

**Handbook
for
Computer Science Graduate Students**

Lane Department of Computer Science and Electrical Engineering

College of Engineering and Mineral Resources

West Virginia University

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2006-2007

PREFACE

This handbook is designed to present you, the new graduate student in Computer Science, with a summary of some important information you should know. This is not an official policy document or a substitute for the West Virginia University Catalogs. Official rules and guidance are contained primarily in the West Virginia University Graduate Catalog that was effective during your **first** semester in a particular graduate program. If these rules are changed in a subsequent catalog, you may have the option to follow the newer rules instead.

If this document says anything that conflicts with your catalog, believe the catalog (and please let us know.)

This handbook is for students already admitted to CS graduate programs. Admission requirements are not discussed. The document is especially designed to be helpful to students who are new to our programs and facilities, and perhaps new to WVU. However, some of the contents may be useful to students already established in the programs.

We have planned the content of this handbook to be as helpful as possible. However, this handbook cannot possibly answer all of your questions. A lot of detailed information on many topics is available from other sources. We will try to provide pointers to these sources without repeating information unnecessarily.

A great deal of information, including most official documents, is now available on the World Wide Web. In fact, the full 2004-2006 WVU Graduate Catalog is available **only** on the Web. The URL for this catalog is <http://www.ia.wvu.edu:8888>. The URL for West Virginia University is <http://www.wvu.edu>, and the URL for the Lane Department is <http://www.csee.wvu.edu>. We will cite other web references throughout this handbook.

We welcome suggestions for improving this handbook, and will try to incorporate them into future editions.

This handbook was originally developed by Frances VanScoy. It was later revised by Jim Mooney and John Atkins. The present edition was prepared by Jim Mooney, and incorporates material developed also by William “Chip” Klostermeyer and Mike Henry. It was revised in 2006 by John Atkins

TABLE OF CONTENTS

1. What is Computer Science?	1.
2. About the Department.....	5.
3. Advising and Registration	9.
4. Financial Aid.....	11.
5. The Master of Science Program.....	12.
6. The Doctor of Philosophy Program	26.
7. Notes on the Curriculum.....	32.

1. WHAT IS COMPUTER SCIENCE?

It is simplistic to say that computer science is the study of computers or computing, and we certainly claim that computer science is something more than just “programming.” Intuitively, we generally feel that computer science is concerned with the “software” issues of computing, while hardware issues are more the domain of computer engineering. However, the distinction between these two is muddled by the need to ultimately consider and understand both the software and hardware aspects of a computing system.

The Draft Report of the 1988 ACM Task Force on The Core of Computer Science states:

Computer science . . . is the systematic study of algorithmic processes that describe and transform information: their theory, analysis, design, efficiency, implementation, and application. The fundamental question underlying all of computing is, 'What can be (efficiently) automated?' . . . [T]he fundamentals of the discipline are contained in three basic processes—theory, abstraction, and design—that use the subject matter of the disciplinary subareas to accomplish their goals. . . . Theory includes the processes for developing the underlying mathematics of the subarea. . . . Abstraction deals with modeling potential implementations. These models suppress detail while retaining essential features; they are amenable to analysis and provide means for calculating predictions of the model's behavior. Design deals with the process of specifying a problem; transforming the problem statement into a design specification; inventing and investigating alternative solutions; iterating a reliable, maintainable, documented, tested design that meets desired cost criteria; and implementing the system.

The report *Computing Curricula 1991*, produced jointly by ACM and the IEEE Computer Society (see below), was the first attempt to define a common framework for both computer science and computer engineering. This report defines ten fundamental subject areas in its common requirements. The summary below is taken from this report. Although the purpose of this classification is to define a recommended undergraduate curriculum, it provides a good overview of the areas that were then considered to form the core of computer science:

1. **Algorithms and Data Structures.** This area deals with specific classes of problems and their efficient solutions. The performance characteristics of algorithms and the organization of data relative to different access requirements are major components.
2. **Architecture.** Methods of organizing efficient, reliable computing systems provide a central focus for this area. It includes implementation of processors, memory, communications, and software interfaces, as well as the design and control of large computational systems that are reliable.
3. **Artificial Intelligence and Robotics.** The basic models of behavior and the building of (virtual or actual) machines to simulate animal and human behavior are included here. Inference, deduction, pattern recognition, and knowledge representation are major components.

4. **Database and Information Retrieval.** This area is concerned with the organization of information and algorithms for the efficient access and update of stored information. The modeling of data relationships, security and protection of information in a shared environment, and the characteristics of external storage devices are included in this area.
5. **Human-Computer Communication.** The efficient transfer of information between humans and machines is the central focus of this area. Graphics, human factors that affect efficient interaction, and the organization and display of information for effective utilization by humans are included.
6. **Numerical and Symbolic Computation.** General methods for efficiently and accurately using computers to solve equations from mathematical models are central to this area. The effectiveness and efficiency of various approaches to the solution of equations, and the development of high-quality mathematical software packages are important components.
7. **Operating Systems.** This area deals with control mechanisms that allow multiple resources to be efficiently coordinated during the execution of programs. Included are appropriate services of user requests, effective strategies for resource control, and effective organization to support distributed computation.
8. **Programming Languages.** The fundamental questions addressed by this area involve notations for defining virtual machines that execute algorithms, the efficient translation from high-level languages to machine codes, and the various extension mechanisms that can be provided in programming languages.
9. **Software Methodology and Engineering.** The major focus of this area is the specification, design, and production of large software systems. Principles of programming and software development, verification and validation of software, and the specification and production of software systems that are safe, secure, reliable, and dependable are of special interest.
10. **Social, Ethical and Professional Issues.** This area is intended to help students understand the basic cultural, social, legal and ethical issues inherent in the discipline of computing. They should understand where the discipline has been, where it is, and where it is heading. They should appreciate the philosophical, technical, and aesthetic issues that are important to the discipline; learn to ask serious questions about the social impact of computing; and be aware of basic legal and ethical issues.

Ten years after the publication of CC2001, a new joint task force of the ACM and IEEE-CS is considering appropriate revisions to produce a new set of recommendations, tentatively called Computing Curriculum 2001 (CC-2001). This report considers changes that have taken place in the discipline in the last decade:

Much of the change that affects computer science comes from advances in technology. Many of these advances are part of an ongoing evolutionary process that has continued for many years. Moore's Law -- the 1965 prediction by Intel founder Gordon Moore that microprocessor chip density would double every eighteen months -- continues to hold true. As a result, we have seen exponential increases in available computing power that have made it possible to solve problems that would have been out of reach just a few short years ago. Other changes in the discipline, such as the rapid growth of networking after the appearance of the World Wide Web, are more dramatic, suggesting that change also occurs in revolutionary steps. Both evolutionary and revolutionary change affects the body of knowledge required for computer science and the educational process.

Technological advancement over the past decade has increased the importance of many curricular topics, such as the following:

- *The World Wide Web and its applications*
- *Networking technologies, particularly those based on TCP/IP*
- *Graphics and multimedia*
- *Embedded systems*
- *Relational databases*
- *Interoperability*
- *Object-oriented programming*
- *The use of sophisticated application programmer interfaces (APIs)*
- *Human-computer interaction*
- *Software safety*
- *Security and cryptography*
- *Application domains*

The report also takes note of several key cultural changes:

- *Changes in pedagogy enabled by new technologies.*
- *The dramatic growth of computing throughout the world.*
- *The growing economic influence of computing technology.*
- *Greater acceptance of computer science as an academic discipline.*
- *Broadening of the discipline.*

As a result, CC 2001 proposes a somewhat revised breakdown of the CS body of knowledge:

1. Discrete Structures (DS)
2. Programming Fundamentals (PF)
3. Algorithms and Complexity (AL)

4. Programming Languages (PL)
5. Architecture and Organization (AR)
6. Operating Systems (OS)
7. Net-Centric Computing (NC)
8. Human-Computer Interaction (HC)
9. Graphics and Visual Computing (GV)
10. Intelligent Systems (IS)
11. Information Management (IM)
12. Software Engineering (SE)
13. Social and Professional Issues (SP)
14. Computational Science and Numerical Methods (CN)

This model essentially retains the ten categories from CC 1991 and adds several more. The area formerly called Algorithms and Data Structures is now represented as two areas, Programming Fundamentals and Algorithms and Complexity. Discrete Structures, seen by CC 1991 as an area of the mathematics discipline, is identified as a more critical area for computer science. Net-Centric Computing is entirely new; the Internet and network-based computing scarcely existed in 1991. Finally, Graphics and Visual Computing is an area receiving greatly increased attention due to advances in technology and user expectations. Formerly part of Human-Computer Interaction, these topics are now considered as a separate area.

In the graduate computer science curriculum at WVU, the fourteen areas cited above are covered by our courses in various ways.

Discrete Structures and Programming Fundamentals are considered to be fundamental areas of the undergraduate curriculum.

Social, ethical, and professional issues are addressed continuously throughout the curriculum, and also form the subject of periodic seminars.

All other areas are covered by one or more regular courses at either the advanced undergraduate level or the graduate level as listed in the current catalog. In most cases, courses at more than one level are available.

2. ABOUT THE DEPARTMENT

You are now a graduate student in the Lane Department of Computer Science and Electrical Engineering (LDCSEE for short). This Department was formed in 1997 by merging the Computer Science program and with the former Department of Electrical and Computer Engineering. Prior to that time, Computer Science was part of the Department of Statistics and Computer Science in the Eberly College of Arts and Sciences.

The original name of this department was the Department of Computer Science and Electrical Engineering. In April 2001 the Department was renamed the Lane Department of CSEE, in recognition of a substantial donation provided by Ray and Stephanie Lane. Ray Lane is a WVU graduate and former Chief Operating Officer of Oracle Corporation.

We are now a unit of the College of Engineering and Mineral Resources. Graduate programs at WVU are supervised at the college level. Thus, many matters relating to your graduate degree will be handled by the CEMR Office of Student Services, located in Room 141 of the Engineering Sciences Building (ESB). Graduate affairs in this office are handled by Linda Cox. The Dean of the College is Eugene Cilento, with offices on the third floor of the Mineral Resources Building (MRB). The Associate Dean for Academic Affairs is Warren Myers (106 ESB). The telephone number for the Dean's office is 293-4611.

Our Department offers programs and degrees in computer science, software engineering, computer engineering and electrical engineering. In addition, LDCSEE participates in interdisciplinary programs in biometrics and forensic identification.

Currently the Department serves about 100 Master's students and 20 PhD students in the computer science graduate programs. About 200 undergraduates are enrolled in the CS and pre-CS majors. There are about 30 tenure-track faculty members in the Department; about half of whom work primarily with Computer Science programs. There are also several instructors, visiting faculty, and research faculty, and a number of adjunct faculty. Complete information about the current faculty is available on the Department web pages.

The Chairman of the Lane Department is Dr. Brian Woerner. Dr. John Atkins is the Associate Chair for Academic Affairs, Dr. Parviz Famouri is the Associate Chair for research and Graduate Programs, Dr. Elaine Eschen is the director of the CCDM program and Dr. Jim Mooney is the Associate Chair for the Software Engineering Program and Extended Learning. Dr. Atkins is also the Graduate Coordinator for Computer Science. Various other faculty serve as coordinators for other graduate and undergraduate LDCSEE programs.

The Department administrative staff at present consists of seven people: Laura Ann Ridenour, Lucy Freed, Chris Randall, Maggie LeMasters, Karen Grimm, and Sharon Chadderson. Laura Ann is the Chair's secretary and handles a variety of other administrative responsibilities. Chris is responsible for undergraduate programs and records, and Lucy handles graduate programs and records. Maggie, Karen and Sharon handle budgetary and financial matters. In addition, Maggie is the overall supervisor for the Department staff.

The department and faculty offices, along with some classrooms and laboratories, are located primarily on the 7th, 8th, 9th and 10th floors of the ESB. The main department offices,

and those of administrative staff, are on the 8th floor. Most of the classrooms we use are in ESB and MRB. Several labs and some offices are in the Engineering Research Building and the Chestnut Ridge Research building. Finally, a few instructional or research labs are located in Eiesland, Armstrong, and Hodges halls on the Downtown campus.

Some specific rooms you may want to know about on the Department's floors of ESB are:

Room 901: Office space for graduate teaching and research assistants.

Room 801: General purpose classroom. Some LDCSEE classes are held here, as well as classes for other Departments.

Room 813: General purpose computer lab provided with PCs running Windows 2000. Login accounts are required.

Room 823: Office of Laura Ann Ridenour, Secretary to the Department Chairman. See LauraAnn if you wish to speak with Dr. Woerner. Laura Ann also handles some other miscellaneous matters including scheduling of conference rooms.

Room 829: Lucy Freed, Administrative Assistant responsible for graduate records. Important forms for graduate students are available at the door of Lucy's office.

Room 848: Mail room. Contains mailboxes for faculty and staff. Graduate student mailboxes are in Room 829. There is also a copy machine, a fax machine, and a high-speed printer. Use of this equipment is intended for faculty, staff, and graduate assistants only, in connection with official business. Code numbers are required for the copier and for long distance faxes.

Room 849: Department conference room (the "Brown Conference Room") used for small group meetings and many graduate final exams. See Laura Ann to schedule its use.

Room 701: Office space for graduate teaching and research assistants.

Room 711: Computing research lab and operating systems lab.

Room 733: Student lounge, with a coffeepot and microwave.

Room 756: Classroom equipped with computers at every desk. Sometimes available as an open lab.

Room 757: Systems administration office. This is the place to submit account applications and report *urgent* problems. Less urgent problems and requests should be reported by email (see below).

The Engineering Research Building (ERB) adjacent to ESB houses a number of LDCSEE research labs and some graduate student office space. All LDCSEE facilities are on the 2nd floor.

2006-2007 Handbook for CS Graduate Students

The Chestnut Ridge Research Building on Rt. 705 (behind Sheetz) is home to the Concurrent Engineering Research Center (CERC) (on the fourth floor) and the Virtual Environments Laboratory (on the ground floor) in addition to WVU research offices. This building is also known as the “CERC Building.”

Additional computer labs open to all students of the college are located on the second floor of ESB. A small lab reserved for CEMR graduate students is on the ground floor.

On the downtown campus, a lab shared with the Statistics Department is located on the 4th floor of Hodges Hall. This lab is equipped with Macintosh computers. In addition, several labs on the 3rd floor of Armstrong Hall and the Ground floor of Eiesland Hall are used for instructional purposes. These labs are primarily for undergraduate students.

The mailroom, shared office space, and most labs require either a key or a combination for access. Combinations will be issued to students on a need-to-know basis by your instructor or research supervisor. Keys are issued on a more limited basis. Contact your advisor or supervisor if you have a need.

The ESB/MRB building complex is open and accessible on a nearly 7 day, 24 hour basis. Occasionally keys are required for the outside doors. The doors most likely to be open are the west entrance (facing the Creative Arts Center) and the east entrance (facing the ERB).

According to postal service rules, the official address of the department is:

Lane Department of Computer Science and Electrical Engineering
West Virginia University
PO BOX 6109
MORGANTOWN WV 26506-6109

There is a campus mail system, using special envelopes, for mail directed to on-campus locations. A campus mail deposit box is located in the mail room. Campus mail addresses should use the department and PO BOX lines as given above.

If you are a GRA or GTA, you have been assigned a mail slot in the 829 ESB. Don't forget to check this periodically, as important notices (and pay slips) are distributed to this box. If you are not funded, but mail for you arrives at the Department, it may be placed in one of the alphabetic slots at the very top of the mailboxes.

The Department phone number is (304) 293-0405. Individual offices are reached using a 4-digit extension. WVU numbers (presently this means the 293 exchange) are called by dialing the *last five* digits of the number. A local outside line may be obtained by dialing 9. Long distance calls require use of an authorized 9-digit ID number (TID).

Please help to keep the Department's labs and public facilities clean! Trash and recycling containers are available in all public rooms.

3. ADVISING AND REGISTRATION

As a new graduate student, you have been assigned an advisor. If you do not know who your advisor is, contact the CS Graduate Coordinator. In most cases, you will probably find that your advisor is the CS Graduate Coordinator (John Atkins).

The advisor's role is to help you with your initial course selection and registration. He or she is also available to answer questions and provide counsel on a variety of academic matters. Be sure to meet you advisor promptly, and to work with him or her to prepare your initial registration and to address any deficiencies that were identified in you're acceptance letter.

Undergraduates are **required** to consult with their advisor prior to registration each term. The advisor provides the student with a "Term PIN number" which is needed to complete the registration process. Graduate students also need a Term PIN number. You are required to consult your advisor at the beginning of each semester to register for the subsequent semester. Graduate students in their second semester must have a signed program of study on file before a PIN number will be provided. The program of study form may be obtained from <http://www.cemr.wvu.edu/studentservices/forms/index.php>.

Once you have formed your graduate committee (discussed later), your committee chair becomes your advisor. Your original advisor has no further role.

The early registration period for each semester begins about halfway through the previous semester. Registration for Fall and Summer terms begins in March, and registration for Spring terms begins in October. Registration opens on different "priority dates" according to your class rank. All graduate students have an opportunity to register before any undergraduates. This gives you the best opportunity to get into many classes with limited enrollment.

The bad news is, if you have just arrived for your first semester, you will not be able to take advantage of this priority. You will have to compete with all students who did not participate in early registration.

The question about which courses to sign up for, especially in your first semester, must be discussed with your advisor. Basic information is given in later sections of this document. This section is concerned with the mechanics of registration.

At the beginning of the registration period, a schedule of courses is available on the web. The schedule is available on the web at <http://www.arc.wvu.edu/courses>. This web page offers information on each course including how many spaces, if any, are still available. This data is updated daily.

Note that you will need the Graduate Catalog for descriptions of the courses listed. Alternately, LDCSEE and most other departments maintain detailed information about most courses on the web.

There are presently three distinct methods to carry out your registration:

2006-2007 Handbook for CS Graduate Students

1. Obtain a blue registration form, available in 829 ESB. Fill in the information from the schedule for the courses you wish to register for. Bring the form in person to the Admissions and Records office on the Downtown Campus.
2. Register using the automated telephone (IVR) system. The phone number is 293-2892. Before calling you must have your planned schedule information ready, including alternate courses in case you are not admitted to your first choices.
3. Register on the web using the STAR registration system, available at <http://star.wvu.edu>.

Any of these methods can be used for courses for which space is available and no special permission is needed. For various reasons, a permit may be needed for some courses. This is true, for example, if the course is currently filled or restricted to a major other than yours. Permits can be obtained only from the instructor for the course you wish to enter. In this case, the only way to register is in person using the blue registration form, which must be signed by the course instructor or your advisor.

The procedures above may be used for original registration for each term, and subsequently to add, drop, or change certain details of your courses, up to the first day of classes.

It is possible to add, drop, or change courses during the first week of classes, but generally a permit is required.

It is possible to drop a course much later in the semester, but it is **not** permitted to add a course to replace it. It is also not possible to change the grading method for a course after the first week. In particular, you may not, after the first week, drop a course in which you are doing poorly, then add another to maintain a required number of credit hours. Choose your courses wisely before the term begins!

It is not appropriate to sign up for courses you do not actually intend to take. This behavior takes seats away from students who may seriously wish to take this course and artificially inflates the enrollment in a course.

4. FINANCIAL SUPPORT

If you are reading this near or after the beginning of your first semester, you already know if you have been given any type of financial aid for this semester. This section discusses options that may be available in the future.

The primary source for financial support within the department is the Graduate Teaching Assistantship (GTA). A number of research programs also offer positions for Graduate Research Assistants (GRAs). Even if you do not have an assistantship at the present time, you may apply for assistantships in future semesters. Yellow application forms are available in 829 ESB. These must be renewed **every semester**.

It is normal and appropriate that doctoral students may be funded as GRAs in connection with funded research projects in which their own research advisor participates. If you are a doctoral student, very possibly you were recruited to come to WVU specifically as a GRA for a particular project.

International students must provide certification of their abilities in spoken English to be eligible for a GTA. This can be achieved by taking the Test of Spoken English (TSE) administered by the Educational Testing Service, or the SPEAK test given at the beginning of each semester by the WVU Department of Foreign Languages. A score of 50 is required on either test.

Graduate assistants receive a waiver of tuition fees plus a basic stipend for living expenses. Normally, graduate assistants work 20 hours per week.

A *very limited* number of meritorious tuition waivers are also available each semester to students who do not have assistantships. To receive such a waiver, you must have a demonstrated record of superior performance. Applications must be submitted by the established deadlines each semester. These applications are available outside Room 829. The following rules apply:

1. Only **regular** graduate students may be considered for tuition waivers.
2. By law, West Virginia residents must be considered first, followed by other U.S. residents.
3. Preference is given to PhD students who have completed master's level coursework and/or passed their qualifiers.
4. Tuition waivers may not be used to maintain your registration status in your graduation semester.

A number of graduate fellowship programs are also available for outstanding students and students who are in certain special categories. Fellowship can be awarded to current graduate students, not only those entering for the first time. See your advisor for more information.

5. THE MASTER OF SCIENCE PROGRAM

The primary source of information for academic policies and requirements for the Master's program is the West Virginia University Graduate Catalog for the year in which you were admitted to the program. **You are responsible for reading, understanding, and following all information in your catalog that is applicable to your program.**

Additional information is contained on the Department web pages. We will try to minimize repetition of information from those sources. The purpose of this discussion is to provide an overview of the procedures you will follow as a Master's student in our program, along with some additional information on policies, recommendations and suggestions.

What is my Status?

If you hold a bachelors degree in computer science, and have completed all the undergraduate coursework that the Department considers necessary, you are probably in a position to begin work directly on your Master's degree. Note, however, that some Master's level courses have undergraduate courses as prerequisites. If you do not have the necessary background for a course you want to take, you may have to begin with the undergraduate course.

If you did not have a BS in computer science, or were lacking some necessary background, you probably were assigned one or more specific deficiency courses before beginning your regular Master's program. If your background does not include calculus, introductory probability and statistics, or introductory programming, you are required to complete courses in these areas before beginning any other work.

In addition to these fundamentals, the program requires completion of preparatory coursework in the following specific areas:

1. Data structures (CS 111)
2. Introduction to Software Engineering (CS 230)
3. Discrete mathematics (CS 220)
4. Analysis of algorithms (CS 221)
5. Introduction to Systems (CS 350)
6. Semantics of Programming Languages (CS 310)

The course numbers given with each topic indicate the undergraduate courses that cover that topic in the LDCSEE curriculum.

If you believe that you have completed courses equivalent to any deficiencies that have been identified for you, you may present a request to the CS Graduate Coordinator to re-evaluate your status. You should provide documentation that you have completed equivalent courses, including catalog descriptions or syllabi for the courses you have taken. Please consult the WVU **Undergraduate** Catalog or the Department web pages for a more detailed description of each course.

You must complete the deficiency courses before beginning to enroll in regular Master's courses. Some undergraduate courses may be available to you before or at the same time as the deficiency courses, but your choices will be limited.

Note that your WVU major code is **3022**.

In some cases, where regular admission requirements have not been met, or where it is not your intent to obtain a degree, you may have been admitted as a **non-degree student**. In this case, you are not currently admitted to any degree program, nor actually to any specific department. You may remain a non-degree student as long as you wish, but no more than 12 credit hours earned as a non-degree student may be transferred to a degree program.

It is assumed that as a non-degree student your goal is to obtain knowledge, not to obtain a degree. If you later wish to apply to transfer to a degree program in computer science, you will need to meet all admission requirements and formally apply to be considered for admission along with other entering applicants. There is no guarantee that you will be admitted, or that a transfer of any of your courses will be accepted.

While a non-degree student, you may register for CS graduate courses for which you have the necessary prerequisites and which are not major restricted. Admission to other courses generally requires a permit from the instructor.

The WVU major code for all non-degree students in CEMR is **3099**. By WVU rules, a non-degree student **cannot** receive a graduate assistantship or tuition waiver.

How Long Will It Take?

The average length of time required for a **regular Master's student** to complete all requirements of the Master's program is about four semesters. If you select the problem report option (see below), this should include about three semesters for course work, and one primarily for your research project. If you select the thesis option, your course work may be completed in two semesters, but plan on two more semesters to complete a thesis. The coursework option should take at most four semesters.

If you were admitted as a provisional graduate student, you were assigned some deficiency courses to complete before beginning your regular requirements. The time to complete these courses may add one or two semesters to the regular schedule.

Summer terms can, of course, be used to shorten the time required for your graduate program. Summer is a particularly good time to make progress on your problem report or thesis. However, you should be aware that there are limited courses offered during the summer, especially at the graduate level, and that many faculty members may be unavailable for part or all of the summer terms.

Course Requirements

Official course requirements are stated in your catalog. For convenience we summarize them here.

You may elect to follow either the **Problem Report Option**, the **Thesis Option** or the **Coursework Option**. Later we will discuss the difference between these, and how to make a choice.

For the Coursework option, you will need 33 hours of coursework that meet the specific course requirements outlined below.

For the Problem Report Option, you will need to complete 30 credit hours of course work chosen primarily from graduate level courses. As explained below, Master's courses are assigned three digit numbers beginning with 5 or 6, and are referred to as 5xx and 6xx courses. Doctoral courses, which may also be chosen for your program, are 7xx courses.

In addition, you will need to register for at least 3 hours of Master's level research (Course CS 697). As discussed below, this can only be done after forming your graduate committee.

For the Thesis Option, you will need to complete 24 credit hours of course work as described above, and 6 hours of **Master's** level research.

With any option, the following additional rules apply:

1. You must complete one course in each of two "core areas," explained below.
2. You may include a maximum of 3 courses at the advanced undergraduate (4xx) level.
3. You may include a maximum of two courses which are not Computer Science courses (i.e., those with a CS prefix in their course number.). The exception to this opportunity to take two courses which are not specifically designated Computer Science courses applies to students who are choosing to complete the Information Assurance and Biometrics track or the Forensics track as part of their Master's program. Such students have a standing waiver of the two non-CS courses limit but are limited to taking only those non-CS courses prescribed in the individual tracks.
4. You may include a maximum of 12 credit hours transferred from another institution. This must not include coursework which was counted toward a previous degree.
5. You may include a maximum of 12 credit hours completed at WVU while registered as a non-degree student.
6. If you have completed a previous **Master's** degree, at WVU or elsewhere, you may include a maximum of 2 courses which were counted toward this degree.
7. You may count at most one independent/directed study course toward your masters' degree.

As part of your program you must complete one course in each of 2 areas: theory and systems. The following courses are specifically identified to meet the requirements for these areas:

Theory - CS 510, 520, or 525

Systems - CS 550 or 555

Specific substitutions may be approved by decision of the Department and your graduate committee.

Your graduate committee may specify additional requirements on the courses you should take. This is an important reason for forming your committee early in your coursework sequence. Under special circumstances, your committee may also consider requests to modify your requirements, as long as these modifications do not conflict with College or University rules.

The Department offers an MS in Computer Science with an emphasis in Information Assurance and Biometrics (IAB). The curriculum for this option includes both a Theory and Systems requirement as above plus the following courses: Biometrics 426 and 626, Computer Science 465 and 665 and Statistics 591.

Forming your Committee

As a new graduate student, you have been assigned an advisor by the Department. If you are not sure who your advisor is, see the CS Graduate Coordinator.

The advisor's role is to help you with your initial course selection and registration. He or she is also available to answer questions and provide counsel on a variety of academic matters. Be sure to meet you advisor promptly, and to work with him or her to prepare your initial registrations.

During your initial semester, your principal goal should be to obtain some exposure to a range of CS topics, meet the faculty, and begin thinking about areas you may want to specialize in for your research.

Before registering in your penultimate semester, you **must** form a graduate committee. Organizing this committee is your responsibility. At this time you will need a general idea of the subject field or fields you would like to work in, and possibly some more specific project ideas. Your most important task is to find a chairperson for your committee. Your chairperson must be a "regular" member of the *graduate faculty* (most faculty are, except those very recently appointed). It is a good idea to talk to several faculty members who have interests in your chosen areas. Many of them will have specific projects to propose (a much smaller number will have support available for those projects!). Most faculty will also be willing to discuss your own specific ideas in fields of mutual interest.

When you have selected a chairperson (and he or she has agreed to work with you), you have taken a major step towards organizing your formal graduate program. Note that your

chairperson is now your advisor, and will approve all of your future registrations. Your former advisor has no further role.

You must recruit at least two additional faculty members to serve on your committee. At least one must be from the Lane Department. The final member could be from another department if his or her work is related to your project. At least all but one of your committee members must be regular or associate members of the graduate faculty.

Your next steps are to decide on your program option (problem report, thesis or coursework), to identify your specific project (if appropriate), and to formally organize your program by meeting with your committee to complete and approve a Plan of Study. The approved Plan of Study must be submitted before a PIN will be provided that will permit you to register for your final semester as a graduate student.

Problem Report, Thesis or Coursework?

The coursework option does not require a problem report or a thesis. Requirements under this option consist only of coursework.

If you elect a problem report or thesis, you must decide whether your research project will be carried out under the *problem report* option or the *thesis* option. The problem report option requires 30 hours of course work and 3 hours of research credit. The thesis option requires 24 hours of coursework and 6 hours of research. However, a thesis must meet a substantially higher standard of quality than a problem report.

A thesis is a piece of original research. That is, the results presented in the paper should be new to the computing science community and should be interesting enough and good enough to be published in a refereed journal or refereed conference proceedings. Often a graduate committee will want a student writing a thesis to demonstrate attempts to publish the thesis research.

A problem report, on the other hand, describes a substantial project which might not contribute to the body of knowledge in computer science. Most often this project takes the form of the development or enhancement of a specific software system. For example, a student wanting to write a compiler for Pascal would normally choose the problem report option, since there are many Pascal compilers in existence. If the compiler were used to test and demonstrate some new improvement in compiler technology, which would be useful to other compiler writers, then it could be a suitable thesis topic.

A problem report can also take other forms, such as a literature search of a current field of computer science. In all cases, the problem report should involve development of some useful knowledge, and/or investigation of an “interesting” problem (the definition of “interesting” is at the discretion of your committee).

The thesis option is strongly recommended for those considering an eventual PhD degree and a research or academic career.

The exact form of a thesis or problem report document will be prescribed by your committee. This form may vary widely. Some discussion of the probable content of these documents is given later in this handbook. You should be aware that the thesis must meet a number of technical requirements and deadlines that are not prescribed for problem reports. Furthermore, at WVU, all theses must be officially submitted in electronic form to a public archive.

A Research Project

Working with your chairperson, you must define a plan for your research project. At a minimum, this plan should provide a one or two paragraph summary. Your committee may request a more detailed outline.

It is important that you provide a project plan with clearly stated objectives. This plan becomes a part of your program agreement. Your work will be evaluated based on your success in achieving the stated objectives.

If your project involves improving the work of others, or working as part of a team, it is particularly important to identify *personal* objectives which you plan to accomplish as an individual. It will also be essential in your final report and presentation, to clearly distinguish the work of others from your own personal work.

Many students select a project based on work they are doing in connection with an assistantship or outside employment. This is clearly an attractive approach, but it does carry some dangers. If you are considering this course you should consider carefully the following points:

1. Your academic objectives are not, in general, the same as your work objectives. If your work objectives change, your committee might not approve a similar change in your project objectives.
2. Resources you are relying on from your work environment may become unavailable.
3. Your problem report or thesis is an entirely separate document from any reports or papers you may be producing for your employer. Its form and contents are determined solely by your committee.
4. You must provide a report for department files with full technical details of your work. This may be a problem if your project is proprietary or classified.

The Plan of Study

The Plan of Study is a formal agreement between you and your committee. This agreement establishes the membership of your committee, the courses you will take, and the project goals you will achieve. Any substantial deviation from this plan may require a new agreement. You must complete this agreement, and establish your committee, by the end of your second semester as a **Master's** student.

The Plan of Study is approved at a short, formal meeting with your complete committee. This meeting provides the opportunity for an open discussion of all plans, issues, and concerns.

The primary goals of the committee at this meeting are to approve your specific course plan, program option, and project plan. Be aware that your committee may augment the basic course requirements by requesting that you take specific courses you may not have anticipated.

Normally your project plan should be clearly established at this time, so that an outline of your plan can be included with the Plan of Study. Under exceptional conditions, this project definition may be deferred for a short time (perhaps 30 days). In this case, the date for completion is entered on the agreement.

Plan of Study forms may be obtained from Lucy Freed or downloaded from the College web site. Information on the forms should be typed. The project outline may be attached as a separate sheet.

Doing the Research

You should anticipate spending the equivalent of at least one semester to perform the work and writing required for a problem report. Two semesters should be allocated for a thesis. This assumes that you can dedicate at least 20 hours a week to your research. A longer period may be required if you are employed or taking courses during your research semesters.

Normally you will work closely with your chairperson, meeting with him or her regularly to review your progress. Other committee members may be less involved. You should ask them if they want to receive progress reports.

You must be registered for at least one credit hour each semester while you are doing research. Normally during this period you will register for CS 697. This registration must be approved by your chairperson and can be used *only after* your Plan of Study is approved and while you are performing project-related research. Normally a maximum of six hours of 697 credit is permitted in one semester. Graduate Teaching Assistants who are completing the project option may not take more than 3 hours of CS 697 hours (with the exception that graduating students may enroll for one hour of research in the semester in which they graduate.)

You should plan to complete the principal work associated with your project *at least six weeks* before the end of your graduation semester. This will allow you three weeks to complete writing your report and three weeks to arrange for your oral exam.

Writing the Report

The exact content of your problem report or thesis may vary widely, depending on the nature of your project and the preferences of your committee. A thesis must meet a number of precise formatting requirements relating to margins, line spacing, etc., but these requirements are not concerned with content.

Your chairperson may be able to lend you examples of previous problem reports for guidance. Theses are available at the main library. Recent theses may also be accessed electronically from the ETD system (see <http://www.wvu.edu/~thesis>).

Your report should answer the following key questions: What problem did you work on? Why is this problem of interest in computer science? What similar or background work has been done in this area in the past? How did you approach the problem? What special techniques did you use? What problems did you experience? Were you able to overcome these problems, and, if so, how?

In general, your report should explain clearly what you produced and what you learned. If your project was to build a software system, you should describe the finished project: how does it work (i.e. the Technical Manual) and how is it used (the Users' Manual). However, you must also explain how you built it, and what you learned. This is an important way in which an academic report will differ from a production manual.

Background material should be included (concisely) if your specific topic may be unfamiliar to some readers. However, provide an introduction stating your project goals *before* you launch into background discussions!

A thesis should include a comprehensive review of related technical literature, to demonstrate the relevance and originality of your work. An important element of any report is a discussion of concrete recommendations for further work. Finally, all reports should include an adequate bibliography in an appropriate format.

It is impossible to state an ideal length for your report, but the typical length of the main text of a problem report, exclusive of figures or appendices, is probably around 30 double-spaced pages, while that of a thesis may be 50 or more.

If your project included software development, full source listings and demonstration outputs should be included as appendices. If the program is extremely large, a single copy should be provided to the committee. This listing will be examined for good structure and documentation, etc.

A good *first draft* of your report should be presented to your committee members when you ask them to approve the scheduling of your final exam. This approval must take place *at least one month* before the end of the semester.

The Final Examination

The last hurdle you must meet to complete your Master's degree is the final examination. This exam is composed of two distinct parts. The first part of the exam is an oral review of selected concepts from your coursework. *Do not underestimate the importance of this part!* Your performance should demonstrate that you have prepared and studied adequately during the weeks leading up to the exam. You will not be expected to repeat all of your final course exams, but you *will* be expected to show that you can recall important principles. You may also be asked to discuss the relationship among concepts that originally came from separate courses. This part of the exam must be scheduled at least three weeks before the "last day to defend" as advertised by the College, and must be completed satisfactorily before the second part of the exam can be initiated.

If the coursework exam is completed satisfactorily, you may proceed to initiate your project defense. If so planned, the defense may be held immediately after the coursework exam, or it may be scheduled for a later date up to the “last day to defend.”

If the coursework exam is not completed satisfactorily, you will be given one opportunity to schedule a repeat within the same semester.

The second part of the examination is a presentation and oral defense of your project, lasting about one hour. During this time you will make a presentation of your project and answer questions. Use of PowerPoint slides or other visual aids is strongly recommended here. Live demonstrations should be included if appropriate; alternately, these may be carried out separately before the exam itself.

At the end of the oral exam, after a short discussion by your committee, you will be notified of the result. If the exam is not passed, a repeat examination will be scheduled. This may require delaying your graduation until the following semester.

It is **your** responsibility to arrange a date and time for both your coursework oral and final defense, that meets the above requirements and that is acceptable to all members of your committee. Remember that graduate faculty members become extremely busy at the end of the semester. If you plan on the last few days, you may find that scheduling is impossible.

A *Request for Final Exam* form available from Lucy Freed is used to schedule your oral exam. This form must be submitted at least one week before the requested coursework exam date. The form must specify the date, time, and location for the exam. The majority of exams in this department are held in the Brown Conference Room. See Laura Ann to schedule an appropriate location.

Additional scheduling may be needed to ensure the availability of a computer projector, overhead projector, or other special equipment. See your committee chair for assistance with this.

Your committee will want to see a draft of your report before agreeing to schedule the final exam. When you have obtained their agreement for a date and time, you should obtain a final exam request form, fill it out, and obtain the signatures of your committee members, the CS Graduate Coordinator, and the Department Chairman. The form should then be brought to Linda Cox in the CEMR Student Services office.

The College will return a *Shuttle Sheet* to your chairperson; this is an official authorization for your exam. The College will also review your records and provide a report stating any problems that need to be resolved before graduation. The exam must take place as scheduled, or else a new Shuttle Sheet will be required. NOTE: It is **not** necessary to request separate approval for the date and time of your project or thesis defense, but of course this must also be scheduled with the agreement of your committee.

Before seeking your committee’s approval to schedule your coursework exam and final defense, you should deliver draft copies of your problem report or thesis to each committee member. This is still a draft and should not be bound, but it should be substantially complete

and final as far as you can make it. The committee will evaluate this draft before and during the oral exam. After the exam, if you have passed, you will be given some instructions for final revisions to the paper.

You should allow at least a week *after* the exam for final completion of your paper. This includes time for final revisions and for binding. Binding is optional but recommended for problem reports; it is required for theses. Contact Morgantown Printing and Binding or other local facilities. Binding may take three days or more. You will probably need at least five copies for a problem report or seven for a thesis, including one copy for yourself. In addition, all theses must be submitted to the ETD program electronically following instructions and deadlines available on the web site (<http://www.wvu.edu/~thesis>).

The final examination and paper preparation are not meant to be overly burdensome, but they must be taken seriously. You will *not* be granted your degree until the exam is passed satisfactorily, and until a satisfactory paper is presented. This is true even if you have a job waiting, travel plans, or a visa about to expire! In these cases you may find it necessary to leave without a degree, or to return for completion at a later time.

Graduation Details

You must be registered during the semester in which you will graduate. You must also submit an Application for Graduation and pay the graduation fee. If you have no other appropriate reason to register, you should register for one hour of CS 697. Tuition for this registration may **not** be waived.

Each semester a list of important dates for graduate students is published by CEMR Student Services. You should review this list early in the semester in which you hope to graduate.

The final semester on campus is usually extremely busy as you finish the project, write the paper, and study for the defense. Additionally, most students use their last semester for job interviews, and this can consume a large amount of time. This means that you might need even more time than described above after the work is done to prepare for graduation.

Formal graduation ceremonies are held only once a year, in May. These ceremonies are for all graduates from the preceding summer term or Fall or Spring semesters. A less formal convocation is also held in December. Your participation in these ceremonies is not required but it is encouraged. Diplomas are distributed after the graduation in a separate ceremony conducted by the College.

Changing your Plan

You should be reasonably certain, when you complete your Plan of Study, that you intend to follow your Project Plan as you submitted it. However, you may find that a change in your circumstances or interests requires you to change your plan.

Minor changes of direction are expected and routine; this is why your initial Project Plan is not extremely detailed. These changes can be made by approval of your committee without difficulty.

If you wish to substantially change your topic or switch to a new area, a new Plan of Study form must be submitted. You should consult with your chairperson and committee; some of these people may not choose to continue on your committee under your revised plan. In particular, your chairperson may prefer to chair committees only when the topic is of particular interest to him or her. It is very likely that you may need a new chairperson. In general, it may be necessary for you to start all over to form a new committee and develop a new Plan of Study.

If you change your committee membership, so that some former members are no longer included, your revised form must be accompanied by an agreement form signed by the former members who are being removed.

Occasionally a committee must be changed because a member has left the faculty or is no longer able to serve. If this occurs, the rest of your committee should help you to select a new member with minimal delays to your program.

Delaying Your Program

A number of students find that, for one reason or another, they must delay or extend their studies, or leave campus before the degree is complete. While it is still possible to obtain your degree under these circumstances, there are a number of pitfalls to watch out for.

By University policy, as stated in the catalog, all degree requirements must be met within a period of 8 years. After this time you will begin to lose credit for your earlier coursework since it is no longer considered to represent current knowledge. You will then need to repeat the appropriate courses and probably meet more current degree requirements.

Moreover, every student in a graduate degree program must register for at least one semester in a two-year period to remain in good standing. If your registration is inactive for two years you will be dropped from student status. To resume graduate work you must then reapply to WVU and the Department. To be readmitted to the Department you must meet all current admissions requirements, which may be higher than those under which you were originally admitted.

Ordinarily, each registration must be for at least one credit hour, even if you have completed all credit requirements. If you need to register when you are not actually taking courses or conducting research, you should register for one hour of CS 697. Tuition for this registration may **not** be waived.

We strongly recommend that you do not plan to complete your research project after leaving campus. In our experience, students who make such a plan in good faith will often fail to complete. Jobs and personal lives intervene, and there is no more time for the discipline of a research project. If you plan to combine your research with work assignments, these plans fall apart when work assignments change. Finish your research before leaving! If you must leave, plan to return later for one full-time semester to complete your degree.

A Typical MSCS Program

In this final section we outline the typical steps to be followed by a **Master's** student initially admitted to regular status.

First Semester

When you first arrive on campus, contact John Atkins or Lucy Freed to let us know that you have arrived. Consult your advisor promptly. Seek his or her advice in scheduling your courses and sketching out an informal, preliminary plan of study. You may register online using the STAR system (<http://star.wvu.edu>). For graduate students, no explicit approval or PIN number is required.

Generally you should plan on taking about four courses. Criteria for selection should especially include:

1. Courses to satisfy deficiencies if appropriate
2. Undergraduate (400-level) courses in an area of interest to you, where graduate courses are unavailable, or where they may be needed as prerequisites for graduate courses.
3. Graduate courses that will help to fulfill the specific requirement for the two core areas.
4. Graduate courses in an area of particular interest to you, especially an area in which you might choose to do research.

Second Semester

In this semester, you will register for several more courses with the aid of your advisor, based on your evolving informal plan of study. You must submit a preliminary program of Study before you can register in the second semester. You should be more familiar with the available curriculum now, and you should be starting to identify areas in which you might want to work on a problem report or thesis, and faculty with whom you might be interested in working.

Make some appointments to talk with faculty you know or who are working in areas you are interested in. They will usually be glad to talk to you. Your goal is to identify a faculty member to chair your committee before the end of the semester. When you have a tentative agreement, you can recruit the other committee members, and work with your chair to define a tentative topic. You should also determine whether you wish to pursue the Problem Report option or the Thesis option.

Bear in mind that if you hold a research assistantship, your supervisor has the right to require that you do your **Master's** research under his or her direction.

By the end of this semester, you should schedule the formal meeting of your committee and complete your official Preliminary Plan of Study. At this point, your committee chair becomes your advisor.

Third Semester

With the guidance of your committee, you should now register for any courses remaining on your Plan of Study. If you are choosing the thesis option, there may be few if any courses yet to be taken.

With the end in sight for your coursework, you should begin planning your research. If you are following the thesis option, you should register for up to 6 hours of CS 697 and begin moving forward with your actual research program under the guidance of your committee chair or research director. If you are following the problem report option, you may have more coursework to complete, and should limit yourself to preliminary planning for your research.

Fourth Semester

If you are proceeding at a normal pace, this will probably be your graduation semester. You should have all your coursework complete and your research plan established to the satisfaction of your committee. If you are following the thesis option, your research should already be well underway.

Due to procedural deadlines and the need to spend time writing a report or thesis, you should plan on completing the work on your research to the satisfaction of your committee by the middle of the semester. This will allow you a month to concentrate on writing your report, which should be about the minimum time required. You will then be able to schedule your final exam sessions to meet all necessary deadlines.

During this semester, you must apply for graduation (see Linda Cox) and pay the graduation fee. If your graduation is delayed, the fee can be carried over, but you will have to apply again. Also remember that you **must** be registered for at least one credit hour in your graduation semester.

6. THE DOCTOR OF PHILOSOPHY PROGRAM

The primary source of information for academic policies and requirements for the PhD in Computer and Information Science (PhD-CIS) is the West Virginia University Graduate Catalog for the year in which you were admitted to the program. **You are responsible for reading, understanding, and following all information in your catalog that is applicable to your program.**

Additional information is contained on the department web pages. We will try to minimize repetition of information from those sources. The purpose of this discussion is to provide an overview of the procedures you will follow as a Doctoral student in our program, along with some additional information on policies, recommendations and suggestions.

What is my Status?

If you hold at least a bachelors degree in computer science, and have completed all the undergraduate coursework that the department considers necessary, you have probably been admitted as a **regular Doctoral student**. This does not mean that you have been accepted as a PhD **candidate**; admission to candidacy has a special meaning and will take place sometime later.

If you do not have a bachelors or Master's degree in Computer Science, or are lacking in some specific background, then you may have been admitted as a **provisional Doctoral student**.

Regular and provisional PhD-CIS students will be assigned Major Code **3023**.

How Long Will It Take?

A PhD student entering the program without a Master's degree must either earn an MSCS degree or complete coursework equivalent to that required for the thesis option. The time required to complete a Master's degree is discussed in the previous section. A student electing only to complete the coursework, and **having no need for preparatory courses**, may be able to do this in two semesters.

A PhD student who has completed the MSCS or equivalent should anticipate an average of at least two additional years to meet all requirements for the PhD degree. This normally includes at least one full year, taken in residence, to perform the research leading up to your dissertation. An additional semester or summer may be required for the actual writing.

Master's Degree or Coursework

If you do not have a Master's degree in Computer Science or equivalent coursework, you will be considered a "Master's student with PhD intent." You will proceed as though you are a Master's student, at least until you complete the coursework equivalent to that required for the thesis option. Since you have the Major Code of a Doctoral student, however, the department assumes that you have the bona fide intent of proceeding beyond the Master's degree to work towards an actual Doctoral degree. If this is not the case, please consult with the CS Graduate Coordinator.

If you do not have a degree in Computer Science or equivalent, you must complete coursework equivalent to the MSCS with thesis option. This requires a total of 24 credit hours as explained above. In some cases, graduate level work that you have completed elsewhere may be used to partially fulfill this requirement.

You may decide whether you wish to actually complete a Master's degree prior to concentrating on your Doctoral requirements. If so, you will need to complete all normal requirements for the MSCS, either the problem report or thesis option, as explained elsewhere. The thesis option is strongly recommended. You will also need to form a Master's degree committee, which will probably not be the same as your Doctoral committee.

If you do not choose to complete an actual Master's degree, you need to complete only 24 credit hours of Master's level coursework consistent with the requirements for the thesis option, and you do not need to write a problem report or a thesis.

Qualifying Examinations

After you complete your Master's level coursework, if required, you should plan to take the **PhD-CIS Qualifying Examinations**. The qualifiers consist of a series of three written exams, each given in a two hour period, which include questions on three subject areas:

1. Theory of Computing
2. Programming Languages
3. Computing Systems

Qualifiers are offered once each semester if there are candidates to take them. Information is available on the web about the material to be covered by each of these qualifiers. **It is up to you to learn this material** before sitting for the qualifiers. You are responsible for the prescribed content whether or not it was included in the coursework you have taken.

It is not necessary to take all qualifiers in the same semester. If you fail any one Qualifying Examination, you must sit for the Qualifying Examination in the following semester. Should you not have passed all Qualifying Examinations by the second attempt, you must sit for the Qualifying Examination in the following semester. Doctoral students are limited to three (3) attempts at passing the Qualifying Examination. The Qualifying Examinations must all be passed by the third semester following the first semester in which you attempted one or more Qualifying Examinations. For example, should your first attempt at the Qualifying examinations be in the fall semester, 2006, you must have passed all three examinations by the fall semester, 2007.

Forming your Committee

By the end of your second semester as a **regular** Doctoral student, you are required to form your Doctoral committee. This requirement holds if you have entered the program with a Master's degree in Computer Science, or if you are completing Master's level coursework. If you are pursuing an actual Master's degree, however, you should first form a Master's committee, and then form a Doctoral committee after your Master's degree requirements are complete.

Doctoral programs are designed to focus from the start on a concentrated area of study and research. By the time you have completed your Master's level work and passed the qualifiers, you should have a clear idea of the area of Computer Science on which you wish to concentrate.

The most important member of your committee is the chair. Chairing a PhD committee is a major commitment on the part of a faculty member. Normally your chair will direct your research project, working very closely with you over an extended period of time. If you have a research assistantship, it is very probable that a faculty member associated with your research project will become your chair. Otherwise, talk to the faculty whose interests lie in your chosen area. Most faculty are willing to work with qualified PhD students, though not all can offer funding.

Your chair must be a faculty member in the Lane Department and a **regular** member of the graduate faculty.

Your committee must consist of at least five members. A majority must be from the Lane Department. A majority must be regular members of the graduate faculty, and no more than one may be a non-member. One member of your committee **must** be from outside the Lane Department. The Dean has the right to appoint one of your committee members, but he is unlikely to do so.

At the first meeting of your committee, your Doctoral Plan of Study will be developed and approved. The role of your committee is to direct both your PhD coursework and your research.

The Plan of Study

The Plan of Study is a formal agreement between you and your committee. This agreement establishes the membership of your committee, the courses you will take, and the tentative title for your research. Any substantial deviation from this plan may require a new agreement. You must complete a *preliminary* Plan of Study, and establish your committee, by the end of your second semester as a regular Doctoral student.

The Plan of Study is approved at a formal meeting with your complete committee. This meeting provides the opportunity for an open discussion of all plans, issues, and concerns. Plan of Study forms for the PhD in CIS may be obtained from Lucy Freed or Linda Cox.

Course Requirements

As emphasized in the Graduate Catalog, the PhD is not a coursework degree. The most important component of the program is research, not the completion of classes. Nonetheless, you are expected to complete a limited set of courses that strengthen and deepen your knowledge, primarily in areas closely related to your research.

The specific requirement is to complete 18 hours (6 courses), which must be CS courses at the doctoral (7xx) level. At most two of these courses may be directed study (CS 792), which is the only type of independent study permitted. Due to the limited availability of CS 7xx courses, your committee may prescribe substitutes which may come from other related disciplines and which may if necessary be at the Master's level. **It is extremely important that you work with**

your committee to plan your study for these courses. It is **especially** important that your committee participate in planning and supervising any directed study course you may pursue.

Comprehensive Examinations

After your doctoral coursework is complete, your committee will prepare and administer a series of comprehensive examinations. The purpose of these exams is to ensure that you have acquired an in-depth knowledge of subjects related to the field in which you will perform your research. Typically, they are take home exams requiring further research over a period of several weeks. The exact format of these exams is determined by your committee.

When you have successfully passed all of your comprehensive exams, you will be formally **admitted to candidacy** for the PhD degree.

Research Proposal

When your comprehensive exams are complete, your next step is to present and defend your research proposal. This should include both an oral presentation and a formal proposal document. The proposal should identify the goals and objectives of your research, and your plan for achieving these goals. It should include results of a preliminary feasibility study and a detailed literature review. Your committee will critically evaluate your proposal, propose additions and modifications, and work with you to shape a sound research plan.

Doing the Research

When your proposal is accepted, you may register for research credit under course number CS 797 and begin your actual research. Unless a great deal of preliminary work has been done, this will occupy you full time for at least a year. Ordinarily this is also the time that you will fulfill your residency requirement, registering for at least 9 hours of research in two consecutive semesters.

It is also possible to register for preliminary research using CS 797 before your research proposal is complete. In all cases, however, such registration must be approved by the chair of your doctoral committee.

Normally, you will work closely with your chairperson, meeting with him or her regularly to review your progress. Other committee members may be less involved. You should ask them if they want to receive progress reports.

You **must** be registered for at least one credit hour each semester after admission to candidacy, up to and including your graduation semester. If this requirement is not met, your candidacy may be cancelled. If, during a particular semester, you are doing no research and using no University resources, you should register for one hour of CS 799. You are required to complete all requirements and graduate not later than five years after admission to candidacy.

You should plan to tentatively complete your research by the end of the semester prior to your graduation semester. This will provide reasonable time for correcting any problems, writing your dissertation, and preparing and conducting your defense.

The Dissertation

The vehicle by which you present your finished work for approval, as well as for a permanent archive, is your dissertation. Because of the scope and required quality of this document, we recommend you plan on **at least two months of full time writing** after your research work is completed.

The dissertation must thoroughly explain what you have done in such a way as to show the reader that your results are interesting, original, and sound. First, you must explain what you have achieved and what value it may have for those who read it. A reasonable amount of background should be provided for the non-specialist. Second, you must present a comprehensive survey of the published literature relating to your work, and compare and contrast your work with other research that addresses similar problems. Third, you must present sound theoretical and/or experimental evidence to convince your committee and future readers that your results are correct and your conclusions are reasonable.

After final approval, the dissertation must be presented to the WVU ETD program in electronic form, where it will be archived for future access by interested scholars.

It is likely that your committee will ask you to submit one or more papers for publication based on your dissertation. The dissertation itself is normally far too long and detailed to be published in full.

The Final Defense

When your research is completed and your dissertation is ready, you will defend your work by presenting it in a public forum and standing for questioning by your committee. The questions will critically explore whether you have fully met the expectations for PhD quality research. The subject of the questions is limited to your research topic and closely related areas.

If you complete the defense satisfactorily, you have successfully earned your PhD degree. Congratulations!

Graduation Details

You must be registered during the semester in which you will graduate. You must also submit an Application for Graduation and pay the graduation fee. If you have no other appropriate reason to register, you should register for one hour of CS 799. Tuition for this registration may **not** be waived.

Each semester a list of important dates for graduate students is published by CEMR Student Services. You should review this list early in the semester in which you hope to graduate.

The final semester on campus is usually extremely busy as you complete your research, write your dissertation, and prepare for your defense. Additionally, most students use their last semester for job interviews, and this can consume a large amount of time. This means that you might need even more time than described above after the work is done to prepare for graduation.

2006-2007 Handbook for CS Graduate Students

Formal graduation ceremonies are held only once a year, in May, about a week after the end of classes. These ceremonies are for all graduates from the preceding summer term or Fall or Spring semesters. Doctoral graduates are individually recognized and receive their diplomas at the graduation ceremony.

A less formal convocation is also held in December. Your participation in these ceremonies is not required but it is encouraged.

7. NOTES ON THE CURRICULUM

The department course offerings, and the course requirements for the Master's and PhD programs, are fully described in the Catalog. This section contains some additional notes to help you plan your program.

Graduate credit is available for courses numbered 400 and above. Normally 5xx courses and 6xx are considered to be Master's level; the difference between the two is that advanced undergraduates may take 5xx courses but not 6xx courses. Courses at the 7xx level are primarily for PhD students but may be taken by Master's students as well. 4xx courses are primarily for undergraduates. Up to three courses at the CS 4xx level may be included in an MSCS Plan of Study.

No graduate credit may be obtained from courses registered pass/fail. This is an option for undergraduates only. A very few courses, including CS 697 and 797, are graded S or U (satisfactory or unsatisfactory).

Courses designated CS 491, 591, 691, and 791 are experimental courses. Often, there are several of these courses in a single semester, distinguished by letters (691a, 691b, etc.) You may take any number of x91 courses. Each is distinct unless they have the same title. Occasionally a course has a dual designation such as 491/591. In this case graduate students must register under the 591 number to receive credit.

Course numbers are available at both the Master's level and the Doctoral level designated "independent study" or "directed study." An independent study is a program equivalent to a course, supervised by a faculty member on an individual basis. Agreement to supervise you is a significant commitment by the faculty member. Many faculty members may be unable to do this, especially if asked on short notice. Do not assume that you can arrange an independent study at the last minute with any faculty member of your choice.

Generally, independent study is intended for students wishing to study an area in which no regular course is offered, or to study in more depth selected topics found in a previous course. It is **not** intended to substitute for a course that is offered regularly, even if the course is unavailable during a particular semester.

Directed study is a type of independent study specifically for PhD students. A directed study should be arranged in consultation with your committee and should be related to your Doctoral research area.

Course numbers 697 and 797 are for research credit only. These course numbers are reserved exclusively for MSCS and PhD-CIS students. You may register for these numbers **only** under the direction of your committee after your Plan of Study form has been approved.

Members of the Department administration are typically listed as the "instructor" for independent study and research course numbers. This means that these individuals are responsible for submitting your grade, so you should be sure it is reported to them. It does **not** mean that they will be the ones supervising your independent study or research.