

Food, *Agricultural* and Biological Engineering



**Guide
for
Graduate
Studies**

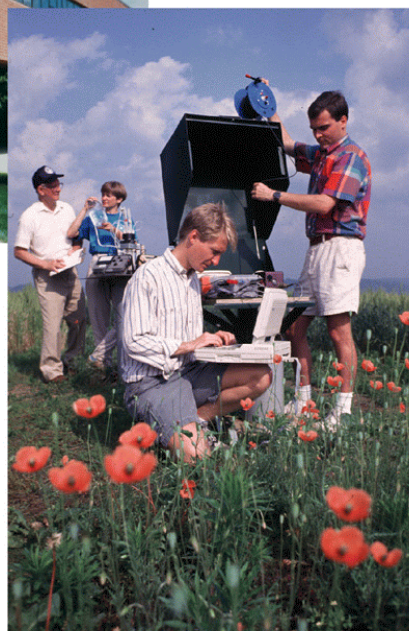


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Updates at: <http://fabe.osu.edu>

Dear New Graduate Student:

Welcome to The Ohio State University. You have chosen one of the premiere universities in the world to continue your educational career and I am glad you have chosen The Department of Food, Agricultural and Biological Engineering (FABE) for your professional studies.

The Department of Food, Agricultural & Biological Engineering takes great pride in its people, programs and facility. The people who comprise the faculty and staff are knowledgeable about the university, department and programs and will provide direction and support to you throughout your career at Ohio State. The graduate program is a major contributor of research in agricultural and biological engineering and has leading programs in the nation in these areas.

As a graduate student you will work closely with faculty on research activities while pursuing your academic degree. You will have opportunities to learn about and understand basic, independent research; to synthesize and interpret data; to conceptualize new ideas, articulate them, and turn your ideas into realities. During your graduate education at FABE, you will actively participate in integrating the knowledge from the classroom activities into your research projects, teaching, opportunities, peer contacts, seminars, and professional meetings. You will also be able to apply the knowledge you've gained in the classroom in technology transfer activities and learn how adoption of your project may be accomplished outside of the university setting.

As you encounter new learning opportunities, strive to use the resources at your disposal. The university has much to offer and you have much to contribute. Look for ways to utilize both of these attributes as you learn about Ohio State, and the Department of Food, Agricultural and Biological Engineering. I am sure the faculty and staff in the department are eager to see you succeed as a graduate student in the department. If you have any suggestions concerning the graduate program and the department please do not hesitate to let me know. Again, welcome, and best wishes.

Sincerely,

K. C. Ting
Professor and Chairman
Department of Food, Agricultural and Biological Engineering

1. Introduction

This handbook contains policies, rules, procedures and general information that affect both graduate students and graduate faculty in the Department of Food, Agricultural & Biological Engineering (FABE). The material presented here has been discussed, and approved by a vote of the graduate faculty in FABE. The primary document governing graduate programs at The Ohio State University is the most recent edition of the Graduate School Handbook (GSH). This handbook, prepared by the Graduate Studies Committee, is intended to specify Departmental policies and facilities unique to the Department and not covered in the GSH. FABE students are advised to become thoroughly familiar with, and abide by, the appropriate sections of the GSH and this Departmental Guide. None of the regulations of this program contradict those of the Graduate School. Faculty and graduate students in the FABE Program are strongly encouraged to keep updated copies of the Graduate Departmental Guide and the OSU Graduate School Handbook. Remember that if you cannot find a regulation in this handbook, Graduate School regulations are always available on-line at the Graduate School website (www.gradsch.ohio-state.edu).

There are many other instructive publications which contain information directly relevant to graduate education. For example, specific instruction on preparation of M.S. and Ph.D. theses in Guidelines for Preparing and Submitting Theses, Dissertations and

D. M. A. Documents (issued by The Graduate School) is required reading for every graduate student who intends to submit a document for approval. If you are new to the university, you should obtain a copy of The Student Handbook (available from the Office of Student Life) and the Graduate School Bulletin. Both are guides to the process and services available at Ohio State. The FABE Department will make every effort necessary to provide both the physical resources and intellectual environment for successful completion of your graduate program. Graduate students are expected to exhibit motivation, integrity, and the professional ambition to fully utilize the resources available for this achievement. We hope that each student will experience professional growth and personal enjoyment during their graduate program at OSU.

The Department offers the M.S. degree, both Plan A (thesis) and Plan B (non-thesis), and the Ph.D. degree in Food, Agricultural & Biological Engineering. Graduate research may be conducted in any of the research areas associated with the graduate faculty shown in Table 1 (for the most current graduate faculty list visit the Department's website at: <http://fabe.osu.edu/graduatestudies>). Research also may be conducted in other areas if approved in advance.

There are also several forms which graduate students will periodically use during their time at Ohio State. These are noted in Appendix A.

2. Graduate Studies Committee

The Graduate Studies Committee (GSC) in FABE is composed of the members of the Graduate Faculty in the Department who wish to serve on the Committee, and two FABE graduate students (an M.S. and a Ph.D. representative) who are advised by the Graduate Faculty and elected by the FABE Graduate Student Council to represent them. The GSH defines the Graduate Faculty (Part IV, Section 3) and describes the responsibilities of the Graduate Studies Committee (Part IV, Section 2.) Several of the Graduate Faculty are based at the Ohio Agricultural Research and Development Center (OARDC) at Wooster, about 90 miles northeast of Columbus.

The Chair of the Graduate Studies Committee (CGSC) is elected by the FABE graduate faculty for a three-year term. The staff member designated as assistant to the CGSC serves as secretary to the committee.

3. Graduate Studies Council

The Graduate Studies Advisory Council (GSAC) consists of at least 3 graduate faculty elected by the GSC for a three-year term. The major responsibility of GSAC is to help the Chair of the Graduate

Studies Committee in matters such as admission, recruitment, identifying fellowship nominees, revising guidelines and publications for the FABE Graduate Program, development of recruitment materials and other items as related to the graduate program at FABE. The Chair of the Committee will be an ex-officio member. Nominations (self, and made by other GSC members) to serve on GSAC are sent to the FABE Chair who administers the election process. Terms of service in the GSAC are staggered so that one member leaves the council and a new one is elected every year. Members leaving the GSAC are eligible for re-election to serve on the council. The re-nomination process is the same as the nomination process outlined above.

4. Admission

Applicants who seek admission to the Graduate School for graduate study in FABE must fulfill admission criteria established both by the Graduate School and by the FABE Graduate Faculty. Application materials can be obtained from and must be submitted to the Admissions Office of The Ohio State University, 1800 Cannon Drive., Columbus, OH 43210; (614) 292-3980. Applications are accepted for any quarter, but applicants are encouraged to apply for Autumn admission. International students should consider Summer quarter admission, since this will permit them to gain some experience with American English before the intensive coursework which occupies the Autumn Quarter. Credentials of those who apply are evaluated without consideration of race, color, creed, sex, age, disability or national origin.

General Admission

The Department follows the policies, procedures, and requirements of graduate admission described in the GSH (Part II, Section 1). Graduate students are admitted under all classifications defined in Part II, Section 1.4), and may request a change in classification following the procedures, and subject to the conditions defined in Part II, Section 1.4.

When a complete application (Part II, Section 1.6) is referred to the GSC for its recommendations on admission, it is circulated to potential advisers in the applicant's areas of interest. The applicant must be acceptable to at least one Graduate Faculty member who is willing to serve as adviser before being recommended for admission.

The GRE General Test is highly recommended for all applicants and it is required for: those seeking graduate associateships, graduates of foreign universities, applicants with GPA below 3.0, and fellowship applicants. Typically, the application package contains the following items:

- (a) Graduate School Admission Application form.
- (b) Verification of an earned Baccalaureate or professional degree from an accredited college or university.

(c) Transcripts covering all undergraduate and graduate academic work undertaken prior to application.

(d) Graduate Record Exam (GRE) scores for the General Test (Verbal, Quantitative and Analytical).

(e) Three letters of recommendation, preferably on the standard form provided by OSU Graduate Admissions, from persons knowledgeable about the student's academic and/or research performance.

(f) A Statement of Purpose. In a brief and focused description, this statement should give background information concerning the factors which have stimulated your interest in science in general, and particularly in the sub-disciplines which comprise FASE. You should indicate which specific areas of specialization are most interesting to you as a possible focus for graduate research, and include information about previous undergraduate or graduate research experiences.

(g) TOEFL and English Placement. The Test of English as a Foreign Language (TOEFL) is required for all students whose native language is not English. A TOEFL score of 550 (or 213 if computer based test is taken) or above is recommended for admission. The requirement may be waived if the student has earned a degree in an English-speaking country. (Students whose native or first language is not English are required to take the English Placement Exam prior to their initial course registration at OSU. The exam tests oral/verbal, vocabulary, grammar and writing skills to determine which courses, if any, are needed in order to meet basic levels of communication.)

Admission of students holding a B.S. degree in Engineering, but not meeting the minimum requirements for admission to the Graduate School.

When a complete application (GSH, Part II, Section 1.6) is received from an applicant who holds a B.S. degree in Engineering, but who does not meet the minimum admission requirements, the guidelines below are followed in determining admission status of the applicant.

(a) An Applicant's folder is sent to the graduate faculty whose research area most closely matches that of the student's interest. If no Graduate Faculty member agrees to accept the student as an advisee, admission to the Graduate Program is denied, and the Graduate School is notified of such.

(b) If a Graduate Faculty member agrees to accept the student as an advisee, then the Faculty member is responsible for providing, in writing, compelling evidence beyond what is in the application package, that the student deserves admission

to the Graduate Program. The request and supporting materials are to be submitted to the Chair of the Graduate Studies Committee (CGSC).

- (c) A subcommittee of 3 voting members of the GSC (excluding the Faculty member) shall be appointed by the CGSC to review the student's application file and the evidence provided by the Faculty member. The CGSC will designate a chair to manage the review. Every effort should be made to evaluate the case and present the report (see item d below) to the CGSC within 30 days.
- (d) After evaluation and discussion of the student's case, the subcommittee will make a recommendation to either accept or not accept the student to the Graduate Program, by a simple majority vote. The Chair of the subcommittee will then prepare a report on the decision in the form of a letter explaining in detail why the subcommittee favored or opposed the student's admission. The decision report letter shall then be submitted to the CGSC.
- (e) In the event of a negative recommendation, the CGSC will return the student's referral form to the Admissions Office indicating the student is not qualified for admission to the FABE Graduate Program.
- (f) In the event of a positive recommendation on acceptance to the Graduate Program, the CGSC will in turn forward the subcommittee's letter to the Graduate School, which will make the final decision on whether or not the student should be admitted to the Graduate School.

Admission of students who do not hold a B.S. degree in Engineering, but who do meet the minimum requirements for admission to the Graduate School.

The Food, Agricultural, and Biological Engineering (FABE) Graduate Program recognizes that the basic credentialing as an engineer in the discipline occurs at the B.S. degree level. Furthermore, it recognizes that students without such credentialing may benefit from advanced study in the FABE Graduate Program. Notice that completion of a graduate degree in the FABE Graduate Program does not guarantee credentialing as an engineer. Admission procedures are as follows:

- (d) Any student requesting admission to the Graduate Program who does not hold a B.S. degree in Engineering, shall be required to take a set of preparatory courses, as specified by a subcommittee of the FABE GSC.
- (e) A Faculty member must be willing to accept the student as an advisee, and initiate the process of review by the GSC subcommittee. If no Faculty member agrees to accept the student as an advisee, admission to the Graduate Program is denied.

- (f) When a Faculty member has agreed to accept the applicant as an advisee, he/she will submit a written request to the CGSC for a review of the student's application, and provide a list of proposed courses for the student, which should address the preparatory coursework requirements. It is the responsibility of the Faculty member to develop this list of preparatory courses in consultation with the student, and to make the student fully aware of these requirements, and their rationale.
- (d) A subcommittee of 3 voting members of the GSC (including the Faculty member) shall be appointed by the CGSC to review the student's application. The materials to be reviewed should include the application file and the proposed set of preparatory courses. The CGSC will designate a chair to manage the review. Every effort should be made to evaluate the case and present the report (see item f below) to the CGSC within 30 days.
- (e) The subcommittee's charge is to make a recommendation to the CGSC on the admission conditions for the student. After evaluation and discussion of the student's case, the subcommittee will approve the recommendation by a simple majority vote. The Chair of the subcommittee will then prepare a report on the recommendation in the form of a letter explaining in detail any conditions, such as all courses that the student is required to successfully complete, and the timing and minimum grade levels on specified courses as appropriate. (As a guide, a minimum of 15 additional credit hours of preparatory courses is recommended.) The recommendation report letter shall then be submitted to the CGSC.
- (f) The CGSC will then notify the Graduate School in writing about the requirements of the student's conditional admission to the Graduate Program. The written notification should include the list of courses and other conditions that the student will be required to fulfill before starting and/or completing the proposed degree.
- (g) Following admission to the FASE Graduate Program, conditions of admission may be changed in accordance to the rules outlined in the Graduate School Handbook (Section II.1.4.6). The decision to change these conditions, for example substituting a required course, will be made by the adviser, the CGSC, and one other voting member of the GSC.

5. Adviser and Graduate Advisory Committee

Normally an Adviser is assigned to a student before the student is admitted to the FASE Graduate Program. If an assignment was not made, then the GSC Chair will serve as a temporary adviser to a

student to facilitate the registration for the first quarter of enrollment.

Communication between the adviser and student is vitally important and dissatisfaction with the adviser/student relationship should be voiced directly to the person(s) involved. In addition, the student is encouraged to discuss the unresolved issues with the Department Chair and/or Graduate Studies Committee Chair. It is occasionally necessary to change advisers and such changes should be handled through the GSC Chair in a way that all interested parties (student, old adviser, new adviser, and GSC Chair) are aware of the desired changes. Students wishing to change advisers must notify the GSC Chair in writing.

The adviser guides the student in planning a program of study and research suited to the best interests of the student while meeting Graduate School and Departmental standards and objectives. The adviser shall supervise the graduate program of the student, and

shall chair the committees for the thesis or the dissertation, the Candidacy Exam (Ph.D. only), and Final Examination (M.S. and Ph.D.). The approval of the adviser is required on most facets of the graduate program as detailed in the following sections of this guide.

The student's Graduate Advisory Committee should be appointed by the adviser, in consultation with the student, and approved by the GSC Chair prior to the end of the third quarter of enrollment. The members of the committee should be consulted regarding the student's course program and proposed research. The GSC Chair should be advised in writing of any changes in the make-up of the Advisory Committee such as resignations, new appointments, etc.

The responsibility of completing all of the forms required for the Master's Examination that are to be signed by the GSC Chair falls under the responsibility of the Adviser.

6. Registration and Scheduling

The GSH clearly specifies the policies and procedures of graduate registration and scheduling (Part II, Section 2). In addition, all full-time FABE graduate students are expected to earn Graduate Seminar (FABE 850) credit. Each student shall be expected to present at least one seminar pertaining to their research at the FABE 850 seminar. Each student in the FABE graduate program must take the FABE 895 Professional Development Course.

7. Course Credit, Marks, and Point-Hour Ratio

The Department follows the policies and criteria of course credit, marks, and point-hour ratio defined in the GSH (Part II, Section 3).

8. Academic Standards

The Department follows the academic standards of the Graduate School as specified in the GSH (Part II, Section 4). A FABE graduate student who, in the opinion of his/her adviser, is not making reasonable progress toward the degree shall be reviewed by the GSC. If the GSC concurs, its chair shall recommend to the Dean of the Graduate School that the student be denied further registration in FABE.

9. Master's Degree Program

The Master's (M.S.) program, conducted in accordance with Part II, Section 4 of the GSH, generally constitutes either the student's first experience in research planning, conduct, and reporting under Plan A (thesis), or an opportunity to complete a coherent program of advanced courses under Plan B (non-thesis). The Department has a six-year limit on all M.S. programs; no credits earned prior to six years before award of the degree may be used to meet its requirements.

A minimum of 45 graduate credit hours is required for Plan A and 50 graduate credit hours is required for Plan B. No more than 15 credit hours of FABE 999 shall count towards the minimum for Plan A; none shall count toward Plan B. Therefore, the M.S. program for Plan A requires a minimum of 30 graduate credit hours of course work. Students in the M.S. Program are required to take no less than 3 credit hours in each of the following areas:

- (a) Major Field of Study (FABE): 3 credit hours required, 6 credit hours recommended
- (b) Numerical Methods for Engineers: 3 credit hours required
- (c) Engineering Mathematics: 3 credits required, 6 credit hours recommended
- (d) Experimental Statistics for Engineers: 3 credit hours required
- (e) Biological and Chemical Sciences for Engineers: 3 credit hours required

A detailed list of recommended courses in each of the six areas above can be found in Appendix B at the end of this document. Students who have already had some of the required courses as part of a previous curriculum are exempt from this requirement insofar as that course area is concerned however, the total course credit hour requirements of the M.S. program still apply. Advisers may substitute other courses for the above areas depending on individual graduate student needs however any deviations from the above requirements, requires approval of the Chair of the GSC.

The student shall develop the course of study in consultation with their adviser and Graduate Advisory Committee. The program should be submitted on Departmental Master's Program forms. These forms are available from the GSC Chair, and completed forms should be included in the student's departmental file prior to the end of the second quarter of enrollment. Changes can be made upon approval of the adviser.

An oral Master's Examination is held after the submission and preliminary approval of the thesis. The examination is conducted by a committee composed of the adviser (as chair) and at least two additional members of the Graduate Faculty of which one may be from another department. The responsibility of completing all of the forms required for the Master's Examination that are to be signed by the GSC Chair falls under the responsibility of the Adviser. Department policy permits other faculty and graduate students to attend the oral examination if the following provisions are met.

- At the time that the examination is scheduled, the departmental administrative assistant or designee notifies the faculty and graduate students of the examination.
- Those faculty and graduate students who wish to attend the oral examination shall notify the student's adviser at least 24 hours before the exam.
- The level of participation of non-committee members shall be strictly in keeping with Graduate School rules and within the discretion of the student's adviser.

During the first quarter of enrollment, the Plan A student should discuss research opportunities with the adviser and by the end of the second quarter prepare a written research proposal for the thesis. The purposes of early research topic definition are: (1) to provide focus to the student's program, (2) to allow the adviser and the Department Chair to plan and manage resources, and (3) to permit the student and adviser time to acquire appropriate instrumentation. Classroom learning and research discovery should proceed concurrently throughout the entire program.

An M.S. degree using Plan B (non-thesis) may be obtained provided that the student meets at least one of the following criteria: (1) has had other research experience and at least one refereed technical publication, (2) has a specific employment objective in which the additional course work would be more valuable than research experience, or (3) desires an intermediate degree while pursuing a Ph.D. program. The adviser should submit a letter to the GSC indicating the reasons for the Plan B degree along with supporting evidence. The final decision will be made by the GSC. If approved, the adviser will guide the student in planning the course program and to conduct the Master's Examination (Part II, Section 5.10.6). A minimum four-hour written Masters examination is required along with a two-hour oral examination. Satisfactory completion of the Ph.D. Candidacy Examination waives the Master's Examination (Part II, Section 5.10). For the Plan B option, the student must satisfactorily complete a special problem which provides in-depth design, analysis, or research experience.

10. Ph.D. Degree Program

Procedures and requirements for the Ph.D. degree are detailed in Part II Section 6 of the GSH. The Department does not require

preliminary or qualifying examinations. No foreign language is required.

A minimum of 135 graduate credit hours is required beyond the B.S. degree of which 90 hours are for courses, not including FAFE 999. Only 45 hours are allowed for the M.S. degree, unless the degree was received from OSU and the student's Advisory Committee approves additional hours. Course credit hours should normally be divided about equally among (1) Food, Agricultural and Biological Engineering (including 999 and 850), (2) basic sciences, and (3) area of specialization. At least one graduate FAFE course is required, not including FAFE 850. Students shall develop their course of study in consultation with their adviser and the other members of the student's Graduate Advisory Committee. The course work shall provide a concentration in a specific area, yet allow reasonable breadth of subject matter, being designed to foster both productive scholarship and a knowledge of FAFE in relation to allied fields.

It is the responsibility of the Graduate Student in the quarter of their Candidacy Examination to learn what they need to do in order to graduate. They must learn the deadlines, options, and forms necessary to graduate; then take the full responsibility of executing them in a timely manner. Attendance at the oral portion of the exam is limited to the student and the members of the Examination Committee. Successful completion of the Candidacy Examination requires a unanimously affirmative decision of the Committee. After satisfactory completion of the Candidacy Exam the student may be admitted to candidacy for the doctoral degree which signifies that the student is judged to be properly prepared to undertake work on the dissertation.

Departmental policy permits university faculty and graduate students to attend the Ph.D. Final Oral Examination. Attendance at these examinations is subject to the same policies as for the Master's Examination. These additional attendees may ask questions and provide comments only if permitted by the Examination Committee Chair. All additional attendees must notify the Chair of the Examination Committee of their intent to attend the Final Oral Examination at least one day prior to the examination and shall be excused when the candidate is excused for discussion, evaluation, and voting. The candidate will pass if there is no more than one negative vote cast by members of the Examination Committee.

Each Ph.D. student is expected to assist in teaching one undergraduate course for one quarter unless he/she has had previous college teaching experience. The duties to be performed and the schedule for completing this requirement will be developed for each student in consultation with the adviser and the course instructor.

11. Graduate Associates (GA)

Specific GA responsibilities depend on whether the appointment is as a Graduate Research Associate (GRA) or Graduate Teaching Associate (GTA). Both GRAs and GTAs should have duties in addition to their own thesis or dissertation research. These duties may include resident instruction, research, extension, administration and service on committees. Scheduling teaching assignments is the responsibility of the FABE Academic Affairs Committee Chair in consultation with the adviser. The responsibilities of the GRAs are determined primarily by the adviser. GRAs may also be required to teach.

Details of Graduate Associate (GA) employment at The Ohio State University are covered in Part II, Section 8 of the GSH. Terms for all Graduate Associate appointments in FABE shall be stated in a detailed letter from the Department Chair. To be eligible for Graduate Associateship employment, the student must meet minimum coursework requirements as outlined in Part II, Section 8.5 of the GSH. Most are for half-time, 12-month stipends, in which the student devotes 50 percent time to graduate studies and the other 50 percent, or 20 hours per week to departmental or research tasks (including time between quarters), with all tuition and out-of-state enrollment fees paid by the department or a sponsoring agency. A one-fourth time appointment which commits the student to 10 hours per week for the department (including time between quarters) may be available. In this case, only half the tuition and out-of-state fees will be paid by the department or a sponsoring agency. The GSC shall monitor quarter time appointments, especially, to assure that only 10 hours per week are demanded of the appointee. No official vacation time accrues for graduate students with GA appointments. Any leave, vacation, or time off shall be approved by the adviser and the Department Chair.

Associateship support from appropriated departmental funds generally may be made during any quarter of the year and may continue subject to the availability of funds, contingent upon satisfactory progress towards the degree, and maintaining a grade point average of 3 (based on a scale of 4.0).

Graduate Associate appointments and subsequent terminations, if necessary, will be in keeping with procedures and criteria outlined in Part II, Section 8 of the GSH. Most appointments, other than University and special fellowships, are dependent upon the timing, scheduling, and funding of non-state supported research. All reasonable efforts will be made to avoid termination notices for a quarter in which classes have already started.

Graduate Associates supported by state-appropriated funds will generally be appointed as GRA's or GTA's by the Department Chair in consultation with the Graduate Studies Committee Chair. Generally, associates will serve as GTAs for two of their first four quarters if they are M.S. students or for three of their first five quarters if they are Ph.D. students. The quarters for appointment as a GTA will be determined by departmental teaching

needs, graduate associate course load, and research project requirements. GTA's will assist in the departmental teaching program. GRA's will assist in the Departmental research program by ordinarily working on their thesis/dissertation research project. Graduate Associates supported by other than state-appropriated funds will be appointed in accordance with the terms of the supporting grant.

Graduate student appointments are terminated prior to the end of the appointment for any of the following reasons:

- (a) the GA is no longer enrolled in the Graduate School
- (b) the GA is registered for fewer than the required number of credit hours.
- (c) performance as a GA is determined to be unsatisfactory
- (d) the GA graduates
- (e) the funding source has insufficient funds.

Eligibility requirements listed above must be met in order to qualify for reappointment.

Evaluation of the GAs performance is the responsibility of the advisor or supervisor. Grievance procedures related to GA appointments are described in Section 11-8 of the Graduate School Handbook.

Every effort will be made to provide appropriate office facilities for GTAs and GRAs. Secretarial support for the teaching and research duties may be provided through the instructor (for GTAs) or adviser (for GRAs). *This does not include typing of thesis, dissertation or personal assignments.*

12. Fellowships and Traineeships

Outstanding incoming students are eligible for various University Fellowships (UF) or the Research and Graduate Council Fellowship (RGCF) through the Graduate School of The Ohio State University or for the Director's Fellowship through the Ohio Agricultural Research and Development Center (OARDC). Stipends for these Fellowships are similar to or greater than those for GAs. Fee waivers are also waived with these Fellowships.

To be eligible for Fellowship support, the applicant must indicate an interest by checking the appropriate box on the Admissions Office application form. Students must be nominated by the GSC to be eligible for these awards. Information regarding other fellowships and scholarships may be obtained from the Graduate School office; refer to the listings in the Graduate School Bulletin. Be aware of all stipulations on any fellowship or scholarship such as course load, GPA, etc.

13. Professional Ethics and Code of Student Conduct

Graduate students in FABE shall take personal responsibility to be aware and adhere to the laws, rules and regulations of the United

States, the State of Ohio, and the university. Conduct and ethics in research and coursework studies are special concerns for graduate students. Students are expected to be thoroughly familiar with and adhere to the Code of Student Conduct which is approved and published as Ohio Administrative Code 3335-23-01 through 3335-29-05. The complete code is published in the OSU Student Handbook and a synopsis of the Code is published each quarter in the Master Schedule of Classes.

It is extremely important for Graduate Students to uphold the standards of scholarship, research, and creative activity of the academic community. Specific instances of scholarly misconduct applicable to Graduate Students include, but are not limited to: falsification of data, deliberate misuses of data, plagiarism, and abuse of confidentiality.

Ethics deal with the standards of right and wrong, good and bad, or moral conduct and judgment. FABE students are obligated to follow and abide by the Code of Ethics of Engineers as published by ASAE.

Graduate Students in FABE shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession. The students should support the professional and technical societies of their disciplines. Students shall be completely truthful in all professional report and statements. They shall include all relevant and pertinent information in such reports and statements. Students shall admit and accept their own errors when proven wrong and refrain from distorting or altering the facts to justify their decisions. Students shall give proper credit for work to those to whom credit is due. Students shall endeavor to extend the public knowledge of engineering, and shall not participate in the dissemination of untrue, unfair, or exaggerated statements regarding their work.

14. General Concerns and Grievance Procedures

General graduate student concerns should be brought to the attention of the GSC through the graduate student representatives after thorough consideration by the Departmental Graduate Student Council (complete body of graduate students). If necessary, a GSC sub-committee will be appointed by the Chair of GSC to address special student concerns. Individual student grievances should be resolved on an informal basis, if possible, by discussion with the student's adviser, the GSC Chair, and/or the Departmental Chair. If resolution is not provided by recourse to these persons, grievance procedures which have been established by the Council on Research and Graduate Studies should be followed.

15. Special Departmental Procedures and Facilities

A. Computers

The Office of Information Technology (OIT) has computer facilities throughout campus and the FABE Department has several computers available in the building for general graduate student use. The systems in Room 120 and 120B are part of the College of Engineering computing facilities for the direct support of Resident Instruction programs, including courses such as FABE 999. The systems in graduate student access areas are intended primarily for use by faculty, staff, and graduate students.

The Department also has several other computer systems dedicated for use in certain labs and/or offices. Graduate students may use these systems only if authorized to use the related labs and/or offices.

Day-to-day management of these computers in graduate student office areas is provided by a committee of graduate students elected by the Graduate Student Council and approved by the Department Chair. **NO STUDENT MAY ADD, DELETE, OR IN ANY WAY MODIFY THE SOFTWARE AND CONFIGURATION OF THESE COMPUTERS WITHOUT THE APPROVAL OF THE CHAIR OF THIS COMMITTEE. BECAUSE OF LIMITED HARD DISK SPACE, NO USER FILES ARE TO BE STORED ON THE HARD DISK.**

Graduate students using these computers for research project work should have the project reimburse the graduate student computer account or replace the supplies consumed. This includes paper, toner, and plotter supplies.

B. Statistical Services

OARDC in Wooster has data processing equipment and a full-time statistician which are available to anyone working on an approved OARDC project. Full use should be made of this service. Statistical services are also available on the Columbus campus. The adviser must approve the statistical services before they are performed.

C. Thesis and Dissertation Preparation

Preparation of the thesis or dissertation is strictly the responsibility of the student.

D. Correspondence

Correspondence regarding requests for research data, acquisition of equipment by loan or gift, and other items which would involve long-term contracts shall be approved by the adviser or project leader to avoid duplication and keep requests in line with established policies. Because of personal acquaintance with other professional people, the adviser can often obtain information more expediently than

the student. However, direct correspondence by the student with other researchers is encouraged.

E. Shop Service

A limited amount of shop help is available on research projects, provided that requests are made in writing through the adviser. Occasional advice and assistance in construction do not require approval. Use of any equipment, supplies in stock, and stored apparatus must be cleared with the adviser and the head technician in the Department. All graduate students are to become familiar with, and must observe all Health and Safety precautions including use of eye and ear protection, as well as following the Departmental policies on shop procedures.

F. Transportation

OSU and OARDC cars and trucks are available for graduate students on project travel when the students are in compliance with State of Ohio rules, University rules, and Department rules at Columbus and Wooster. All people driving a University vehicle must have a valid Ohio Drivers license. The University rules are in the University Operating Manual, Volume II, Section 7. Rev. 9.95, Travel Policy and Procedures, pages 1-10. This manual is in the Administrative Associate's Office. The Department requires all students to complete proper forms necessary to drive state vehicles. These forms can be obtained from the Administrative Associate. Completed forms are to be returned to and maintained in the Administrative Associate's office. In Columbus the Department vehicles can be reserved on forms located in the Head Technician's Office in Room 145. Students in Wooster should check with the Administrative Associate for any variance in policy. In addition, mileage logs must be maintained and noted by recording the information on the forms which are kept in the Head Technician's Office.

G. Equipment and Supplies

Equipment and supplies are obtained for use in an OSU or OARDC approved project by approval of the project leader. These may be secured in the following way:

- (a) Regular requisition through official channels (allow several weeks for processing).
- (b) Open orders which are written in advance for a limited amount and for specific projects. These are normally written for OSU Stores and outside vendors. See project leader for forms and procedures to follow. Order number and project number are to be shown on all invoices.

- (c) Photocopying of personal materials on the Department Copiers (including course materials) may be done by graduate students at a cost determined by the Department, by using the graduate student copy card. This card is available through the Copy Card Administrator, a graduate student who manages use of the card.
- (d) Thesis and dissertation expenses, such as paper, typing, etc., needed for the first copy, are paid by the student. Photographic supplies are paid by the project and should be turned over to the project leader for filing. They are the property of the Department.

H. Laboratory Safety

All graduate students using hazardous materials, working in laboratories, or at construction sites are required to sign up for and attend the appropriate health and safety training courses. This includes taking the training required by the Occupational Health and Safety Act (OSHA).

I. Thesis Distribution and Cost Responsibility

<u># of Copies</u>	<u>Recipient</u>	<u>Costs to be Paid By</u>	
		<u>Reproducing</u>	<u>Bind ing</u>
1	OSU Library	Student	
		Student*	
1 or more	Student	Student	
		Student	
1	Adviser	Student	Student
2 to 5	Committee Members	Student	Department
1	Department Library, OARDC Department		
1 or more	Project Leader	Project	Project
7	Student (extra)	Student	Student

* Paid as thesis or dissertation fee to the Bursar no later than one week before graduation.

APPENDIX: A
FORMS YOU SHOULD KNOW, (For Students and Advisors)

Below is a list of forms which may need to be used during the graduate education of a student in the Department of Food, Agricultural and Biological Engineering (FABE). Please note that these forms are subject to change. The student and the adviser should always check with the Graduate School for the latest version of each form.

Forms which are available to students include:

- Request for Transfer of Graduate Credit
- Request for Transfer of Graduate Program
- Checklist for Master's Degree Procedures
- Application to Graduate Master's Degree
- Doctoral Notification of Candidacy Exam
- Doctoral Draft Approval Notification of Final Oral Exam
- Checklist of Doctoral Degree Procedures
- Guidelines for Teleconferencing and Doctoral Oral Examinations
- FABE Course Program

Forms which are sent to the Adviser or GSC include:

- Recommendation of Status Beyond the Master's Degree
- Master's Exam Report
- Master's Thesis Approval
- Candidacy Exam Report
- Final Oral Exam Report
- Final Approval Ph. D. Dissertation

(The following pages have copies of these forms.)

**Examples of Forms Available to Students
On Following Pages**

Forms Which Are Sent to
The Advisor or
Graduate Studies Chair

APPENDIX B
Department of Food, Agricultural, and Biological Engineering
M.S. Program Course Requirements
(Approved Sept. 26, 1997)

COURSES IN MAJOR -- (3 Hrs Required; 6 Hrs Suggested)

Food, Agricultural & Biological Engineering

- 625 Modeling and Design of Biological Systems** U G
4
Application of transport processes, enzyme kinetics and the simulation of plant and animal growth to the analysis and design of biological systems and processes.
- 645 Environmental Engineering of Agricultural Structures** U G
4
Functional requirements and principles involved in housing animals and crops; analysis of factors and properties affecting energy exchanges with the environment.
- 650 Design of Waste Management Systems**
U G 4
Application of bioengineering principles of pollution control in the design of management systems for wastes from food and fiber production, storage, and processing operations.
- 673 Design of Agricultural Water Management Systems** U G
4
Basic knowledge of water management principles and introduction to agricultural drainage and irrigation methods and their applications.
- 694 Finite Element Applications to Agriculture** U G
3
Currently not taught on a regular basis.
- 695 Professional Development** U G 1
Needs and programs for professional development in engineering related to food, agriculture, and environment; communication for professional advancement, engineering ethics, and responsibilities to society.
- 724 Capstone Design in Agricultural Engineering I** U G
2
Methodology of design; practice in the design and communication of a specific system within the student's area of specialization.

725 Capstone Design in Agricultural Engineering II U G

3

Continuation of 724.

773 Engineering Soil-Water Management

U G 4

Engineering design of systems with high potential for negative environmental impacts; livestock waste, rural landfills, and strip mine reclamation; related water storage and conveyance structures.

784 Advanced Food Process Engineering

U G

3

Application of heat and mass transfer, fluid flow, food properties, and food processing constraints in the design and selection of food process equipment.

810 Teaching in Engineering

G 3

Designed as initial preparation for instruction in professional engineering programs at the college level. Focuses on skills, strategies and issues common to university teaching in general and engineering instruction more specifically. Designed to introduce learner to pedagogical literature and research relevant to practicing teachers of engineering.

895 Professional Development

G 2

Overview of FASE and University requirements and procedures for a graduate program. Professional development topics pertinent to successful careers in research and development and academia.

NUMERICAL METHODS FOR ENGINEERS -- (3 Hrs Required)

Computer & Information Science

541 Elementary Numerical Methods

U G 3

Survey of basic numerical methods, number systems and errors of finite representation, solution of a single nonlinear equation, interpolation, numerical integration and solution of linear systems.

640 Numerical Analysis

U G 3

Analysis of numerical methods for ordinary differential equations, boundary values, and characteristic value problems, splines, nonlinear equations, approximation of functions, standard mathematical software libraries.

Mathematics

707 Numerical Methods in Scientific Computing I

G 3

Numerical simulation of dynamic systems and evolution equations, linear and nonlinear systems, boundary value problems, bifurcation diagrams, form fit of data, interpolation and approximation theory.

708 Numerical Methods in Scientific Computing II

G 3

Continuation of 707; numerical quadrature, integral equations, iterative procedures, multi-grid techniques, computation of eigenvalues and eigenvectors, Hopf bifurcation and optimization.

709 Numerical Methods in Scientific Computing III

G 3

Numerical solution of ordinary differential equations, consistency, stability and convergence, reaction/diffusion equations, phase diagrams, domains of attraction, strange attractors and chaos.

727, 728 and 729, Scientific Computing Laboratory I, II and III

Designed to teach the computational tools required to write and use numerical codes to study physical systems.

ENGINEERING MATHEMATICS -- (3 Hrs Required; 6 Hrs Suggested)

Mathematics

512 Partial Differential Equations and Boundary Value Problems

U G 3

Fourier series, orthogonality relations, vibrating string, steady state heat, Laplace transform, and applications.

513 Vector Analysis for Engineers

U G 3

Vector algebra, vector operators, line integrals, vector integral theorems, curvilinear coordinates; applications.

514 Complex Variables for Engineers

U G 3

Introduction to complex variables, analytic functions, complex integral theorems, power series, residues, conformal mapping.

556 Differential Equations I

U G 3

Systems of linear, first-order differential equations, existence and uniqueness theorems, numerical methods, qualitative theory (phase plane analysis, linearization, stability, limit cycles), and physical applications.

557 Differential Equations II

U G 3

Sturm-Liouville theory, partial differential equations in three or more variables, nonhomogeneous problems, Green's functions, physical applications.

571 Linear Algebra for Applications I

U G 3

Linear systems of equations; vector spaces, matrices, linear operators; inner products, projections and least squares, approximations or eigenvalue problems; applications.

572 Linear Algebra for Applications II

U G 3

The eigenvalue problem or inner product spaces, projections and least squares approximation; classification of operators and quadratic forms; applications.

601 Mathematical Methods in Science I

U G 5

Real and complex vector spaces, inner product spaces, linear operators, matrices, eigenvalue problems, normal operators, real and Hermitian forms; applications to physics and engineering.

602 Mathematical Methods in Science II

U G 5

Linear differential equations, solutions about singular points; Sturm-Liouville problems; Bessel functions, Legendre functions; Green's functions; Orthogonal expansions; Laplace's equation and boundary value problems.

701 Mathematical Methods in Science III

U G 5

Introduction to tensor analysis with applications to geometry; elements of the calculus of variations with applications to physical problems.

EXPERIMENTAL STATISTICS FOR ENGINEERS -- (3 Hrs Required)

Statistics

520 Mathematical Statistics I

U G 5

Probability, random variables, discrete and continuous distributions; binomial, Poisson, normal, gamma (chi-square), t, F, distributions, change of variable and moment-generating function techniques; order statistics; limit theorems.

521 Mathematical Statistics II

U G 5

Confidence intervals; minimum variance unbiased estimation, maximum likelihood estimation; Neyman-Pearson theorem, uniformly most powerful tests, likelihood ratio tests, chi-square and F tests, nonparametric tests.

528 Data Analysis I

U G 3

Non-calculus treatment of descriptive statistics, statistical inference, goodness of fit, use of t, X^2 in one sample situation.

529 Data Analysis II

U G 3

Two samples tests, non-parametric one and two sample procedures, regression analysis, one and two way analysis of variance.

641 Design and Analysis of Experiments

U G 5

The linear model for experimental designs; analysis of variance; factorial experiments; and block designs.

645 Applied Regression Analysis

U G 5

Simple and multiple linear regression, diagnostics, model selection, models with categorical variables.

BIOLOGICAL & CHEMICAL SCIENCES FOR ENGINEERS -- (3 Hrs Required)

Plant Biology

630 Plant Physiology

U G 3

Advanced study of plant physiology; solutions, diffusion, osmotic quantities, transpiration, absorption and translocation of water, protein metabolism, enzymes, and respiration.

631 Plant Physiology

U G 3

Advanced study of plant physiology; pigments, photosynthesis, carbohydrate and fat metabolism, absorption of mineral salts, translocation of solutes, regulation of plant growth, and development.

632 Physiological Ecology of Plants

U G 5

Physiological relationships between light, water, and mineral nutrients and plant growth including plant-insect and plant-microbe interactions.

Evolution, Ecology & Organismal Biology (EEOB)

617 Theoretical Ecology I

U G 5

The models, assumptions, and conclusions of the mathematical theory of ecology, including stability notions, deterministic and stochastic models, and models for patchy environments.

Microbiology

509 Basic and Practical Microbiology

U G 5

Provides an understanding of microorganisms and their interactions with the human experience.

520 General Microbiology I

U G 6

Fundamental principles of microbiology and the characteristics of microorganisms with an emphasis on their structure, metabolism, growth, and classification.

521 General Microbiology II

U G 6

Continuation of 520; basic principles of microbiology with an emphasis on bacterial genetics, ecology, and applied and pathogenic microbiology.

Biochemistry

511 Introduction to Biological Chemistry

U G 5

An introductory course in biochemistry dealing with the molecular basis of structure and metabolism of plants, animals, and microorganisms.

512 Biochemistry of Physiological Processes

U G 5

The biochemical basis for physiological processes in higher animals; topics include digestion and absorption, respiration, blood function, kidney function, and endocrine control.

635 Plant Biochemistry

U G 5

The biochemistry of plants, emphasizing the similarities and differences as compared to other life forms.

Chemistry

531 Physical Chemistry

U G 3

The fundamental course in physical chemistry.

532 Physical Chemistry

U G 3

Continuation of 531.

35

533 Physical Chemistry

U G 3

Continuation of 532.

