MS PROGRAM OF

BIOINFORMATICS & BIOSTATISTICS

GRADUATE STUDENT HANDBOOK

Updated 6/30/2016

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OVERVIEW

The Program in Bioinformatics & Biostatistics was previously housed in the University at Buffalo (UB), Roswell Park Cancer Institute (RPCI) Graduate Division. Beginning June 1, 2015, this program will be administered by the Department of Biostatics at UB. The roots of the program derive from the Biometry program that was discontinued in 1998. In August 4, 2009 the program was revived and updated in order to better align it with current standards. The program now has a strong emphasis in bioinformatics. The program is a joint collaboration between the Department of Biostatistics at RPCI, RPCI's Division of Bioinformatics and the Department of Biostatistics at UB with contributions from several other departments on campus. These affiliations, in addition to collaborations with researchers in the Center of Excellence in Bioinformatics, the College of Medicine and Biomedical Sciences, the College of Nursing, the College of Dentistry, the school of Engineering and Applied Sciences, the School of Pharmacy and the School of Public Health and Health Professions, provide a rich environment for the education and training of bioinformaticians and biostatisticians. In addition to their classroom studies, the Program's students have opportunities to gain practical training through mentored, hands-on data analyses in the context of exciting biological, medical and health science research projects. The program in Bioinformatics and Biostatistics began enrolling students in Fall 2010. It is an exciting environment and an exciting time for bioinformatics and biostatistics at the Roswell Park Cancer Institute.

MISSION OF THE PROGRAM

The mission of the Program of Bioinformatics & Biostatistics is to educate and train bioinformatics and biostatistics scientists; to collaborate with researchers in the basic, medical, and clinical sciences; to conduct methodological research; to collaborate with local, state, or national health institutions; and to serve our Institute, University and the bioinformatics, biostatistics and health-care professions.

TEACHING AND TRAINING PHILOSOPHY

Our philosophy of education is that students best learn what they apply and what they teach. Practical training requirement is included in the MS program. The Program seeks to provide opportunities for students to communicate their knowledge to others, either through classroom presentations, student seminars, or assignment to teaching assistantships.

Faculty bring a philosophy to the classroom and to their mentoring that is consistent with the Program's goals to promote and extend the proper use of quantitative thinking and skills in the medical sciences, to contribute substantively and methodologically to the advancement of knowledge in medical related disciplines, and to aid the advance of data-driven, evidenced-based medicine, healthcare, public health practice and policy making. This emphasis brings a high degree of relevance to the classroom and enhances students' opportunities to work as apprentices with faculty. Faculty and students together work with collaborators in the Roswell Park Cancer Institute, the Gynecologic Oncology Group, the University at Buffalo, and at the Hauptman

Woodward Institute. Students receive practical training in these environments in parallel to their formal coursework.

We believe in a holistic approach to education. The Program is dedicated to providing a wide variety of educational, research, and collaborative opportunities to students in a friendly, respectful, nurturing, and stimulating environment that promotes intellectual and professional development.

RESEARCH ACTIVITIES

The Program faculties engage in theoretical, methodological, and applied bioinformatics and biostatistical research. This work is often motivated by their collaborations with medical and health science researchers. There is ongoing involvement in medical informatics, cancer research, maternal and child health, research on addictions, and epidemiology. Projects span a wide range of topics such as translational bioinformatics, computational genomics, statistical genetics, genetic epidemiology, microarray and next-generation sequencing data analysis, pattern recognition and classification, proteomics, metabonomics and clinical trials to assess the efficacy of cancer diagnosis and treatments, epidemiologic studies of environmental risk factors, and outcomes research.

PERSONNEL

Program Phone Number: 829-3690
706 Kimball Tower – South Campus
University at Buffalo Department of Biostatistics will begin administering this program as of June 1, 2015.

FACULTY

Interim Chair and Professor

Gregory E. Wilding, PhD   University of Rochester
Vice-Chair of Biostatistics at Roswell Park Cancer Institute and Co-Director of the Biostatistics Shared Resource
Research interests: clinical trial design, permutation tests, resampling techniques, goodness-of-fit tests, distributional characterizations, copulas, tests of independence, biostatistics.

Associate Chair, Graduate Program Director and Professor

Lili Tian, PhD   University of Rochester
Research interests: goodness-of-fit testing; skewed data analysis; order-restricted inference; inverse Gaussian models; design of clinical trials; longitudinal data analysis; survival analysis; analysis of medical expenditure data; generalized variable approach; statistical genetics; cancer research; behavioral studies; health policy studies.

Professor

Marianthi Markatou, PhD   Pennsylvania State University
Statistical Sciences (Statistics and Biostatistics): Problems in model assessment and selection, robustness, mixture models, statistical distances, biomarker development and ROC analysis, high dimensional data analysis, large databases data analysis, surveillance in large databases, methods for the analysis of observational data. Interdisciplinary: Machine learning and data mining, text data mining, biomedical informatics, emerging safety sciences relevant to health, study of dependence in microarrays and proteomics data, comparative safety and comparative effectiveness research.

Research Professor

John Blessing, PhD   University at Buffalo
Clinical trials, Biostatistics Data Center Administration

Mark Brady, PhD   University at Buffalo
Clinical Trials, drug development, time to failure analyses, screening trials

Alan D. Hutson, PhD.   University of Rochester
Biostatistics, clinical trials design, epidemiological modeling, Bioinformatics, computational methods and order statistics

Dietrich Kuhlmann, PhD   University of Missouri

Calyampudi Radhakrishna Rao, PhD - National Medical of Science Winner
PhD received at ScD at Cambridge University
Recipient of 27 honorary doctoral degrees in 16 countries

David Tritchler, PhD   University of Toronto
Statistical Analysis of DNA microarrays, statistical genomics, design & analysis of genetic studies, graphical models, casual inference, Bayesian networks, meta-analysis, statistical computation.

Research Associate Professors

Kathleen Darcy, PhD
Translational research science - Gynecologic Oncology Group , Roswell Park Cancer Institute
Song Liu, PhD   University at Buffalo

Vice-Chair of Roswell Park Cancer Institute Dept. of Bioinformatics
Research interests: developing computational and statistical methods to discover genetic risk factors and biomarkers for predicting some human diseases such as cancer using integrative analysis of multi-dimensional data from biomedical science such as mircoarray, high throughput sequencing, etc.

Michael Sill, PhD   University of Pittsburgh
Adaptive designs and inference, Phase I and II clinical trial development, exact methods for small sample sizes, translational research, differences between Bayesian & frequentist methods

Associate Professors

Chang-Xing Ma, PhD   Nankai University
MPH Concentration Co-Director
Statistical genetics and experimental design

Jeffrey Miecznikowski, PhD   Carnegie Mellon University
MS Program Co-Director
Research interests: bio-technical image analysis, array comparative genomic hybridization (aCGH) analysis, microarray analysis, nonparametric statistics, bootstrap methods, and software development

Albert Vexler, PhD   Hebrew University of Jerusalem, Israel
Research interests: receiver operating characteristic curves analysis; measurement error; optimal designs; regression models; censored data; change point problems; sequential analysis; statistical epidemiology; biostatistics; applications of Bayesian approaches to tests; asymptomatic methods of statistics; forecasting; sampling; optimal testing; nonparametric tests; empirical likelihoods; renewal theory; tauberian theorems; time series; categorical analysis; multivariate analysis; multivariate testing of complex hypotheses; factor and principal component analysis
Jihnhee Yu, PhD   Texas A & M University
Research interests: stochastic processes and small clinical trials

Assistant Professors

Daniel P. Gaile, PhD   Texas A&M University
Research interests: Biomarker identification, array comparative genomic hybridization (aCGH) analysis, expression analysis via array, NGS and bead-based technologies, proteomics, normalization methods for data generated by high throughput biotechnologies, non-parametric statistics, bootstrap methods, exact methods, linear combinations of order statistics, sparse matrix approaches, finite mixture models, statistical computing, software development.

Rachael Hageman Blair, PhD   Case Western University

Research interests: mathematical biology, optimization, numerical analysis, inverse problems, statistics and scientific computing, methodology development for mathematical modeling and simulation of metabolic and genetic networks, data analysis including microarray and quantitative trait loci.

Jiwei Zhao, PhD   University of Wisconsin-Madison

Research Assistant Professors

Kristopher Attwood, PhD   University at Buffalo
Research interests: Clinical, observational and diagnostic studies, decision theory, research operations, and statistics education.

William Brady, PhD   University at Buffalo
Research interests: statistical methods research focuses primarily on phase I and II clinical trial design and the application of exact methods to binary data.

Wei Deng, PhD   University at Buffalo
Gynecologic Oncology Group

Kevin Hasegawa Eng, PhD   University of Wisconsin-Madison
Research interests: Translational genomics in ovarian cancer; Biomarker development and validation; and statistical genomics algorithms for personalized medicine

Virginia Filiaci, PhD   University at Buffalo
Gynecological Oncology Group, Roswell Park Cancer Institute

Terry Mashtare, Jr., PhD   University at Buffalo

Yoram Shotland, PhD   Hebrew University of Jerusalem, Israel

Jianmin Wang, PhD   Iowa State University
Roswell Park Cancer Institute

Austin Miller, PhD   University at Buffalo
Research interests: The design and analysis of experimental, clinical and observational studies, measurement error models and structural equations modeling

Lei Wei, PhD	University at Buffalo
Roswell Park Cancer Institute	
Qianqian Zhu, PhD	University at Buffalo
Roswell Park Cancer Institute	

Professors Emeriti

Randolph L. Carter, PhD — Iowa State University

Research interests: measurement error models, structural equation models, longitudinal data methods, risk assessment, biostatistics, radiation effects, epidemiological modeling, maternal and child health epidemiology

Manavala M. Desu — University of Calcutta

Adjunct Professor

Leonid Khinkas, PhD — Voronezh State Univ., Voronezh, USSR

Peter Rogerson, PhD — University at Buffalo
Spatial Statistics and GIS Analysis

Enrique E. Schisterman, PhD — University at Buffalo
Senior Investigator at NICHD, Washington, DC

Adjunct Research Professor

Calyampudi Radhakrishna Rao, PhD — Purdue University

Adjunct Associate Professor

Joseph Lucke, PhD — University of Kansas
Research Institute on Additions, Buffalo, NY

Adjunct Assistant Professor

Zihua Hu, PhD — University of Iowa
Center for Computational, Buffalo, New York

Tao Liu, PhD   Institute of Bioinformatics, Chines Academy   of Sciences

Pinaki Sarder, PhD

Lara Sucheston, PhD   Case Western University
Research interests: molecular and genetic causes for complex diseases and the methodology used to find these mechanisms.

Yijun Sun, PhD   University of Florida

Li Yan, PhD   University of Rochester PhD in Physics and University at Buffalo PhD in
                                                    Biostatistics

STAFF

Amy Barczykowski– Data Manager
Nancy M. Barczykowski – Assistant to the Chair
Noreen D. McGuire – Graduate Program Coordinator
Teresa Sikorski –Secretary

ADVISEMENT AND SUPERVISION

Each student may select a faculty advisor to assist in planning a program to meet his/her educational goals and to answer questions relating to graduate studies. You may consult with Dr. Lili Tian, Director of Graduate Studies for advisement before you choose an advisor.

Students are expected to consult with the advisor prior to registration each semester. Failure to do so could result in a student's program not meeting the requirements necessary for graduation, which may delay or prevent degree conferral.

Administrative questions should be directed to the Program's Director of Graduate Studies or the Graduate Program Coordinator.

If a student wishes to change advisors, he/she should submit a request in writing to the Director of Graduate Studies. Changes will be made with the approval of the new advisor and the Director of Graduate Studies. The program will try to accommodate all student requests.

GRADUATE PROGRAM IN BIOINFORMATICS & BIOSTATISTICS

MASTER OF SCIENCE DEGREE

Coursework leading to a Master of Science degree in Bioinformatics & Biostatistics typically takes two years to complete. A minimum of 36 credit hours with average GPA 3.0 or better is required. In addition, practical data analysis experience is required at a level commensurate with master's degree coursework. A practical training project counted as 0 credit hours is required. The student must prepare a paper for his/her committee and pass a final oral exam, which is a presentation and defense of their practical training project report.

Core Course Requirements
STA 502	Introduction to Statistical Inference (3)*
STA 509	Statistical Genomics (3)
STA 511	Mathematical Analysis for Biostatistics (3)
STA 525	Statistics for Bioinformatics (3)
STA 545	Data Mining I (3)
STA 546	Data Mining II (3)
STA 782	Department Seminar (0)

Students are ***also required*** to have the following public health and epidemiology courses:

CHB 550 Public Health and Population Well Being (3)
EEH 501 Principles of Epidemiology (4)

Completion or demonstrated knowledge of the material in STA 511 (Mathematical Analysis for Biostatistics) is a prerequisite for STA 521.

All students are required to attend the weekly departmental seminar

To be more specific:

1) Attendance for all full-time students is **mandatory** at our 4pm Thursday seminar. Seminars scheduled outside that timeslot are optional. However, all students are strongly urged to attend.

2) An attendance sheet will be administered at the beginning of each seminar that you will be   required to sign in order to register your attendance.

3) You are expected to attend 80% of the seminars each semester. Failure to do so may delay your graduation date until seminar attendance is deemed adequate. TAs who fail to attend the seminar may lose their assistantships.

Elective Requirements

Students must take at least 12 hours of masters electives (ME). The following is a list of courses offered by the Program that can be used to satisfy this requirement:

BCH/BI0 519	Introduction to Bioinformatics (3)
CSE 503	Computer Science for Non Majors I (3)
CSE 536	Computational Biology (3)
RPN 525	Cancer Epidemiology (3)
EEH 501	Principles of Epidemiology (4)
EEH 561	Advanced Cancer Epidemiology and Prevention (3)
STA 509	Statistical Genomics (3)
STA 522	Introduction to Theoretical Statistics II (3)
STA 503	Analysis of Variance (3)
STA 504	Analysis of Variance (3)
STA 515	Distribution-Free Inference (3)
STA 517	Categorical Data Analysis (3)
STA 521	Introduction to Theoretical Statistics I
STA 522	Introduction to Theoretical Statistics II
STA 526	Design and Analysis of Clinical Experiments (3)
STA 531	Theory and Methods of Sample Surveys (3)
STA 536	Statistical Design and Analysis (3)
STA 537	Sequential Analysis (3)
STA 551	Stochastic Processes (3)
STA 561	Longitudinal Data Analysis and Time Series Analysis (3)
STA 567	Bayesian Analysis (3)
STA 571	Special Topics in Statistics (3)
STA 575	Survival Analysis (3)

STA 581   Multivariate Data Analysis (3)

Practical Training Requirement/Data Analysis Project

Bioinformatics & Biostatistics Masters students are required to have at least one semester of practical training that involves the application of methods from their master's degree coursework to real data. This requirement can be satisfied by working under a faculty member in a consulting or collaborative research setting, by participating in an internship that has been approved by the student's advisor/committee. The student must submit a detailed written report of a data analysis project to their supervisory committee for evaluation at the final oral exam. The presentation of this report must be given to the committee in the form of a seminar announced to all faculty and students of the School of Public Health and Health Professions.

Supervisory Committee

The student's MS supervisory committee must be appointed prior to the third semester of study. The faculty must have graduate faculty standing. This committee will advise the student, check on qualifications and progress, evaluate the student's written report and oral presentation satisfying the practical training requirement, and conduct the final oral exam. This committee must include at least three faculty members from the Program of Bioinformatics & Biostatistics. Students are strongly encouraged to add an additional committee member from outside the program in their second year, ideally one associated with their practical training project.

Thesis Option

A student who wishes to complete the master's thesis option may substitute up to six research hours (STA 700) for two master's elective courses **or** for the practical training requirement, provided they complete at least 12 credits of STA master's elective courses. A Master's thesis with general content pre-approved by the student's advisory committee is required.   To replace practical training hours the thesis must include an in-depth analysis of data from the health or biological sciences.   An oral presentation of the thesis must be given to the supervisory committee at a seminar announced to all faculty and students of the Program of Bioinformatics & Biostatistics. Two bound copies of the thesis must be submitted to the Graduate School and one bound copy to the Program. Copies should be bound in boards covered with blank imitation leather, with the title and author's name embossed, not printed, on the front in gold and the author's last name, degree and year of conferral of the degree on the spine (also in gold). See the section entitled Dissertation and Final Defense for Guidelines for Thesis Preparation.

ADMINISTRATIVE REQUIREMENTS

These can be found at http://grad.buffalo.edu/Academics/Policies-Procedures.html
(see University policy)

Time Limit to Complete the Degree. The time limit for obtaining the master's degree is <u>four</u> years from the date of matriculation in the department, not counting official leaves of absence. Students unable to complete the master's program within the time limit must petition the Graduate School for an extension of time to complete the degree. Students must provide a detailed description of work completed to date as well as a timeline for completion of the thesis/degree. Normally, extensions are approved for a maximum of one year. A total of more than two years will not be approved. Requests for extensions should be made at <u>least two weeks prior</u> to the start of the semester. ***Graduate Student Petition Forms*** are available at http://grad.buffalo.edu/Academics/Forms-for-Students.html. Be sure to indicate the dates of the extension, the reason for the request, and the intended date of degree completion. The Graduate School will not approve an extension for 'personal reasons'. You must be specific and present strong justification for your request.

Application to Candidacy

The Application to Candidacy is a document that includes a summary of courses to be applied toward a degree and usually is competed after three semesters. The ATC is available at http://grad.buffalo.edu/Academics/Forms-for-Students.html.   Once the ATC has been approved, a student is not required to enroll for 12 credits (or 9 credits if supported on an assistantship) to be considered full-time for tuition scholarship or student loan purposes. To be certified full time, a student must submit a ***Certification of Full-Time Status Form***. (See section on Certification of Full-Time Status).

> ***Read Carefully**: The Application to Candidacy (ATC) form must be submitted to the Program a minimum of FOUR weeks before the Graduate School deadline. If the ATC form is not submitted one month prior to the deadline, we cannot guarantee that it will be reviewed and approved in time for the student to graduate as planned.

The Application to Candidacy should be submitted to the program with an unofficial UB transcript.

M-**Form**. The ***M-form*** (Multi-Purpose) is prepared by the Graduate Program Coordinator and given to the student after all degree requirements have been completed. Usually, this form is available at the time of the presentation of the project or defense of the thesis for committee members to sign. You must provide the title and abstract of your project or thesis to the Graduate Program Coordinator. This form must be signed by the major professor, committee members, and the Director of Graduate Studies to certify that the student has satisfactorily completed ALL academic requirements for the degree. A copy of the ***M-Form*** is placed in the student's file. The original must be received at the Graduate School by the following deadlines:

> Friday before spring classes for a February 1 degree conferral
> Last day of spring exams for a June 1 degree conferral
> Friday before fall classes for a September 1 degree conferral

CHECKLIST FOR AN MS DEGREE CONFERRAL:

- ❑ 36 graduate credit hours (including core courses specified above) are completed with at least an overall 'B' (3.0) average.

- ❑ Satisfactory completion of public health and epidemiology course requirement.

- ❑ Satisfactory completion of oral exams (Data Analysis Project or Thesis option).

- ❑ Continuous registration from the date of matriculation (unless on an approved leave of absence).

- ❑ If beyond the four-year time limit for completion of degree, an approved petition for extension of time to complete the degree is on file in the Graduate School.

- ❑ An approved *Application to Candidacy* is on file in the Graduate School with all necessary attachments, including original transcripts.

- ❑ *M Form* submitted to the Graduate School within the established deadlines with all necessary attachments.

EXAMPLE PROGRAM OF STUDY

Master of Science Degree

Note that the sample program of study for the Master of Sciences Degree is based on those students required to take 12 credit hours per semester in order to be considered full-time. If you have an assistantship, you only are required to have 9 credits per semester to be considered full-time.

MASTER'S DEGREE IN BIOINFORMATICS AND BIOSTATISTICS		
Year 1: Fall Semester	**Year 1: Spring Semester**	**Year 1: Summer**
STA 502 Introduction to Statistical Inference (3) STA 511 Mathematical Analysis for Biostatistics (3) Epidemiology Course Masters Elective (3) STA 782 Department Seminar	STA 525 Statistics for Bioinformatics (3) Masters Elective (3) Masters Elective (3) Masters Elective (3) STA 782 Department Seminar	Practical Training (PT)
Year 2: Fall Semester	**Year 2: Spring Semester**	**Year 2: Summer**
STA 509 Statistical Genomics (3) STA 545 Data Mining I (3) Public Health Course Master's project/Thesis Option STA 782 Department Seminar	STA 546 Data Mining II (3) Masters Elective (3) Master's project/Thesis Option STA 782 Department Seminar	

COURSE DESCRIPTIONS

The course is comprised of required and elective courses from the UB Department of Biostatistics, Department of Community Health and Health Behavior (CHB), Department of Epidemiology and Environmental Health (EEH), the RPCI Department of Biostatistics, the RPCI Division of Bioinformatics, the UB Department of Computer Science, the UB Department of Biochemistry, and from UB's Center for Computational Research (CCR). Also, courses will be contributed from the Roswell Park Cancer Institute (RPCI) graduate programs in Cancer Pathology and Prevention and Cellular and Molecular Biology.

Course Prefix Definitions
BCH -- Courses administered through the UB Biochemistry Department
CHB – Community Health and Health Behavior
CSE -- Courses administered through the UB Computer Science & Engineering Department
RPN -- administered through the Roswell Park Cancer Institute Interdisciplinary Master of Science Program in Biomedical and Natural Sciences
STA -- Courses administered through the UB Biostatistics Program
EEH – Epidemiology and Environmental Health (formerly known as SPM)

Unless otherwise specified, courses are 3 credit courses.

CHB 550 PUBLIC HEALTH POPULATION WELL-BEING
The course will provide students with an understanding of and appreciation for population approaches to improving the health of our nation and the world, as well as knowledge of various career paths in public health. Course content includes: public health perspectives on health, wellness, illness, and population well-being; key influences on the health and well-being of individuals and populations; assessing public health problems from a population health perspective; using the five core components of public health to address health problems; effectively utilizing health information to address public health issues; and career paths in public health and the training/expertise required to pursue them. Students will engage in critical assessment of historical and current public health events, and creative application of their foundational knowledge to new public health problems. The course is particularly applicable to students preparing to pursue a health-related career and to students in health professions programs desiring a knowledge of public health approaches.
No pre-requisites

CSE 503 COMPUTER SCIENCE FOR NON MAJORS I
Overview: This course introduces students to algorithm design and implementation in a modern, high-level, programming language (currently, Java). It emphasizes problem-solving by abstraction. There will also be a brief coverage of the social and ethical aspects of computing. Topics include data types, variables, expressions, basic imperative programming techniques including assignment, input/output, subprograms, parameters, selection, iteration, Boolean type, and expressions, and the use of aggregate data structures including arrays and records. Students will also have an introduction to the basics of abstract data types and object-oriented design, as well as the mathematics of computer science such as Boolean algebra, basic number theory, etc.

CSE 536 COMPUTATIONAL BIOLOGY
Overview: Computational Biology studies the problems arising from Biology using algorithmic techniques. Typical problems include: sequencing and alignment of DNA and protein sequences; construction and comparison of evolutionary trees. These problems are of central importance in Biology. The course provides insights that will help students gain a comprehensive understanding of computational problems in Biology, and techniques for designing efficient algorithms for solving these problems. Prerequisite: Basic understanding of programming, or molecular biology and genetics.

BCH/BIO 519 INTRODUCTION TO BIOINFORMATICS
Introduction to Bioinformatics will introduce graduate students to the principles and practices used in computational analysis of DNA and protein sequences, analysis of large scale DNA and protein datasets, statistical analysis of sequence alignments and gene array datasets, proteomics, and protein structure prediction.

EEH 501 EPIDEMIOLOGY PRINCIPLES (4 credits)
Introduction to the basic principles, methods and uses of epidemiology.

EEH 519 PRINCIPLES OF MEASUREMENT IN PUBLIC HEALTH
An explanation of basic principles and methods of measurement and their application in epidemiologic research. These include development and use of different types of instruments and scales for measuring biological characteristics and behavioral and social constructs, questionnaire construction and validation, sampling, data collection methods, and fundamental principles underlying data analysis and interpretation. Students will gain practical experience developing a questionnaire relevant to an epidemiologic issue, role-playing interview techniques in class, and resolving issues related to other data collection methods, sampling, and preparing data for analysis.

EEH 604 FUNDAMENTALS OF GENETIC EPIDEMIOLOGY
An overview of the field of genetic epidemiology including how to study the genetic causes of phenotypic variation. Topics include human genetics, molecular genetics, and population genetics as they apply to the conduct of a genetic epidemiology study. The concepts of heritability and linkage disequilibrium are covered. The course covers more detailed aspects of segregation, linkage, and association as they are used in family- and population-based studies to search for disease-causing genes. Current concepts in the genetics of complex traits as well as an exploration of online databases used in genetic epidemiology are included. The course includes in-class computer laboratory exercises using standard software tools to analyze genetic data. **Prerequisites: EEH 501, EEH 502, EEH 505**

ES/NTR 568 EPIDEMIOLOGY AND PUBLIC HEALTH FOR HEALTH PROFESSIONALS
The purpose of this course is to provide students in Health Professions degree programs an introduction to epidemiology and a foundational knowledge of public health concepts. Students will learn basic epidemiologic principles and methods and apply them to current public health

issues, particularly those related to their discipline. Topics include an overview and history of public health, how epidemiologic methods have evolved over time to help us study disease, the natural history and transmission of disease, investigation of an outbreak, basic epidemiologic study designs, measures of disease occurrence, measures of association and risk, criteria used to assess causal relationships in health, and basic principles of population screening and surveillance.

PTR 525 CANCER EPIDEMIOLOGY
Overview: Provides an in-depth overview of the epidemiology on various cancer sites. Standard methodologies and analytic techniques used in cancer epidemiology will be covered. Attention given to critical review of known or suspected cancer risk factors.

STA 502 STATISTICAL INFERENCE
May not be used as credit for Masters students in biostatistics
Introduces basic principles of probability and distribution theory and statistical inference. Topics include axioms of probability theory, independence, conditional probability, random variables, discrete and continuous distributions, functions of random variables, moment generating functions, central limit theorem, point and interval estimation, maximum likelihood methods, tests of significance, and the Neyman-Pearson theory of testing hypotheses.

STA 503 REGRESSION ANALYSIS
Regression analysis and introduction to linear models. Topics: Multiple regression, analysis of covariance, least square means, logistic regression, and non-linear regression. This course includes a one hour computer lab and emphasizes hands-on applications to datasets from the health sciences. LEC/LAB
Prerequisite: MTH 142 or second course in calculus or permission of instructor.

STA 504 ANALYSIS OF VARIANCE
Advanced presentation of statistical methods for comparing populations and estimating and testing associations between variables. Topics: Point estimation, confidence intervals, hypothesis testing, ANOVA models for 1, 2, and k way classifications, multiple comparisons, chi-square test of homogeneity, Fisher's exact test, McNemar's test, measures of association , including odds ratio, relative risks, Mantel-Haenszel tests of association, and standardized rates, repeated measures ANOVA, simple regression and correlation. This course includes a one hour computing lab and emphasizes hands-on applications to datasets from the health related sciences. LEC/LAB
Prerequisite: STA 503

*STA 506 INTRODUCTION TO STATISTICAL COMPUTING
The purpose of this course is to familiarize students with PC-based statistical computing applications for public health. It is a companion course for STA 505: Introduction to Biostatistics. The course will develop basic skills in the use of a statistical package through classroom demonstrations and independent lab assignments that will complement the material covered in STA 505. The course will emphasize data definition, verification, descriptive and inferential

statistics and graphical presentation. The course will familiarize the students with the use of a statistical package and give them the skills needed for effective data management, data manipulation, and data analysis at a basic level. LEC
Prerequisite: STA 505 or 527 or permission of instructor.   Concurrent registration in prerequisite is admissible.

STA 509 STATISTICAL GENOMICS
Statistical tools for analyzing experiments involving genomic data. Topics: Basic genetics and statistics, linkage analysis and map construction using genetic markers, association studies, Quantitative Trait Loci analysis with ANOVA, variance components analysis and marker
 regression (including multiple and partial regression), QTL mapping with interval mapping and composite interval mapping, LOD test, supervised and unsupervised methods for gene expression microarray data across multiple conditions. LEC
Prerequisites: STA 505 and STA 506 or STA 527 and STA 506 or STA 503

STA 511 MATHEMATICAL ANALYSIS FOR BIOSTATISTICIANS
This course provides the background in special topics in mathematics required to succeed in the biostatistics graduate programs and is required for students who have not had an advanced calculus and/or matrix algebra course. The basic mathematical concepts relevant to statistical studies will be discussed. Topics: convergence of sequences of sets, numbers, and functions, convergence of series, uniform convergence, power series, term by term integration and differentiation, matrix algebra, and other topics as time permits. LEC
Prerequisite: MTH 241. (Third semester calculus) or permission of instructor.

STA 515 DISTRIBUTION-FREE INFERENCE
Introduces alternate methods for designing and analyzing comparative studies that may be used when some or all of the assumptions underlying the usual parametric method are questionable. Topics: 1-, 2-, and k-sample location problems, randomized block and repeated measures designs, the independence problem, rank transformation tests, randomization tests, the 2-sample dispersion problem, and other topics as time permits. LEC
Prerequisite: Undergraduate Probability and Statistics course.

STA 517 CATEGORICAL DATA ANALYSIS
This course provides students with useful methods for analyzing categorical data. Topics: Cross-classification tables, tests for independence, log-linear models, Poisson regression, ordinal logistic regression, and multinomial regression for the logistic model. LEC
Prerequisite: STA 504 and STA 522. Concurrent registration in prerequisites is admissible.

STA 521 INTRODUCTION TO THEORETICAL STATISTICS I
Provides student with probability and distribution theory necessary for study of statistics. Topics: axioms of probability theory, independence, conditional probability, random variables, discrete and continuous probability distributions, functions of random variables, moment generating functions, Law of Large Numbers and Central Limit Theorem. LEC
Prerequisite: MTH 431 (Advanced calculus) or concurrent enrollment in STA 511

STA 522 INTRODUCTION TO THEORETICAL STATISTICS II
Introduces principles of statistical inference. Classical methods of estimation, tests of significance, and Neyman-Pearson Theory of testing hypotheses, maximum likelihood methods, and Bayesian statistics are introduced and developed. LEC
Prerequisite: STA 521.

STA 526 DESIGN AND ANALYSIS OF CLINICAL EXPERIMENTS
Introduction to fundamental principles and planning techniques for designing and analyzing statistical experiments. Recommended for students in applied fields. Topics: Justification for randomized controlled clinical trials, methods of randomization, blinding and placebos, ethical issues, parallel groups design, crossover trials, inclusion of covariates, determining sample size, sequential designs, interim analyses, repeated measures studies. LEC
Prerequisite: STA 505 and STA 506, or STA 504 or permission of instructor.

STA 531 THEORY AND METHODS OF SAMPLE SURVEYS
Introduction to theory and practice of sample surveys involving collection of statistical data from planned surveys. LEC
Prerequisite: STA 503 or permission of instructor

STA 536 STATISTICAL DESIGN AND ANALYSIS OF EXPERIMENTS
Introduces factorial experiments, fractional factorial experiments, confounding, lattice designs, various incomplete block designs, efficiency of experimentation, and problems of design construction. LEC
Prerequisite: STA 504 or permission of instructor.

STA 537 SEQUENTIAL ANALYSIS
Deals with statistical methods for estimation and testing hypotheses when samples are observed and analyzed sequentially. LEC
Prerequisite: STA 522.

STA 545 DATA MINING I
This course presents the topic of data mining from a statistical perspective, with attention directed towards both applied and theoretical considerations. An emphasis will be placed on supervised learning methods. Topics include: linear and logistic regression, discriminant analysis, shrinkage methods, subset selection, dimension reduction techniques, classification and regression trees, ensemble methods, neural networks, and random forests. Model selection and estimation of generalization error will be emphasized. Considerations and issues that arise with high-dimensional (N<<p) applications will be highlighted. Applications will be presented in R to illustrate methods and concepts.
Prerequisite: STA 511

STA 546 DATA MINING II
This course presents the topic of data mining from a statistical perspective, with attention directed towards both applied and theoretical considerations. An emphasis will be placed on unsupervised learning methods, especially those designed to discover and model patterns in data. Applications to high-dimensional data (N<<p) and big data (N>>p) will be highlighted. Topics include: Market basket analysis, hierarchical and center-based clustering, self-organizing maps, factor analysis,

computer vision, eigenfaces, data visualization, graphical models. Applications will be presented in Matlab and R to illustrate methods and concepts.
Prerequisite: STA 511 and STA 545

STA 551 STOCHASTIC PROCESSES
For graduate students who have had an introduction to probability theory and advanced calculus. Concepts, properties, basic theory, and applications of stochastic processes. LEC
Prerequisite: STA 521 or permission of instructor.

STA 561 LONGITUDINAL DATA ANALYSIS AND TIME SERIES
Introduction to methods for analyzing longitudinal and time series data. Topics: Random coefficient regression models, growth curve analysis, hierarchical linear models, general mixed models, autoregressive and moving average models for time series data, and the analysis of cross-section time series data. LEC
Prerequisite: STA 504

STA 567 BAYESIAN STATISTICS
The Bayesian approach to statistical design and analysis can be viewed as a philosophical approach or as a procedure-generator. The use of Bayesian design and analysis is burgeoning. In this introduction to Bayesian methods, we consider basic examples of Bayesian thinking and formalism on which more complicated and comprehensive approaches are built. These include adjusting estimates using related information, the use of Bayes Factors in testing of hypotheses, the relationship of the prior and posterior distributions, and the key steps in a Bayesian analysis. We consider the Bayesian approach that requires a data likelihood (the sampling distribution) and a prior distribution. From these, the posterior distribution can be computed and used to inform statistical design and analysis. Applications of this technique are presented. LEC
Prerequisite: STA 521

STA 571 SPECIAL TOPICS IN STATISTICS
Special topics courses provide regular classroom instruction in evolving areas of biostatistics. They are used to educate students on topics that have not yet been included in permanent course offerings.   LEC
Prerequisite: permission of instructor.

STA 575 SURVIVAL ANALYSIS
Provides an advanced course on the use of life tables and analysis of failure time data. Topics: Use of Kaplan-Meier survival curves, use of log rank test, Cox proportional hazards model, evaluating the proportionality assumption, dealing with non-proportionality, stratified Cox procedure, extension to time-dependent variables, and comparison with logistic regression approaches. LEC
Prerequisite: STA 504 and 522.

STA 581 MULTIVARIATE DATA ANALYSIS
Presents methods for analyzing multiple outcome variables simultaneously, and for classification and variable reduction. Topics: Multivariate normal distribution, simple, partial, and multiple correlation; Hotelling's T-squared, multivariate analysis of variance, and general linear

hypothesis, and discriminant analysis, cluster analysis, principal components analysis, and factor analysis. LEC
Prerequisite: MTH 142 (second semester calculus) and STA 505 or STA 527, or STA 503

STA 589 STATISTICAL CONSULTING
(1 CREDIT per semester)
Principles and practices of statistical and biostatistical consulting; supervised experience in consultation; report writing and other aspects of consulting; case studies; participation in discussion of actual cases. LAB
Prerequisites: STA 504 or permission of instructor

STA 600 INDEPENDENT STUDY
(1-8 CREDITS per registration)
TUT

STA 782 DEPARTMENT SEMINARS (0)
*Held weekly in fall and spring semesters. Students ***must*** register for this course.*

UNIVERSITY REGULATIONS

http://grad.buffalo.edu/Academics/Policies-Procedures/Introduction-to-Policies-Procedures-Manual.html
It is the student's responsibility to check with the graduate school for any updates.
TRANSFER CREDIT

Each graduate program determines the applicability of graduate courses offered for transfer credit. Only those graduate courses completed with a minimum grade of 'B' (3.0) are eligible as transfer credit. Courses with 'S' or 'P' grades are not transferable unless the transcript specifically states they are equivalent to a 'B' grade or higher. Credits earned in correspondence or undergraduate courses may not be transferred.

Students requesting approval for transfer credit should make their request in writing to the Director of Graduate Studies at the first opportunity after admission to the program and within the first semester of study. A copy of the course outline and description should also be provided. A maximum of 6 credit hours of graduate work may be transferred for the MS.

AGE LIMIT FOR PRIOR COURSEWORK

All coursework (whether transfer or UB credits) more than 10 years old must be petitioned at the time of admission to the program. If these credits were included in an approved extension of time limit petition, they are valid only until the expiration date of that petition. Any further extension of the approved time limit for degree completion will require, concurrently, a re-petition for

approval of these older courses. Requests for approval of courses more than 10 years old must be petitioned through the Graduate School by completing the *Graduate Student Petition Form* located on the web at http://grad.buffalo.edu/content/dam/www/graduate/documents/students/pet_prior.pdf. Appropriate justification of how the course(s) relate to the student's program and how the student has kept current with the subject matter of each course must be provided.

Prior Coursework Checklist:

- ✓ Complete form for prior coursework toward a degree program
- ✓ Include letter stating how student has maintained the knowledge gained from these courses,
- ✓ Include CV or resume
- ✓ Sign the form
- ✓ present to the Director of Graduate Studies for approval (do not send directly to the graduate school

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REGISTRATION

All students are required to consult their advisor prior to registration, and to register before the beginning of each Fall and Spring semester while matriculated in the program according to the procedures and within the deadlines established by the Office of Records and Registration. This includes semesters in which formal courses are taken, and also semesters in which a student is working on their thesis/dissertation/project. No credit will be allowed for work done without proper registration. It is important that students verify their registration.

Registration Deadlines. The registration timetable, course offerings and class schedules are posted on the University's web site at http://registrar.buffalo.edu/schedules/index.php. Continuing students may take advantage of early registration by registering in November for the Spring semester and April for the Fall semester. Registration is continuous through the last day of drop/add. It is financially advantageous to register before the University's first billing in the third week of July (for Fall) and the third week in December (for Spring).

Registration Checklist:

- ✓ verify registration before the add/drop deadline each semester

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REQUIREMENTS FOR FULL-TIME REGISTRATION

- Full-time registration is defined as 12 credit hours per semester for students without an assistantship, or 9 credit hours per semester for those students with an assistantship or grant support.

- Full-time registration is a necessary condition of appointment for an assistantship and/or ition waiver.
- International students must maintain full-time registration as a condition of their student visa.

CONTINUOUS REGISTRATION AND LEAVES OF ABSENCE

- Both full-time and part-time students must register each Fall and Spring semester for a minimum of one credit hour until all degree requirements are met (including the final defense of the thesis/dissertation/ project). A zero credit course does not fulfill the requirement for continuous registration.
- Students must register for a minimum of one credit hour in the semester following an approved leave of absence and in the semester of degree conferral.
- Students must be registered in the semester they defend their thesis/dissertation. They may not be on a leave during the semester the degree is conferred. If a leave of absence terminates at the end of the spring semester, registering for a minimum of one credit hour for the summer session is required for a September degree conferral.

If continuous registration is not possible at any time, the student must secure a leave of absence at least two weeks prior to the start of the semester in which the leave is to begin. Approval for a leave of absence must be petitioned through the Graduate School by completing the *Graduate Student Petition Form* **located on the web at http://grad.buffalo.edu/content/dam/www/graduate/documents/students/pet_loa.pdf**

Requests for Leaves of Absence must be negotiated through the chair or director of graduate studies of the student's major department using a Petition for Leave of Absence: http://grad.buffalo.edu/content/dam/www/graduate/documents/students/pet_loa.pdf. The form **must** then be forwarded to the Graduate School for review **by the end of the first week of the semester in which the Leave is to begin**. Normally, Leaves are granted for a maximum of one year, but may be extended for up to one additional year if circumstances warrant. Each department may establish its own policies within the limits of these guidelines. All Leave requests must be supported by adequate documentation.

Students approved for a Leave of Absence remain liable for any outstanding tuition and fee charges.

International students are advised to consult with International Student and Scholar Services, 210 Talbert Hall, North Campus, (716) 645-2258, prior to applying for a Leave of Absence.

Failure to register for classes or secure a Leave of Absence by the end of the first week of the semester in which the leave is to begin, will result in the student losing his/her access to register for classes in a future semester. To regain registration access within a subsequent five-year period, the student's home academic department must file a semester record activation request on behalf of the student (see the *Returning Student Semester Record Activation and Associated Fee* section immediately below for more details).

- The Graduate School will not approve a leave of absence for 'personal reasons,' you must be specific and present strong justification for your request.
- The Graduate School will not approve a leave of absence if a student is not in good academic standing.
- Students may not petition for a leave of absence <u>after</u> the leave has occurred.
- Students returning from a leave of absence are considered re-entering students and must be re-instated in the department in order to register (see section on Re-Entry.)

It should be noted that, normally, leaves are approved for a maximum of one year. A total of more than two years will not be approved. <u>Students who are not on a leave of absence and fail to register for a semester are considered having left the University and must reapply to the department in order to reenter</u>. The department reserves the right to accept or deny readmission, and to decide what prior course work can be applied to the degree. Therefore, it is important to maintain continuous registration.

NOTE: No credit will be allowed for work done without proper registration.

Leave of Absence Checklist:

- ✓   complete Graduate Student Petition for A Leave of Absence
- ✓   complete Reason for Leave
- ✓   sign the form
- ✓   forward to the Department (do not send directly to the Graduate School)

RE-ENTRY

When a student returns from an approved leave of absence, he/she must request to have their status reactivated by the Department. This request should be made a minimum of two weeks before the start of the semester.

Academic departments may file a semester record activation request for graduate students who were previously admitted into an academic program through GrAdMIT, *and* had a break in attendance of no more than five (5) years, *and* had neglected to secure an approved Leave of Absence from the Graduate School. Once reviewed and approved by the Vice Provost for Graduate Education, a new semester record will be created with *exactly the same academic career, program, and plan* as recorded for the last semester in which the student attended UB. At the time of semester record activation, the student will be assessed a non-refundable record activation fee (currently $350).

It is the prerogative of the academic department to decide whether or not to process/endorse a former student's request for Semester Record Activation and return to graduate study as described in the previous paragraph. The department also determines how much of the previously completed work may be applied toward the graduate degree program, within established Graduate School guidelines.

Any graduate student who has had an enrollment lapse of more than five (5) years must reapply through the graduate program's regular application process.

Re-entry Checklist:

✓ request the Department file a semester record activation request

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GRADUATE COURSE CREDIT

Graduate Courses for Graduate Credit is granted only for 500, 600 and 700 level courses provided proper registration requirements are met.

Undergraduate Courses for Graduate Credit requires prior petition and approval by the Dean of the Graduate School. *Graduate Student Petition Forms* are located on the web at http://registrar.buffalo.edu/pdfs/OutsideofCareerPetition.pdf

Undergraduate courses may be taken by graduate students as appropriate prerequisites to their chosen field of study but may not be used to satisfy graduate program requirements or carry graduate credit. Exceptions are possible for some 400-level courses subject to approval in advance by the Graduate School. In order to obtain approval, the student must file a Petition for Course Credit Outside Your Primary Career that must include:

- o justification for taking an undergraduate course for graduate credit. (For example: that the course curriculum is important to the student's program and not offered in a graduate course.)

- o the signature of the course instructor, who must be a UB tenured or tenure-track faculty member, with a brief description of the nature and extent of the extra work to be assigned graduate students.

- o the signature of the department chair or director of graduate studies of the student's graduate program.

A student may file a maximum of two petitions for up to eight credit hours of this nature while pursuing a graduate degree.

All such petitions must be filed prior to the end of the official add/drop period of the semester of registration. The student must officially register for the course during the designated registration period. The petition must be submitted to the department prior to the start of the semester in which the student will enroll in the course; no requests for retroactive approval will be considered.

> *Undergraduate Courses for Graduate Credit Checklist*:
>
> ✓   complete Petition For Course Credit Outside Your Primary Career
>   Graduate Credit
> ✓   provide description of additional work required of the student
> ✓   obtain signature of course instructor
> ✓   complete justification
> ✓   sign
> ✓   forward to the Department (do not send directly to the Graduate School)

GRADING

- Students are expected to maintain at minimum a 'B' average (3.0)
- Students receiving two or more 'C' (or lower) grades may be dismissed from the program.
- Students electing to receive an S/U grade for a course must inform the instructor in writing by the fourth week of the semester, or the letter grade system will prevail. If the instructor approves the request, a copy of the approval should be sent to the department for the student's file. An 'S' grade will be awarded only in those instances where a student's letter grade would be 'C' or better.
- 'S' grades are not acceptable for required courses.
- 'L' grades are assigned for thesis/dissertation courses where continuing work is to be indicated instead of a final grade. 'L' grades automatically convert to 'S' grades at degree conferral.

'J' grades denote an invalid grade. Students should immediately consult with the professor to validate their grade or the 'J' will revert to a grade of 'F' at the end of the following semester

REPEATING REQUIRED COURSES
http://grad.buffalo.edu/Academics/Policies-Procedures/Grading-Procedures.html

Per the Graduate School policy, if a graduate student repeats a course that is not normally "repeatable" ("repeatable" courses include dissertation, research, thesis, project or portfolio guidance; independent study; directed readings, etc.), only the highest grade earned in the course will be counted toward the degree and used to calculate the grade point average associated with the graduate degree program requirements. However, the student's official graduate transcript will record all courses attempted (including repeated courses). All resulting grades earned are calculated in the cumulative GPA reflected on the students' final official transcript. Also note that:

- Students who repeat a course must officially register for it.
- Students are responsible for the tuition for repeated courses even if they are currently receiving a tuition waiver.

INCOMPLETE GRADES

- A grade of 'Incomplete' ('I/U') may be assigned <u>only</u> when the student has been unable to complete all the assigned projects and/or examinations in a course. Such circumstances must be communicated to the faculty member as soon as known, but no later than the end of the semester during which the course is taken.
- A grade of 'Incomplete' ('I/U) is not available to students who have not performed a "C" or better in the course material completed.
- A grade of "Incomplete' ('I/U') cannot be assigned for thesis/dissertation guidance.
- If an 'I' is given, a letter grade must be assigned within two semesters (May 31st for the Spring semester and December 31st for the Fall semester.) If the course requirements are not completed by the deadline, the 'Incomplete' will automatically default to an 'Unsatisfactory' 'U' or 'F' grade.

Individual instructors may set their own conditions for removing 'I' grades providing the time limit is no longer than specified by the University. The instructor may set an earlier deadline for completion of the course requirements. If an earlier date for completion is set, the instructor shall inform the student thereof in writing. **A student may not re-register for any course in which the student has an interim 'IU' grade**.

Incomplete Grade Checklist:

- ✓ Be sure to verify the change of grade has been made in the Office of Records and Registration

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STUDENT GENERAL PROGRESS REPORTS

The academic progress of each student is reviewed by their advisor at the end of the Spring semester. This review is designed to develop a program most suitable for each student, to discuss their coursework and plans for upcoming registration, and to advise a student of any deficiency in their progress toward degree conferral. Students receive a copy of their progress report for their review and signature. (See Appendix *General Progress Report*.)

PROGRAM PROBATION

Students who receive a grade of 'U', 'D' or 'F' in any course required for their degree, or whose cumulative GPA falls below 3.0 will have immediate academic review and may be placed on academic probation. Students placed on probation will be notified in writing the terms of the probation and its removal. Students not meeting the written terms of their academic probation may be dismissed from the University.

COURSE RESIGNATIONS

Graduate Students have the prerogative to resign any course for which they have registered without Q.P.A. penalty through the end of the 11 week of the fall or spring term. All course resignations processed during the permissible dates (as published in the Class Schedule available through the Office of the Registrar) will be indicated as officially resigned courses by the notation 'R' on all grade reports, transcripts, and other official University documents. Resignation from all courses should be done through the HUB Student Center, which students may access through the [MyUB portal](). There are no quality points attached to an 'R' designation.

All course resignations processed within the official deadlines will be indicated as officially resigned by the notation 'R' on grade reports, transcripts, and other official University documents.

Course Resignation Checklist:

✓ process resignation of course thorough MyUB Portal.

AUDITING COURSES

A student wishing an "Audit" (N) grade in a course must officially register for the course. The student must also submit a written request to the instructor by the <u>fourth</u> week of class. The instructor's decision will be final and will be transmitted to the student in writing. A copy of the approval must also be forwarded to the department for the student's file. The instructor's decision is final and must be communicated to the student in writing in a timely manner. A student may repeat a previously audited course and receive a weighted grade and academic credit.

INDEPENDENT STUDY (STA 600)

This course is available as an elective when appropriate to the student's educational goals. Students must receive approval from both their supervising faculty and the Director of Graduate Studies before registering. Students must provide their supervising faculty with a course description for signature. This will be signed by both faculty and student and forwarded to the Director of Graduate Studies for approval. A copy of the approved description is attached to the *Application to Candidacy* when filed (see section on Application to Candidacy.)

Independent Study Checklist:

✓ brief summary of the goals and objectives of the independent study
✓ syllabus outlining activities to be carried out
✓ tangible mechanism for assessing student performance, e.g., test, term paper or a grant proposal
✓ ability to demonstrate that the independent study includes an amount of effort equivalent to the number of credits requested.

CERTIFICATION OF FULL-TIME STATUS

Students who are required to maintain full-time status for the purpose of tuition assistantship/scholarship, loan deferral or immigrant status may be certified as full time when registering for less than 12 graduate credit hours (or 9 if receiving a graduate assistantship) if the following conditions have been met:

    ✓ all coursework has been completed satisfactorily
    ✓ student has maintained full-time status since matriculation in the program
    ✓ registration will include a minimum of one credit hour per semester
    ✓ student is engaged in full-time research on their thesis/ dissertation/project
    ✓ the *Application to Candidacy* form has been completed and signed by all committee members

NOTE: It is not required that the proposal be defended at this time. The *Certification of Full-Time Status* form is located on the web at http://grad.buffalo.edu/content/dam/www/graduate/documents/students/certfts.pdf
Students must be registered for the semester in which they are filing.

Certification of Full-time Status Checklist:

    ✓ complete (type) the *Certification of Full-Time Status Form*
    ✓ obtain signature of academic advisor
    ✓ attach photocopy of the ATC form signed by all committee members
    ✓ forward to the Department (do not send directly to the Graduate School)

ADDITIONAL INFO ABOUT GRADUATE STUDIES AT UB

Graduate School Web Site: www.grad.buffalo.edu

    Forms (*Application to Candidacy, Graduate Student Petition Form, Certification of Full-Time Status Form, Outside Reader Appointment, Outside Reader Response Form*)

    Graduate School Policy and Procedures Manual

    Guidelines for Graduation and Theses and Dissertation Preparation

ACADEMIC HONESTY

ACADEMIC INTEGRITY

Academic integrity is a fundamental university value. Through the honest completion of academic work, students sustain the integrity of the university while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas.

When an instance of suspected or alleged academic dishonesty by a student arises, it shall be resolved according to the procedures set forth herein. These procedures assume that many questions of academic dishonesty will be resolved through consultative resolution between the student and the instructor.

It is recommended that the instructor and student each consult with the department chair, School or College dean, or the Graduate School if there are any questions regarding these procedures.

Examples of Academic Dishonesty

Academic dishonesty includes, but is not limited to, the following:

- **Previously submitted work**. Submitting academically required material that has been previously submitted -- in whole or in substantial part -- in another course, without prior and expressed consent of the instructor.
- **Plagiarism**. Copying or receiving material from any source and submitting that material as one's own, without acknowledging and citing the particular debts to the source (quotations, paraphrases, basic ideas), or in any other manner representing the work of another as one's own.
- **Cheating**. Soliciting and/or receiving information from, or providing information to, another student or any other unauthorized source (including electronic sources such as

cellular phones and PDAs), with the intent to deceive while completing an examination or individual assignment.

- **Falsification of academic materials**. Fabricating laboratory materials, notes, reports, or any forms of computer data; forging an instructor's name or initials; resubmitting an examination or assignment for reevaluation which has been altered without the instructor's authorization; or submitting a report, paper, materials, computer data, or examination (or any considerable part thereof) prepared by any person other than the student responsible for the assignment.

- **Misrepresentation of documents**. Forgery, alteration, or misuse of any University or Official document, record, or instrument of identification.

- **Confidential academic materials**. Procurement, distribution or acceptance of examinations or laboratory results without prior and expressed consent of the instructor.

- **Selling academic assignments**. No person shall sell or offer for sale to any person enrolled at the University at Buffalo any academic assignment, or any inappropriate assistance in the preparation, research, or writing of any assignment, which the seller knows, or has reason to believe, is intended for submission in fulfillment of any course or academic program requirement.

- **Purchasing academic assignments**. No person shall purchase an academic assignment intended for submission in fulfillment of any course or academic program requirement.

Consultative Resolution

Step 1. If an instructor has reason to believe that a student may have committed an act of academic dishonesty, the instructor shall notify the student suspected of academic dishonesty by e-mail to the student's UB IT address with receipt requested, by certified mail return receipt requested, or by written notice delivered in person with a copy countersigned by the student and retained by the instructor within 10 academic days[1] of discovery of the alleged incident.

Once the alleged incident has occurred, the student may not resign from the course without permission of the instructor.

The instructor shall meet and consult with the student within 10 academic days[1] of the date of notification. If the student fails to attend the consultative meeting, the instructor has the authority to reach a decision and to impose a sanction (if appropriate) without the student consultation.

At consultation, the instructor shall inform the student of the allegations relating to the specific infringement, and the student shall be given a copy of the Academic Integrity Policy and Procedures.

At the request of either or both parties, the consultation may be recorded. A departmental note-taker (a staff or faculty member, but not a teaching assistant) may record consultation proceedings. The student must agree to the presence of the note-taker, and the student may also have a note-taker in attendance.

Step 2. If, after consultation with the student, the instructor believes the student did not commit an act of academic dishonesty, no sanctions may be imposed. The instructor will orally inform the student of that finding and, if the student so requests, will provide the student with a written statement confirming that finding. Procedures end.

If, after consultation with the student, the instructor believes the student did commit an act of academic dishonesty, the instructor has the authority to impose one or more of the following sanctions:

1. **Warning**. Written notice to the student that he/she has violated a University academic integrity standard and that the repetition of the wrongful conduct may be cause for more severe sanctions.

2. **Revision of Work**. Requiring the student to replace or revise the work in which dishonesty occurred. (The instructor may choose to assign a grade of "I" [Incomplete] pending replacement or revision of the work.)

3. **Reduction in Grade**. With respect to the particular assignment/exam or final grade in the course.

4. **Failure in the Course**. To be indicated on the transcript by a grade of "F" without comment.

5. **Such other reasonable and appropriate sanction(s)** as may be determined by the instructor (or Committee at later levels of review) with the exception of those subsequently described under #6.

6. **Recommendation of any of the following University sanctions** (these require approval at the department, College/School, and Graduate School levels).
   1. *Failure in the Course with Citation of Academic Dishonesty:* To be indicated by an "F" on the transcript with the notation that the grade of "F" was assigned for reason of academic dishonesty. Only the Dean of the Graduate School or his or her designee may impose this sanction.
   2. *Suspension from the University:* For a definite term upon stated conditions. Only the University President or his/her designee may suspend a student from the University.
   3. *Expulsion from the University:* With comment on the transcript. Only the University President or his/her designee may expel a student from the University.

Step 3. The instructor shall provide the student with a copy of the decision, sanction(s) imposed, and the student's right to appeal that decision. The instructor's decision letter shall be sent to the student (via certified, return receipt mail), the department chair, and the Dean of the Graduate School within 10 academic days[1] of the date of the consultation meeting. This statement of decision shall be included in the student's confidential file maintained in the Graduate School. The student shall have access to this file.

University Sanctions. If the sanctions imposed at the instructor level include recommendation of University sanctions (as listed in Step 2.6), departmental level procedures are required, and shall be initiated within 10 academic days[1] of the department chair's receipt of the statement of decision.

Right to Appeal. The student may appeal the instructor's findings. The student's request for an appeal, including specification of the grounds for appeal, must be submitted in writing to the instructor and to the department chair no later than 10 academic days[1] after the instructor has notified the student of his or her decision.

Departmental Level Procedures

Step 1. The instructor and student have no more than 10 academic days[1] following the filing of the request for the initiation of departmental proceedings to deliver evidentiary materials to the department chair. The instructor and student shall each provide the department chair with a written statement of evidence supporting his or her position, any relevant documentation, and the names of potential witnesses.

If the department chair is the faculty member who has brought the academic dishonesty charge against the student, or if a department is unable to assemble a committee because of a limited number of faculty or students, direct consideration at the college or school level may be requested.

Pending resolution, the instructor shall temporarily assign a grade of "I" (Incomplete). This "I" grade can only be adjusted by resolution of the case.

Step 2. Upon review of relevant materials (including all evidence and statements communicated during consultation), if the department chair does not deem it necessary to consider further the circumstances of the case, the department chair will notify the student (via certified, return receipt mail), the instructor, the cognizant academic dean, and the Dean

of the Graduate School of his or her decision within 20 academic days[1] of receipt of the student's appeal or instructor's recommendation. If the sanctions imposed at this stage include recommendation of University sanctions (as listed in Consultative Resolution Step 2.6), decanal level procedures are required (see "Decanal Level Procedures").

Alternatively, if the department chair deems it necessary to consider further the circumstances of the case, he or she shall convene the Departmental Adjudication Committee within 20 academic days[1] of the date the department office received the request for initiation of departmental proceedings (see Appendix A).

The department office shall convey all evidentiary materials to the Departmental Adjudication Committee, the student, and the instructor at the time the notice of the hearing is delivered. The student and the instructor shall be given at least 72 hours notice of the hearing.

At hearing(s), the Departmental Adjudication Committee shall provide sufficient opportunity for both principals to present their positions and shall allow each principal the right to question the presentation(s), written or verbal, of those who contribute information to the committee.

The hearing(s) shall be conducted in a fair and expeditious manner, but shall not be subject to the rules governing a legal proceeding. Each principal shall have the right to be present (under unusual circumstances, if either party is considered to pose a physical threat to the other or to the committee, the chair of the committee may request that either the student or instructor participate by phone) and to have one advisor present at all hearings. In no such case will the advisor be an attorney, unless he or she is a member of the UB faculty who is not acting in a legal capacity on behalf of a principal. An advisor may not speak on behalf of or advocate for a principal or otherwise address members of the hearing committee.

The technical and formal rules of evidence applicable in a court of law are not controlling, and the committee may hear all relevant and reliable evidence that will contribute to an informed result. The Departmental Adjudication Committee shall only consider evidence presented at hearing(s). Discussion of a student's formerly alleged or documented academic misconduct shall not be admissible as evidence to determine whether the student is responsible for breaching the university's academic integrity code in the current case, although such history may be introduced and considered during the sanctioning phase. Hearings shall be confidential (see Appendix B).

The Departmental Adjudication Committee shall provide the department chair with a written statement of recommendations and reasons for recommendations within 10 academic days[1] after the final meeting of the committee. Recommendations may include:

1. **Findings Overturned**. Finding that no academic dishonesty took place and that no sanctions should be imposed.
2. **Findings Sustained**. Finding that academic dishonesty occurred, and the committee is in agreement with the sanction(s) previously imposed or recommended.
3. **Finding of Different Sanction**. Finding that academic dishonesty occurred, but that the sanction(s) previously imposed or recommended are inappropriate and that greater or lesser sanction(s) should be imposed.

Step 3. The department chair considers the Committee's findings and recommendations and renders a final decision. The department chair's decision and the student's right to appeal that decision shall be submitted in writing from the department chair to the student (via certified, return receipt mail), the instructor, the cognizant academic dean, and the Dean of the Graduate School within 10 academic days[1]. from receiving the Departmental Adjudication Committee's statement of recommendations.

The department chair shall forward the record of the matter consisting of all written communications, all written evidence, an audiotape or other record of the hearing, and its

statement of recommendations to the Dean of the Graduate School, where a confidential file will be maintained. The student shall have access to this file.

University Sanctions. If the sanction(s) imposed at the departmental level include recommendation of University sanctions (as listed in Consultative Resolution Step 2.6), decanal level procedures are required, and shall be initiated within 10 academic days[1] of the dean's receipt of the statement of decision.

Right to Appeal. The student or the instructor may appeal the department chair's findings. The request for an appeal, including specification of the grounds for appeal, must be submitted in writing to the department chair and to the cognizant academic dean no later than 10 academic days[1] after the department chair has notified the student of his or her decision.

Decanal Level Procedures

Step 1. The instructor and student have no more than 10 academic days[1] following the filing of the request for the initiation of decanal level proceedings to deliver evidentiary materials to the cognizant academic dean. The instructor and student shall each provide the academic dean with a written statement of evidence supporting his or her position, any relevant documentation, and the names of potential witnesses.

Pending resolution, the temporarily assigned grade of "I" (Incomplete) will continue in place. This "I" grade can only be adjusted by final resolution of the pending case.

Step 2. Upon review of relevant materials (including all evidence and statements communicated during consultation), if the academic dean does not deem it necessary to consider further the circumstances of the case, the academic dean will notify the student (via certified, return receipt mail), the instructor, the department chair, and the Dean of the Graduate School of his or her decision within 20 academic days[1] of receipt of the student's

appeal or instructor's recommendation. If the sanctions imposed at this stage include recommendation of University sanctions (as listed in Consultative Resolution Step 2.6), a hearing at the decanal level is required, and procedures below shall be initiated within 20 academic days[1] of the academic dean's receipt of the department chair's statement of decision.

Alternatively, if the academic dean deems it necessary to consider further the circumstances of the case, he or she shall convene the Decanal Adjudication Committee within 20 academic days[1] of the date which the academic dean received the request for initiation of decanal level proceedings (see Appendix C).

The academic dean's office shall convey all evidentiary materials to the Decanal Adjudication Committee, the student, and the instructor at the time the notice of the hearing is delivered. The student and the instructor shall be given at least 72 hours notice of the hearing.

At hearing(s), the Decanal Adjudication Committee shall provide sufficient opportunity for both principals to present their positions and shall allow each principal the right to question the presentation(s), written or verbal, of those who contribute information to the committee.

The hearing(s) shall be conducted in a fair and expeditious manner, but shall not be subject to the rules governing a legal proceeding. Each principal shall have the right to be present (under unusual circumstances, if either party is considered to pose a physical threat to the other or to the committee, the chair of the committee may request that either the student or instructor participate by phone) and to have one advisor present at all hearings. In no such case shall the advisor be an attorney, unless he or she is a member of the UB faculty who is not acting in a legal capacity on behalf of a principal. An advisor may not speak on behalf of or advocate for a principal or otherwise address members of the hearing committee.

The technical and formal rules of evidence applicable in a court of law are not controlling, and the committee may hear all relevant and reliable evidence that will contribute to an informed result. The Decanal Adjudication Committee shall only consider evidence presented at hearing(s). Discussion of a student's formerly alleged or documented academic misconduct shall not be admissible as evidence to determine whether the student is responsible for breaching the university's academic integrity code in the current case, although such history may be introduced and considered during the sanctioning phase. Hearings shall be confidential (see Appendix B).

The Decanal Adjudication Committee shall provide the academic dean with a written statement of recommendations and reasons for recommendations within 10 academic days[1] after the final meeting of the committee. Recommendations may include:

1. **Findings Overturned.** Finding that no academic dishonesty took place and that no sanctions should be imposed.
2. **Findings Sustained.** Finding that academic dishonesty occurred, and the committee is in agreement with the sanction(s) previously imposed or recommended.
3. **Finding of Different Sanction**. Finding that academic dishonesty occurred, but that the sanction(s) previously imposed or recommended are inappropriate and that greater or lesser sanction(s) should be imposed.

Step 3. The academic dean considers the Committee's findings and recommendations and renders a final decision. The academic dean's decision and the student's right to appeal that decision shall be submitted in writing from the academic dean to the student (via certified, return receipt mail), the instructor, the department chair, and the Dean of the Graduate School within 10 academic days[1] from receiving the Decanal Adjudication Committee's statement of recommendations.

The academic dean shall forward the record of the matter consisting of all written communications, all written evidence, an audiotape or other record of the hearing, and its

statement of recommendations to the Dean of the Graduate School, where a confidential file will be maintained. The student shall have access to this file.

University Sanctions. If the sanction(s) imposed at the decanal level include recommendation of University sanctions (as listed in Consultative Resolution Step 2.6), Graduate School level procedures are required, and shall be initiated within 10 academic days[1] of the Dean of the Graduate School's receipt of the statement of decision.

Right to Appeal. The student or the instructor may appeal the academic dean's findings, but only based on claims of limitations on, or violations of, applicable due process. Any such appeal request must describe the specific due process violation(s) claimed and must be submitted in writing to the academic dean and to the Dean of the Graduate School no later than 10 academic days[1] after the academic dean has notified the student of his or her decision.

Graduate School Level Procedures

Step 1. The instructor and student have no more than 10 academic days[1] following the filing of the request for the initiation of Graduate School level proceedings to deliver evidentiary materials to the Dean of the Graduate School. The instructor and student shall each provide the Dean of the Graduate School with a written statement of evidence supporting his or her position, any relevant documentation, and the names of potential witnesses.

Pending resolution, the temporarily assigned grade of "I" (Incomplete) will continue in place. This "I" grade can only be adjusted by final resolution of the pending case.

Step 2. Upon review of relevant materials (including all evidence and statements communicated during consultation), if the Dean of the Graduate School does not deem it necessary to consider further the circumstances of the case, the Dean of the Graduate School will notify the student (via certified, return receipt mail), the instructor, the department

chair, and the cognizant academic dean of his or her decision within 20 academic days[1] of receipt of the student's appeal or instructor's recommendation. If the sanctions imposed at this stage include recommendation of University sanctions (as listed in Consultative Resolution Step 2.6), the Dean of the Graduate School will pursue appropriate steps to implement or seek implementation of such sanction(s).

Alternatively, if the Dean of the Graduate School deems it necessary to consider further the circumstances of the case, he or she shall convene the Graduate School Adjudication Committee within 20 academic days[1] of the date on which the Dean of the Graduate School received the request for initiation of Graduate School level proceedings (see Appendix D).

The Graduate School shall convey all evidentiary materials to the Graduate School Adjudication Committee, the student, and the instructor at the time the notice of the hearing is delivered. The student and the instructor shall be given at least 72 hours notice of the hearing.

At hearing(s), the Graduate School Adjudication Committee shall provide sufficient opportunity for both principals to present their positions and shall allow each principal the right to question the presentation(s), written or verbal, of those who contribute information to the committee.

The hearing(s) shall be conducted in a fair and expeditious manner, but shall not be subject to the rules governing a legal proceeding. Each principal shall have the right to be present (under unusual circumstances, if either party is considered to pose a physical threat to the other or to the committee, the chair of the committee may request that either the student or instructor participate by phone) and to have one advisor present at all hearings. In no such case shall the advisor be an attorney, unless he or she is a member of the UB faculty who is not acting in a legal capacity on behalf of a principal. An advisor may not speak on behalf of or advocate for a principal or otherwise address members of the hearing committee.

The technical and formal rules of evidence applicable in a court of law are not controlling, and the committee may hear all relevant and reliable evidence that will contribute to an informed result. The Graduate School Adjudication Committee shall only consider evidence presented at hearing(s). Discussion of a student's formerly alleged or documented academic misconduct shall not be admissible as evidence to determine whether the student is responsible for breaching the university's academic integrity code in the current case, although such history may be introduced and considered during the sanctioning phase. Hearings shall be confidential (see Appendix B).

The Graduate School Adjudication Committee shall provide the Dean of the Graduate School with a written statement of recommendations and reasons for recommendations within 10 academic days[1] after the final meeting of the committee. Recommendations may include:

1. **Findings Overturned**. Finding that no academic dishonesty took place and that no sanctions should be imposed.
2. **Findings Sustained**. Finding that academic dishonesty occurred, and the committee is in agreement with the sanction(s) previously imposed or recommended.
3. **Finding of Different Sanction**. Finding that academic dishonesty occurred, but that the sanction(s) previously imposed or recommended are inappropriate and that greater or lesser sanction(s) should be imposed.

Step 3. The Dean of the Graduate School considers the committee's findings and recommendations and renders a final decision. The Dean of the Graduate School's decision shall be submitted in writing to the student (via certified, return receipt mail), the instructor, the department chair, and the cognizant academic dean within 10 academic days[1] from receiving the Graduate School Adjudication Committee's statement of recommendations.

The Dean of the Graduate School shall file the record of the matter consisting of all written communications, all written evidence, an audiotape or other record of the hearing, and

statements of recommendations to the Dean of the Graduate School, in the confidential file located in and maintained by the Graduate School. The student shall have access to this file.

University Sanctions. If the sanction(s) imposed at the Graduate School level include implementation or recommended implementation of University sanctions (as listed in Consultative Resolution Step 2.6), implementation or recommended implementation of those sanctions shall be initiated within 10 academic days[1] following the Dean of the Graduate School's decision in the matter.

No Right to Further Appeal. The decision of the Dean of the Graduate School is final, and no further appeal is available.

Note:

[1] Academic days are defined as weekdays when classes are in session, not including the summer sessions.

Appendix A: Departmental Adjudication Committee Membership

The department chair or the chair of the departmental adjudication committee shall assemble, from a pool of individuals comprising the departmental Academic Integrity Pool, a Departmental Adjudication Committee comprised of no fewer than two faculty members and two graduate students or a larger number of participants maintaining this same ratio. The departmental Academic Integrity Pool shall be selected by the respective faculty and student constituencies in an appropriate democratic fashion, and in no case shall these representatives be appointed by the departmental or decanal administration. If deemed appropriate, the Departmental Academic Integrity Pool may also serve as the Departmental Grievance Pool.

The members of the Academic Integrity Pool and the Adjudication Committee shall be selected so that no member is involved in a disproportionate number of cases. Each

principal to the dispute shall have the option of requesting, without stipulating a reason, the replacement of one member of the Committee appointed to hear the case. If any principal finds the replacement member inappropriate, the party shall transmit, within five academic days[1] of the naming of the committee, a written statement of the grounds for this "challenge for cause" to the cognizant department chair who shall rule on the merits and either retain or replace the committee member so challenged. Each committee member selected shall have the option of disqualifying him/herself from the Committee by stipulating reasons why he or she feels unable to deal with the case in an unbiased fashion.

Appendix B: Confidentiality of Proceedings.

Once the department chair, college or school dean or the Dean of the Graduate School initiates an academic integrity hearing, principals and committee members shall have the obligation to maintain the confidentiality of the proceedings and of all materials or testimony presented in hearing proceedings, until a decision is formally transmitted to the principals involved in the case.

If a breach of confidentiality by either principal (as defined above) is formally brought to the attention of the Adjudication Committee, upon a majority vote of the committee, it may choose to consider this breach a case of possible misconduct. If a committee member is charged with a possible misconduct, such charge will be heard at the next highest level Adjudication Committee. Such consideration shall take precedence over the pending case, and a misconduct hearing shall be conducted, and findings shall be transmitted, in writing, to the principals and committee members, and shall be placed in a supplemental file of the case proceedings. Such findings may then be considered in the subsequent review of the case.

Appendix C: Decanal Adjudication Committee Membership

The cognizant college or school dean, or the chair of the school or college Adjudication Committee, shall assemble, from a pool of individuals comprising the college or school

Academic Integrity Pool, a Decanal Adjudication Committee comprised of no fewer than two faculty members and two graduate students or a larger number of participants maintaining this same ratio. In those college/schools comprised of multiple academic departments, the Decanal Adjudication Committee shall not include representatives from the department(s) involved in the case. The college or school Academic Integrity Pool shall include two representatives, as appropriate, from each department: one faculty member and one graduate student. The departmental representatives in the Academic Integrity Pool shall be selected by the respective faculty and student constituencies in an appropriate democratic fashion, and in no case shall these representatives be appointed by the departmental or decanal administration. If deemed appropriate, the Decanal Academic Integrity Pool may also serve as the Decanal Grievance Pool.

The members of the Academic Integrity Pool and the Adjudication Committee shall be selected so that no member is involved in a disproportionate number of cases. Each principal to the dispute shall have the option of requesting, without stipulating a reason, the replacement of one member of the Committee appointed to hear the case. If any principal finds the replacement member inappropriate, the party shall transmit, within five academic days[1] of the naming of the committee, a written statement of the grounds for this "challenge for cause" to the cognizant academic dean who shall rule on its merits and either retain or replace the committee member so challenged. Each committee member selected shall have the option of disqualifying him/herself from the Committee by stipulating reasons why he or she feels unable to deal with the case in an unbiased fashion.

Appendix D: Graduate School Adjudication Committee Membership

The Graduate School Adjudication Committee shall be comprised of no fewer than two faculty members and two graduate students (all from outside the cognizant academic department[s]) or a larger number of participants maintaining this same ratio. The departmental representatives comprising the Graduate School Academic Integrity Pool shall be selected by the respective faculty and student constituencies in an appropriate democratic fashion, and in no case shall these representatives be appointed by the departmental or

decanal administration. If deemed appropriate, the Graduate School Academic Integrity Pool may also serve as the Graduate School Grievance Pool.

The members of the Graduate School Academic Integrity Pool and the Graduate School Adjudication Committee shall be selected so that no member is involved in a disproportionate number of cases. Each principal to the dispute shall have the option of requesting, without stipulating a reason, the replacement of one member of the committee appointed to hear the case. If any principal finds the replacement member inappropriate, the party shall transmit, within five academic days[1] of the naming of the committee, a written statement of the grounds for this "challenge for cause" to the Dean of the Graduate School who shall rule on its merits and either retain or replace the committee member so challenged. Each committee member selected shall have the option of disqualifying him/herself from the committee by stipulating reasons why he or she feels unable to deal with the case in an unbiased fashion.

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