent of the instructor. Explores the elements of nursing leadership in health systems essential to planning, organizing, staffing, directing, and evaluating patient care delivery outcomes.
6986. Analytical Foundations of Nursing Leadership (1)

P: Admission to the MSN or consent of instructor. Examines the process, theories and principles of leadership; analyzes student leadership strengths and challenges through self-evaluation and team reflection.

6987. Budgeting and Decision Making in Healthcare (3)

P: Admission to the MSN or consent of instructor. Practical skills in budgeting.

[6989. Clinical Practice for the Clinical Nurse Specialist Across the Adult Lifespan \(3\) Formerly NURS 6958 P: NURS 6959 or consent of director of clinical nurse specialist concentration. Role of the clinical nurse specialist in adult through geriatric practice in various care settings.](#)

#### **IV. Thomas Harriot College of Arts and Sciences**

##### **Department of Mathematics**

<http://www.ecu.edu/cs-acad/grcat/coursesmath.cfm>

##### **MATH: Mathematics**

5000. Introduction to Sampling Design (3) (F)

P: MATH 3308 or 3229 or consent of instructor. Fundamental principles of survey sampling. Data sources and types, questionnaire design, various sampling schemes, sampling and nonsampling errors, and statistical analysis.

5002. Logic for Mathematics and Computer Science (3) (S) Same as CSCI 5002

P: CSCI 3510 or MATE 3223 or 2775 or MATH 2427 or 2775 or 3256 or PHIL 3580 or equivalent. Methods of mathematical logic that have important applications in mathematics and computer science.

5021. Theory of Numbers I (3)

P: MATH 3263 or consent of instructor. Topics in elementary and algebraic number theory such as properties of integers, Diophantine equations, congruences, quadratic and other residues, and algebraic integers.

5031. Applied Statistical Analysis (3) (WI)

May not count toward mathematics hours required for the mathematics concentration of the MA. P: MATH 2228, 3584; or equivalent; or consent of instructor. Topics include analysis of variance and covariance, experimental design, multiple and partial regression and correlation, nonparametric statistics, and use of computer statistical package.

5064. Introduction to Modern Algebra II (3)

May not be taken for credit by those having completed MATH 6011. P: MATH 3263 or consent of instructor. Continuation of development of topics begun in MATH 3263. Normal subgroups, factor groups, homomorphism, rings, ideals, quotient rings, and fields.

5101. Advanced Calculus I (3)

P: MATH 2173 or consent of instructor. Axioms of real number system, completeness, sequences, infinite series, power series, continuity, uniform continuity, differentiation, Riemann integral, Fundamental Theorem of Calculus.

5102. Advanced Calculus II (3)

- P: MATH 3256, 5101; or consent of instructor. Mathematical analysis of functions of several real variables. Includes limits, continuity, differentiation, and integration of multivariable functions.
5110. Elementary Complex Variables (3)  
May not be taken for credit by those having completed MATH 6111. P: MATH 2173. Complex numbers, analytic functions, mapping by elementary functions, integrals, residues, and poles.
5121. Numerical Analysis in One Variable (3)  
P: MATH 2173. Numerical analysis of problems with one independent variable. Solution of nonlinear equations in one unknown, interpolation and approximation of functions of one variable, numerical integration, and numerical differentiation and optimization.
5122. Numerical Analysis in Several Variables (3)  
P: MATH 2173, 3256, 4331. Numerical analysis of problems with several independent variables. Numerical solution of ordinary differential equations, systems of linear equations, numerical linear algebra and matrix algebra, systems of nonlinear equations, and systems of ordinary differential equations.
5131. Deterministic Methods in Operations Research (3)  
P: MATH 2173; 3307 or 5801. Mathematical models; linear programming; simplex method, with applications to optimization; duality theorem; project planning and control problems; and elementary game theory.
5132. Probabilistic Methods in Operations Research (3)  
P: MATH 2173, 3256; 3307 or 5801. Introduces stochastic processes. Queuing theory with applications to inventory theory and forecasting, Poisson and Markov processes, reliability simulation, decision analysis, integer programming, and nonlinear programming.
5270. Pascal Using the Microcomputer (3)  
May not be taken by students who have successfully completed CSCI 2610. May not count toward MATH or CSCI major or minor. P: MATH 1065 or equivalent. Pascal language and use in problem solving utilizing a microcomputer.
5311. Mathematical Physics (3) Same as PHYS 5311  
P: MATH 4331; PHYS 2360; or consent of instructor. Mathematical methods important in physics. Emphasis on application. Functions of complex variables, ordinary and partial differential equations, integrals and integral transforms, and special functions.
5322. Foundations of Mathematics (3) (WI)  
P: MATH 3233, 3263; or equivalent. Fundamental concepts and structural development of mathematics. Non-Euclidean geometries, logic, Boolean algebra, and set theory. Construction of complex number systems. Transfinite cardinal numbers and study of relations and functions. Topics developed as postulational systems.
5521. Readings and Lectures in Mathematics (3)  
Individual work with student.
5551. The Historical Development of Mathematics (3)  
P: MATH 3233; C: MATH 2172 or consent of instructor. History of mathematics from antiquity to present. Emphasis on study of significant problems which prompted development of new mathematics. Uses computer resources and library for research of topics and solutions.
5581. Theory of Equations (3)  
P: MATH 2173 or consent of instructor. Topics include operations with complex numbers, De Moivre's Theorem, properties of polynomial functions, roots of general cubic and quartic equations, methods of determining roots of equations of higher degree, and methods of approximating roots.
5601. Non-Euclidean Geometry (3)

P: MATH 3233 or consent of instructor. Non-Euclidean geometries, finite geometries, and analysis of other geometries from point of view of properties which remain invariant under certain transformations.

5774. Programming for Research (3) Same as CSCI 5774

For graduate student who wishes to use computer science to meet required research skills of his or her dept. May not count toward MATH major or minor. P: General statistics course or consent of instructor. Emphasis on minimum-level programming skill and use of statistical packages.

5801. Probability Theory (3)

P: MATH 2173 or 3307. Axioms of probability, random variables and expectations, discrete and continuous distributions, moment generating functions, functions of random variables, Central Limit Theorem, and applications.

6000. Introduction to Graduate Mathematics (3)

May not be taken for credit after MATH 5101 or 6011. P: Consent of director of graduate studies or advisor. Introduces advanced mathematics for beginning graduate students. Covers various proof methods and provides rigorous introduction to topics in logic, number theory, abstract algebra, and analysis.

6001. Matrix Algebra (3)

P: MATH 3256 or consent of instructor. Properties of vectors and matrices and their applications.

6011, 6012. Modern Algebra I, II (3,3)

P for 6011: MATH 3263 or equivalent; P for 6012: MATH 6011. Basic algebraic structures. Groups, rings, modules, integral domains, and fields.

6022. Theory of Numbers II (3)

P: MATH 5021. Advanced topics in algebraic and analytic number theory.

6100. Mathematics of Risk Analysis (3)

P: MATH 2172, 3307, 3308; or consent of instructor. Single-period mathematical risk theory is covered, including approaches to modeling and measuring (insurance) risks. Topics include (univariate) distribution theory: exponential dispersion models, elliptical distributions, (a,b,k) class, heavy-tailness; risk measurement: value-at-risk, expected shortfall, coherency; policy modifications: deductibles, (co)insurance, limits. Students are prepared to take the Society of Actuaries Exam P "Probability" and Exam C "Construction and Evaluation of Actuarial Models."

6111, 6112. Introduction to Complex Variables I, II (3,3)

P for 6111: MATH 5102; P for 6112: MATH 6111. I. Analytic functions, mapping of functions, differentiation and integration, power series, and residues. II. Integral functions, infinite products, Mittag-Leffler expansion, maximum modulus theorem, convex functions, the Schwarz Christoffel transformation, analytic continuation, Riemann surfaces, and selected topics in functions of a complex variable.

6121, 6122. Real Variables I, II (3,3)

P for 6121: MATH 5101 or consent of instructor; P for 6122: MATH 6121 or consent of instructor. I. Study of functions of one real variable and convergence of sequences and series of functions: functions of bounded variation, measures, measurable sets, measurable functions, convergence almost everywhere, absolutely continuous functions, Lebesgue integration, differentiation, and the Fundamental Theorem of the Calculus. II. Lebesgue spaces and associated inequalities, measures in  $R^n$ , measure spaces and the associated theory of integration and differentiation; the Radon-Nikodym Theorem with applications to probability and statistics.

6150. Graph Theory (3)

- P: MATH 2300 or consent of instructor. Structure of graphs, trees, connectivity, Eulerian and Hamiltonian graphs, planar graphs, graph colorings, matchings, independence, and domination.
- 6251, 6252. Advanced Placement Mathematics for Secondary Teachers I, II (3,3)  
 May count toward certificate renewal or certification in teaching gifted and talented students. May not count toward MA in mathematics. Intensive study of topics covered in Calculus AB and Calculus BC of advanced placement mathematics.
6271. Teaching Collegiate Mathematics (2)  
 P: Consent of instructor. Curricula and methods of teaching mathematics to adults in colleges and technical schools.
- 6401, 6402. Introduction to Partial Differential Equations I, II (3,3)  
 P for 6401: MATH 4331 or consent of instructor; P for 6402: MATH 6401 or consent of instructor. I. Linear and nonlinear partial differential equations of the first order with emphasis on formal aspects of these equations. Use of partial differential equations in analysis, geometry, and physical sciences is considered where appropriate. II. Continuation of MATH 6401 to include nonlinear partial differential equations of the second order and higher orders. Certain theoretical aspects of partial differential equations and a limited amount of Fourier Series, Fourier transforms, Laplace transforms, and boundary value problems are included.
- 6411, 6412. Ordinary Differential Equations I, II (3,3)  
 P for 6411: MATH 4331 or consent of instructor; P for 6412: MATH 6411 or consent of instructor. I. Existence, uniqueness, and technique of solutions to first and second order differential equations are considered. Bases for linear equations, stability, and series solutions about an ordinary point are considered. II. Autonomous systems, series solutions about a regular singular point, and Sturm-Liouville Systems are examined.
6500. Special Topics (3)  
 May be repeated for credit with change of topic. P: Consent of instructor. Selected topics of current interest.
6561. Properties of Infinite Series (3)  
 P: Consent of instructor. Infinite series beyond advanced calculus level.
6571. Elements of Probability (3)  
 May not count toward mathematics requirement for MATH MA. P: Consent of instructor. Axiomatic development of probability from set operations viewpoint. Use of probability measures.
6601. An Introduction to Differential Geometry (3)  
 P: MATH 2173, 3256. Basic ideas of differential geometry through study of curves and surfaces in three-dimensional space. Regular curves, regular surfaces, Gauss Map, and intrinsic and global differential geometry of surfaces.
- 6611, 6612. Introduction to Higher Geometry I, II (3,3)  
 P for 6611: MATH 3233 or consent of instructor; P for 6612: 6611. I. Homogeneous linear equations and linear dependence; projections and rigid motions, homogeneous Cartesian coordinates; linear dependence of points and lines; point geometry and line geometry; harmonic division and cross ratio; one and two-dimensional projective transformations. II. Continuation of study of projective coordinates in the plane; introduces various types of geometries; study of point curves and line curves with intensive study of point conics and line conics.
6651. Introduction to Topology (3)  
 P: MATH 5101. Metric spaces and basic point-set topology, open sets, closed sets, connectedness, compactness, and limit points.
6802. Statistical Inference (3)  
 P: MATH 3307 or 5801; consent of instructor. Estimation and hypothesis testing from both classical and Bayesian points of view. Use of t, F, and chi-squared distributions. Least squares procedures.

6803. The Linear Model (3)

P: MATH 3256, 5801. Topics include general linear model, regression models, design models, estimation of parameters, theory of least squares, and testing general linear hypotheses.

6804. Stochastic Processes (3)

P: MATH 3256, 5801. Most widely used models for random phenomena which vary with time. Topics include Markov, Poisson, birth and death, and stationary processes.

6805. Topics in Mathematical Statistics (3)

P: MATH 3256, 5801. Mathematical theory of certain topics in statistics outside range of MATH 6802. Topics vary by faculty and student interests.

7000. Thesis (1-6)

May be repeated. May count maximum of 6 s.h.

7001. Thesis: Summer Research (1)

May be repeated. No credit may count toward degree. Students conducting thesis research may only register for this course during the summer.